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THE MOBILEDNA (DIGITAL NARRATIVE APPROACH): SUPPORTING COLLABORATIVE CREATIVITY IN MOBILE MOVING MEDIA PRODUCTION

P.H.D

2009

INMACULADA ARNEDILLO-SÁNCHEZ

THE MOBILEDNA (DIGITAL NARRATIVE APPROACH): SUPPORTING COLLABORATIVE CREATIVITY IN MOBILE MOVING MEDIA PRODUCTION

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for the degree of

Doctor of Philosophy

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October 2009

DECLARATION

The work presented in this thesis is, except where otherwise stated, entirely that of the author and has not been submitted as an exercise for a degree at this or any other university.

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DEDICATION

This thesis is an homage to the pillar, and role model of my life, my mother Señora Doña Mª Ángeles Sánchez-Olóndriz. For a life of unconditional love, and dedication to one of her numerous successful projects in life: Our Family; I am deeply honoured to have inherited your morals of life, and work ethics, and your determination. Without it, I would have never made it.

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ABSTRACT

Collaboration and creativity are beneficial for learning. While collaboration involves conflict, articulation and co-construction, creativity banks on the interplay between divergent and convergent thinking. Collaborative creativity requires developing common understanding, engaging in discussion, and sharing knowledge resources. Moving media production engenders opportunities for collaboration, and encourages creativity and self-expression. However access to technology, time investment, and the lack of pedagogical methodologies, are impediments for the adoption of the activity as a teaching and learning tool.

The advent of mobile technology, and the penetration of mobile telephones in society, has contributed to the phenomenon of user-generated content. While this promotes the democratization of media production and offers potential for learning, mere access to technology may lead to indiscriminate use.

This thesis is a qualitative multiple case study which designs, develops, implements, and evaluates a pedagogical methodology, the mobileDNA, to support and scaffold collaborative creativity in moving media production with mobile technology. To achieve this objective an investigation in two stages was conducted: 1. *An iterative design process* to devise the methodology, involving 12 exploratory case studies with 56 participants; 2. *The evaluation of the methodology* arising from the first stage of the research, through 9 explanatory case studies conducted with 60 participants. A participant researcher approach was adopted and data collected through video recording, observation, and interviews. Data sets comprise the video recordings of the sessions and the 'Diary Room', interviews, the researcher's journal, the scripts and media assets created by the participants, including the productions at different development stages, and the final Digital Narratives (DNs).

The iterative design process was aimed at identifying the resources, tasks, roles, activities, group formation, tasks distribution, sequencing, and orchestration models, likely to create conditions for the emergence of collaborative creative interactions. The results from this process led to the articulation of the mobileDNA. The objective of the evaluation was to examine how the mobileDNA supported collaborative creative interactions and to extract design implications for tools to support this type of activities. Findings illustrated that the mobileDNA supported participants to engage in collaborative collective divergent and convergent thinking, synchronous productive engagement, and productive fashioning reviewing, underpinned by cognitive synchronicity. Technology played an instrumental role in enabling the aforementioned processes and interactions.

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CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

There is lack of understanding on the use of moving media production as a 'generic' teaching, and learning tool outside the scope of media studies. While authors report it motivates students (Ryan, 2002), promotes ownership (Kearney & Schuck, 2005), draws on the students' out of school interest (Parker, 2002), and supports authentic learning (Kearney & Schuck, 2005) in a variety of curriculum areas (Kearney & Schuck, 2006), access to technology, time investment, and most importantly, the lack of appropriate pedagogical methodologies (Burden & Kuechel, 2004; Reid et al., 2002) represent difficulties for the wide adoption of the activity as a teaching, and learning tool.

Studies on the use of moving media production such as Digital Film Making (DFM), and Video Production (DVP), agree that they provide opportunities for collaborative learning (Buckingham, 2003; Burn, 2001), and encourage creativity and self-expression (New, 2006; Swain et al., 2003). While these studies (ibid) describe the incidental occurrence of collaborative, and creative interactions, authors indicate that by and large, collaboration occurs under specific conditions (Dillenbourg et al., 1996). Structuring collaborative situations so as to set up conditions under which collaborative interactions are likely to occur is widely addressed in the field of CSCL (Computer Supported Collaborative Learning). Similarly in relation to creativity, the literature outlines elements of learning environments conducive to creative developments (Craft, 2005; Loveless, 2002), and strategies for teaching for creativity (Craft, 2005). Thus, in order to bank on the potential of moving media production to promote collaborative creativity, the design of these type of learning experiences should be explicitly informed on pedagogical principles of collaboration, and creativity.

Initiatives embracing DFM to support curriculum learning, such as FÍS[1] (vision in Irish); and Films for Learning[2], exist. The foregoing, and the above cited research on moving media production are characterised by the adoption of professional film making approaches, and procedures. While these have provided well-established 'ready-to-go' frameworks for the use of DFM for leaning, it has also led to the adoption of their intrinsic 'constraints'. Namely, a focus on aesthetic value, requiring quality image, and sound, as well as media language beyond media consumer level, hierarchical team structures adhering to horizontal labour division, and workflow patterns based on commercially cost-efficient models, among others.

[1] FÍS[1] (The Film for Primary Schools) http://www.fis.ie/
[2] Films for Learning http://community.filmsforlearning.org/

Whereas the previous appears appropriate within the domain of media studies, imposing professional film making parameter requirements in moving media production may be counterproductive to the promotion of collaborative creative interactions.

The advent of mobile technology, and the increasing penetration of camera-phones in global society have contributed to the phenomenon of user-generated content. It has also witnessed the emergence of numerous studies on the social practice of using camera-phones (Kindberg et al., 2005b; Okabe, 2004; Scifo, 2005), the creation and sharing of images (Antti et al., 2006; Crabtree et al., 2004; Van House et al., 2005), and mobile learning projects involving some degree of media capture (Grant et al., 2007; Kurti et al., 2006; Loveless et al., 2007). While access to technology has invigorated the democratization of moving media production, and offers potential for learning, mere access to technology may lead to indiscriminate use (Buckingham et al., 1999; Sefton-Green, 2005). Thus, to harness the wide accessibility of multimedia capable mobile phones to enable pedagogically sound media authoring approaches remains a major challenge.

Against this background, the present qualitative study attempted to address the foregoing gap in current knowledge. In so doing, it aimed to design, develop, implement, and evaluate a pedagogical model to support, and scaffold collaborative creativity among distributed participants engaged in the creation of multimedia digital narratives (DN) with mobile technologies. This enabled the author to investigate questions in relation to the design, development, and implementation of workflows, and orchestration models that, availing of the features of mobile technologies, create conditions for collaborative creative interactions to occur.

1.2 BACKGROUND AND CONTEXT

This thesis is grounded in three main areas of research as they apply to teaching, and learning. They are collaboration, creativity, and moving media production. In addition, is it is concerned with studies in the field of mobile learning that have addressed one, or more of the foregoing areas. This section frames the thesis within the pertaining literature, and provides a brief theoretical rationale.

Collaboration and creativity are beneficial for learning. Collaboration involves conflict, articulation, and co-construction (Crook, 1994) enabling knowledge acquisition from peers (Dillenbourg, 1999). Advocates of creativity highlight its value in supporting 'possibility thinking' in making choices in life (Craft, 2000a). Engaging learners in creative learning brings about divergent, and convergent reasoning (Goldstein, 2001) encompassing processes such as

exploration, and experimentation (Edmonds & Candy, 2002), and fashioning and judging value (Cropley, 2001). The essence of collaboration resides on the joint development of understanding, implying transformation, and reflection (Facer & Williamson, 2004). Grounding, the interactive process by which mutual understanding is constructed, augmented and maintained, is a required prerequisite for collaboration to occur (Baker et al., 1999). Collaborative creativity requires developing a common understanding, engaging in discussion, and sharing knowledge resources (Weakley & Edmonds, 2004).

The role technology can play in supporting collaboration, and creativity for learning is widely recognised. Features of Information Communication Technology (ICT), for instance, interactivity, capacity, range, and speed, facilitate creative processes such as developing ideas, establishing connections, and creating and making (Loveless, 2002). Similarly, CSCL tools can contribute towards engineering productive social interactions, for example, by controlling data access, reinforcing interaction rules through semi-structured interfaces, and providing peers and facilitators with group and self-regulation tools (Dillenbourg, 1999). Notwithstanding the difference technology makes, the qualifying distinction in technology enhanced learning (TEL) remains the pedagogical approach, and the conditions under which teaching, and learning occur. To this end, while CSCL macro-scripts describe didactic models to structure collaboration, and foster the emergence of knowledge-productive interactions (Dillenbourg & Hong, 2008); orchestration defines the role of teachers in managing the cognitive, pedagogical, and practical aspects of CSCL environments (Dillenbourg & Fischer, 2007).

Media production activities, such as DFM and DVP, provide opportunities for collaborative learning (Buckingham, 2003; Burn, 2001), encourage creativity, and self-expression (Reid et al., 2002), as well as deeper thinking (Swain et al., 2003), and draw on students' out-of-school interest (Parker, 2002). Despite the learning benefits of moving media production, access to technology, the costly time investment, and the lack of appropriate pedagogical methodologies (Burden & Kuechel, 2004; Reid et al., 2002) still represent difficulties for the adoption of this practice as a teaching, and learning strategy. While limitations imposed by the restricted availability of equipment may work to the advantage of group work, technology dependent activities such as filming and editing, offering the greatest learning benefits (Becta, 2003b), become impractical as a whole group activity (Arnedillo-Sánchez & Tangney, 2006). Moreover, traditionally sequential, and time consuming approaches to DFM and DVP, involving planning, scripting, storyboarding, filming, and editing, further affect the prospect of whole group synchronous participation in all phases of the process, and impose time demands (Arnedillo-Sánchez, 2008).

The advent of mobile technology, and the high penetration of camera-phones in global society has contributed to the phenomenon of user-created multimedia content. While this stimulates the democratization of media production, improves technology access, and offers potential for learning, mere access to technology may lead to indiscriminate use (Buckingham et al., 1999). To this end, mobile learning research studies how learners' mobility, supported by personal and public technology, can contribute to the process of gaining new knowledge, skills, and experience (Sharples et al., 2009).

1.3 RESEARCH OBJECTIVES AND CONTRIBUTIONS

This thesis is a qualitative multiple case study, which examines the use of mobile technology to facilitate, and scaffold collaborative creativity among distributed participants engaged in moving media production. Additionally, the thesis proposes a methodology, named mobileDNA (Digital Narrative Approach), to support the foregoing. The study instantiates moving media production through the creation of DNs entirely shot on camera-phones. In particular, the thesis investigates:

> ***The design, development, implementation, and evaluation of a pedagogical methodology to support, and scaffold collaborative creativity in moving media production with mobile technology.***

Arising from the foregoing, the thesis examines the following subset of questions:

- What resources, tasks, roles, and activities engender conditions conducive to the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What group formation, task distribution, and sequencing enable workflows which trigger the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What kind of orchestration is appropriate to foster, and develop capabilities to engage in learning experiences based on productive, collaborative, and creative moving media production?
- How does the mobileDNA support, and scaffold collaborative and creative processes of moving media production?
- What are the design implications for tools to support collaborative creative moving media production, with mobile technology, arising from this study?

The thesis contributions are:

- The design, development, and implementation of the mobileDNA.
- The evaluation of the mobileDNA.
- The mC^2 Macro-script (mobile collaborative creative).
- Design principles for the DNT (Digital Narrative Tool).
- Insights into the teaching, and learning implications arising from this study.

1.4 THE MOBILEDNA (DIGITAL NARRATIVE APPROACH)

The mobileDNA is a pedagogical methodology, designed and developed by the author, which utilises features of mobile technology to scaffold, and support collaborative creativity among a group of distributed learners engaged in collective moving media production. It encompasses an entire media authoring process, from idea generation to final production, and involves the creation of a multimedia DN in approximately four hours. Although it is informed by traditional filming approaches (Fig. 1), and principles, it differs from these in that the mobileDNA: a) short-circuits their planning, scripting, and storyboarding phases; and b) parallelises shooting and editing (Fig. 2). Thus, it enables the synchronous participation of a group of distributed learners in all phases of the production, and lowers the time demand barriers. It's a three-phase task-oriented activity, involving *Story Generation*, *Shooting & Editing*, and *Production & Screening*.

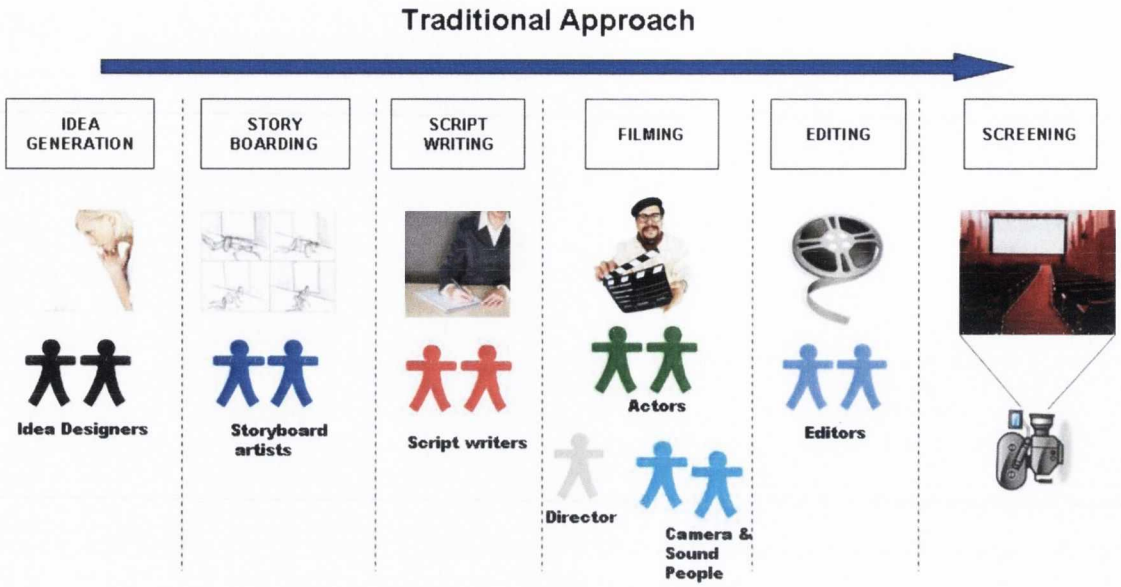

Fig. 1 Traditional versus mobileDNA media production model

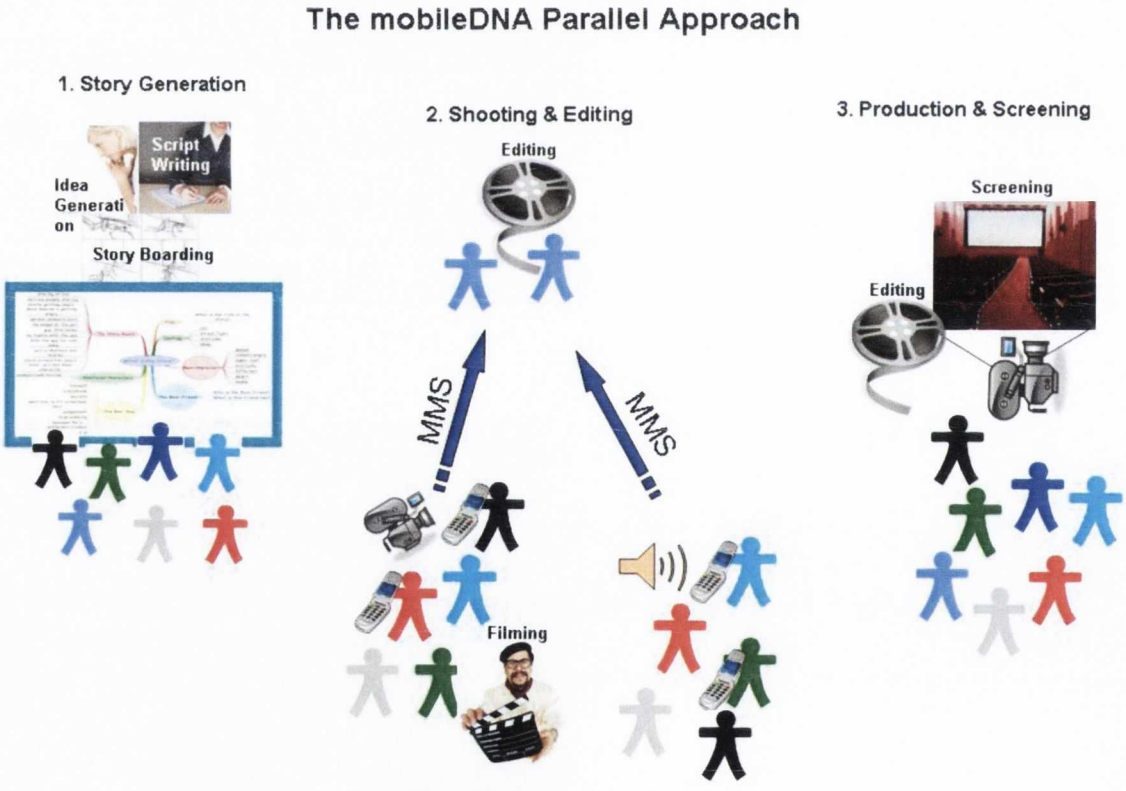

Fig. 2 The mobileDNA media production model

Initially the participants, scaffolded by a Scripting Tool, and a facilitator, collaboratively create a story. They are then divided into three groups: the *Image Group*, in charge of creating the visuals, and acting the parts; the *Sound Group*, charged with creating the audio, be it dialogues, narrations sound effects, or tracks; and the *Editing Group*, in charge of

assembling the media created by the other two groups. With the Script in-hand, the Image and Sound groups, separately go on location to shoot the story, while the Editing group stays in the Editing Station (EdS). As the media is captured with the mobile phones, it is transferred via Multimedia Messaging Service (MMS) to the editors, who can start editing shortly after the Image, and Sound groups have arrived on location and start generating media. By the time crew, and cast are back in the EdS, a first version of the DN is ready for viewing. While viewing the DN in the making, the group engages in a critical review of their production. Once the group is satisfied with their production, the DN is ready for screening.

1.5 THESIS STRUCTURE

Chapter Two presents a review of the literature on collaboration, creativity, and moving media production, within the context of TEL. It also examines a sample of mobile technology projects in the context of the foregoing areas of research. The various sections in the chapter discuss, and analyse concepts underpinning teaching and learning approaches in each field. The chapter provides the theoretical rationale for the present study, and concludes by outlining the open questions to be addressed by it.

Chapter Three presents, and discusses the research methodology adopted for the thesis. It roots the decision for the adoption of a multiple case study methodology in the complexity, and nature of the phenomenon under investigation. It describes the two phases of the research: 1. the iterative design process to devise the mobileDNA, involving 12 exploratory case studies; and 2. the evaluation of the mobileDNA, comprising 9 explanatory case studies. The chapter also outlines the data collection tools, the data sets, and the approach to data analysis.

Chapter Four is concerned with the iterative design process leading to the articulation of the mobileDNA. It begins by outlining the statements of purpose adopted for the first iteration of the methodology. It then provides an overview of the 12 exploratory case studies conducted, providing information regarding the task, procedure and technology utilised, the context and participants, and the data sets. It proceeds by presenting the cases, and it concludes by discussing the findings, and addressing the first three research questions of this thesis.

Chapter Five presents the mobileDNA. It describes its three phases, and the activities, tasks, and roles associated with each phase. It outlines the workflows, and mechanisms enabling the collective creation of a DN, and highlights the features of mobile technologies

that support the foregoing. The chapter also presents the technology used in the mobileDNA and suitable group organisation, and working space layout.

Chapter Six provides a thick description of 2 of the 9 explanatory case studies conducted to evaluate the mobileDNA. In addition, it presents details regarding the context and participants, duration, and procedures of the cases. The chapter extract relevant episodes from the data that portray the kind of collaboratively creative interactions that take place and how these are triggered, enabled, and scaffolded by the mobileDNA.

Chapter Seven discusses the findings of the evaluation of the mobileDNA, and addresses the two remaining research questions of this thesis. In so doing, it presents the mC^2 Macro-script arising from this study. The chapter then discusses difficulties encountered by the participants due to the lack of interoperability among the various tools utilised for the mobileDNA. Arising from these difficulties the chapter puts forward the design for the DNT (Digital Narrative Tool).

Finally, Chapter Eight summarises how the research questions have been addressed, outlines the limitation of this study, and provides recommendations for future work.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter sets the present study in the context of the relevant literature pertaining to the areas of technology enhanced collaboration, creativity, and moving media production. It examines how the use of technology may affect these, and suggests the exploration of mobile technologies to support the development of alternative collaborative creativity approaches to moving media production. The chapter is structured in four sections.

Section 2.2, Computer Supported Collaborative Learning (CSCL), provides a historical overview of the development of this area of research. It reviews definitions of collaborative learning (CL) within the field. It presents two dimensions: collaborative situations, and interactions relevant to the design of CSCL experiences. Within the context of the foregoing, the role a/symmetries of knowledge, action, and status, as well as the importance of working together towards a shared goal in the emergence of collaborative interactions, is discussed. Regarding the latter, CSCL scripting approaches to designing learning scenarios are investigated. Against this background, studies with mobile technologies aimed at supporting collaborative learning are presented. The section concludes with a summary.

Section 2.3, Creativity and Technology, begins by examining definitions of creativity and proposing a pedagogically mindful articulation of the same. It presents and analyses different frameworks for creativity such as High, Little-C, and Mini-C. The section proceeds by exploring teaching and learning approaches for supporting the emergence of creativity and for teaching and learning creatively. Against this background, projects with mobile technologies addressed at scaffolding the development of creativity are presented. The section concludes with a summary.

Section 2.4, Digital Moving Media Production, starts by outlining reasons which have contributed to the democratisation of the process. It examines the influence of traditional film making approaches on media projects outside the specific scope of media studies, and analyses the learning benefits the practice can support. It presents and discusses teaching and teacher training approaches for moving media production, and investigates the learning associated with authoring. In particular, it considers filming and editing, and how these may provide a context for collaboration and creativity. Against this background, projects with mobile technologies which explore media authoring are presented. The section concludes with a summary.

Section 2.5, Discussion, concludes the chapter by providing a discussion of the literature and analysing the synergies among the various areas. It articulates how principles from CSCL, creativity, and moving media can be intertwined to design a mobile learning approach to media production aimed at supporting the emergence of collaborative creativity among co-authors. The section concludes by outlining the challenges of the aforestated proposition.

2.2 COMPUTER SUPPORTED COLLABORATIVE LEARNING

The field of CSCL is reasonably young, with early work dated from the late eighties. Authors argue that it emerged as a reaction to software that forced students to work alone (Stahl et al., 2006), and as a means to address the disregard educational technology had demonstrated towards collaborative learning for over twenty years (Dillenbourg et al., 2008).

The field has evolved in three phases. The first, 1990-1995, yielded the understanding that collaborative learning is the product of the effort required to construct shared understanding, and that interactions to obtain this common ground can be engineered using CSCL tools (ibid). Social interaction was proposed as a cognitive resource (Miyake, 1986) and Piagetian principles were used to investigate how this asset affected individual learning (Doise, 1990). Much of the earlier work during this period focused on comparing the benefits of learning in groups versus learning individually (Slavin, 1995). The emphasis on studying personal achievement was also present in research informed by the socio-cultural school of thought. In general, solo-learner models pervaded, even within constructivist paradigms (Crook, 1994). Learners' individual benefits of working in groups, such as more achievement, higher productivity; and increased factual information, were reported (Johnson et al., 1986). However, the inappropriateness of examining cognitive and social processes separately, given their circular causality was acknowledged (Perret-Clemont et al., 1991).

During the second phase, 1995-2005, expertise in the design of CSCL systems and activities was accrued (Dillenbourg et al., 2008). The emphasis shifted from investigating individuals to examining groups and their social interactions. From the studies the interaction paradigm emerged (Baker et al., 2007; Dillenbourg & Traum, 1996). The focus of the research was to investigate collaborative processes to identify the interactions that took place, their pattern of occurrence, and how these triggered certain cognitive effects (Dillenbourg, 2000). The development of specific CSCL applications aimed at supporting critical enquiry skills, and knowledge building, such as the well known examples of Belvedere (Suthers & Jones, 1997), CoVis (Edelson et al., 1996), or CSILE (Scardamalia & Bereiter, 1996), proliferated. Studies

with generic tools like forums, emails, or chats also took place (Dillenbourg & Fischer, 2007). The third phase, from 2005 to the present, is dominated by the outlook of the disappearance of CSCL as a distinct approach. The field is moving towards a broader conceptualization of CSCL. This is underpinned by the notion of integrated learning which is characterized by scenarios and episodes where the differentiation between activities with, or without, technology has became trivial (Dillenbourg & Fischer, 2007).

The first studies on how computers could be used to improve group work are dated 1984, when Greif and Cashman coined the term Computer Supported Cooperative Work (CSCW) (Grudin, 1994). The controversy over whether both terms, CSCL and CSCW, are interchangeable because they broadly define the same concept is an open question. However, principles articulated in pioneering CSCW in educational settings (Johnson et al., 1985), have informed CSCL research, and still inform the design of emerging mobile CSCL (See Cortez et al., 2005; Zurita & Nussbaum, 2007). In an attempt to distinguish the two approaches, some authors (Dillenbourg, 1999; Roschelle & Teasley, 1995; Stahl et al., 2006) have argued that the difference resides in how the work is divided and executed by the members of a group. In cooperative scenarios, the work is divided into subtasks which are performed by different members, and assembled at the end to obtain the group's output. In collaborative activities, the members of a group work together in a collective effort to complete the tasks.

On the one hand, Johnson & Johnson (1999b) define cooperative learning as a structured situation in which learners work together towards the achievement of shared goals. They seek mutually beneficial results, and help each other to understand by discussing their work. The performance of individual group members is checked in order to ensure everyone is contributing and learning (p. 68). On the other hand, Schrage (1990) defines collaboration as the shared creation of understanding involving two or more people with complementary skills (p.40). Furthermore, Roschelle & Teasley (1995, p. 70) sustain that:

> ***"Collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem".***

These definitions highlight core elements of collaborative scenarios. For instance, Johnson & Johnson specify the need to structure the situation. Putting learners together to perform a collaborative task may not be enough to achieve collaborative learning (Weinberger et al., 2008). Though in so doing, spontaneous collaboration leading to learning episodes may take place. Unplanned 'collaborative' activities leave students to flounder, and waste time;

such activities fail to yield learning benefits from interaction (Barkley et al., 2005). They defeat the purpose of the practice since successful collaborative leaning rests upon effective interactions among learners (Kobbe et al., 2007). The pursuit of a shared goal creates interdependences and group cohesiveness triggering greater personal and group accountability and more commitment towards the fulfilment of the task (Johnson & Johnson, 2005). Checking performance, similar to informing the group of the need for homogenous participation, reduces social loafing and free riding (Kerr, 1983). The construction of shared understanding invokes the need for effective communication (Meier et al., 2007) to reach a common ground in relation to ideas, assumptions and expectations (Clark, 1996). This is an interactive processes that involves the transition from divergent individual perspectives to collaborative knowledge building (Puntambekar, 2006). To this end, three main categories of interactions are said to facilitate learning: explanation, argumentation/negotiation and mutual regulation (Dillenbourg et al., 2008). Complementary skills suggest some level of asymmetry of knowledge among people, and echo the notion of the Zone of Proximal Development (ZPD). Thus, the difference between what one can do alone and with the help of a more knowledgeable one (Vygotsky, 1978). In sum, the definitions indicate that:

> ***"Collaborative learning describes a situation in which particular forms of interaction among people are expected to occur, which would trigger learning mechanisms, but there is no guarantee that the expected interactions will actually occur. Hence a general concern is to develop ways to increase the probability that some types of interaction occur" (Dillenbourg, 1999, p. 7).***

Against this background, Koschamann argues that CSCL investigates collective meaning making, its practices, and how these are mediated by artefacts (2000, p. 18). However, technology by itself, no matter how sophisticated or cleverly designed, cannot change the practices of meaning making (Stahl et al., 2006). Research has consistently demonstrated that technology alone is not an effective teaching and learning tool (Kulik et al., 1985). Its function, within the context of learning as a shared construction of understanding, is to mediate collaboration and disambiguate language (Roschelle & Teasley, 1995). It enables the creation of frameworks within which communication takes place in relation to points of shared reference (Crook, 1994), and it provides additional communication channels within which actions as well as verbal interactions constitute communication acts (Roschelle & Teasley, 1995).

CSCL encompasses a wide spectrum of situations ranging from asynchronous to synchronous, and from distance to face-to-face (Stahl et al., 2006). As technology develops and more artefacts are being designed for multiple users, the notion of personal computers is fading away and the idea of interpersonal computers is emerging (Dillenbourg et al., 2008). Mobile technologies afford specific collaboration processes in which experiences become less virtual and more real (ibid). CSCL scenarios are transitioning from computer environments to the real world, and they co-exist in both. In this increasingly varied and changeable context, CSCL scripts emerge as an approach to set up and facilitate effective collaborative learning across virtual and real worlds (Weinberger et al., 2008). Scripts attempt to increase the probabilities of knowledge generative interactions, such as explanation or mutual regulation, taking place during collaboration (Dillenbourg & Tchounikine, 2007). They are underpinned by the idea that collaborative learning by itself is neither effective, or ineffective (Dillenbourg & Traum1996). It works under certain conditions which incorporate an extensive set of factors such as the CSCL tools, the pedagogical scenarios (Dillenbourg, 2000), and the emotional plane (De Jong et al., 2005). The following section of the literature explores factors at play in collaborative situations.

2.2.1 COLLABORATIVE SITUATIONS

Dillenbourg (1999) outlines three criteria that characterise collaborative situations: symmetry among peers; a common goal; and collective work. The first refers to three types of symmetries: symmetry of knowledge, comprising the extent to which members of a group have similar levels of knowledge; symmetry of action, including the degree to which all members of a group can perform the same actions; and symmetry of status, encompassing the extent to which all participants have a comparable status within the community.

2.2.1.1 SYMMETRY OF KNOWLEDGE

De Jong & Fergusson-Hessler (1996) describe five types of knowledge: *situational*, which refers to knowledge about situations as they normally take place in a domain; *conceptual*, relating to factual knowledge of an area; *procedural*, extending to acceptable actions or manipulations within a field; and *strategic*, describing a sequence of actions leading to solutions. Novice and experts differ not only on the degree of domain-specific knowledge they possess, but also on its structure. Experts build schemata, or scripts containing larger units of information (Chi et al., 1981; Dufresne et al., 1992). They are said to hold tacit knowledge which is put to use in automatic continuous flow (De Jong & Fergusson-Hessler, 1996). Novices instead need to make their knowledge explicit, and take a step-by-step approach. The knowledge available to learners, and how this is exchanged, is relevant for collaborative

problem solving. Knowledge at the disposal of peers can range from completely disjointed and unrelated, to disjointed but complementary, and to partially overlapping or quasi identical (Hoppe & Ploetzner, 1999). The degree of knowledge exchange can vary from interchanging achieved results, to single generic or specific units of information, to complete general or concrete explanation structures. While the commutation of achieved results might not be very challenging, the exchange of elaborated explanations might be overwhelming (ibid).

According to Piaget (1932) coupling children with adults brings about situations of asymmetry of power and status which interferes with the children's exploration of their environment, and hence impedes their development of understanding. Explanations are more likely to take place when groups are discreetly heterogeneous (Webb, 1991), and in interactions between peers (Hogan et al., 2000). A reason for this is that adult-child interactions may not be reciprocal if controlled by the adult (Dillenbourg et al., 1996). The adult-child dilemma has informed peer-tutoring research which identifies requirements for this to be effective. For instance, the peer-tutors have to be proficient on the task, able to reflect on their work, and capable of evaluating the peers' performance, and of producing the subsequent suitable intervention (Rogoff, 1991). These are demanding tasks that learners may not be able to undertake when left to their own devices since, in these occasions, they rarely engage in productive interactions such as asking questions, providing explanations, justifying opinions, or reflecting on their knowledge (Barron, 2003). Learners may also lack procedural knowledge on how to learn together (Weinberger et al., 2008), or adopt a weaker position in argumentation when they perceive other members of the group to be more expert (Dillenbourg, 1999).

In addition to possessing various types of knowledge, collaborative partners can benefit from utilising tools to interact and construct shared understanding. Although dialogue is the most important resource for collaboration (Roschelle & Teasley, 1995), at times learners may not possess the necessary knowledge domain vocabulary to execute appropriately. An additional difficulty in engaging in conversation is the lack of common ground which can inhibit collaborative knowledge construction (Dillenbourg et al., 2008). Semi-structured interfaces (Baker & Lund, 1997), designing for conversations (Roschelle, 1996) and representational guidance (Suthers et al., 2008) are CSCL approaches to design task representations, which mediate verbal interactions and structure collaborative learning. These approaches provide technological scaffolds that supports structures to assist in the attainment of higher levels of achievement (Shapiro, 2008), to help learners overcome difficulties arising from the lack of social, task related or domain specific knowledge, and common ground.

Sentence openers and prompts to guide conversation, such as self-explanation prompts (Davis & Linn, 2000) or reasons-justification prompts (Lin & Lehman, 1999), are typical of semi-structured interfaces. They are often instantiated as pop-up windows, drop-down menus or buttons that learners can choose from. Design for conversation and representational guidance use graphical interfaces to represent the underlying structures and concepts of a domain. These design approaches strive for epistemic fidelity (Lave & Wenger, 1991), in the degree to which the interface mirrors accurately, clearly and without ambiguity, the expert's knowledge, to allow learners who are yet to acquire this knowledge, to interact with its underlying concepts and structures.

Besides scaffolding interactions, a concern in CSCL has been to design tools that can compensate for the difficulties arising from non face-to-face interactions when learners are distributed in time and space. Transparent tools are best suited to compensate for the lack of co-presence since they support communication episodes more akin to face-to-face interactions (Lubich, 1995). According to their level of transparency (Ihde 1975), tools are classified as *transparent* when they permit users to feel the environment directly through them; *translucent*, when they no longer provide the tactile experience; and *opaque*, when they do not afford a bodily experience, and acquire their own identity separate from the user. Though much emphasis has been placed on replicating face-to-face interaction through rich media such as video-conferencing, even small transmission delays can substantially disrupt communication (O' Conaill & Whittaker, 1997). The overhead and production loss associated with learning to operate tools and how to perform tasks have also been reported (Weinberger et al., 2008). To this end, Baker et al. (1999) suggests that some level of prior appropriation of the semiotic tools would contribute towards a more efficient occurrence of productive interactions. The apparent limitations of tools, for instance 'poor media' and restricted availability of characters in SMS (short messaging service) composition, may be generative and force users to 'think harder' (Cereijo Roibás & Arnedillo-Sánchez, 2002). The foregoing has led authors to suggest (Dillenbourg et al., 2008) that the role of CSCL tools is no longer to compensate for loss of face-to-face interaction, but rather to provide collaborative functionalities that are not available face-to-face, and thus to augment face-to-face interactions.

A concern in CSCL has been group formation and its membership. Factors such as gender, socio-cultural background, number, cognitive level of development, and the knowledge peers possess have been examined. Three types of groups are proposed (Johnson & Johnson, 1999b). Formal cooperative learning groups have a lifespan of a class, to several

weeks, and are recommended when students need to achieve shared learning goals and complete particular assignments. Informal cooperative learning groups are integrated by temporary ad hoc collaborators who work together to obtain shared goals during a shorter period of time, of a few minutes or a class duration. Cooperative based groups are characterised by a small heterogeneous membership which provides the continuous peer-support needed to encourage its members to maintain hard work. They are permanent, with a lifespan ranging from one, to several years.

The group size is influenced by the composition of the group, the tasks at-hand, its duration, and the physical context (Dillenbourg & Traum, 1996). Johnson & Johnson (1999b) sustain that for meaningful face-to-face interaction the size of the group needs to be small (two to four members), while Barkley et al., (2005) propose that effective collaborative groups are formed by two to six members. In formal educational settings five is considered to be an appropriate size (Bean, 1996). However, groups of three are more effective at the beginning of the task to achieve greater engagement (Smith, 1996), and in general to avoid competitiveness among peers (Trowbridge, 1987). The optimal group size is relative however: if the group is too small it may not be able to trigger interaction; if it is too large interactions may not take place at all (Dillenbourg et al., 1996). In larger groups, for instance, individuals are less likely to see their personal contribution as important to the group's success (Kerr, 2001), and social loafing is likely to increase (Johnson & Johnson, 2005).

2.2.1.2 SYMMETRIES OF ACTION AND STATUS

Symmetries of action and status are intrinsically related to the notion of social interdependences in a group. Johnson & Johnson define it as a situation in which the outcomes of individuals are affected by each other's actions (2005, p. 287), and the achievement of common objectives is not possible unless everyone in the group succeeds in meeting their goals (Johnson & Johnson, 1999b). They contest that there are two types of social interdependence: positive and negative. The first implies the actions that individuals contribute towards the fulfilment of shared objectives, and should be promoted in groups. The latter represent actions that obstruct the achievement of common goals, and hence should be avoided. Social interdependence differs from social dependence, independence, and helplessness. In a situation of dependence, the actions of learner A influence learner B's actions but the reverse does not apply; in independence, actions by either learner do not affect the other; in helplessness, neither learner can affect the achievement of the goal (Johnson & Johnson, 2005).

Social interdependence in relation to different aspects of collaborative learning situations can be designed to promote productive collaborative interactions. Among others, they include goal, reward, resource, role, and task interdependence (Johnson & Johnson, 1994) (we discuss these in the following section). The relevance of social interdependence for symmetries of action and status is that it generates conditions under which the sense of responsibility, accountability, and group cohesiveness increases. This in turn raises the likelihood of peers supporting and helping each other in the completion of their work. Devising activities that promote individual accountability fosters a sense of personal responsibility. Johnson & Johnson (2005) argue that learners are more likely to reduce their personal contribution to the group when: their individual input is not clearly identified; they perceive their contribution might be redundant; there is no group cohesiveness, or there is little responsibility for the final product. The more learners perceive their contributions to be unique for the group, the more they will contribute to it. High individual accountability, clear distinction of contributions, elimination of redundant efforts, group cohesiveness, and responsibility for the final outcome erode the space for social loafing (ibid).

A/symmetries of action and status also relate to the affective and motivational aspects of working together. They indicate the need for a sense of community in which an open and sensitive atmosphere is a precondition for collaborative learning (Weinberger et al., 2008). In groups, competitive and individual behaviour should be deterred because they cause inaccurate communication, stereotyped and static views of others; low self-esteem, and lower achievement and productivity (Johnson & Johnson, 2005). On the contrary, group cohesiveness promotes more commitment towards the achievement of the shared goals, personal responsibility, motivation, persistence on the task, and a greater likelihood that peers will be influenced by each other and the facilitator (Johnson & Johnson, 2006); and thus, more receptiveness towards others. The shared responsibility created by social interdependence contributes to learners' motivation by means of the concept of ought to the group. Peers feel they ought to do their part, provide input, and adhere to the group's rules (Johnson & Johnson, 2005). The more responsibility learners are endowed with, the more motivated they will be to contribute (ibid).

Motivation has been articulated in relation to two dimensions: the choices one makes and the effort needed to pursue those choices (Keller, 1987b). Motivational design is concerned with setting the conditions, and arranging resources and procedures likely to bring about changes in motivation (Keller, 1988). As it applies to learning it refers to strategies, principles, and processes to make instruction appealing (ibid). The ARCS model (Keller,

1987a) provides a framework for doing so. It explores four aspects of motivational design: *Attention*, *Relevance*, *Confidence*, and *Satisfaction*. *Attention* can be gained by two main means, provoking curiosity, and exposing learners to unexpected and unusual situations (ibid). A certain degree of uncertainty or paradox between the known and unknown favours capturing and retaining attention. In order for learners to perceive the *relevance* of the task, it is recommended to use language and experience with which they are familiar (Keller, 1987a). *Confidence* can be accommodated by providing feedback, setting reasonable stepping stones, and endorsing learners with control over their learning process and assessment (ibid). *Satisfaction* can be intrinsic or extrinsic, and it refers to the reward learners obtain (Keller, 1987a). This can take various forms such as sense of achievement, praise, or simple entertainment. To this end, a main concern in motivational design is to avoid the danger of been captivated by designing fun and enjoyable activities with little educational worth (Keller, 1988).

Control plays a major role in the dynamics of symmetries of action and status, and is influenced by the nature of the task, the labour division among group members, and the group workflow. These elements are intertwined in the design of holistic learning experiences, and point to one of the most relevant features of collaborative learning: intentional design (Barkley et al., 2005, p. 4). Intentional design underlines that, although collaborative partners are to take responsibility for their own learning, the onus for defining and structuring tasks that will allow them to do so rests on the instructors. In truly collaborative interactions the teacher engineers the learning situation to enable learners to take control of the learning process (ibid). Social, cognitive, and procedural horizontal design of collaborative situations is favoured over vertical hierarchical scenarios. In horizontal settings, the effects of positive interdependence translate into peers providing each other with assistance, exchanging needed resources; offering feedback; challenging each other's conclusions and reasoning, and influencing each other's efforts to achieve their mutual goals (Johnson & Johnson, 2005). The foregoing is paramount since learning processes and outcomes in CSCL critically rely on the availability of suitable regulatory information (Dillenbourg et al., 2008).

Issroff & del Soldado (1996) propose the concept of the distribution of control to refer to the control learners exert over their learning process and the tools. They assert that a peer taking control over the tool, for instance the mouse, does not imply s/he has control over the learning process. In fact, it is plausible that the control may be divided; the learner in control of the tools executes actions following the instructions of the learner in control of the process (ibid).

Fundamental for symmetry of status, and core to symmetry of action, is that all members of the group hold the same status (Dillenbourg, 1999). Successful collaborative interactions are characterised by constructive interpersonal relationships (Meier et al., 2007); and peers should be taught and motivated to use interpersonal skills. In order to coordinate their effort and achieve shared goals, group members must become acquainted with each other, communicate accurately and unambiguously, accept and support each other, and resolve conflict constructively (Johnson & Johnson, 2006). A respectful and polite atmosphere will allow learners to maintain a feeling of self-worth and autonomy, and will prevent negative feelings (Meier et al., 2007) that could adversely affect learning.

2.2.1.3 WORKING TOGETHER TOWARDS SHARED OBJECTIVES

One of the main tenets of collaborative learning is that learners engage in a joint effort towards the achievement of a common goal. Joint group effort accountability increases when the performance of the group is assessed (Johnson & Johnson, 2005) but it can also be promoted by carefully designing goal, reward, resource, role, and task interdependence (Johnson & Johnson, 1994). Goal interdependence implies learners believe they can only achieve their learning goals if their peers do so (ibid). Although it is a perception, it can be concretised by having peers creating a collective output into which everyone's input is necessary to complete the final product. Reward interdependence can be implemented in various ways. While complex point systems have been proposed (Johnson & Johnson1994), a simple way to execute it is to grant all peers the same reward for a collective output. The collective reward approach however requires careful management to ensure a fair distribution of labour, and corresponding contributions. Task interdependence is a mechanism to achieve this.

Effective task interdependence requires the division of labour into complementary activities to be performed by different group members (Johnson & Johnson, 1999b). It implies that, if executed properly, peers will not be able to complete their tasks unless their task-bound counterparts have concluded theirs. Independent of designed task interdependence, spontaneous labour division in collaborative learning takes place. This often leads to a partner attending to the procedural low-level execution of the task, and the other engaging with the high-level aspect of the same (Miyake, 1986). While horizontal labour division provides scope for partitioning activities into reasoning layers, vertical labour division favours the appearance of independent subtasks (Dillenbourg, 1999). The latter can be completed autonomously by each member of the group, and assembled together at the end to obtain the group's output. In the preceding scenario, peers are working together; they are,

however, cooperating rather than collaborating (Dillenbourg et al., 1996; Roschelle & Teasley, 1995). Task interdependence is influenced by the nature of the task at hand. This should be complex enough to cater for broad participation (Barkley et al., 2005), provide scope for negotiation (Dillenbourg et al., 1996), and be easily distributed among peers (Jones & Issroff, 2005). To this end some activities are inherently distributed; for instance geographically, functionally, and or temporally, (Dillenbourg et al., 1996) and hence are more suitable for collaborative learning.

Resource interdependence entails the distribution and allocation of information in such a manner that peers individually hold only a portion of the information and materials necessary to complete the task (Johnson & Johnson, 1994). This approach has been widely implemented in the development of CSCL systems since they support automated data access mechanisms, and distribution of resources. Role interdependence requires the articulation of different functions for each member of the group. Roles are associated to tasks and resources (Kobbe et al., 2007), and are a way of formalising the group's workflow. The description of the workflow and related interdependence, role, task, resources, goal, and reward, contributes towards the over-specification of the collaborative situation, and to establishing the collaborative contract (Dillenbourg, 1999; Zurita & Nussbaum, 2004), which in turn increases the likelihood of productive collaborative interactions taking place.

A less operational perspective of working together towards the achievement of shared goals is proposed by Crook (2000). He offers the concept of cognitive synchronicity, the communal meaning and understanding engendered through joint history. In a similar vein social affinity, peers willingness to work with each other, is proposed as a criteria for group formation (Issroff & del Soldato, 1996). Rather than considering more traditional measures such as cognitive development or prior knowledge, social affinity relies on the social and affective plane, and enables learners to choose their partners accordingly. The benefits of this group formation include rich resources in the form of shared histories that learners can draw from, and the peers implicit understanding of each other's work practices (Issroff & del Soldato, 1996; Vass, 2002). Peers' knowledge of their work habits contributes towards reducing process losses, simplifying social procedures, and limiting the operational space to the peers 'social comfort zone'. Within this zone, less demanding social and procedural interpersonal negotiations are likely to occur.

2.2.2 COLLABORATIVE INTERACTIONS

Productive interaction among collaborators is the key to successful collaborative learning (Dillenbourg & Fischer, 2007). Baker at al., (2007, p. 316) describe "inter-action" as:

"A series of actions that mutually influence each other".

They argue that interactions can be verbal or not, and conveyed in various ways, for instance via written, oral, or bodily-kinaesthetic language, or through graphical representational means. Interactions can mutually influence peers at different planes: physiological, epistemic, emotional, and socio-relational (ibid). To this end, it is not the frequency of its occurrence that matters, but rather the extent to which the interaction influences the peers' cognitive processes (Dillenbourg, 1999). The relevance of interaction in CSCL can be understood within the context of its potential to mediate the co-construction of shared understanding. However, successful collaborative activity relies upon effective communication among collaborators who need to coordinate the content, and the process of their conversation (Meier et al., 2007). The content dimension of collaborative communication is often articulated in terms of common ground; a set of collective concepts, assumptions, and expectations among group members which have to be established, enlarged, and maintained (Clark, 1996). Grounding, the interactive process by which common ground is constructed and maintained (Baker et al., 1999, p. 32) is at the heart of shared understanding development (Dillenbourg & Fischer, 2007). Collaborative learning can hence be defined as the effort required to create shared understanding (Schwartz, 1995).

Productive interactions force the elaboration of cognitive structures in social context (Dillenbourg et al., 2008), and they can take various forms such as; elaboration, explanation, argumentation. and asking questions (Kobbe et al., 2007). Elaboration requires learners to improve their understanding through successive operations. These operations may include relating ideas or concepts to what is known, personalizing information to make it intrinsically relevant, augmenting understanding by adding details or examples, or even creating visualizations (ibid). Both the creation and reception of elaborations are said to benefit learners (Nastasi & Clements, 1992; Van Boxtel et al., 2000).

Explanations embody interpretations. When they take the form of self-explanations they can help learners monitor their own understanding, and allow them to identify and fill knowledge gaps (Chi et al., 1981). Giving explanations is a means to share concepts, principles, and relationships (Roscoe & Chi, 2008), and of adjusting misunderstanding. Learning through creating explanations comes about as learners check for inconsistencies, and

reorganize and clarify materials to meet the target audience's need (Kobbe et al., 2007). Argumentation is a means for resolving socio-cognitive conflict (Dillenbourg et al., 1996). It involves making inductions, drawing conclusions, and applying them. When constructing arguments learners engage in an active search for knowledge to support their claims, and reflect on what they know with the view to identify possible ambiguities or inconsistencies (Kobbe et al., 2007). Asking questions implies eliciting information, enticing it forth or bringing it to light. It can directly influence the nature of the conversation that takes place (Roscoe & Chi, 2008). Besides eliciting information that may be needed to close gaps, asking questions contributes to fostering comprehension through elaboration on content (Kobbe et al., 2007).

2.2.2.1 CSCL SCRIPTS

Two complementary approaches to promoting collaboration are currently diffused (Dillenbourg, 2002). The first attempts to structure the collaborative process by creating suitable situations by manipulating conditions that indirectly affect the emergence of productive interactions. The second regulates productive interactions by directly influencing them, for instance by increasing the occurrence of conflicts, promoting complex explanations, or supporting mutual understanding. The quality of interactions among learners determines the effect of collaborative learning (Dillenbourg & Tchounikine, 2007). A difficulty with structuring collaborative learning by arranging external conditions such as group formation, task, and tools, is the uncertainty that productive collaborative interactions among learners will actually take place (Wallace, 2003). While learners share ideas and compare information, they rarely engage in demanding cognitively productive interactions such as debating ideas, concept, and statements, or negotiating meaning (Barron, 2003; Engel & Onrubia, 2008). Reasons for the foregoing include the learners' lack of procedural knowledge in relation to the task, and/or how to learn together (Weinberger et al., 2008), and the provision of general instructional guidelines which do not specify the way in which learners should work together (Dillenbourg, 2002). Drawbacks of direct interventions include the requirement for complex skills when moderating interactions, and its reliance on the proficiency of individual facilitators (Weinberger et al., 2005).

A more explicit approach to structuring and guiding collaborative learning are collaborative scripts. Collaborative scripts facilitate learning by structuring learners' interaction through specifying the sequence of the activities they are to undertake (O'Donnell & Dansereau, 1992). They diverge from other instructional collaborative approaches in that scripts stipulate the cognitive activities with which learners are to engage (O' Donnell, 1999).

Early scripts were verbally conveyed or paper-based, regulated by the teacher, and mainly instructed prior to the collaborative phase (Weinberger et al., 2008). Different to these, CSCL scripts imply that actions, and/or interactions among learners are mediated by technology to some degree (Tchounikine, 2008). Two types of scripts exist: micro-script and macro-script. Micro-scripts attempt to structure the actual interactions among learners, for instance an argumentation episode. They relate to procedural and cognitive knowledge, and are meant to be internalised by learners (Dillenbourg & Hong, 2008; Kollar et al., 2006; Tchounikine, 2008). Macro-scripts are pedagogical models; they set up conditions, and structure and sequence activities with the intent to generate productive interactions (Dillenbourg & Hong, 2008). While macro-scripts emphasise the orchestration of activities and the facilitators role in doings so, micro-scripts are concerned with the individual learner, and ensuring s/he engages in particular socio-cognitive processes (Kobbe et al., 2007).

Besides the micro and macro distinction, different script schemata have been identified (Dillenbourg & Jermann, 2006). These include: the *Jigsaw schema* (Aronson et al., 1978; Hoppe & Ploetzner, 1999), where resources are divided in such a way that peers have complementary information, and hence are forced to collaborate to achieve the common goal; the *conflict schema* (Dillenbourg & Jermann, 2006; Weinberger et al., 2005), where learners are grouped according to antagonistic views, roles and so forth. The underlying idea of this script is that through engaging in argumentation learners will solve the conflict and restructure their knowledge; the *reciprocal schema* (King, 2007), where peers are allocated roles, and in turns they regulate each other; the *inquiry schema* (Dillenbourg & Hong, 2008), where learners are encouraged to engage with the planning, monitoring, and evaluation process of enquiry learning; and the *SWISH* (Split Where Interaction Should Happen) which is connected to various schema, and relies on disturbing 'natural' interaction in order to increase the effort required from learners to engage in productive interactions (Dillenbourg & Hong, 2008; Dillenbourg & Jermann, 2006). Schemata can further be specified into script classes which are variations of their higher order categories, and are instantiated into prototypes. Examples of these include the following scripts: Universanté (Dillenbourg & Jermann, 2006), ArgueGraph (Jermann & Dillenbourg, 2003), ConceptGrid and WiSim (Dillenbourg & Hong, 2008), and Social Script (Weinberger et al., 2005).

In terms of their structural composition and dynamics, scripts are integrated by script components, and distributed among collaborators through script mechanisms (Kobbe et al., 2007; Weinberger et al., 2008). There are five basic components in scripts: participants, activities, roles, resources, and groups. The participants, roles and groups relate to the social

structure of the script, and this may change over time; for instance by getting learners to swap or rotate groups or roles (Dillenbourg & Hong, 2008). The activities are paramount in influencing the type and degree of learning that takes place (King, 2006). Resources include virtual or physical objects that can provide information, functionality or even be modified during the course of the activity (Kobbe et al., 2007). To this end, resources can be provided a priority, or be created by learners through the course of the script, for instance the outcome of an activity in one phase may become the resource for the next (Dillenbourg & Hong, 2008). The three main mechanisms that regulate the workflow and dynamics of scripts are; task distribution, group formation, and sequencing (Kobbe et al., 2007; Weinberger et al., 2008). Scripts are stories that learners and facilitators perform as actors play a script (Dillenbourg, 2002). However unlike theatre scripts, macro-scripts provide guidance rather than dictating the collaborative activities and interactions that ought to take place (Weinberger et al., 2008).

2.2.3 COLLABORATIVE LEARNING AND MOBILE TECHNOLOGY

At the dawn of the use of mobile technologies to facilitate CSCL two seminal keynotes (Roschelle, 2003; Roschelle & Pea, 2002) set an agenda for this area. On the one hand, the research community was cautioned against technologically sophisticated adaptations of CSCL designs for mobile devices. It was argued that mere extensions of the lessons learned in CSCL would not sufficient to release the value of WILDs (Wireless Internet Learning Devices) (Roschelle, 2003). On the other hand, researchers were called to observe and study the emergent social practices afforded by WILDs. From the outset this pointed to the potential for rich social practices created around simple but functional and reliable technology (ibid). The path of pursuit was articulated as follows (Roschelle, 2003, p. 267):

> ***"Simple, well-honed technology and rich, pedagogically developed social practices."***

In addition to the initial admonitory advice and technical direction, five application affordances of WILDs were proposed (Roschelle & Pea, 2002): augmenting physical space; leveraging topological space; aggregating coherently across students; conducting the class; and act becomes artefact. Rochelle & Pea (op. cit.) articulated how WILDs distinctly augmented the physical learning space in at least two ways. First, they released CSCL interaction from the confinement of the computer screen, as collaborative interaction with WILDs extend beyond the devices, and pervade the physical world. Second, WILDs provide the scope for reconnecting abstract ways of thinking, and formalising knowledge with their embodied,

physical, and spatial counterparts. In terms of the topological space, (changeable visual and spatial-based representations) WILDs allow learners to capture information in their vicinity. They also support the storage and distribution of the same, and hence facilitate subsequent reflection and discussion. Furthermore the tactile input mechanisms afforded by WILDs, such as stylus, and their data transfer mechanisms, for instance infrared; enable an easier correlation of user control with representations, and support bodily-kinaesthetic communication acts. The value of aggregating contributions to a collective output is found in the intermediate representation it generates. This allows facilitators and learners alike to 'monitor' the groups' development, and informs ensuing actions. In terms of conducting the class, WILDs displace the common metaphor of the guide-in-the-side. The new interaction patterns afforded by WILDs highlight the need for a conductor who oversees the group's performance, and orchestrates it. Finally, WILD applications support usage information logging which can be examined to identify interaction patterns, and so forth. Thus, usage creates research and evaluation artefacts.

2.2.3.1 MOBILE CSCL RESEARCH

Over the past ten years research in mobile learning has developed from a minor area of interest to a significant body of projects conducted in formal and informal settings; in schools, workplaces, museums, cities, and rural areas all over the world (Sharples et al., 2009). The development of mobile learning applications has been articulated in a functional framework (Fig. 3) (Patten et al., 2006), which highlights the spectrum of usage of mobile technologies for learning purposes, and points to constructionist, collaborative, and contextual learning as the most fruitful areas of application. Numerous projects with mobile technologies have been conducted under the umbrella of collaborative learning. For the most part, these have adopted a loose definition of the practice, implying learners working together in a collaborative task, in a grouped configuration. This section is not concerned with this type of project. Instead it provides a limited overview of the research in which intentional design to support collaborative interaction has been accomplished, and which, to some extent, relates to the application affordances of WILDs proposed by Roschelle & Pea (op. cit.).

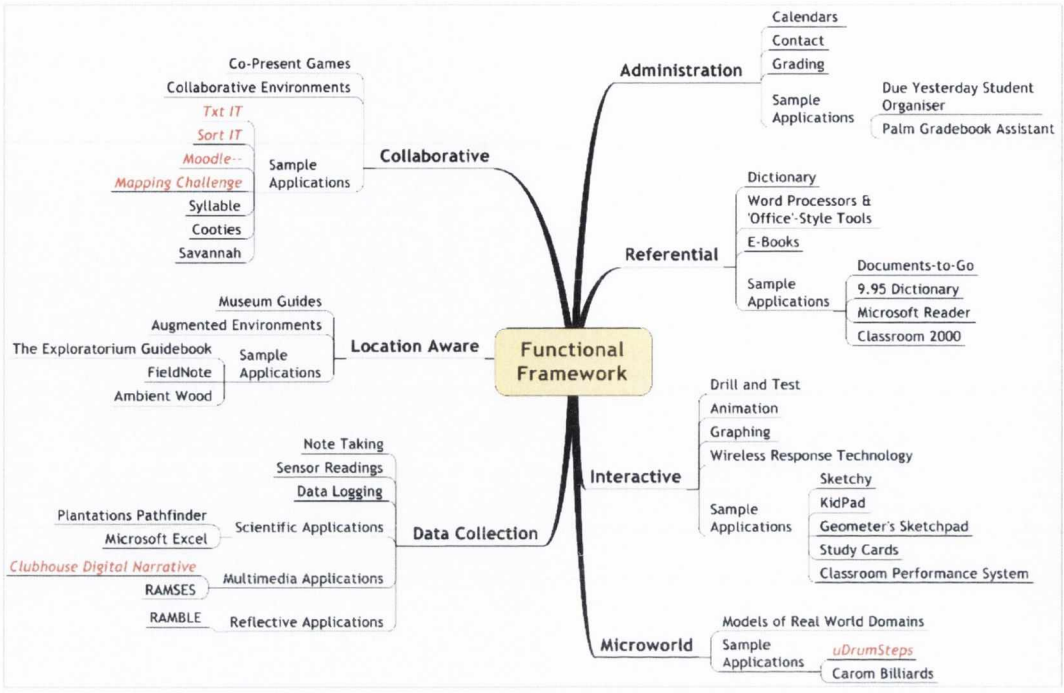

Fig. 3 Handheld applications functional framework (Pattern et al., 2006)

In her seminal work using wearable microcomputers, Think Tags, Colella (2000) investigated how learners collaborated in a participatory simulation. The experience imitated the dissemination of a virus among a population. As learners moved around the classroom, they used the ***Think Tags*** and infrared to transmit information to each other. In so doing, they also transmitted the virus. When infected, the flashing LEDs on the tags were activated to give notice that the learners had become afflicted, and to apprise the learners' peers of the latest casualties. The representation of the infection by means of the visual output provided the group with immediate feedback on the development of the spread. This led to the articulation of hypothesis regarding the underlying rules for the spread of the disease. Among findings relating to the personalisation of the Think Tags, Colella reported how the use of mobile devices enhanced and facilitated collaborative face-to-face interactions.

In ***Ambient Wood*** (Rogers, 2002) researchers investigated how the technological augmentation of a real wood could support learners in collaborative science learning. The aim of the project was to support learners to explore, reflect, and hypothesise about the physical world. Dyads endowed with PDAs and probes engaged in a three-phase activity: 1. they explored the wood and took readings with the probes and additional information, beyond what was observable around them, was provided through the PDA either as response to the readings or as the learners entered different areas of the wood; 2. the participants gathered

back in the den where reflecting tools aggregated and displayed the information from the experience in the wood; 3. the learners went back to the wood to observe experiments that had been introduced there, and hypothesised about the outcomes of the same. The evaluation of the project revealed that the experience triggered high levels of interaction among the dyads while in the field. These were particularly noticeable in terms of exploration promoted by the actual context, the peers' elicitation, the readings, and the feedback on the readings provided by the PDAs. In addition, the readings promoted the generation and testing of hypothesis, and the den aggregation and reflection tools supported collective reflection. In relation to the augmentation of the experience through constant unsolicited information flow, researchers found that this was not particularly helpful for collaborative learning. They concluded occasional well-structured information, rather than a continuous flow, would be more suitable to allow participants interweave this information in their ongoing collaboration (Cole & Stanton, 2003).

Savannah, (Facer et al., 2004) built on the simulation work by Colella (op. cit.) and saw the development of a group game in which learners assumed the role of lions roaming a savannah. The aim was to learn about the animals, their behaviour, and their natural habit. The objective of the game was to survive. However in so doing, learners had to be mindful of the lion's needs, such as water and food, and dangers that could jeopardise its safety, for instance other lions in the savannah. Although the game had a degree of competiveness collaboration with other lions, creating alliances or exchanging information, could contribute to securing survival. The game was played outdoors and learners accessed it through PDAs and headphones. A den was also available, and in it learners gathered to review and reflect on their experience. Two relevant findings of this project are highlighted. Firstly, learners were found to adopt multiple roles; the lion itself, the player attempting to decode the rules, and the learner reflecting on the experience; and explicit support to help them transit from one role to the next was required. Secondly, the practice of the classroom teacher when facilitating this kind of experiences must radically change. To this end, it was observed that the classroom teacher's presence in the den was counter-productive for the reflective process associated with playful learning.

Think Tags, Ambient Wood, and Savannah portray three degrees and approaches to mobile CSCL physical space augmentation. These range from the enrichment of the learners' classroom-based experience in the first, to the enhancement of curriculum-based field trips in the second, to the exploration of alternative modes of learning in the third. These projects also exemplified complex technological solutions that, although groundbreaking, are not

sustainable, scalable, or transferable beyond their research and experimental settings. The latter has characterised much of the early work with mobile technologies to support collaboration. Furthermore, although the activities at-hand were collaborative in nature, and intentional design in relation to collaborative interaction can be discerned in them, the projects were not explicitly underpinned by collaborative learning principles.

The promotion of domain-based social interactions among learners in classrooms has been investigated by researchers in Chile (Cortez et al., 2005; Zurita & Nussbaum, 2002, 2004, 2007). Their work is strongly grounded and designed upon CSCL principles and has yielded the development of a MCSCL architecture, an application, and curriculum-based activities in various domain areas. In this project learners, endowed with peer-to-peer networked PDAs, work in small groups (2-3) on activities chosen and distributed by the teacher directly to the students' PDAs. The information provided to each learner in a group is complementary and hence peers are obliged to interact in order to complete their tasks. In addition to the student view of the application, the system provides a teacher's view and a management system. This, besides providing access to the activities and various tools, monitors and aggregates the groups' progression in real-time and sends grid representations to the teacher's PDA who can then intervene as needed. Evaluations at different stages have found that productive interaction among learners are scaffolded and supported by the tool and underlying approach. Findings also reported the establishment of social networks in the classroom, and increases in learners' domain knowledge content. In relation to the teachers, the system helps them update their knowledge of the subject area, and serves as a means for exchanging teaching strategies. This project has been running for several years in Chile and the system developed within its context has been adopted in schools in Argentina, Brazil, and the UK.

The type of MCSCL proposed by Zurita, Nussbaum & colleagues is akin to traditional CSCL. The instructional design embedded in the system and activities strongly determines the path learners can take, and limits the negotiation involved in deciding the next step. Although mobile devices are utilised, and they provide greater levels of participation, their affordances are only partly exploited. Learners remain in the classroom and the model supported is anchored on traditional school learning. Additionally, devices that offer a wide range of tools and capabilities are being used in a limited fashion to support single purpose, dedicated use, and application. In this case the potential of WILDs seems to have been limited by the adoption of archetypical CSCL design.

ENLACE (Verdejo et al., 2006; Verdejo et al., 2007) and ***AMULETS*** (Advanced Mobile and Ubiquitous Learning Environments for Teachers and Students) (Kurti et al., 2006; Kurti et al., 2008) are also school-based projects which, unlike the foregoing, explore how mobile technologies can support collaboration while bridging indoors and outdoors learning. They both propose activities that mix classroom-based learning with field work in the area of science and history. Typically experiences are curricular or cross-curricular, and involve three stages: 1. Indoors initiation of the activity and preparation for the field work; 2. Outdoors field work supported by mobile technologies (PDAs or mobile telephones) and tasks in this phase generally involve the collection and storage or transfer of information; 3. Indoors follow up in which the data collected in the previous phase is elaborated as required by the activities. In both projects, throughout the experiences learners are arranged in different group configurations, and work on collaborative tasks. While in ENLACE the entire class proceeds together through the three phases (ibid), in AMULETS researchers have experimented with subgroups for the field trip phase(Kurti et al., 2006). This involved a subgroup going outdoors, and collecting information to complete a task; while the other subgroup stayed indoors, and elaborated the data received from the peers in the field.

In terms of technology, both projects have developed sophisticated systems that support the interoperability of various tools (for instance mobile devices, PCs, and data projectors), applications (for example visualisation tools, and voting systems), and which manage transfer, encode, and storage data. ENLACE's infrastructure relies on a Learning Object Repository (LOR) (Celorrio & Verdejo, 2008) and researchers in the team explore the creation and reusability of learning objects. In AMULETS (Kurti et al., 2008) the technological emphasis is placed on real-time encoding of the information collected on the field with meta-data containing attributes such as GPS coordinates, time stamp, and the telephones' ID. This, the researchers argue, provides rich contextual information for later use in the classroom.

While ENLACE and AMULETS provide stimulating uses of mobile technologies that can support collaborative learning the research underpinning the projects has a technical emphasis, and the evaluation of collaborative processes has not been extensively reported. However, findings from AMULETS (Kurti et al., 2006) report on more learner engagement when the tasks were related to real-life situations as opposed to computer provided, or generated content. In order to fully profit from the outdoors experience, post-experience activities must be carried out.

The advent of mobile telephones with enhanced capabilities, for instance, cameras, Multimedia Messaging Service (MMS), and internet access among others, has also been exploited to support collaborative learning. Unlike, the previously described projects, ***Mobimissions*** (Grant et al., 2007; Grant et al., 2007) and ***Fliers in the Wild*** (Laru & Järvelä, 2008; Laru et al., 2005) relied on mobile telephones as the main platform to enable outdoor collaborative experiences. They portray two common approaches to using mobile telephones for collaborative learning: developing specific applications for the activities, or adapting existing ones. The projects also highlight the difficulties with portability of applications across devices from different manufacturers, and even across different models from the same manufacturer. Thus, they highlight the limitations imposed by manufacturers which determine the type of telephone that can be used, and how they can be used. Ultimately these substantially influence the mobile learning experience.

Mobimissions explored the concept of location-aware games. It involved a group of teenagers creating, 'dropping', collecting, and completing missions with mobile telephones running the Mobimission application. Missions could be composed of an image and text, and could be related to any topic of interest for the participants. In addition to the mobile phone, the players availed of the Mobimission website where they could see all the missions created and completed. The project ran for five weeks, with 11 teenagers engaged in playing the game. Findings from the trials (Grant, 2007; Grant et al., 2007) indicated that players preferred to respond to missions rather than to create them. They also showed a clear preference for playing the mission together, co-located, and sharing a phone, rather than by themselves. In terms of their collaborative effort, researchers reported that the anonymity of the mission meant peers did not feel an obligation to respond to them, and did not have social affinity towards the creator. Furthermore, this lack of reciprocation frustrated participants, in particular those that had worked harder to create good missions, and eventually made them stop playing.

Fliers in the Wild (Laru et al., 2005) investigated the use of mobile telephones to support collaborative biology inquiry learning during a field trip. The project used the existing Nokia Flier application which enabled learners to create and distribute (using Bluetooth) short messages containing text and a picture. The software was adapted to suit the learning situation, and, for instance, flier templates with sentence openers to scaffold interaction were created. In addition fliers with a storyboard of directions and instructions for collaborative tasks were developed and delivered to the telephones when appropriate. Unlike Mobimissions or any of the previously discussed projects, Fliers on the Wild used the telephones as the sole

technological platform and involved no pre or post activities. Findings (Laru & Järvelä, 2008) from the evaluation reported a progressive decline in task-oriented activity among the learners. Low-achievers did not attempt to establish and maintain a common ground in relation to the content of the activities, and in general the fliers created related to superficial information and matters. This indicated that learners did not engage in productive collaborative interactions. The researchers concluded that the scaffolding provided was not enough to support learners in collaborative learning inquiry.

2.2.4 SUMMARY

This section has explored the area of CSCL as it is relevant to the present study. It provided definitions, and examined two dimensions to be considered when designing CSCL: collaborative situations, and interactions. The anteceding disquisition has discussed the importance of creating horizontal situations in relation to symmetry of knowledge, status, and actions in order to create conditions for collaboratively productive interactions to come about. The analysis also implies the need for a shared goal, and a joint effort. The relevance of positive task, role, and resource interdependence, and personal and group accountability were underlined within this context. The latter defined the CSCL scripting approach. It illustrated various types of scripts and specified the elements that compose a script. The last part of this section presented an agenda for mobile CSCL, and provided an overview of MCSCL research. The projects described were chosen because they portray the range of technologies, purposes, and methodologies that have characterised attempts to explicitly support collaborative learning with mobile technologies. The following section of this literature review examines creativity and technology.

2.3 CREATIVITY AND TECHNOLOGY

Notions of creativity can be traced far back to the Greek, Judaic, Christian, and Muslim cultures (Craft, 2001a; Negus & Pickering, 2004) to the extent that archaic explanations of the concept such as inspiration, anchored in the Greek mythology, have long lingered in the literature (Fryer, 2000). Craft (ibid) positions the beginning of the systematic and empirical examination of creativity at the end of the nineteenth, and the beginning of the twentieth century. She argues studies during this time fell under four traditions: the psychoanalytical, cognitive, behaviourist, and humanistic. The relationship between creativity and learning was recognised by theorists such as Piaget and Vygotsky (Sawyer et al., 2003). However, Guilford is credited for initiating the line of research investigating creativity and learning (Beghetto & Kaufman, 2007; Craft, 2001a). Guilford's work focused on the study of divergent thinking and was concerned with measuring creativity. This may have led to the

common and inaccurate use of divergent thinking as a synonym of creativity (Fryer, opt cit.). To this end, he devised an instrument to appraise divergent thinking which was followed by others such as the Torrance test for creativity (Torrance, 1966). The emphasis on measuring and testing creativity, to identify its traits and promote it through tailored pedagogical approaches, endured till the 1990's when researchers became concerned with understanding the creative mind, and people's implicit understanding of creativity (Craft, 2001a). The appropriateness and validity of creativity tests has since been questioned, and its popularity significantly declined to the extent they are, at present, hardly utilised.

The current predominant line of investigation provides a broader conceptualisation, and proposes the study of creativity within the context of social systems (ibid). However, concerns have arisen since this approach implies models of creativity that largely depend on socially-endorsed conceptualisations, such as appropriateness, acceptability, and so forth, and divergence from these may not be accommodated (Banaji, Burn, & Buckingham, 2006). Furthermore, the creativity mobilised by current society may have been dispossessed of values associated with the artistic practice, for instance inspiration and rule-breaking, leading to a perception of discarded artistic activity (O'Connor, 2007). To this end, commentators (Fleming, 2008) sustain that the term creativity has positive connotations, and it is often used as a overarching catch word to legitimise any kind of endeavour.

2.3.1 DEFINING CREATIVITY

Numerous definitions of creativity are found in the literature. For instance, an earlier interpretation by Stein (1984 in Fryer, 2000 p163) describes it as: 'a process that results in novelty which is accepted as useful, tenable, or satisfying by a significant group of others at the same point in time'. Boden, puts forward two very similar, yet slightly different, definitions of creativity as: 'the ability to come up with new ideas that are surprising yet intelligible, and also valuable in some way' (2001, p. 95); and the 'ability to come up with ideas or artefacts that are new, surprising and valuable' (2003, p. 1). Sternberg and colleagues (2005, p. 351) propose that 'creativity is typically defined as the ability to produce work that is novel (i.e. original, unexpected), high in quality, and appropriate (i.e. useful, meets task constraints)'.

The foregoing definitions place emphasis on different elements; for example, while Stein describes creativity as a process, Boden and Sternberg et al., refer to the ability to carry out processes (come out with ideas and produce work). Regarding the outcome of the processes, all the authors agree on the need for it to be novel. However, the result of creativity is described at various levels of concreteness, ranging from a rather vague outcome,

novelty (Stein, op cit); to two broad, yet all encompassing, categories that cover the abstract as well as the concrete planes: ideas and artefacts (Boden, op cit.); to a very specific description of what the outcome should be, work. The value judgement required for the output to be recognised as creativity is present in all the definitions. Nonetheless, while Boden does not specify what qualifies the outcome as valuable, Stein refers to the need for it to be useful or tenable, and Sternberg et al., further concretise the high quality requirement and meeting the task constraints. The latter criterion implies that creativity takes place within constraints, and some framework of reference against which its appropriateness is evaluated. This theme has been explored by many authors; and Sharples (1999) for instances, has examined the role of structure and constraints in writing as a creative design process. A final observation on the definitions is needed in regard to whom is granted the task of ascertaining the novelty, and various other attributes. None of the authors name the evaluator. However, Stein does specify that it needs to be a significant group who agree contemporaneously.

The definition of creativity most widely adopted within the educational arena in England, and one which bears significant relevance to this study, is the one elaborated by the National Advisory Committee on Creative and Cultural Education (NACCCE). It is a construct that rests on the underlying assumption that everyone has the capacity to be creative, and that creativity occurs in every facet of human activity. It describes creativity as (NACCCE, 1999, p. 30):

> ***"Imaginative activity fashioned so as to produce outcomes that are both original and of value".***

Dwelling on the definition, the authors (ibid) distinguish imaginative activity from fantasying or imagining; however, they assert the latter two might be involved in the former. An imaginative activity may be both a mental process as well as a more tangible, and bodily kinaesthetic behaviour; the embodiment of an idea. It is generative action channelled towards the achievement of a creative goal. The actions and purpose involved in imaginative activity construct, shape, and reshape it until the objective is achieved. The implication is that there is premeditated, rather than arbitrary, active involvement, in which actions are driven by, and moving towards the aim. This focus of attention does not preclude creative insights from emerging; neither does it bound the imaginative activity to the initial idea which may change along the way. While imaginative activity caters for generative or divergent thinking, judging the merit of these actions, and their outputs provides scope for evaluative or convergent thinking. For creative productions, both divergent and convergent thinking are necessary

(Goldstein, 2001). To this end, a central responsibility of creative education is to support learners to understand and manipulate the interplay between these types of thinking (NACCCE, 1999).

The dilemma over whether creativity can or cannot be taught comes hand in hand with the question over whether it is a capacity we all possess, or an innate trait of a few gifted people. While different degrees of creativity in people may be recognised, educators do not support approaches that adhere to the singular creative genius idea (Banaji et al., 2006). The ordinary versus genius question has triggered the articulation of various models of creativity which range from high creativity and little-c creativity (Craft, 2001b), to P-creativity (psychological) and H-creativity (historical) (Boden, 2003), to the latest emerged mini-c creativity (Beghetto & Kaufman, 2007). They all denote different approaches to promoting, and learning through creativity. A starting point to understanding the proliferation of different conceptualisations of creativity may be the fracturing of associations commonly endorsed by people. First, creativity is often affiliated to the arts, music, drama, dance, art, literature, and so forth. Notwithstanding the role it plays in the development of the creative arts, creativity is not exclusive to these, and it occupies a paramount role for instance in the sciences, technology, and business (Lawson, 1997). Second, it is thought that only extraordinary people are creative and that being creative implies being gifted and possessing unusual talents. However, creativity encompasses both the ordinary and the extraordinary and it should be detached from any sense of genius awarded to individuals (Negus & Pickering, 2004). The foregoing does not imply the denial of the existence of extraordinary creative beings, rather the recognition of creativity within the ordinary and mundane, and of everyone's potential to be creative. This is a notion to which Craft, Boden, Beghetto & Kaufman (op cit) adhere, together with many other authors in the field (Amabile, 1988; Bentley, 2002; Cropley, 2001; Reilly, 2008; Sternberg, 2006a). Nonetheless, supporting the idea that everyone can be creative does not imply everyone will be creative (Fryer, 2000).

2.3.2 THE 'SIZE' OF CREATIVITY: HIGH, LITTLE-C, AND MINI-C

Craft proposes the notion of little-c or 'ordinary' creativity, the ability to effectively deal with life in the ever changing twenty-first century (2000b), as a useful framework to examine the education of young people who face increasing uncertainties (Craft, 2001b). She positions possibility thinking, at the heart of little-c creativity, and as core element of creativity (Craft, 2002, 2005), and defines it as: 'refusing to be stumped by circumstances but being imaginative in order to find a way around a problem' (Craft, 2000b, p. 3). Possibility thinking is characterised by features such as: self-determination and direction; innovation, which she

refers to as doing things differently; development; depth, which in this context implies knowing that one has been creative (in ideas or actions) in relation to prior personal or broader conventions; risk, not knowing how one's ideas may develop in terms of achieving the intended goal; being imaginative; posing questions; and play, as it refers to being receptive to playing with ideas and possibilities (Craft, 2001b).

The framework to foster and observe little-c creative involves agents, processes, and domains (ibid). Agent stands for the activity carried out by a person, which must necessarily involve change. It implies that first, to undertake activities, people make choices which reflect the knowledge available to them, as well as their strengths or weaknesses in applying it; second, actions occur as individuals enter into a relationship with someone and/or something. Little-c creativity related processes may be intuitive and unconscious as well as rational and/or conscious. They include using the imagination, considering possibilities, problem solving and problem finding, and they may involve divergent and convergent thinking. Processes used in little-c creativity are tinted with a lack of contentment regarding what already exists. The notion of domain proposed in little-c creativity departs from the idea of creativity as a domain independent cross-curricular skill (Craft, 2001a). It recognises that creativity is based on domain knowledge. However, it refuses to accept that it is exclusive to the arts, or even academic areas, and strongly defends little-c creativity as pertaining to all knowledge in life. This may mirror the predominant current view which sustains that creativity encompasses both, domain-specific and domain-general aspects (Sternberg, 2005). Little-c creativity is concerned with personal development, accomplishment, divergence, and agency (Craft, 2000b). Critics of little-c creativity (Negus & Pickering, 2004) argue that everyday life and creativity are not the same, and hence, it is not appropriate to portray them as such. They support that although there is a connection between creative practice and everyday life, not every event in life is a creative act; though some might be.

The P-creativity (psychological) and H-Creativity (historical) distinction put forward by Boden (2003) also springs from the recognition of creativity in mundane acts, and everyone's potential to be creative. P-creativity represents the ordinary creativity that is of relevance mainly for the individual and his/her immediate context. H-creativity involves contributions that are widely recognised and have an impact on what is globally known. Boden's (ibid) conceptualisation is however distinct in a number of ways. First, it explores creative processes from an Artificial Intelligence (AI) perspective, arguing that these can be observed and made transparent through computational techniques. Second, it is strongly anchored on the notion that creativity is knowledge domain specific and that expertise is

essential for it (Boden, 2001). Third, it proposes that it is the rules and constraints in a given field, within which associations are made, that enable creative acts. She argues it is the associations themselves that are often creative (Boden, 2003).

Three types of creativity: *Combinational*, *Exploratory*, and *Transformational* are identified by Boden (2001). *Combinational* creativity involves generating new ideas by associating old ones in uncustomary ways. It requires two conditions from the creator; first, a pre-existing pool of ideas, and the richer the reservoir in terms of knowledge, the richer the resource for novel combinations; second, the ability to make unusual associations which have to be understandable and valuable within the content domain. *Exploratory* creativity comprises the examination of what one can do within a given set of rules. As it transpires from this definition it implies some degree of prior knowledge of the principles governing a conceptual space. However, this does not equate, although it might, to following the rules. It may mean that the rules are slightly, or significantly changed. *Transformational* creativity is characterised by the substantial modification of one or more conventions within a domain. The alteration of the rule gives rise to the generation of new ideas, which would have not been engendered had the rule not been changed. Though conventions within domains is a concept emphasised in Boden's work (2001, 2003), these are only relevant to the extent to which they serve as a reference to judge new contributions. Thus, without a framework against which to appraise novel input this would not be understood or valued. The latter is a view shared by other authors (Bentley, 2002; Negus & Pickering, 2004) who also sustain that creativity cannot come about in the absence of connections to existing rules, devices, codes, and procedures.

In relation to Boden's (2001) claim on expertise, the extent to which expertise is a necessary precondition for creativity has been studied by Reilly (2008). She suggests that creativity also resides in the dialogical interactions of groups, and concludes that it does rely on expert thinking. However, expertise does not necessarily reside in a single individual. Reilly (ibid) demonstrates novices as a group can cognitively function at levels that eclipse individual performance, and that is comparable to expert performance levels. To this end, the construction of shared expertise, defined as collective knowledge that to some degree surpasses the level of each individual, and which is acquired through dialogical creation and recreation, can be an efficient learning approach.

The case for mini-c creativity (Beghetto & Kaufman, 2007) is grounded on the present lack of conceptualisations to describe the developmental nature of creativity. Mini-c creativity is described as: 'the novel and personally meaningful interpretation of experiences, actions,

and events' (ibid p.73). It differs from high creativity and little-c creativity in that the judgement in relation to the novelty or meaningfulness of the creative acts is *intrapersonal.* In high and little-c creativities the evaluation of worth is *interpersonal.* In addition mini-c creativity underlines the important relationship between creativity and learning, echoing cognitive development processes of internalisation, and appropriation of cultural tools and interactions. Beghetto & Kaufman (op cit.) sustain the current articulation of little-c creativity does not accommodate individual creative processes of knowledge construction, and understanding. The effective implementation of mini-c creativity relies on providing timely, appropriate, and personalised feedback, which matches the learner's developmental needs. This leads one to suggest that mini-c creativity depends on proficient, and expert teachers to facilitate learning. This being the case, the divergence between this conceptualisation and others substantially narrows.

The absence of frameworks to address the description of development in creativity has also been investigated empirically from the teachers (Craft et al., 2007) and learners' perspectives (Burnard et al., 2006; Burnard et al., 2006). Within this context, the distinction between *creativity* and *creative learning* has been made. The latter is described as: 'significant imaginative achievement as evidenced in the creation of new knowledge as determined by the imaginative insight of the person or persons responsible and judged by appropriate observers to be both original and of value as situated in different domain contexts' (Craft et al., 2006, p. 77). This definition underlines the distinction made by Beghetto & Kaufman (op cit.) regarding *intrapersonal* versus *interpersonal* value judgement. Findings reported on the teachers' stance (Craft et al., 2007) conclude that the type of activities chosen by the teachers in tandem with the attitudes they conveyed expand, or limit what learners do. The implication of the foregoing is learners' progression may be misjudge by setting inappropriate tasks, or as a consequence of initial inaccurate assessment of what the learners can really do. The findings reported by Craft et al. (ibid) resonate with the need for appropriate personalised feedback proposed by Beghetto & Kaufman (op cit.), and further emphasise the paramount role of the teacher in orchestrating the development of creativity. In this regard, Craft et al., (2007 op cit.) also warn that the classroom culture endows power and authority to the teachers, which in turn limit learners' agency.

2.3.3 CREATIVITY AND TEACHING APPROACHES

Many pedagogical approaches aimed at fostering creativity exist (Boden, 2003; Craft, 2000a; Kessler, 2000; Sternberg, 2006a; Torrance, 1984; Woods, 1990; Woods & Jeffrey, 1996). Among these Kessler (op cit.) suggests a cyclical process-centred model with four

stages each involving different activities. *Preparation* is the first step, and comprises getting the necessary resources together whether they may be skills, ideas, or information. *Incubation* is a dormant or idle time in which learners are not required to do anything in relation to the task, and which is followed by the *inspiration* stage. At the end of the cycle *verification* involves working on the creative outcome in order to further refine it. Sternberg (op cit.) instead, proposes the Investment Theory of Creativity (Sternberg, 2006b) in which six elements come together: intellectual abilities, knowledge, styles of thinking, personality, motivation, and environment. The confluence of these elements, which is more than their mere sum, is fundamental for creativity to come about. For instance, Sternberg (ibid) argues that for certain components such as knowledge, a minimum level might be required for creativity to take place. Equally so, compensation among elements may occur, and for example, adverse environmental conditions may be counterbalanced with personal motivation. Lastly, the components may interact among themselves, and for instance, high occurrences of two may improve creativity. The role of the teacher within the Investment Theory of Creativity is to teach learners how to use the six elements.

Moving away from the creative process itself or its 'feeding' elements, Woods (1990) puts forward a model in which the characteristics of creative teaching - innovation, ownership, control, and relevance - are highlighted. Woods describes the interoperability of these four traits in the following way:

> ***"Relevance aids identification, motivation, excitement, and enthusiasm. Control, in turn, leads to ownership of the knowledge that results. If relevance, control and ownership apply, the greater the chance of creative learning resulting—something new is created, there is significant change or 'transformation' in the pupil—i.e., innovation." (2002, p. 7)***

Woods (1990) describes innovation as the teachers' inventiveness in finding ways to enable students' learning; a job that he compares to that of a detective. Teachers are mainly concerned with understanding what is posing difficulties for the learners, and finding ways to overcome these predicaments in order to enable them to move forward. Ownership defines the knowledge that teachers possess. This is not just external knowledge that they pass on to learners, but rather, knowledge that has been integrated into their own realities. It is applied to know-how as it is relevant to the class and its members. Control of their pedagogy is what Woods (ibid) argues creative teachers exhibit; their power of decision over what methods, or mix of methods they use, and when to use them. This is in clear contrast with teachers who

follows prescriptive modes of teaching, regardless of the learners' real learning needs, that may be enforced as a result of the assessment mechanisms or other external constraints (Woods, 2004). Finally, relevance describes the way in which teachers make teaching applicable to the learners' circumstances. This positively influences their engagement with the experience, and supports knowledge construction.

Craft (2005), elaborating on Woods' model, suggests teachers demonstrate innovation through providing opportunities for the learners to indicate, formulate, and offer ideas, and by encouraging them to make connections. Ownership, she argues, can be observed when teachers employ an acknowledging manner towards learners, or when they progress at a suitable pace. Control is not only exhibited by using a variety of teaching strategies, but also by recognising one's own limitations. Finally, relevance can be catered for by incorporating the learners' interest into the content of the lesson, through the teacher's engagement with the learners' interests, and by personalising the responses provided to learners (ibid). Expanding the application of Woods' model to learners, Jeffrey (2006b) suggests that *innovation* refers to a radical change in what learners know. This involves mastering a new skill, or understanding something new. *Ownership* describes the learners' knowledge as differentiated from that of the teachers, parents, and so forth. *Control* specifies the power of decision learners have over their learning process, and implies a level of intrinsic motivation. Handing over control to learners when they are undertaking tasks is key to allowing them to become aware of, and experience different perspectives (Haringman, 2001). Supporting learners in adopting diverse perspectives while doing tasks has been described as a 'part-ownership' which eventually leads to learners' full ownership (ibid). Relevance in the learners' case describes the meaningfulness of the experience for them, as well as for their group (Jeffrey, 2006b).

A more holistic model of facilitating creative learning is the construct of Creative Teaching (NACCCE, 1999), which encompasses two types of teaching: teaching creatively, and teaching for creativity (Jeffrey & Craft, 2004; NACCCE, 1999). The former, originally articulated as the use teachers make of imagination to make the students' learning more interesting, exciting, and effective (NACCCE, op cit.), has also been redefined as being concerned with effective teaching (Jeffrey & Craft, op cit.). Creative teaching involves using imaginative approaches, making learning more appealing, but also being effective (Craft, 2005). Teaching for creativity implies approaches to teaching that above all are aimed at developing the learners' creative thinking and attitudes (NACCCE, op cit.). For Jeffrey & Craft (op cit.) this equates to strategies aimed at empowering learners. Teaching for creativity encompasses three inter-related tasks: encouraging, indentifying, and fostering (NACCCE, op

cit.). Encouraging requires teachers to promote self-confidence, and belief in the learners to reassure them of their creative potential, and support them in taking the first step. Identifying, calls for teachers to support learners in observing themselves, and identify their creative strengths. Fostering involves stimulating the students, and drawing upon common skills and capacities through active engagement in creative activities. Doing so makes learners become more aware of the creative process, and understand what it entails. Teaching for creativity ought to motivate autonomy, authenticity, openness, and fulfilment (ibid). A hands-on approach is key to making learning relevant to students, and promoting ownership. This in turn endows them with control which provides opportunities to be innovative and for self expression (Jeffrey & Craft, 2004).

Beyond the scope of different pedagogical models for creativity, Craft (2001a, 2005) and the English Qualifications and Curriculum Authority (QCA) (2008a) propose various teaching strategies that foster creativity:

- Setting clear, challenging but achievable goals, and sharing these with learners
- Promoting confidence, ownership, and control
- Promoting openness to possibilities, unknown , and unexpected
- Integrating different ways of knowing (physical, emotional, and mental) and encouraging expression through these, and various media
- Balancing freedom and form
- Balancing safety and risk
- Designing relevance within learning experiences
- Reviewing progress regularly, and
- Providing adequate space and time

2.3.4 CREATIVITY AND LEARNING

The term creative learning has of recent gain currency in the literature to describe 'any learning that stimulates learner creativity' (Craft, 2005, p. 54). Sefton- Green (2008) relates that it has came into being through the amalgamation of concepts from various areas such as art and art education, self-management, and creative thinking. However he argues, claims made in relation to creative learning may not differ from those made about learning, and hence the distinction is unclear. In a similar vein, Craft (op cit.) contests that if one adheres to a constructivist learning philosophy, creativity and learning are not distinguishable. Jeffrey

(2006a), however, sustains that creative learning is different from creativity because of the emphasis the first places on learning.

Rather than putting forward definitions, some authors and educational bodies have described what is involved in creative learning. For instance, Jeffrey (2006b) reporting on a large European project concludes that creative learning exhibits three characteristics: engaging in intellectual enquiry, engaging productively with the work, and reviewing the process and product. Intellectual enquiry can take place in relation to possibility thinking and interaction with problems, and is evident when learners engage in manipulation, comparisons, experimentations, risk taking, co-participation, and reflection. Productive engagement with the work is enabled by handing over control to the students, and is observable when learners show intent in the making of their products, and the process underlying this. It involves learning by doing and through discovery, and requires that learners maintain ownership. Reviewing is taking a step back, observing and evaluating the work done, and making decisions regarding the next steps. This may involve adhering to the original plan, or modifying it slightly or substantially, as the emergent production may require.

The QCA (2008b) proposes five areas which demonstrate learners' creativity: Questioning and challenging; Making connections and seeing relationships; Envisaging what might be; Exploring ideas, keeping options open; and Reflecting critically on ideas, actions, and outcomes. These are consistent with the criteria underpinning a comprehensive rubric for evaluating learners' creative performance in the visual arts in Sweden (Lindström, 2006). The product criterion of the foregoing is tailored to the domain, and observes characteristics such as the visibility of the intention behind the picture or the colour, form, and composition. However, the process dimension maps onto the QCA (ibid) areas and examines, for instance: the learners' investigative work as demonstrated by their pursue of problems, and experimentation; their inventiveness as shown through the application of novel solutions, and their willingness to take risks; their ability to use models by identifying these in conceptual domains; and their capacity for self-assessment.

The QCA (2008b) guidelines for teachers to identify creativity is further elucidated by proving illustrative examples under each category as follows: *Questioning and challenging*, can be identified when learners ask unconventional question, meet ideas, activities, or problems in an unexpected fashion, question rules or one's own ideas, and think independently; *Making connections and seeing relationships*, requires that learners draw from their prior knowledge and experiences, connect ideas that are not commonly associated, engage in divergent thinking,

and elaborate and reapply what they have learned in other situations; *Envisaging what might be*, may involve learners asking what if question, visualizing alternatives, hypothesizing about possibilities, and adopting different viewpoints; *Exploring ideas, keeping options open*, involves a degree of experimentation and playfulness with ideas, alternatives and approaches. It requires predicting difficulties, and being able to deal with the uncertainties of products in the making. It calls for learners' persistence in achieving the goals; *Reflecting critically on ideas, actions and outcomes*, implies a critical review of the work done, and a value judgment of the same. It is an invitation to proving and receiving constructive feedback, and critiques through ideas, explanations, or proposing alternative solutions.

Creative capacities are developed through application and direct involvement in creative production, and require learners understand and master the underlying creative processes (NACCCE, 1999). Development in creative endeavours occurs as a result of 'successive approximations' in which the task at hand gets shaped, and clarified as it is being explored (ibid). Understating that creativity develops gradually is paramount, and should guide the design of the learning tasks. Attempting a complete outcome in a single move is not in the reach of most people, and could inhibit the creative process (ibid). Creative development involves walking on the tightrope of constraints and freedom, risk and safety, and intuition and premeditation. Above all, there is the interplay between divergent thinking, the generation of novel, different, and elaborated ideas, and convergent thinking, the execution of selection, evaluation, and critique of ideas. Both are essential for creative outputs (Goldstein, 2001).

Defining how creativity comes about Loveless (2002, p. 10) suggests that emerges through 'the interaction between the 'intelligence' of individuals, the domain or areas of human endeavour, disciplines, crafts or pursuits, and the field, such as people, institutions, award mechanisms and 'knowledgeable others'. The foregoing suggests a social dimension in creative processes that calls for collaboration among creators.

Research in collaborative creativity (Mamykina et al., 2002) outlines four activities collaborators in joint creative ventures should undertake. These are: Devising a shared language; Creating a common understanding of the creative intention and vision; Engaging in discussion; and Sharing resources. A shared vocabulary in relation to the conceptual and procedural planes of the activity is necessary for communication to take place. Common languages develop over time, and tend to be task specific (Mamykina et al., op cit.). A common language greatly facilitates the development of a collective creative vision, and intent. Nonetheless, verbal utterances are not the sole medium of creative communication,

and may even hinder creative expression. Lightweight computational channels such as sketching tools can provide alternative communication avenues, and support creative expression (ibid). Discussion forges common creative visions and languages, and feeds and scaffolds the development of the collective output. However ideas might be lost in conversation, and the recall of what has been discussed fades with time. Tools to capture, collect, and revisit discussions may contribute in this regard (Mamykina et al., op cit.), and may help the collaborators to maintain common ground (Clark, 1996). Collaborative situations are characterised by the flow of information among collaborators. Tools such as email, websites, and shared drawing or knowledgebase systems could be used to this end (Mamykina et al., op cit.).

Researchers in the area of music composition have been particularly active regarding the investigation of collaborative creativity. In their examination of collaborative music composition Miell & MacDonald (2000) highlight the importance of the 'presence of reasoned dialogue' as an indication of mutual engagement in collaborative creative tasks. The relevance of the four activities proposed by Mamykina et al., (op cit.) is further supported by Bryan-Kinns et al., (2007). Studying CSC music composition with graphical interfaces, the authors concluded a lack of communication among collaborators translated into loss of control over the task, and clashes of ideas among participants. The latter evidenced the lack of common shared creative vision, and led participants to adopt competitive behaviours rather than adopting a collaborative attitude. In relation to social structures in collaborative music composition, and how these affect interactions, Burnard & Younker (2008) report that when labour division was not shared among learners conflict arose. Exploring collaborative creative writing Vass (2007) highlights the relevance of emotions, and playfulness to support the process. She identifies four types of affective, playful interactions among collaborators that support collaborative creativity: musing, acting out, humour, and singing. Vass (ibid) underlines the need to adopt more holistic approaches to the study of collaborative creativity that depart from the current over-emphasis on the relevance of intellect-driven thinking.

The study of creativity has also addressed personal characteristics such as motivation (Amabile, 1988; Ruscio et al., 1998), concluding that intrinsic motivation is conducive to creativity. The proposition posits that intrinsically motivated individuals are more likely to investigate, and hence prove feelings of interest, involvement, enjoyment, curiosity, satisfaction, and find positive challenge in problems (Ruscio et al., op cit.1998). The investigation of the creative products has also been a line of research. While some authors (Bentley, 2002) have supported the requirement for creative activities to yield real world

observable outcomes that can be judge and discussed, an undue emphasis on creative outcomes can hinder creativity (NACCCE, 1999). In relation to the environment and context in which creative activity takes places, authors (Craft, 2001a; Edwards et al., 1998; Loveless, 2002) have suggested they need to exhibit the following characteristics:

- Provide rich resources materials, ideas and information, and opportunities to explore and play with them,
- Encourage risk taking and learning from mistakes in a non-threatening atmosphere,
- Provide occasions for rich encounters between worlds: the inner and outer world of the learners, or indoors and outdoors experiences,
- Freedom to make contributions and take initiative, and
- Feel challenged by the task.

2.3.5 TECHNOLOGY ENHANCED CREATIVITY

Various models to describe the way in which technology can support creativity exist. For instance, Lubart (2005) proposes a model in which technology is classified according to the type of assistance it provides to users. He suggests technology fulfils four functions: Nanny, Pen-pal, Coach, and Colleague. When technology fulfils the *Nanny* function it can help users manage and monitor progress by, for instance, overseeing time: setting time constraints, providing reminders, and supporting scheduling. It can also scaffold progress by implicitly guiding the learners through graphical interfaces, or even by fashioning the production process itself (Sefton-Green, 2005). In addition, by providing multiple representations and mediums of interactions, technology can support creative expression. The Nanny technology can also take care of routine tasks, such as file management, and frees the learners' mind for the creative activities. This proposition resonates with the computers as a Mindtool articulation proposed by Jonassen (2000). The *Pen-pal* technology gains relevance in collaborative contexts where users engage in joint creative acts. Email, and conferencing systems support collaboration over time, and space. More sophisticated uses of technology as a communication enabler are shared applications for brainstorming, or uses of mobile devices. Through these, individuals can provide their personal contribution to a collective pool of, for instance, ideas that can be displayed in a public shared space. The scope of technology as a *Coach* in creative processes can range from simple tutorials, which inform users about various models of creativity, to more complex computational systems such as knowledge-bases. The latter could hold models of creative processes and resources associated with them, and users

utilising these could be guided through the completion of a creative task. The *Colleague* analogy is the most ambitious, and envisages a human-computer partnership in which both parties work hand-in-hand. Technological solutions to achieve this rely on artificial intelligence techniques; and this approach is exemplified by virtual narrative environments (Dettori & Paiva, 2009), in which the users and system jointly contribute to the creation of stories.

A 'human'-centred model of technology and creativity with a distinct focus on learning is proposed by Wheeler et al., (2002). They argue classroom-based learning is underpinned by three core activities: social interaction, problem solving, and creative cognition; and sustaining these actions forms the basis of creative processes. They position transformative thought at the intersection of the three activities. which they argue are independent but interactive. According to these authors, creative problem solving is exhibited when learners engage in divergent thinking through, for instance, manipulation of images and text, or concise navigation through complex web content. Social aspects of creativity can be displayed when using computer - mediated communication (CMC) tools in which, for example, one can create an avatar, or engage in argumentation. Creativity in this model can be illustrated through the creation and management of content such as web pages, and through engaging in writing tasks among others.

A more comprehensive framework for the examination of the interaction between technology and creativity, and its implication for learning, is articulated by Loveless (2002, 2003). She associates the features of digital technologies: Provisionality, Interactivity, Capacity, Range, Speed, and Automatic functions; as defined by the Department for Education and Employment (1998) (In Loveless, 2002, p. 12); with the five core elements of the definition of creativity put forward by the NACCCE (1999): Using imagination; Fashioning processes; Pursuing purpose; Being original; Judging value. This mapping of characteristics (Table 1) provides a lens through which one can examine how technology can explicitly support creative processes. In particular Loveless (op cit.) suggests technology can support the development of ideas, elaboration of connections, creating and making, collaboration, communication, and evaluation.

Table 1 Features of ICT & the NACCCE Framework for Creativity (Loveless, 2002)

Features of ICT	NACCCE Framework for Creativity
Provisionality	Using imagination
Interactivity	A fashioning process
Capacity	Pursuing purpose
Range	Being original
Speed	Judging value
Automatic functions	

In describing the characteristics of technology Loveless (2002) explains how provisionality implies a freedom to modify work in progress, experiment with alternative approaches, and also keep a history of the development of ideas. She emphasizes interactivity; for instance, learners reactions to the consequences of their decisions (Loveless, 2007), are facilitated via the dynamic real-time feedback that learners receive from a variety of tools such as games and probes. Capacity and range illustrate the way in which technology opens windows into other worlds to access a vast amount of information and social groups. Speed refers to how technology can automate arduous, mundane, and time consuming tasks, freeing learners to engage with higher order process. It also denotes the ways in which technology can display and transform information in a manner not feasible prior to its invention. The characteristics of technological tools have also been articulated in terms of affordances, and the opportunities and constraints they provide (Loveless, 2007). Proposed affordances of technology for learning, which to some degree correlate to the characteristics previously outlined, include: speed of change; diversity; communication and collaboration; reflection; multimodal and nonlinear; risk, fragility and uncertainty; immediacy; and monopolization and surveillance (Conole & Dyke, 2004).

In a more recent review of creativity and technology, Loveless (2007) proposes the clusters model put forward by Fisher et al., (2006) as an additional framework through which to examine the interplay of these two areas. Fisher et al., (ibid) outline four areas of purposeful activity with digital technologies as follows: *Knowledge building*: adapting and

developing ideas; modelling; representing understanding in multimodal and dynamic ways; *Distributed cognition*: accessing resources; finding things out; writing, composing and presenting with mediating artefacts and tools; *Community and communication*: exchanging and sharing communication; extending the context of activity; extending the participating community at local and global levels; and *Engagement*: exploring and playing; acknowledging risk and uncertainty; working with different dimensions of interactivity; and responding to immediacy (Fisher et al., 2006, p. 4).

The use of technology to support creative processes it is not without strong critique. In this regard Cordes & Miller (2000, p. 4) contest:

> ***"Creativity and imagination are prerequisites for innovative thinking, which will never be obsolete in the workplace. Yet a heavy diet of ready-made computer images and programmed toys appear to stunt imaginative thinking. Teachers report that children in our electronic society are becoming alarmingly deficient in generating their own images and ideas".***

Concerns alluding to the impoverished creative experience of youth and children with media technology and moving image media production software have also been reported by other authors (Buckingham et al., 1999; Sefton-Green & Parker, 2000). In acknowledging the potential of digital tools, Loveless warns that the danger lies on the degradation of creativity to its initial ideation stage, followed by mere recoding, imitation and broadcasting without pursuit of purpose, value judgement or fashioning processes (2007). She contests that without premeditated design of activities, and experiences, the use of technology can be superficial, and procedural, bypassing the opportunities for engagement in creative flow (Loveless, 2008). Access to technology, important as it is, does not bring about creativity; creative imagination to identify its possibilities is also required (Loveless, 2002). Perhaps technologies' greatest potential resides in the interactions among people's intent, their activities, and the technological tools they utilise to execute them (Loveless, 2008).

In addition to addressing an appropriate use of technology to support creativity, authors have also identified traditional educational settings as an inhibitor to the success of digital media projects (Sefton-Green, 1999). In particular, 'the organisation of the school day with its narrow subject disciplines, short working periods, and heavy assessment load' (ibid 1999, pp. 146-147). The challenge to support creativity in these settings has also been voiced by other authors (Loveless, 2002) who call for suitable management of creative learning environments, and mindful teacher training on the domain area as well as on the technical

skills. It is suggested the latter is better executed through the active hands-on application of skills, rather than training on specific software applications (Loveless, 1999; Loveless et al.,2006); this remains a significant concern for educators (Banaji et al., 2006).

2.3.5.1 CREATIVITY AND MOBILE TECHNOLOGY

Currently, more than ever, context and mobility have became core concepts in attempting to support creativity, since the re-conceptualisation of learning scenarios for creativity is called to address the relationship between physical, and virtual spaces (Loveless, 2007). To this end, research into mobile learning has been defined as (Sharples et al.,2009):

> ***"The study of how the mobility of learners augmented by personal and public technology can contribute to the process of gaining new knowledge, skills, and experience".***

The convergence of technologies such as mobile telephones, cameras, recorders, PDAs and GPS systems into mobile devices calls for the examination of how the design of mobile digital technologies can foster creativity (Loveless, 2007). Questions such as how mobile devices 'can bring together experiences of physical and virtual spaces where people can interact with the environments, with each other and with information from many sources associated with a location' (Loveless, 2008, p. 65), and how features offered by mobile devices such as 'portability, social interactivity, context sensitivity, connectivity and individuality, can be used to capture, compose and communicate creative responses to physical settings' (Loveless, 2007, p. 8) have been posed.

Research into the use of mobile technologies for creativity is an emerging area, fuelled by the proliferation of mobile devices. The literature reports a number of experiences that bank on mobile technologies, and claim loose or tighter connections to the broad concept of creativity. However, few have been intentionally designed to support creative learning. Creative uses of mobile technologies in informal settings include projects such as Surface Patters[3] and City Poems[4] which bank on the ubiquity of mobile telephones, and social participation. Surface Patterns provides an open platform for citizens to create, and share short audio social history memories associated to ten points of a delimited urban area. To create a memoir, citizens can make a phone call and record it, or submit it in text format via the project's website. Memoirs are subsequently made available through the telephone, and citizens wishing to hear the memoirs related to a particular point call its associated number.

[3] www.centrifugalforces.co.uk/surfacepatterns
[4] www.centrifugalforces.co.uk/citypoems

Exploiting the same underlying concepts, City Poems allows people to write and read 'text' poems associated to specific areas of a city. When at a PoemPoint people can send an SMS with its reference number, and receive the poems associated with that area. Similarly, poems can be submitted via a simple SMS. The strength of these two projects is found in their innovative use of mobile technologies to support social participation, and broadcast user generated content with tools that are widely accessible. Their weakness is the lack of scaffold to support creativity. The potential danger of this type of projects is twofold; first, they are conducive to the quick creation of content which is likely to be in the germinal stages of the creative process, and may never advance beyond the ideation phase. Second, they provide a platform for anonymous broadcasting, releasing pressure from 'creative accountability' on the part of the creators, or some kind of sense of ought to the audience.

Projects designed with creativity in mind, and aimed at engaging people in the creative generation, sharing, and mapping of local knowledge onto its physical context include; Urban Tapestries[5], and Social Tapestries[6]. Both projects placed a strong emphasis on providing platforms and means for people to be authors and agents of content, rather than passive receivers. Urban Tapestry developed a communication architecture, and an application for mobile telephones. The tools allowed users to create connections among places, and associate stories and other information in various formats to them, such as, sound, image, and video. Two evaluations were conducted, and findings highlighted that while people were keen to author and share knowledge, a dominant concern was not knowing what the purpose for creating this knowledge was, and for whom it was being created (Lane et al., 2005). The intrusiveness of the telephone application that demanded too much attention from the users, when they were on the go, was also reported. Users preferred a less intrusive application in which they had more scope for creating content, than for receiving information being pushed to them (ibid). Although the levels of authoring increased during the trial, the lack of purpose and audience lingered amongst the participants, and negatively influenced content creation. To this end, the report recommended the examination of specific groups of users with some kind of pre-existing affinity, rather than random citizens without any connections, as those involved in Urban Tapestry. Social Tapestry implemented this recommendation, and conducted studies in formal education with primary and secondary schools in which the medium of sound to create, and map social knowledge was explored (Conway, 2006). The

[5] http://urbantapestries.net/
[6] http://socialtapestries.net/

report on these experiences concluded that through embedding creativity into the learning process, associative learning can be achieved (ibid).

Create-A-scape[7] is a project designed to harness the learning potential of creating mediascapes, an assemblage of images and sounds that are relevant to a certain location, and that can be experienced in situ through a PDA and a set of headphones. Create-A-Scape builds on the idea of learners creating their own tours of a location, examined in the Mudlarking in Deptford project[8], and scaffolds the creation of mediascapes with the Mscape free software. Creating a mediascape involves various stages and activities such as planning, creating or resourcing media (normally sounds and images), editing the media if required, adding it to the scape, and actually experiencing the mediascape, whether in the real, or virtual world. In addition to the actual application, the project puts at the disposal of users the Create-A-Scape website. This is an educational resource in which teacher and learners find step-by-step guidelines, templates, sample scapes, media libraries, and other information and resources necessary to engage in the venture.

The project was launched in 2006 and an evaluation of a small sample of early experiences was conducted in 2007. The evaluation report explores the implications of mediascapes for teaching and learning, and proposes they provide a context for creative learning, fostering a sense of place, and contributing to teachers' professional knowledge (Loveless et al., 2007). In particular, the mediascapes evaluated were reported to exhibit imaginative ideas, and in their creation revealed evidence of fashioning process, pursuing purpose, and evaluation. The teachers engaged in teaching creatively and teaching for creativity, and they described high levels of student engagement and student motivation. The teachers/facilitators, and schools involved in the projects evaluated were described as 'early adopters' of technology. These were professionals and sites with strong commitment towards the integration of technology in learning, with good technical skills, and prior experience of technology projects. In relation to the level of involvement of the learners, the report recommends the use of models in which learners participate in all aspects of the creation process. Although learners' participation ranges from creating the actual mediascapes, to just experiencing these, none of the projects reported learner involvement in the planning and preparation phase, which was undertaken by the teachers. The mediascapes created were aimed at different curriculum areas, but for the most part had an underlying cross-curricular approach. Mediascape activities lasted from 2 to 3 lessons, to six weeks when integrated as

[7] www.futurelab.org.uk/projects/create-a-scape
[8] www.futurelab.org.uk/projects/mudlarking-in-deptford

part of a larger teaching programme. In the particular case of the six-week project, students were not involved in the creation of the mediascape. This was created by the teacher who later used it to teach different areas of the curriculum, and moved learners to experience the mediascape.

2.3.6 SUMMARY

This section of the literature review has explored the area of creativity as it relates to teaching and learning. It has defined creativity as a fashioning process in the pursuit of outcomes that must be novel, and of value. The section has also presented models for conceptualizing creativity, and underlined the predominant view in the educational area as one that adheres to the idea of creativity in the ordinary and mundane everyday life, and as a capacity we all posses. The distinction between teaching creatively, and teaching for creativity has been elucidated. It has been suggested that creative learning requires teaching for creativity to support processes underpinned by divergent and convergent thinking. The relevance of the context in which creative learning is likely to take place has been underlined, and characteristics of these contexts outlined. Finally, an exploration of the synergies between creative processes, and technology has been undertaken. The section has concluded by reviewing sample projects which avail of mobile technology to support creative processes.

2.4 DIGITAL MOVING MEDIA PRODUCTION

Even prior to the advent of digital technology, media making by children and youth in formal and informal settings had a long history. Buckingham et al., (1999) argue that the practice has been undertaken and induced by an array of interests ranging from creativity, to technical, and vocational training. They contest that there are two views of media production: firstly, within the context of media studies, it is seen as a means to demonstrate its theory; and secondly, within the framework of formal and informal learning, it is a method to support the development of communication and social skills. However, the common tendency to encompass both approaches results in projects founded upon contradictory principles (Buckingham et al., opt cit). Regardless of the underlying objective endowed to the practice, the arrival of digital technologies has contributed to the democratisation of media making. During the analogue age, media production was an activity almost exclusive to professionals. Back then, engaging students in media making entailed a constant struggle due to the scarcity and the expense of the costly equipment, the danger of handling chemicals, for instance, for image development, the lack of portability of recorders, and the arduous endeavour of finding the few hidden editing suites 'available' (ibid). The advent of digital technology has eradicated

the need for cumbersome and expensive tools, and settings of the analogue age (Hernández-Ramos, 2007).

Wide access to media production has been driven and enabled by technical developments. In particular, the mainstreaming of digital video production has been triggered by the increase in processing speed in standard PCs, and the continued decrease in the price of digital cameras (Becta, 2003a; Pearson, 2005). The aforementioned, priced between £500 and £1000 in 2003 (Becta, 2003a) can now be purchased for anything between £140 and £500. In addition, over the past two years an increasing number of compact handheld video cameras, of lesser but adequate capability, that can be acquired for as little as £30, have appeared in the market. The unprecedented 'affordability' of digital video technology has contributed to the emergence of many small scale moving media projects in formal and informal settings, and the establishment of larger film making initiatives aimed at supporting the development of this activity in schools. Since the irruption of technology in the media making scene several authors (Buckingham et al., 1999; Hofer & Owings-Swan, 2005; Hoffenberg & Handler, 2001) have been concerned with its pedagogical application and implications, and have claimed that harnessing its learning potential is a pedagogical matter rather than a technological one.

Unless being conducted in computer or technology classes, it is recommended that moving media projects be used as avenues to augment learning opportunities, and support the curriculum (Hoffenberg & Handler, opt cit.). Notwithstanding the exiguous(ibid; Pearson, 2005), and mainly descriptive nature of research into the educational application of video production (Schuck & Kearney, 2006), studies reported in the literature appear to endorse the foregoing suggestion. Experiences are documented in, among others, French, Science, and Math (Kearney & Schuck, 2006), History (Swain et al.2003), English (Ryan, 2002), Language Acquisition (Tschirner, 2001), Literacy in special needs education (Faux, 2005), and Teacher Training (Hernández-Ramos, 2007; Hofer & Owings-Swan, 2005; Loveless et al., 2006; Potter, 2005). Video making is also popular outside formal education, and authors have reported on projects in this context (Holzwarth & Maurer, 2001; Pearson, 2005).

The literature pertaining to moving media production relevant to this thesis is concerned with work outside the specific scope of media studies, and it examines its use to support collaboration and creativity. Nonetheless the common tendency to merge conflicting principles, broadly pertaining to media studies and others (Buckingham et al., 1999), blurs boundaries, and renders difficult the task of isolating investigations not concerned with some

aspect of media studies. In addition, the meagre literature available encompasses a variety of activities such as film making, video production (Reid et al., 2002), and the creation of animations (Sefton-Green & Parker, 2000), and multimedia projects (Faux, 2005) among others. Furthermore, the agent and degree of authorship among the projects varies, and for instance, there are studies in which the teachers author the media (Burden & Kuechel, 2004), and others in which students do so (Kearney & Schuck, 2005; Kearney & Schuck, 2006); as well as cases in which resources to create the moving media are provided (Hofer & Owings-Swan, 2005), and others in which they are not (Pearson, 2005). Against this background, the term moving media production has been adopted in this thesis to encompass all of the foregoing.

2.4.1 THE FILM MAKING IMPRINT

Traditional film making approaches are partitioned into four phases: development, pre-production, production, and post-production. These in turn, encompass a series of sequential activities which include the identification and outlining of an idea, scripting, planning, storyboarding, creation of a shooting schedule and location shot-list, shooting, and editing. In professional film making each activity is conducted by experts who, in a cooperative fashion, execute their tasks following the procedural instructions of the production manager, and the creative vision of the director. It is common that moving media projects in learning scenarios involving filming adhere to, or emulate professional film making models. This is done in order to structure the activity, ensure aesthetically worthy products (Holzwarth & Maurer, 2001; Reid et al., 2002), and provide authentic learning experiences (Kearney & Schuck, 2006).

Theodosakis, a professional film maker, (2001) argues that the practice of filming making in schools supports the development of higher order thinking skills, in particular, visioning, researching , problem solving, logic reasoning, planning, and analytical abilities. *Visioning skills* come into play when one develops a vision for a film, defines what to explore, observes how the vision changes or stays the same, and turns intangible ideas into tangible outcomes. *Research skills* are required to investigate the topic of the film, settings, costumes, lighting, and so forth. *Problem solving skills* are essential to overcome difficulties in translating a vision into a film, and they may include, for instance, dealing with adverse weather conditions, time, budget, cost, equipment, or other resources contretemps and challenges. *Logic skills* are important in making decisions regarding the creation of the film, as these will have greater implications for the production as a whole. *Planning skills* in professional film making are mainly related to resource procurement, costs and budgeting. The latter considerations dictate

the shooting order of scenes, normally grouped by location, cast, or equipment availability, and they normally dictate that all footage be shot in a single attempt in order to keep costs down. In this regard, students learn the extreme importance of planning and coordinating every single detail in advance to maximize resources, and keep the project within budget and time. *Analytical skills* are at play from beginning to end, as they are required for continuous decision making (Theodosakis, opt cit.)

Findings from the Becta Digital Video Pilot Project (Reid et al., 2002), the largest study (Banaji et al., 2006) to date in the use of digital video for learning, which involved 50 schools across the UK, are in line with the propositions put forward by Theodosakis (2001). The evaluation of the project (Reid et al., opt cit.) concluded that, in addition to motivating students, supporting a range of learning styles, and providing greater access to the curriculum than traditional teaching methods, the integration of digital video into teaching and learning promotes and supports problem solving, negotiation, thinking, reasoning, and risk-taking. However, the study also highlighted the overall poor aesthetic quality of the students' work. According to the authors (ibid) the main reasons contributing to the deficient worth of the production values were: the lack of attention paid to the language of moving media; and the predominant lack of awareness, among teachers and students alike, of filming aspects such as shots, camera position, lighting, and sound. The latter was exacerbated by the absence of appropriate film making equipment. Each of the participating schools was provided with one digital video camera and one Apple iMac computer, however there was no provision for external microphones, lights, or tripods to improve the sound and image quality. Although some schools had equipment above and beyond what was provided, most relied exclusively on what they had been given. Successful projects were led by teachers who had prior experience in video making, and demonstrated an understanding of media language beyond the standard of the average media consumer. This led Reid et al., (2002) to assert that the most important factors conditioning the production of interesting digital video work were: the teachers' prior experience with it; and a structured approach to organising the tasks. Consequently, they (ibid, p. 4) concluded that the full integration of digital video in the curriculum requires teachers' knowledge of, and training in the language of moving image.

Films for Learning[9] and FÍS[10] are film making initiatives that, while proposing the application of the practice to the curriculum, and as a teaching and learning activity, place a strong emphasis on film making principles. Both programmes adhere to professional film

[9] Films for Learning http://community.filmsforlearning.org/
[10] FÍS http://www.fis.ie/

making sequential workflows encompassing: outlining, scripting, storyboarding, shooting-scheduling (Holzwarth & Maurer, 2001), and so forth, and support schools' engagement in the practice through their websites. These serve as a resource and broadcasting outlet for schools and productions, and offer technical and detailed step-by-step guidelines for teachers and students on how to create their own films. The websites provide information on equipment requirements, explanations of film making concepts, glossaries of film making jargon, galleries of films created by participating schools, and various templates to create, for instance, storyboards, shooting-schedules, location shot-lists, and camera logs. They also offer more pedagogically oriented materials such as lesson plans, or brief explanations on the potential learning benefits of engaging students in film making. In addition, Films for Learning and FÍS run annual competitions, and winning productions are selected according to criteria such as, outstanding execution of the medium's techniques and conventions, quality of image and sound, and excellence in direction, acting, and editing among others. Although both programmes have been running for a number of years, and are endorsed by the national bodies in charge of promoting the use of technology for learning in the UK and Ireland (Becta[11] in the UK provided the funding for the Films for Learning pilot, and the Irish NCTE[12] currently manages FÍS), their pedagogical merit is difficult to assert as there appears to be no published studies on these initiatives.

2.4.2 MOVING MEDIA AND TEACHING

While Reid et al., (2002) highlight the pivotal role of teachers in the successful accomplishment of aesthetically worthy moving media productions by students, Schuck & Kearney (2006) make a similar assertion in relation to their role in facilitating students' learning when these are engaged in the activity. Research investigating teachers' use of moving media production for teaching and learning is sparse in the literature. However, when available their practice has been reported to some extent in studies observing various aspects of moving media production (Burden & Kuechel, 2004; Kearney & Schuck, 2005; Kearney & Schuck, 2006; Reid et al., 2002; Schuck & Kearney, 2006). Besides the foregoing larger investigations, smaller projects also refer to the teachers' role, and practice. Some (Hernández-Ramos, 2007; Hofer & Owings-Swan, 2005) address the need for teacher training highlighted by Reid et al., (opt cit), and document pre-service teacher training in digital video.

Wang & Hartley (2003, p. 128) suggest three uses of video in teacher pre-service education: '(a) representing situations of teaching and learning in a more comprehensive

[11] British Educational Communications and Technology Agency http://www.becta.org.uk/
[12] National Centre for Technology in Education http://www.ncte.ie/

manner, (b) linking various data of a particular teaching event and issue, and (c) connecting preservice teachers to different contexts of teaching and learning to teach'. Hernández-Ramos (2007) and Goldfard (2002) contest that direct experience with production provides alternative perspectives on how meaning is created, and on the role the medium plays in the process. However, the time constraints of instructional situations circumscribed by rigid timetables, are an inhibitor for media authoring (Burden & Kuechel, 2004; Sefton-Green, 1999). Acknowledging the forgoing time challenges, Hernández-Ramos (2007) proposes a two-hour standalone instructional technology activity to introduce pre-service teachers to the procedure of digital video making.

The model (ibid) comprises five stages: Conversation, Guidelines, Shooting, Post-production, and Festival. Contradicting good practice, it bypasses scripting and storyboarding to avoid students spending too much time on deciding on, and agreeing upon ideas for the script. Allowing students to engage in such activities has substantial time implications, and translates into too little time left over for the editing and post-production tasks (Hernández-Ramos, 2007). Regardless of the time saved by ignoring group idea generation, the videos created are unpolished work-in-progress pieces (ibid). Besides the 10 minutes of the Conversation phase, spent discussing pedagogical issues, the remaining time is dedicated to production. During the 5 minutes of Guidelines, students are paired, provided with a video camera, instructed on its utilisation, and offered advice on filming aspects. These include the recommendation of shooting very short takes of 5 to 10 seconds each, and executing slow zooms and pans. Shooting lasts 30 minutes and it is followed by 60 minutes Post-production. During this time, the participants edit their footage into a video adhering to this brief: two to three minutes in length, containing an opening and closing title, featuring at least two transitions, and a minimum of two sound effects, or voiceovers (ibid). A difficulty in achieving the foregoing is the abundance of raw footage. When students capture more than 10 minutes footage they rarely succeed on editing it into a two minute video of their liking (Hernández-Ramos, 2007). In sum Hernández-Ramos (ibid) concludes that although the activity is highly motivating for the participants, it is unlikely that short experiences of the kind will influence the adoption of the practice by future teachers.

Hofer & Owing-Swan (2005, p. 102) contesting that the implementation of technology for learning purposes declare that it is 'incongruent with classroom practice and discipline-specific pedagogy', offer a domain-specific approach to pre-service training of moving media production through the creation of Historical Narratives. Their approach is interesting because it combines learning about a domain: History; and a methodology:

Historical Narratives; with learning how to convey meaning through movie making, and the technological aspects associated with it. In a six-hour experience extending two classes, small groups (of 2 -3 participants) are provided with history topics, background resources, and a template to assemble a historical narrative. Using a movie editor, the groups create a short video (of 3-5 minute duration) with their written narrative, and other resources from the internet. The evaluation of the projects, against appropriate History benchmark criteria, revealed 15 out of 22 videos were electronic encyclopaedias, and lacked creative and insightful treatment of the topic (Hofer & Owings-Swan, opt cit.). Furthermore, students were seduced by the features of the movie editor, and their conversations revolved around the application and its tools, rather than the content of the narratives. Reflecting on the pedagogical implications of the study, Hofer & Owing-Swan (2005) conclude that firstly, careful consideration must be given to the scope and sequencing of teaching; secondly, alignment between content and technology learning must be achieved; and lastly, proposing activities that merge content and process learning with practicing discipline-specific skills is contra-productive for one-off experiences.

The use of video making to support creativity in teacher education has been examined by Potter (2006) and Loveless et al., (2006). The former reports on the videos created by student teachers to capture their peers' experience while engaged in a cross-curriculum activity; the later focuses on the practice of pre-service teachers creating videos with small groups of children in schools. Besides communality of purpose, both studies implemented experiential training on video making which involved student teachers creating 'test' videos, and learning by doing. Loveless et al., (opt cit.) allowed two days for the participants to familiarised themselves with the technology, and Potter (opt cit.) framed the training within the context of the formal pre-service teachers' ICT course. Differences in implementation included the duration of the projects, and the level of participation in producing the videos. While video making in the school-based project (Loveless et al., 2006) lasted two days, in Potter's study the duration was only one day. Participants in both investigations reported spending much more time on the production than initially anticipated. This was due to students being distracted by aspects of the task, and losing sight of the bigger picture, and by the limitation of equipment in group situations which implied that, if each child was to gain access to the experience, everything took '3/4/5, etc., times longer!' (Loveless et al., 2006, p. 9). The foregoing was not an issue in Potter's (opt cit.) project since only a few participants actually engaged in the video production. However, the selection of video makers created an insider-outsider divide. Students performing the cross-curricular activity perceived the video

makers, and their task, as alien to their own. Pre-service teachers described creativity as having ideas, creating tangible outcomes which embodied it, and associated it to feelings of enjoyment from which they thought creativity emanated (Loveless et al., opt cit.). To Potter (2006) creativity is core for learning, and it becomes a social practice when it emerges in a collaborative and referential context. In both studies, the provisionality and immediacy of moving media technology supported the assembling and re-organisation of resources, which drew on shared and emerging understanding.

The investigation of how teachers implement digital video reveals three predominant patterns: extra-curricular, integrated into the curriculum, and cross-curricular; the first being the most popular given the limited availability of equipment in schools, and the technical limitations of that which was available and accessible (Pearson, 2005), which renders whole class participation difficult (Reid et al., 2002). Regarding the use of the medium, its more compelling application is as an expression and communication tool (ibid; Schuck & Kearney, 2006). This is followed by its utilisation as a observation and analysis instrument and, to a much lesser extent, as a scaffold for the development of meta-cognitive skills (Schuck & Kearney, opt cit.). To this end, Kearney & Schuck (2005) found poor pedagogical treatment of content when video making was integrated in curriculum learning, and Burden & Kuechel (2004) observed teachers used media assets to extend traditional teaching methods rather than to support innovative ones.

The most common teaching objectives for moving media production are filming making skills, and media literacy (Schuck & Kearney, opt cit.). These priorities are followed by communication and presentation skills, and writing and speaking skills (Burden & Kuechel, 2004; Schuck & Kearney, 2006). The teachers' focus on media aspects reported by Schuck & Kearney (ibid) contrasts with findings by Reid et al., (2002) who highlight the lack of understanding and attention teachers pay to the language of moving media. Paucity of interest in media language on the teachers' behalf is also documented by Pearson (2005), who argues they perceive editing as a technical skill rather than a meaning making exercise. The latter however, contradicts the views of the teachers' in the study by Burden & Kuechel (opt cit.) who articulated analogies between meaning making in writing, and media editing. Finally, the largest study to date in digital video production as a learning tool (Reid et al., 2002) reveals teachers, in clear contraposition with the media experts who evaluated the study, value the processes and interactions supported by media making more than the products and their aesthetic value.

The potential of moving media production to support collaboration and group work is consistently reported in the literature and specifically associated to filming and editing (Burn, 2001; Hernández-Ramos, 2007; Reid et al., 2002; Sefton-Green & Parker, 2000). The latter bringing the greatest learning benefits (Becta, 2003b) are the least accessible due to equipment limitations, and time constraints. Teachers report herculean classroom management and group organisation issues related to the provision of access and participation (Reid et al., 2002), and call for rethinking of timetabling, class and activities organisation, and classroom layout (Burden & Kuechel, 2004). Adhering to traditional sequential film making procedures, with limited filming and editing equipment, presented challenges to keep non-editing (Reid et al., 2002) or filming students busy. The role of the teacher in facilitating and scaffolding interactions and processes throughout the activity has also been highlighted (Faux, 2005). Commentators contest that rigorous learning, during moving media production, takes place when: teachers facilitate in-depth learning and probe underlying concepts and ideas; and when they encourage students to articulate learning during the process of media making, and after completing the products (Schuck & Kearney, 2006, pp. 17-18). To this end, authors (Buckingham et al., 1999; Pearson, 2005; Reid et al., 2002) concur on the need for alternative pedagogies for moving media production as a teaching and learning tool. They appeal for further research to elucidate 'what forms of teaching and learning work best?' (Reid et al., opt cit, p. 88). In particular, it appears that research is needed to understand suitable groupings, methods to introduce the technology, how and when participants can productively experiment alone, and the roles the various parties should play (ibid, p.88).

2.4.3 MOVING MEDIA AND LEARNING

In addition to engendering opportunities for collaboration, moving media production encourages creativity and self-expression (Reid et al., 2002), draws on students' out-of-school interest (Parker, 2002), and supports the development of problem solving, negotiation, risk taking, and higher order thinking skills (Burden & Kuechel, 2004; Reid et al., 2002). Most notably, it is attributed with high motivational power to the extent that it appeals to students not reached by the curriculum (ibid), and keeps them longer on-task (Burden & Kuechel, 2004). The motivational factor is often credited to the fact that the practice draws on students' implicit media language understanding from outside school (Buckingham, 2003; Sefton-Green & Parker, 2000). However, some authors (Reid et al., 2002) warn that moving media work alone does not automatically motivate students. Engagement is sustained through well structured tasks in the same way, disengagement and lack of motivation arises from unstructured tasks (ibid; Schuck & Kearney, 2006). Although animated graphics are more

appealing, given the similarities between these and television and film, they do not trigger as much cognitive interest as their static counterpart (Kim et al., 2007). Cognitive interest refers to the associations between incoming information and background knowledge, and it is fostered through the act of resolving inconsistencies when, for instance, making inferences (ibid). It is intrinsic to people's need for cognition, inclination to engage in and enjoy cognitively demanding endeavours; and justifies students' preference for sequences of static images they can control over animated ones (Kim et al., op. cit.).

Students' implicit understanding of media language, and the ease of use common to most non-professional media production applications (Sefton-Green, 2005), lower the threshold to media creation. The increasing availability of novice user-friendly moving media editors eliminates difficulties associated with learning specialist software reported in earlier research (Buckingham et al., 1999). Given the foregoing, and the fact that even users of complex applications such as Photoshop[13] only learn how to use specific features of a package, on an *ad hoc* need-to-know basis (Sefton-Green, 2005), instructional introductory training on applications is uncommon. The most successful and sustainable model of training students in the use of moving media production software is peer-tutoring (Burden & Kuechel, 2004). This is often implemented through role rotation and expert systems (Kearney & Schuck, 2006; Reid et al., 2002), and relies on students mastering applications, and becoming a resource for fellow students and teachers alike. Although the benefits of the practice are documented (ibid) the expert model is not without its caveats. Buckingham et al., (1999) report on how it may soon deteriorate into job specialisation and hierarchical labour division in which some students become the experts' worker-bees to the detriment of their own authors' role.

The seductive nature of digital video and underlying technical aspects relating, for instance, to the digitalisation of footage, file formats and size, concerns teachers as they may overshadow the learning objectives of activities involving its production (Hernández-Ramos, 2007; Pearson, 2005). To combat the foregoing, support action-oriented discovery learning, and allow students to engage in creative processes, Holzwarth & Maurer (2001) propose avoiding technical or theoretical explanations, and immersing students directly into filming and editing. They argue the overwhelming adoption of traditional filming models, in which scripts and meticulous planning dictate the story and the course of action from beginning to end, leave little room for students' experimentation, and inhibit participants with less

[13] An image editing application http://www.adobe.com/products/photoshop

reflective and verbal inclination, to whom scripting and planning may not appeal, for the preceding reasons (ibid).

2.4.3.1 FILMING AND EDITING

The arguments in favour of learner media authoring are many. For instance, it affords students control and agency (Burden & Kuechel, 2004) which in turn encourages them to take responsibility for their own learning (Schuck & Kearney, 2006). It provides culturally familiar and authentic learning experiences (Kearney & Schuck, 2006), and opportunities to become more critical and discriminatory. Authoring suits many learning styles (Reid et al., 2002), and learning gains acquired through this activity are transferable to other areas (Burden & Kuechel, 2004). When students author, teachers tend to become technical instructors (Kearney & Schuck, 2005), and seem to have no clear role in supporting students' creative processes (Reid et al., 2002). The lack of creative guidance, however, has serious implications for students, since they tend to imagine only the things they know how to make (Buckingham et al., 1999; Holzwarth & Maurer, 2001).

When authoring involves filming there is an over-emphasis on gathering footage (Reid et al., 2002), which might be underpinned by the common misconception that portrays filming as the core activity in media production. Nonetheless, with novice students, planning and editing have been identified as the key factors in successful productions (ibid). The over-abundance of raw footage not only generates difficulties in terms of file storage and digitalisation (Pearson, 2005), but most importantly, it neglects the possibilities offered by editing technologies (Reid et al., 2002). Students' and teachers' lack of media language fluency, paired to limited availability of filming equipment, leads to recordings made with a single camera, from a single angle and position, which turn live events into inert affairs (ibid). Filming is much more demanding than it may appear since it requires students to keep the sense of what the film should look like. Distractions such as preoccupation with acting (Kearney & Schuck, 2006), and other filming related aspects make students pay little attention to domain specific concepts (Kearney & Schuck, 2005). Allowing students to film without previous planning is characterised by aimlessness, and results in feelings of frustration (Holzwarth & Maurer, 2001). The ease with which digital video technology outputs something that appears good, actually hides the lack of content and thought, masked under good looks and effects (Buckingham et al., 1999) Point and press filming, suitable for introductory video courses, is recommended to address some of the foregoing issues (Reid et al., 2002).

Moving image editing is not just 'putting the shots filmed in the right order' (Reid et al., 2002, p. 6) but rather 'the process where choices and meaning are made' (ibid p. 28). In addition to describing a discrete technical process, editing refers to the mechanisms by which narrative is constructed. It is an aspect of creative capabilities, and the key to meaning making in moving image narrative (Sefton-Green & Parker, 2000, p. 7). Pearson (2005) sustains that when students understand the underlying concept of editing, as a selection and meaning making act, the technical skills required to perform the task soon follow. Reid et al., (2002, p. 20) provide analogies between editing and other meaning making activities which, in addition to further elucidating the underlying concept, highlight the potential of editing as kinaesthetic learning act:

> ***"Pupils who are editing do the equivalent of choreographing (movement, gesture, setting, music and time in combination) sculpting (taking raw material and carving out a finite piece of work), architecture (designing and assembling a structure piece by piece), and composing (layering sound tracks)".***

Digital video editing can support intra-personal reflection and evaluation (Reid et al., 2002), and the development of other thinking skills, since the process invites and requires editors to make their thinking more explicit (Burden & Kuechel, 2004). The iterative possibilities for editing afforded by technology exert a liberating effect on students. These students, engaging in a process akin to a learning progression model, draft and redraft their work, which leads to improvement and exploration of ideas (Reid et al., 2002). The attention students pay to detail when editing highlights their willingness to redraft their own work, and contrasts with their common reluctance to do likewise with, for instance, written work (Burden & Kuechel, 2004). The 'no fail' factor (Faux, 2005) or 'Undo' safety net, inbuilt in media editors, provides a non-threatening environment conducive of risk-taking and experimentation (ibid). This coupled with the immediacy of feedback provided by the technology, enables students to visually realise their ideas and associations (Holzwarth & Maurer, 2001). Thus, digital media editors bestow learners with external representations of their ideas allowing them to deal with the concrete, rather than the abstract, first (Faux, 2005).

Sefton-Green (2005) contest that although in recent years much attention has been paid to the creative and pedagogical potential of media production, the way in which software functions and how this influences the making process itself remains unexplored. He argues (ibid p. 99) that media production applications originate three types of learning effects: '(1) *synaesthetic effect*—representing one medium through another; (2) *translation effect*—moving

between different ways doing same thing; (3) *comparative effect*—similar processes applied to different media'. Generic functionalities such as 'cut & paste', which have become dominant design conventions across software ranging from email, to word processing, and media authoring, allow users to apply and transfer core production processes across domains (Sefton-Green, 2005), for instance, from word processing and editing applications across to media production applications. The abstract nature of moving media editing has become more transparent through the interfaces' layout, and ease with which the applications' functions can be carried out (ibid)., Production software, which is presumed to embody implicit directions for use, is not longer required to be 'taught'. The discovery of applications by trial and error encourages students' risk-taking, and promotes independence (Faux, 2005). Furthermore, scaffolds embedded in the software, as for instance, visual storyboards, relieve the users' memory and cognitive load (Faux, 2005; Holzwarth & Maurer, 2001).

Pearson, (2005) reporting on students' experience when engaged in individual video editing found three types of behaviours: *compliant, creative*, and *futzing. Compliant* students closely adhere to the teacher's instructions. *Creative* students instead, tend to disregard the teachers' guidelines, and pursuit their own ideas through exploration and experimentation. *Futzers* also engage in experimentation, but this is characterised by endless unstructured playfulness leading to little progress towards the completion of a product. In Pearson's investigation (ibid), fuztling appears to be influenced by two factors: firstly, the extracurricular nature of the activity appeared to 'relax' the teachers' practice, and futzers were often allowed to play with little retribution from the facilitators; secondly, the individual nature of the work implied that futzers were not obliged to articulate or explain their choices and actions to anyone and hence, could potentially keep on futzing endlessly. Nonetheless, Pearson (2005) argues that fuztling is not a fruitless activity but rather a process of becoming acquainted with the software interfaces, and getting ready for more productive interactions with the application. To this end, authors (Buckingham et al., 1999) have warned that unless underlying questions regarding selection and manipulation are inbuilt into media production processes, choices made by users may end up being arbitrary experimentation.

In contrast to solo editing, group editing provides a language-rich environment in which co-editors develop interpersonal skills, negotiate decisions, hypothesise about their results, judge the outcomes of their decisions, and attempt to achieve consensus (Reid et al., 2002). The need to elaborate on, and justify propositions supports the development of the ability to elicit shared understanding from peers. The foregoing is needed to clarify aspects of the task the group might be unclear about, and provides a context for purposeful learner-

centred conversation (ibid). Stories emerging from collaborative editing become narratives when the group achieves implicit or explicit shared understanding, and when the group is internally satisfied their series of events are linked by viable motivational or reaction threads (Sefton-Green & Parker, 2000). Narratives in the making are partially carried or borne by the story but fully enacted when the media editor makes the learners' intentions come to life (Reid et al., 2002; Sefton-Green & Parker, 2000). The visual instantiation of editorial decisions provides evidentiary discrepancies between individual interpretations and pre-existing work, and calls upon improvisation skills to reconcile views and move the production forward (Sefton-Green & Parker, 2000). Thus, regardless of the importance attached to the planning process in moving media creation, much of the design of a production takes place in conversation among peers (Reid et al., 2002). To this end, further understanding on the balance between careful planning, and improvisation while using editing software is required (ibid).

2.4.4 MOVING MEDIA AND MOBILE TECHNOLOGY

The advent of handheld devices with cameras, such as mobile telephones and Personal Digital Assistants (PDAs), has inspired much research into their use as data collection and media capturing tools. Research has attempted to understand the use people make of their camera phones, and what kind of actions, activities, and social interactions these may be able to support (Ling & Julsrud, 2005). For instance, phones and large public displays have been used to support the development of personal expression and public opinion (Ananny et al., 2004). Systems to share and network (Van House et al., 2005), annotate (Wilhelm et al., 2004), edit and archive (Wu et al., 2007) media taken with mobile phones at the point of capture have been developed. To date however, little research on how camera phones may be used to enable moving media authoring processes, similar to those supported by traditional technologies and approaches, has been conducted.

An early study by Kindberg et al., (2005a; 2005b) on the spontaneous use people make of their own camera phones reports on usage according to functionalities, and motivation. Data from the 34 participants, 303 pictures, and 17 videos, indicates the most common use of camera phones in order of popularity were: capturing, archiving, sharing, receiving, and printing images. While phones were mainly used to capture, more pictures (34) than videos (3) per person per month were shot. The foregoing contrasts with the amount of pictures received which on average were two (no videos) per user per month. Out of the media captured, 15 pictures (no videos) per person per month were archived, 6 shared by sending directly from the phone, and a small un-quantified number printed. Though sharing through

various mechanisms, such as infrared, Bluetooth, and MMS took place, by far the most prevalent method was co-present screen-sharing. Concerning the motivation for use, Kindberg et al., (2005a, 2005b) present a taxonomy encompassing four planes: individual, social, affective, and functional. Above all, phones were used in an individual fashion, to perform personal tasks, or for personal reminiscing. This was followed by enriching a shared experience, communicating with absent family or friends, undertaking remote tasks with others, and conducting a mutual task with co-present people. Individual use mainly involved capturing information to perform a job at a later stage, or seizing a memento. Social use was dominated by capturing pictures to be shared with others co-present, and as a means to partake of an experience there and then. A very small number of pictures (11) were taken to perform mutual tasks though these were trivial activities. On few occasions were camera phones used to carry out remote tasks with distant people. The effectiveness of images to help communicating parties achieve their objectives however, relied on pre-existing common ground among collaborators. Regardless of the fact that there was little evidence of a 'capture and send' pattern, Kindberg et al., (2005a, 2005b) sustain that capturing, and sending offer potential for new communication genres.

The use of mobile photos to support the development of social discourse has been examined by Sarvas et al., (2005) who contest that the lifecycle of a picture captured on a mobile phone encompasses five phases: Capture, Transfer, Sharing, Viewing, and Archival. Technically this lifecycle is distributed over various devices, and to cater for this and support social discourse the authors present MobShare (ibid). The application runs on mobile phones[14] and allows users to transfer to and share pictures with the MobShare web pages by creating galleries where, they can display, and discuss their pictures with others. Access to the galleries is by invitation only, and this is issued by the creator and owner of a gallery. A study involving five main users (gallery creators) and 48 invited guests over a 5-6 week period yielded 589 pictures and 74 galleries. Data indicates a delay between capturing and sharing, since 84% of the pictures were taken three days prior to being displayed. The social activity around galleries was characterised by discourse based on turn taking which may have been influenced by the fact that potential discussants had to be invited. In terms of patterns of use, Sarvas et al., (opt. cit.) report 60% of the five main users' visits were to their own galleries, and 45% of them lasted just one minute. This, they argue (ibid), indicates routine check up visits to see if any comments had been added to the discussions. The 74 galleries were clicked opened 918 times and 196 comments were made in total. However, 36% of the galleries

[14] Nokia Series 60 smartphone

received no comments at all. The types of discourse triggered by the galleries were classified into four categories: Story telling through narrative-like accounts; reports and self-documenting; greetings and thanks; and questions and opinions formation. The story tellers of narrative like accounts were always the gallery owners who shared stories about birthday parties, gossip, and jokes among others. Regarding the lifecycle of mobile pictures Sarvas et al., (opt. cit.) conclude that assigning part of the lifecycle to different technologies influences the social discourse and activity, and requires an artful integration of distributed functionalities among platforms.

The collective creation of mobile media on handheld devices has been studied by Salovaara et al., (2006) by implementing the mGroup application, a client-server Java MIDlet, which runs on mobile phones[15]. The application enables multiple users to co-author Media Stories, a series of messages containing a combination of images and text, directly on mobile phones. In addition to enabling authoring, it automatically distributes Media Stories to phones in the system, and stores them by time sent. The evaluation of mGroup with 13 users and 8 phones, during a four day rally gathering elucidates the type and purpose of the stories created by the users, and their interaction mode. In total, during the study 22 stories with an average of 10 messages, and 4.7 replies each were created by on average, 7.4 members of the group. Although Stories were initiated by individuals, the latter figure denotes wide participation in their creation by group members other than the initiator., The Stories created predominantly described stages or events of the rally and were used to coordinate activities among the group members, and achieve awareness of their activities while group members were dispersed. According to the authors (Salovaara et al., 2006) mGroup can be used to enhance the feeling of togetherness, and hence increase the sense of social presence. When collocated authoring took place, three main types of usage were identified: Individual use; Asymmetric participation; and Participative use (ibid). The first was characterised by solo viewing and reply. The second involved the participation of people other than the phone holder who were allowed to view stories, and provide input into the reply. However the 'holder', having control over the device, sanctioned whether or not to incorporate the suggestions. The third incorporated mGroup as a mediator of interactions among group members, and was distinguished by events such as taking group portraits, recording recurring events, and collective message creation. Although collectivity during the study was strong, Salovaara et al., (2006, p. 1219) contest that their findings relate to situations in which 'a partly distributed group is temporarily bound together when participating in an event'.

[15] Nokia 6630

More educationally oriented uses of camera phones for the specific use of film making are proposed by Drummond (2008) who presents an action learning framework to engage reluctant learners. The project exploits the participants' interest in mobile phones to produce films following traditional filming approaches. Learners attend workshops by media experts, in which film making principles and underling concepts relating to planning, scripting, storyboarding, camera angles, shot length, lighting and so forth are taught. They then apply the strategies and concepts learned to script, storyboard, act, shoot, and edit their film. An added motivational factor of the project is that films created by the participant enter a mini film festival. Drummond (2008, p. 131) sustains that 'as a framework for mobile learning the Turning Point project encouraged students to critically evaluate films, learn the language of cinema and gain the specific filmmaking skills and techniques of making films for mobile devices'. To this end, she suggests specific techniques for mobile filming arising from the limitations of the cameras on phones. This guidance includes the following prescriptions: 'Use close up shots with cut away to medium range., Detail drops out in long range shots; Use close up shots of main action and characters and keep in the centre of the screen to emphasize the action; Use minimal panning and zooming, mobiles do not use as many frames per second as video cameras; Overstate content e.g. emphasize expressions on faces; A close up shot to capture the action; Use a minimal number of colours and use colours that are bold and bright; Use strong lighting or bright sunlight. Night light is greenish and pixilated; Use slow hand movements when filming, panning and zooming; Use a tripod or an arm rest to prevent shaking'. (Drummond, 2008, pp. 133-134). In addition, due to the poor sound quality provided by microphones in mobile phones, Dummond (ibid) suggests to shoot the video without sound, and adding this later at the editing stage.

2.4.5 SUMMARY

This section has presented and discussed literature pertaining to the field of moving media production. In particular, it has examined approaches to support moving media authoring, in formal and informal learning settings, as well as teacher training. For the most part the research analysed highlighted the learning benefits of the practice arguing that it supports the development of collaborative, critical thinking, and creative skills. Although the use of moving media production as a 'generic' teaching and learning tool outside the scope of media studies is not well documented in the literature, projects conducted to date point to difficulties with time investment, classroom management, and lack of access to technology dependent activities due to the limited availability of equipment. Above all, the literature points to the need for appropriate pedagogical methodologies for moving media production.

The section also provided an overview of projects with mobile technologies which involved some element of media production. Although there appears to be no research explicitly addressing the collective authoring of moving image media with mobile devices, the Turning point project proposes a framework for traditional film making with mobile phones.

2.5 DISCUSSION

The review of the literature in the areas of collaboration, creativity, and moving media production reveals significant synergies among these areas as they apply to teaching and learning. Firstly, the need for intentional design, careful planning, structure, and constraints to scaffold learners, and guide them through the learning experience, are concepts highlighted in the three fields. Within the context of creativity the foregoing is needed to obtain a creative output which is a paramount element of creative processes. In collaborative settings clear articulation and understanding of interaction rules and tasks, and allocation of roles, provides conditions which increase the possibility of productive collaborative interactions taking place. Similarly, studies in moving media production indicate that the most successful implementations of the practice are characterised by careful planning and organisation of the learners, their activities, interactions, resources, and tasks. Failure to provide the appropriate learning structure results in these learners floundering, dividing labour according to expertise or vertically leading to cooperative situations, disengaging and losing interest, not achieving the envisaged outcomes, and making indiscriminate use of technology, among others. To this end, the role of the teacher as an orchestrator of the entire learning experience in its cognitive, interactional, and logistical levels is increasingly emphasised.

Secondly, the level of knowledge learners possess is also a consideration in the three areas. Within the framework of collaboration difference of knowledge between children and adults, experts and novices, and peers are discussed. For instance, novices tackle tasks in a step-by-step fashion while experts, seeing the 'bigger picture', can approach greater undertakings at once. This notion is also mirrored in some creative approaches and alluded to in moving media studies which report the students and teachers' lack of media language as a major difficulty for the achievement of aesthetically 'worthy' outputs.

Thirdly, TEL research in the fields under examination has attempted to address the above mentioned issues, structure and need for knowledge, through features embedded in learning technologies. For instance in CSCL, some applications have inbuilt interaction rules or controlled access to resources according to the desired interactions among learners. Another common approach is to strive for high fidelity in interfaces that mirror the

conceptual knowledge of experts, and allow learners to engage with procedures about which they do not yet possess the underlying conceptual understanding and knowledge. While the previous approaches and others found in the literature offer potential to support learning, there are difficulties associated with the use of these types of tools. For example, the overhead associated with learning how to operate applications is reported to get in the way of the actual learning experiences these applications are actually supposed to support, and hence to a certain degree defeat the purpose. In this regard a level of prior appropriation of the tools would contribute to mitigate the foregoing challenges. In addition, high fidelity of interfaces may lead to the assumption that applications are self-explanatory, and carry enough information to allow learners to perform procedures without any additional scaffold. While this might be the case at a procedural level, studies in moving media production have indicated that the over-reliance on the tools to instruct learners in the procedures has lead to superficial, or limited understanding of meaning making processes. On a more positive note, many common functions in applications, as for instance 'cut & paste' have become 'universal' design features across different tools. This implies that when approaching a tool afresh learners already possess a level of knowledge that can be transferred from what is known to the new situation.

Fourthly, regarding processes, imaging, exploration, experimentation, judging value, and fashioning among others are associated with creativity. These coexist and are underpinned by a number of paradoxes such as divergent and convergent thinking, constraints and freedom, risk and safety, and so forth. Similarly, explanation, negotiation, and mutual regulation implying some degree of elaboration, and elicitation are commonly related to collaboration. The foregoing is dependent on a level of common ground among collaborators sufficient to fulfil the task at hand. When learners engage in collaborative creativity, in addition to engaging in the aforementioned processes, they have to develop a common language and shared created vision. The achievement of these objectives can be facilitated by activities and tasks that provide latitude, and thus are sharable and 'creatively rich'.

Fifthly, research into the use of moving media production has highlighted the practice as a rich context to engender collaborative processes and creativity. Teachers, in particular, in clear contrast with media professionals, appreciate its process value over the end product, and emphasise filming and editing as the activities within the practice offering the most learning benefits. Although there is limited research in the field, that which is available is consistent with the foregoing. However, the implementation of moving media production as a teaching

and learning tool outside media studies presents a number of difficulties: the lack of access to sufficient and appropriate technology; the substantial time investment it requires which is incompatible with formal education timetabling; group management issues arising from the limited availability of equipment and adoption of traditional film making models; and learners' limited access to technology dependent activities such as filming and editing. To address the foregoing, numerous strategies have been adopted. The most common involve: moving media production taking place as an extra-curricular activity; the distribution of learners into small groups, commonly of three members; and the division of the activity according to filming models which provide tasks such as planning, storyboarding, scripting and so forth. This provides all learners with some level of participation in the overall production; and the use of data projectors enables whole class participation in editing.

Lastly against this background, the author questions the appropriateness of traditional film making approaches commonly adopted in educational moving media production projects, to create conditions conducive for collaborative creativity to come about, and scaffold collaborative creative interactions among co-creators. In this regard, she proposes the exploration of alternative pedagogical approaches that avail of mobile technology to: enable and scaffold the emergence of collaborative creativity among learners engaged in collective moving media production.; and to overcome the limitations reported in the literature such as access to technology, time investment limitations, access to technology dependent 'learning rich' activities, and the lack of appropriate pedagogical methodologies.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

Naturalistic research is concerned with creating meaning by interpreting situations which often take place in their natural 'habitat'. As with all qualitative research, it is 'subjective' in that it consists of a set of interpretative practices. Common methods in qualitative inquiries are: Action research, adopted when the objective is to solve a particular problem by changing, and improving a given situation (Cohen et al., 2000; Creswell, 2005); Grounded theory, recommended in instances when there are no theories that explain the events under investigation (Cohen et al., 2000); and Ethnography research, concerned with studying groups of people to investigate phenomena in which they are involved (Creswell, 2005). Geertz (1973) supports that ethnographic investigations should provide 'thick descriptions' of the situation under scrutiny. These descriptions have three characteristics: they are interpretative, they decode the flow of the social interactions and discourse, and the interpretation itself attempts to distil and investigate the main elements of the discourse (Geertz, 1999). This highlights an objective of qualitative research; it remains receptive to what the episodes observed may unveil in relation to the participants' understanding, views, and perceptions (Phelps et al., 2005). The foregoing implies that within an ethnographic paradigm, the phenomenon being studied is context-bound and context rich (Jackson & Taylor, 2007). Hence, the context in which episodes take place ought to be examined and understood. Ethnographic approaches are:

> ***"concerned more with description rather than prediction, induction rather than deduction, generation rather than verification of theory, construction rather than enumeration, and subjectivities rather than objective knowledge" (LeCompte & Preissle, 1993, pp. 39-40).***

This chapter sets out the research methodology of the thesis against the backdrop of naturalistic, ethnographic research. In particular, it presents the rational and theoretical underpinning for the case study methodology adopted. It discusses issues in relation to validity, reliability, and trustworthiness, and aspects of data collection and analysis. The chapter outlines the research methodology of the present study detailing its stages, procedures, sites, participants, data collection instruments, and data analysis approach.

3.2 CASE STUDY RESEARCH

While Cresswell (2005) and Langenbach et al., (1994) propose that case study is a type of interpretative ethnography, Adelman et al., suggests it is the examination of an instance in

action (1980), and Stake (1994) argues it often concerns a single, circumscribed situation. A case study is a 'bounded system' (Creswell, 2005) that calls for in-depth explanation and analysis of the phenomena within it to portray, and interpret what happens in the system. It is an investigation of episodes in their real context where the "boundaries between phenomenon and context are not clearly evident" (Yin, 2003, p. 13) . Case studies offer the possibility to study ideas and/or theories as they regard people in their real settings, and they enable researchers to establish cause and effect relationships as they occur in their authentic context (Cohen et al., 2000; Yin, 2003). Cohen et al., (2000, p. 181) contest:

> ***"It provides a unique example of real people in real situations, enabling readers to understand ideas more clearly than simply presenting them with abstract ideas or principles.....Case studies can penetrate situations in ways that are not always susceptible to numerical analysis."***

A case study is the most appropriate research tool when studying contextual conditions (Yin, 2003), and most beneficial when researchers have little control over events (Hitchcock & Hughes, 1995). As a research strategy, it provides a comprehensive method which comprises the design rationale, data collection techniques, and procedures for data analysis (Yin, 2003). Case studies are characterised by vivid descriptions of relevant episodes, and offer chronological narratives of these blended with their analysis (Hitchcock & Hughes, 1995). The foregoing enables researchers to grasp and maintain the holistic meaning of the characteristics of real-life events (Yin, 2003), and focus on gaining understanding of the stakeholders' perceptions of these (Hitchcock & Hughes, 1995). Case studies are prevalent in educational research because they are 'strong in reality' and concerned with studying authentic, contextualised effects (Cohen et al., 2000). They observe the life-cycle of singularities in an attempt to 'establishing generalisations about the wider population to which that unit belongs' (ibid 2000, p. 106).

Stake (1994) contests that a case study can be *intrinsic* if designed to investigate the situation itself, or *instrumental* if devised to elucidate a broader principle. Yin (1993, 2003) proposes three types of case studies: *Exploratory* case studies address 'what' questions, and aim to inform questions, and hypothesis for subsequent investigations; *Explanatory* case studies are driven by 'how', and 'why' questions, and are concerned with elucidating cause and effect relationships; and *Descriptive* provides a full account of phenomena in their context. In addition, *revelatory* cases offer the opportunity to investigate, and analyse phenomena previously unavailable for scientific examination (Yin, 2003). Bassey (1999) also advances

three categories of case study: *Theory-seeking* and *theory-testing* focus on the issues being investigated rather than the case itself, and it examines general questions representative of broader concern. The first leads to 'fuzzy propositions' (more tentative) and the second to 'fuzzy generalizations' (less tentative); *Story-telling,* and *picture-drawing* are analytical descriptions which enlighten theory. The former provides a chronological narrative description of the case and its analysis, and the latter a description amalgamating the results and interpretation of the case. *Evaluative* cases seek to ascertain in a formative or summative manner the merits of phenomena. Case studies ought to be driven by concrete propositions, reflecting relevant theoretical issues; however, exploratory cases are frequently guided by statements of purpose, given that the proposition itself is often the object of the investigation (Yin, 2003).

Yin (2003) suggests case studies can further be qualified as; single, multiple, embedded and holistic. A *single* case study design is analogous to a single experiment, and is applicable when it "represents (a) a critical test of an existing theory that is, a case which meets all criteria or conditions for testing a specific theory, (b) a rare or unique circumstance that is, a case that is so rare that warrants further investigation, or (c) representative or typical case that is, a case whose object of study is assumed to behave in ways typical of a class or group, or when the case serves (d) revelatory or (e) longitudinal purposes" (p. 45). Similarly, a *multiple* case can be compared to multiple experiments, which seek to achieve 'replication' by either conducting the investigation under the exact same conditions, or by modifying conditions not relevant to the original result. Either way, two likely outcomes ensue: *literal replication*, similar results which highlight patterns common to all cases; or *theoretical replication*, contrasting results accounted for by predictable reasons (Yin, 2003) . When replications occur across cases they strengthen confidence over the findings, and the overall results. Finally, *embedded* case studies are composed of sub-unit/s which are examined in their own right, while *holistic* represents a single unit investigated as a whole. In this regard, Yin (opt. cit) suggests embedded design can be an effective mechanism to focus inquiries.

3.2.1 VALIDITY, RELIABILITY, AND TRUSTWORTHINESS

Validity, or the extent to which research results are what they claim to be, and reliability, the degree to which findings can be replicated (Bassey, 1999), refer to the quality of inquiries and can measure numerous dimensions of a study. Although multiple types of each kind have been articulated and implemented as quality assurance mechanisms, threats to the validity and reliability of research cannot be completely eradicated (Cohen et al., 2000). In social sciences four quality constructs are commonly cited. These are: Construct validity, Internal validity, External validity, and Reliability (Creswell, 2005; Gall et al., 1996; Yin, 2003).

Construct validity implies establishing operational measures suitable for what is being studied (Mertens, 1998). Internal validity concerns the degree to which the changes in the dependent variable, or outcome can be attributed to an independent variable (Gall et al., 1996). In case study methodology inferences are made from collected data, which elucidate how events resulted from earlier occurrences The inferential approach is not applicable to exploratory or descriptive studies, since they do not seek causal relationships (Yin, 2003). Internal validity can be affected by history, changes in the study population such as natural maturation, becoming test-wise, or dropping-out rates, and instrumentation which refers to changes in the dependent variable due to the nature of the instrument, rather than to the independent variable (Mertens, 1998). External validity regards the degree to which the results can be generalised to other people, settings, and times (Cohen et al., 2000). However, case studies investigate the singularity rather than the 'typical' example, and so issues regarding external validity in an empirical sense are meaningless (Bassey, 1999). Finally, reliability aims to ensure consistency, stability and predictability. Its objective is for other researchers to obtain the same results if the study is carried out under the same circumstances. However, Yin (2003) emphasises it implies conducting the exact same case again, rather than replicating the results by conducting another case.

Lincoln & Guba (1985) propose Trustworthiness, the ethics of respect to the truth in a case study, as an alternative to reliability and validity in naturalistic research. They offer credibility as an option to internal validity, transferability to external validity, dependability to reliability, and conformability to construct validity. The implementation of the foregoing they contest should be guided by questions in relation to Truth value, establishing the truth of the results as they refer to the participants, and the context of the case; Applicability, determining to what degree the findings of one case are applicable to other people and contexts; Consistency, ascertaining to what extent the results could be replicated should the study be conducted with similar participants, and in a comparable context; and Neutrality, establishing the results arising from the participants, and the context rather than the potential biases, perspectives, interests, and motivations of the researcher (Lincoln & Guba1985). Bassey (1999, pp. 76-77), elaborating on the concept of Trustworthiness and strategies proposed by Lincoln & Guban (ibid), suggests eight mechanisms contributing towards this end: 1. Prolonged engagement with data sources to immerse yourself in the issues, and build relationships of trust with the participants; 2. Persistent observation of emerging issues to identify salient features, and ascertain whether or not they are relevant; 3. Checking raw data with their sources to verify its accuracy; 4. Triangulation of raw data to generate analytical

statements; 5. Systematic testing of analytical statements against hypothesis, evaluation or emerging story to corroborate these; 6. Challenging of findings by a critical friend to strengthen the project; 7. Provision of a detailed account of the research, to build confidence in the findings; and, 8. Creation of a case record which provides a proper audit trail. Regarding triangulation, Cohen et al., (2000) contest it is a powerful means of attesting the validity of outcomes, and counteracts bias which may arise when a single source is use. They (ibid) propose several types of triangulation, among which are featured; Data triangulation, Time triangulation, Theoretical triangulation, Investigator triangulation, and Methodological triangulation.

3.2.2 DATA COLLECTION AND ANALYSIS

Participant observation, and non-participant observation are two predominant modes of collecting data in case studies (Cohen et al., 2000). The former, although it may affect the case itself, is recommended in naturalistic environments where the researcher has little control. The latter is more suited to settings such as laboratories where variables are controllable, and the researcher can adopt a detach observer role (Harrison et al., 1998). Participant observation cases are characterised by the researcher as the primary instrument of research (Eisner, 1991), and by the central role s/he plays in data gathering, and analysis (Phelps et al., 2005). In these scenarios observation is the dominant data source, while underlying the importance of collecting various data sources for triangulation purposes in case study, Yin (2003) identifies six data source types: documents, archival records, interviews, direct observation, participant-observation, and physical artefacts. Self reports (Langenbach et al., 1994), research journals, students' work, and audio-visual materials are also proposed (Creswell, 2005). In particular, the use of digital video as a data collection tool is "an effective way of illuminating the study's results, and providing valuable insights that might not otherwise be available" (Schuck & Kearney, 2006). This becomes paramount when cases investigate the creation of graphical representations. According to Sherin (2000) in these cases it is crucial to capture a thorough account of the process of creation so as to gain insight into why people make the representations they do when they do.

Observation allows researchers to discover additional relevant environmental, and behavioural information which in cases involving the use of technology, provide valuable data for understanding the actual utilisation of technology, and the problems encountered by its users (Yin, 2003). Likewise, visual information such as images, or video conveys rich characteristics of the cases which may not be portrayed otherwise. In contrast to direct observation, participant observation requires the researcher to adopt a variety of roles in the

case and often to partake in the events under investigation (Yin, opt. cit.). The foregoing provides access to situations that may not be otherwise available for research, and offers the opportunity to present an insider perspective which accurately mirrors the episodes under investigation. However, participant observation presents caveats such as potential biases, demands imposed by the participant roles which may not provide sufficient scope or time to fulfil the observer role, and the distribution of participants or case sites which may not allow the participant observer to be at the right place at the right time (Yin, opt. cit.). To this end, observation protocols contribute towards diminishing potential biases, and focusing the practice. Interviews in case studies are conversations guided by the case's line of enquiry, and can be open-ended or focused (Yin, 2003). In contrast to the former, the latter is likely to be driven by a set of questions arising from the case itself, which are used to corroborate information that may have already been established through the case (ibid). Finally physical artefacts such as the products of technology-mediated practices may allow for examination beyond, and above what can be directly observed. Given that there are no case study specific data collection tools, Bassey (1999) urges researchers to be adventurous in their choices of tools rather than governed by traditional views, and above all to be guided by appropriate research ethics.

The lack of standard data analysis techniques explicitly purposed for case study (Bassey, 1999), and the common abundance of complex data pose serious challenges to researchers addressing data analysis. Creswell (2005) suggests a number of steps for the process. 1. Preparing the data for analysis. This may include transcribing interviews, typing field notes, or classifying various data types according to sources, or other criteria. 2. Immersing oneself in the data by reading through it to get a sense of what it means or what the participants are saying. This step generally involves annotating the data to record thoughts, writing memos of ideas or concepts and thinking about the organisation of the data. The process constitutes a preliminary exploratory analysis. 3. Detailed analysis of the data through coding and theming, which involves partitioning the data into categories, and labelling these prior to attaching meaning to them. This iterative process calls for constant forward and backwards transitions from the data to the codes, and vice versa. 4. Compiling a list of codes, and grouping similar ones in order to eliminate redundant candidates. 5. Revisitingthe data with the list of codes to verify if new codes emerge. 6. Developing interpretations or meaning from the data which holds forth the lessons learned, and presents them.

Similarly, Bassey (1999) proposes that data should be organised into case records, each of which is dedicated to a research question. Raw data, he suggests, is initially annotated and divided into data items, for instance, a question and answer from an interview. This phase is followed by the generation and testing of analytical statements, and involves devising articulations, strongly grounded on raw data, which provide concrete answers to research questions. Once first level analytical statements have been generated, researchers proceed to articulating second level analytical statements by revisiting the first round of statements, and returning to the raw data. Second level statements may zoom into particular issues, and analyse them through different dimensions, such as time and so forth. Regardless of the angle of analysis, Bassey (opt. cit.) underlines the need to always check analytical statements against the raw data. The final stage involves interpreting, and explaining the statements in order to articulate how, and why things are the way they are. While interpretations are normally associated with individuals, and groups of people, explanations advance cause and effect relationships (Bassey, 1999).

Also specifically discussing case study research, Yin (2003) recommends three general strategies for data analysis: Relying on theoretical propositions; Thinking about rival explanations; and developing a case description. He contests (pp. 111-112):

> ***"The first and more preferred strategy is to follow the theoretical propositions that led to the case study ... The propositions would have shaped your data collection plan and therefore would have given priorities to the relevant analytic strategies ... the proposition helps to focus attention on certain data and to ignore other data.... The proposition also helps to organize the entire case study and to define alternative explanations to be examined. Theoretical propositions about causal relations - answers to "how" and "why" questions - can be very useful in guiding case study analysis in this manner."***

Thinking about rival explanations implies devising alternative interpretations for the data, which requires particular attention when addressing issues of causality. This strategy may have been already incorporated in the theoretical propositions if they included rival hypotheses. Regardless of whether or not this may have been the case, articulating divergent explanations may contribute to clarifying, and developing theoretical propositions (Yin, 2003). Developing a case description involves writing a narrative describing the case, and its history. This may not incorporate a formal analysis, and can contain and convey a tacit message in relation to the findings.

In addition to the three general strategies for data analysis, Yin (opt. cit.) also proposes more specific mechanisms such as pattern matching, explanation building, and cross case synthesis, among others. Pattern matching is one of the preferred methods for analysis in case studies, and requires generating predictions regarding patterns, and comparing these to patterns arising from the data. While in explanatory cases the patterns may be regarded as independent, as well as dependent variables, while in descriptive ones, they can still be used as long as the possible patterns or variables are defined prior to data collection. When patterns match, they contribute to reinforcing the case's internal validity. The main difficulty with pattern matching techniques is to decide on closeness of fit, a practice that leaves ample room for interpretation. Explanation building is a type of pattern matching which provides an extra dimension by articulating the nature of the causal relationship among the various elements that compose the pattern. It is most relevant for explanatory cases, and results from a series of iterations in which firstly theoretical propositions are made, and then these are compared to results of an initial case. The initial propositions can be compared to other information from the same case or to another case. This type of process allows the refinement of theoretical propositions, and is well suited to multiple case studies. Finally, cross-case synthesis is a technique specific to multiple cases, and is of particular relevance when one case includes at least two cases. However, cross-case approaches also apply to independent research studies. With this strategy, data is drawn from various studies and compared, which enables the investigation to address broader, and more complex issues than might be possible with a single case. All of the previous data analysis techniques may benefit from leaving aside an unanalysed portion of data which is later used to compare with tentative propositions arising from the data analysed (Lincoln & Guba, 1985).

3.3 RESEARCH METHODOLOGY OF THE STUDY

As stated in the introduction, the objective of the present study is to design, develop, implement, and evaluate a pedagogical methodology (which we have called the mobileDNA) to support and scaffold collaborative creativity in collective media production with mobile technologies. To this end, the previous chapter presented a review of the literature which provides the theoretical background to inform the design of the approach. However, the absence of similar methods, and the ambitious objective of the research required that the investigation be conducted in two phases, each of which addressed distinct research questions. The questions naturally fell under one phase, or the other. However, there were questions that overlapped both phases, such as those related to orchestration models, and the

influence of the technology on the phenomenon under investigation. The two phases of the study, and the questions they address are as follows:

Iterative Design Process to develop the mobieDNA

- What resources, tasks, roles, and activities engender conditions conducive to the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What group formation, task distribution, and sequencing enable workflows which trigger the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What kind of orchestration is appropriate to foster and develop capabilities to engage in learning experiences based on productive, collaborative and creative moving media production?

Implementation and Evaluation of the mobileDNA

- How does the mobileDNA support and scaffold collaborative and creative processes of moving media production?
- What are the design implications for tools to support collaborative creative moving media production, with mobile technology, arising from this study?

The objectives of the research required the investigation of a group of people and phenomena to construct understanding in relation to the research questions through description, interpretation, induction, and generation of propositions. Hence, ethnographic research was deemed the most appropriated method. Given that the study aimed to examine an instance in action of a bounded system, comprising the participants, the researcher, an activity, and technology to enable the completion of the task, case study was adopted as a research strategy. This decision was further supported by the fact that the researcher had little control over the events. Although she intended to propose an activity, and an approach to completing it, she could not exert control in an experimental fashion on the participants, and the numerous possible complex contextual variables. Furthermore, the phenomenon under scrutiny involved real people in a real situation, which again supported a case study approach.

Adhering to Yin's (2003) case study typology, the present thesis can be classified as a Revelatory case in that it examines a situation that was not previously available for investigation since it was arising from the study itself. The research aims to: firstly, design and

develop an approach; secondly, proceed to its implementation and evaluation. It also qualifies as revelatory in that the initial construct under investigation arises from the researcher's conceptual articulations. The relevance of the foregoing motivates the decision to adopt a participant researcher approach. This was deemed necessary because a double insider perspective was required to design, and develop the pedagogical model. Firstly it was the researcher's literature informed understanding of how the activity should be performed, with mobile technologies to trigger certain types of interactions, which guided the initial stage of the research. Secondly, from the foregoing insider perspective, an insider analysis of the instance in action was required to ascertain whether the various interventions yielded the desired outcomes, and to inform subsequent iteration to the design when needed. Although the investigation as a whole qualifies as Revelatory case study, each stage had distinct objects, and they are further partitioned into: Exploratory case study in the first stage; and Explanatory case study in the second.

The investigation concerned with the Iterative Design Process to develop the mobileDNA adheres to Exploratory case study because it regards 'What' questions driven by statements of purpose informed by theory, rather than concrete theoretical propositions. Additionally, the expectation was that these questions inform further questions, and hypothesis for the subsequent stage of the research. The implementation and evaluation of the mobileDNA is considered an Explanatory case study because it explicitly addresses 'How' questions, which implicitly bring about 'Why' questions regarding the mobileDNA under investigation, and its broader implications. Furthermore, the second stage of the research sought to elucidate cause, and effect relationships. Finally, for both stages a multiple embedded case study design was adopted. The foregoing was deemed more appropriate because multiple versus single contributes towards strengthening the Trustworthiness of the study, and because multiple cases could counterbalance possible researcher biases. The rationale for embedded cases is advanced by the need to investigate the overall system, but also distinct elements within it, for instance, the type of tasks, roles, or resources, which affect the system itself. In sum, the present investigation is a multiple embedded case study implemented in two distinct stages: 1. Exploratory case studies to address the Iterative Design of the mobileDNA; and 2. Explanatory case studies to implement and evaluate the mobileDNA.

3.3.1 OVERVIEW OF THE TWO STAGES OF THE RESEARCH

Detailed information regarding the participants, sites, duration, data collection instruments, data sets, and procedures which followed for each stage of the research are

provided in the relevant pertaining chapters (Chapter 4: first stage & Chapter 6: second stage). This is done in attempt to contextualise the research methodology adopted, rather than artificially detaching it from its ecosystem. To assist understanding, however, an overview of the two stages is given.

The first stage of the research involved 12 exploratory case studies, conducted with 56 participants, aged 13-21, from different educational, and socio-cultural backgrounds, in Ireland and South Africa, over a two-month period. The participant researcher also adopted the role of facilitator, and conducted the DN workshops with the assistance of a media professional (MP) and a non-participant editor. Direct observations, video capture, focus groups, and the media artefacts created by the participants were the main data sources. Iterations to the methodology implemented during DN workshops were informed in findings from previous iterations. Data analysis for this stage involved pattern matching (Yin 2003).

The second stage of the research involved 8 explanatory case studies conducted with 60 participants, aged 15-16, in Ireland over two distinct periods in 2006. The participant researcher facilitated, and conducted the DN workshops with the assistance of mentors as chaperons. Video capture of all the DN workshops, direct observation, video from a Diary room, interviews with the participants, and the media artefacts created by the participants were the main data sources. Data analysed for this stage involved relying on theoretical propositions, and explanation building (Yin, 2003).

Ethical issues in relation to the research in both stages were dealt with following research ethics recommendations (Cohen et al., 2000). All participants and their parents/guardians were informed of the purpose of the research, and their consent (appendix A) sought before the research began. It was made clear to participants that their involvement was voluntary, and that they could withdraw from the research at any stage without prejudice.

3.3.2 TRUSTWORTHINESS AND DATA ANALYSIS

Given the potential biases of the participant researcher, every effort was made to maintain the ethics of respect to the truth in the investigation. Trustworthiness (Bassey, 1999; Lincoln & Guba, 1985) was sought through prolonged engagement with the data sources, and the participants, persistent observation, and extensive data triangulation. Internal validity was not a concern during the first stage since according Yin (2003), it is not relevant to exploratory case studies which do not seek causal relationships. During the second stage internal validity was sought by maintaining a systematic approach in the implementation, involving: adhering to the mobileDNA process without making any alterations to this

throughout the cases; providing the same working space, and condition; and always using the same facilitator for the workshops. Potential threats to internal validity such as the population becoming test-wise, or its maturation were not relevant to this study since its focus of investigation was not affected by changes in those variables. Drop-out risk of participants, in the cases extending over several weeks, was perceived as a 'real' threat by the researcher. This was mitigated by making the participants generate, and undersign their own code of conduct, which included undertaking a commitment to attend the workshops (appendix A). Only one participant during the second stage of the research dropped-out. Additionally, group sizes during the second stage were kept within the same range.

Given the distinct differentiated objectives of the two stages of the research, different data collection instruments, and sources applied to the two phases, and minor variations occurred among cases during the first stage. The actual data collation proved more challenging than envisaged, since the researcher had to check every phone used to ensure all the media created by the participants had been collected. It was also found that the participants deleted media they did not consider suitable for the DNs; however, this was a valuable data source for the researcher, and the participants were instructed not to delete any media created from their phones. Once collected and collated, the data was initially treated in the same fashion. To familiarise herself with it, the researcher immersed herself in the data by reading her observations (appendix B), watching the video recordings of the workshops, seeing (appendix C) and hearing all the media created by the participants, and watching the media projects at different development stages (appendix D), as well as the final productions. During the immersion stage, the researcher annotated the data. For instance, the Scripts created by the participants for the DNs were expounded with information extracted from the video footage. In addition, transcripts of conversations, association of ideas in the Script to their contributors, or 'loose coding' regarding collaborative creative processes were also added (appendix E).

The immersion stage was followed by the transcription of the video recordings (appendix F) of the workshops, the Diary Room (appendix G), and the Interviews (appendix H). The transcription of the two cases presented here was done by the researcher while the remaining was outsourced to a professional (appendix I). This expedient served to detach the researcher from part of the data, which was also put aside without being analysed, and was returned to after the researcher had completed the analysis of the data she transcribed. By so doing the researcher had a pristine set of data to test her propositions against. The transcription of the videos provided the researcher with the opportunity to re-experience the

workshops afresh, and grasp numerous episodes, and nuances which had escaped her as a participant researcher. The transcribing process became a reconstruction of episodes by embedding relevant media created by the participants in the transcript at the precise moment in which it was being discussed or used (appendix F).

During this phase the researcher started analysing the data by identifying episodes relevant to the issues under investigation, applying the *Relying on theoretical propositions*, and *Explanation building* strategies (Yin, 2003). Conversely, pattern matching (ibid) was used to analyse the data from the first stage, since the objective was to examine whether the independent variables obtained the predicted outcomes. Additionally, in order to test the interpretations, and propositions arising from one data set, these were checked against other data sets. For instance, the observations made by the participant researcher were tested against data from the video recordings of the workshops, the focus groups and interviews with the participants, and the participants' comments recorded in the Diary room. All the media, and artefacts created by the participants, at different development stages, were also analysed against the foregoing data sources. In particular, the reconstruction of contextualised episodes as they happened was possible by watching the video recordings, and simultaneously analysing the media and the media projects at that precise moment of their creation. The foregoing enabled the researcher to re-contextualised single units of media, comments, movements, and conversations to gain insight into the meaning of the episodes themselves.

3.4 SUMMARY

This chapter presented, and discussed a brief theoretical rationale for the research methodology adopted in this study. It outlined principles regarding naturalistic, and ethnographic research, and argued for the suitability of this method for the current study. In particular, it presented the case study approach and some of its typologies, data collection tools, and analysis strategies. The chapter provided an overview of the two stages of the research methodology, and information in relation to the multiple embedded exploratory, and explanatory cases which integrate and illuminate the investigation. Finally the chapter described how trustworthiness was addressed in this research, and the procedure for data analysis.

CHAPTER 4: ITERATIVE DESIGN PROCESS TOWARDS THE MOBILEDNA

4.1 INTRODUCTION

The review of the literature presented in chapter 2 establishes that moving media production offers opportunities for learning beyond the scope of media studies. It is attributed with supporting numerous cognitive processes, providing a context for curriculum learning, and promoting multiple teaching and learning strategies. There is consensus that moving media production can support the occurrence of collaborative creative processes (Burn, 2001; Hernández-Ramos, 2007; Reid et al., 2002; Sefton-Green & Parker, 2000). Notwithstanding the foregoing, three areas of concern for its adoption as a teaching and learning tool emerge from the literature. These are: 1. Logistical implementation; 2. Media knowledge; and 3. Pedagogical implementation.

Regarding logistical implementation, the advent of digital technology has democratised media authoring (Becta, 2003a; Buckingham et al., 1999). However, the limited availability of sufficient and 'adequate' equipment is still a problem in schools, and beyond (Pearson, 2005; Reid et al., 2002). Additionally, the time investment required for moving media production presents difficulties in general, and it is incompatible with formal education timetabling (Burn, 2001; Potter, 2006). Limited access to equipment and required time investment bring about problems concerning group management (Reid et al., 2002), and learners' access to technology dependent activities(Loveless et al., 2006), such as filming and editing, accredited with engendering the greatest learning benefits (Becta, 2003b). Concerning media knowledge, the lack of teachers' and learners' media language translates into productions with poor aesthetic, and creative value (Hofer & Owings-Swan, 2005; Reid et al., 2002). Their media consumer knowledge does not suffice to demystify filming as the most important activity, and neither provides them with knowledge and know-how regarding shots, camera angles, lighting and so forth, nor makes them understand the importance and potential of editing in moving media authoring (Reid et al. opt. cit.). Yet, traditional filming making approaches with strong emphasis on media language are frequently adopted in moving media projects outside media studies. In respect of pedagogical implementation, commonly moving media projects are founded upon contradictory objectives concerning media studies, and other areas(Buckingham et al., 1999; Schuck & Kearney, 2006). The paramount role of the teacher in assisting the students' creation of aesthetically worthy products (Reid et al., 2002), and in supporting learning through moving media production

(Schuck & Kearney, 2006) has been reported. Nonetheless, in moving media projects involving students' authoring, teachers relinquish their role, and become technical instructors (Kearney & Schuck, 2005; Pearson, 2005). Approaches regarding training of authoring tools vary from providing no induction by relying on the intuitive ease of use of most tools (Sefton-Green, 2005), to providing explicit training on the features and functionalities of the applications (Hernández-Ramos, 2007). The foregoing highlights the need for pedagogies for moving media production outside media studies (Buckingham et al., 1999; Hofer & Owings-Swan, 2005; Pearson, 2005).Research is needed, in particular, to examine 'what forms of teaching and learning work best?', and to understand groupings, methods to introduce the technology, how and when participants can productively experiment alone, and the roles the various parties should play (Reid et al., opt cit, p. 88).

Against this background, this chapter presents the first stage of the researcher's current research concerned with the design and development of the mobileDNA through an iterative process involving 12 embedded exploratory case studies. The next section presents the statements of purpose(Yin, 2003) which guided the general design of the first iteration of the mobileDNA. This is followed by an overview of the case studies, a description of the context and participants, a summary of the data sources, and an outline of the procedure. Subsequently, the chapter presents a 'thin' description of the case studies. These are presented under the three areas of concern in moving media production: 1. *Logistical implementation*; 2. *Media knowledge*; and 3. *Pedagogical implementation*. The chapter concludes with a discussion of the findings from the cases as they regard the design and development of the mobileDNA, and the research question examined in this phase of the research investigation as stated in section 3.3.

4.2 STATEMENST OF PURPOSE GUIDING THE ITERATIVE DESIGN PROCESS

To address difficulties in moving media production an overarching task-oriented objective for an activity was articulated:

> ***Achieve the creation of a collective DN, from idea generation to final production, in two hours.***

The foregoing was underpinned by the following statements of purpose concerning the objective of the research:

- Increase access to equipment to higher access to media dependent activities,
- Shorten the time investment required for moving media production,

- Support whole group participation in all the activities of moving media production,
- Promote the moving media production process over its product output,
- Create conditions conducive to the emergence of collaborative interactions, and
- Create conditions to nurture creativity.

To increase access to filming equipment, commonly utilised video cameras were swapped for camera phones. These are cheaper than video cameras, and for the cost of one, at least three phones, depending on models, can be purchased. Besides, the high penetration of phones worldwide indicates students are likely to own a camera phone, and hence have their personal 'filming equipment' already at-hand. Since the aesthetic value of the productions, from a media perspective, was not relevant to this study, the quality of image and sound provided by standard phones was deemed sufficient, and no need for additional filming equipment, such as external microphones or tripods, arose.

To shorten the time investment an agile model for moving media production was proposed as an alternative to traditional sequential film making models. To save time, rather than eradicating activities of ideation (Hernández-Ramos, 2007) which provide a context for creativity and collaboration, we combined idea generation, planning, scripting, and storyboarding into a single activity. Banking on the availability of multiple 'cameras', and using them in rotation , we parallelised filming and editing by creating a flow of media from the filming location to the EdS. Additionally, a non-participatory editor, someone acquainted with movie editing software and not partaking in the activities as such, was recruited to assembled the media as it arrived. The objective was to minimise the students' overhead associated with learning applications, which detracts from the objective (Baker et al., 1999), in this case supporting collaborative creativity, and adds to the time demands (ibid). The portability of the cameras, ease of transfer of already digitalised media from the phone to the EdS, and the smaller size of the media files created (given the limitations imposed by the storage capacity of the phones), further contributed to short circuiting the time requirements, and improved time savings.

Strategies to support whole group participation in all the activities of the production included collective idea generation and shooting, with some students acting and others filming; and editing, enabled by a data projector (Reid et al., 2002). A clear statement of purpose regarding the process value of the activity, as it regards supporting and scaffolding collaborative creativity, rather than the media-oriented aesthetic value of the products, guided

this study. To create conditions for collaboration we designed goal, reward, resource, and role interdependences (Johnson & Johnson, 1994; Zurita & Nussbaum, 2004), complementary division of labour (Dillenbourg, 1999), and provided scope for grounding, negotiation, explanation, and argumentation (Dillenbourg et al., 2008; Kobbe et al., 2007). Goal and reward interdependence were instantiated by stipulating a single collective production for the group, which, if achieved, constituted the reward. Resource and role interdependence, and complementary labour division were implemented by identifying different tasks, for instance, acting, filming, and editing, to be performed by different people. The collective story generation and editing activities were aimed at providing a context for grounding, negotiation, explanation and argumentation. To nurture creative processes a creativity combinational approach (Boden, 2001) was adopted which provided participants with application possibilities for their ideas, and direct involvement in the creative production (NACCCE, 1999). Premeditated actions towards the achievement of a concrete valuable outcome (NACCCE, 1999) (the DN itself) were structured, and constrained (Boden, 2003; Sharples, 1999) by the story created by the group. Most importantly, control, and ownership were to be handed-over to the participants (Jeffrey, 2006b).

4.3 CASE STUDIES OVERVIEW

In total, 12 embedded exploratory case studies (Table 2) conducted in chronological order (1 to 12), over two moths (October – November 2005), with eight groups (A –H) totalling 56 participants, were conducted. The samples were opportunistic (Creswell, 2005) in that they became available, rather than being pre-selected, and the sample groups ranged in size (3 to 10 people), age (13-21 years), gender make-up, and educational background. Within each group no significant imbalances concerning the preceding characteristics occurred. Of the 12 cases, 8 were conducted in Dublin, Ireland, and 4 in Cape Town, South Africa.

Table 2 Participants Case Studies Iterative Design Phase

Case Study Num.	Num. Participants	Age Participants	Gender[16]	Logistical Implementation		Media Knowledge	Pedagogical Implementation
				Group	Venue	Location	Education
1	3	19-21	1f; 2m	A	Uni. Campus (indoors)	Dublin	Prestigious University
2	3	18-20	3f	B	Uni. Dormitory (indoors)	Dublin	Prestigious University
3	10	13-16	5f; 5m	C	Theatre Coffee bar/outdoors	Cape Town	Shanty town Sec. Sch.
4	10	13-16	8f; 2m	D	Theatre Coffee bar/outdoors	Cape Town	Shanty town Sec. Sch.
5a	6	13-16	3f; 3m	E	Theatre Coffee bar/outdoors	Cape Town	Shanty town Sec. Sch.
5b	7	13-16	4f; 3m	F	Theatre Coffee bar/outdoors	Cape Town	Shanty town Sec. Sch.
6	9	15-16	5f; 4m	G	School (in/out doors)	Cape Town	Suburbia Sec. Sch.
7	8	15-16	4f; 3m	H	Lecture room	Dublin	Disadvantage Sec. Sch.
8	8	15-16	4f; 4m	H	Lecture room	Dublin	Disadvantage Sec. Sch.
9	8	15-16	4f; 4m	H	Uni. Campus (in/out doors)	Dublin	Disadvantage Sec. Sch.
10	8	15-16	4f; 4m	H	Uni. Campus (in/out doors)	Dublin	Disadvantage Sec. Sch.
11	8	15-16	4f; 4m	H	Uni. Campus (in/out doors)	Dublin	Disadvantage Sec. Sch.
12	7	15-16	4f; 3m	H	Uni. Campus (in/out doors)	Dublin	Disadvantage Sec. Sch.

The units embedded in each case regard the decisions made to achieve the statements of purpose, for instance the use of phones, and the division of labour. Given the numerous variables at play, the cases are grouped according to their predominant focus, and colour coded. Blue cases 1 & 2 zoom into logistical implementation; Orange cases 3 – 6, into media knowledge; and Green cases 7 – 12, into pedagogical implementation. However, the examination of each case explores the wholeness of the phenomenon. Table 3 provides an overview of the most significant variables explored across the 12 cases. Each variable is presented below the area of investigation to which it is most relevant, for instance duration under logistical implementation. The information in the table is colour coded to indicate the cases that correlate to each area of interest, and when a set of variables gained greater attention. For example, the relevance of improvisation games (variable 6 from the left) was specifically examined in cases 3 -6, although other variables such as duration continued to be observed. The variables (Table 3) themselves, with the exception of a few, such as duration, or non-participant editor, arise as a result of the case studies. Thus, through conducting the exploratory cases, guided by the statements of purpose, the researcher gained understanding

[16] Legend: f: Female; m: Male

of the phenomena under investigation, and identified the variables that emerged to be the most influential.

Table 3 Media Production Case Studies Iterative Design Phase

	Logistical Implementation					**Media Knowledge**						**Pedagogical Implementation**									
Case Study Num.	Duration (hours)	DN Completed	Facilitator	Media Professional	Non-participant Editor	Improvisation Games	Personal Objects	Video (V)	Images (I)	Sounds (S)	Media Creation Order[17]	Shared Scripting Workspace	Shared Story Template	Portable Script	Participant Editor	Public Editing	Group Editing	Group Post-Production	Labour Differentiation	Sub-groups	Mentors
1	2	x	✓	✓	✓	✓	✓	✓	✓	✓	I/S/V	✓	x	x	x	x	✓	x	x	x	x
2	2 ½	x	✓	✓	✓	✓	x	✓	x	x	N/A	x	x	✓	x	x	x	x	x	x	x
3	2 ½	✓	✓	✓	✓	✓	x	✓	✓	✓	I/S	✓	x	x	x	✓	x	x	✓	x	x
4	2 ½	✓	✓	✓	✓	✓	x	x	✓	✓	S/I	✓	x	x	x	✓	x	x	x	x	x
5a	2 ½	✓	✓	✓	✓	✓	x	x	✓	✓	S/I	✓	x	✓	x	✓	x	x	✓	x	x
5b	2 ½	✓	✓	✓	✓	✓	x	x	✓	✓	S/I	x	x	✓	x	✓	x	x	✓	x	x
6	3 ½	✓	✓	✓	✓	✓	x	x	✓	✓	S/I	x	x	✓	x	✓	x	x	✓	x	x
7	2	x	✓	✓	x	✓	x	x	✓	✓	I/S	x	x	x	✓	✓	✓	x	✓	✓	✓
8	3	x	✓	✓	x	✓	✓	x	✓	✓	I/S	✓	x	x	✓	✓	✓	x	✓	x	x
9	3 ½	✓	✓	x	x	x	x	✓	✓	✓	I/S/I / I/S/I/S	✓	✓	-	✓	✓	✓	x	✓	✓	✓
10	3	✓	x	x	x	x	x	✓	✓	✓	V/S/I / V/S/I	-	✓	-	✓	-	-	-	-	✓	✓
11	3 ½	x	✓	✓	x	✓	x	✓	✓	✓	S/I / S/I	✓	x	✓	✓	✓	✓	x	✓	✓	✓
12	3 ½	x	✓	✓	x	✓	x	✓	✓	✓	S/I	✓	x	✓	✓	✓	✓	✓	✓	✓	✓

4.3.1 CONTEXT AND PARTICIPANTS

While the context and participants for Blue & Orange cases 1- 6 were all different from each other, Green cases 7 – 12 were conducted in the same context, and with the same cohort of participants. For Green cases, focusing on pedagogical implementation, the same population was maintained to enable the adequate investigation of issues relating to collaboration and creativity. These are intrinsically associated to social interactions, and

[17] Legend: I: Image; S: Sound; V: Video

benefit from some degree of the group cohesiveness (Johnson & Johnson, 2005) likely to develop over repeated encounters, and time.

Throughout the 12 cases, with the exception of case 10, the participant researcher orchestrated the workshops. She was assisted by a media professional (MP) in all cases except 9 & 10. A non-participant editor was used in Blue & Orange cases 1 -6. Mentors, predominantly acting as chaperons to accompany participants while shooting in various locations, participated in Green cases 7 – 12[18]. The participant researcher was a researcher in TEL, with eight years of experience in the field. She is a trained teacher with a higher diploma in education, and over 20 years of experience teaching. The MP was a script-writer, and film director, with experience in mentoring novice film makers and facilitating groups of professionals as a consultant. His role was to co-facilitate the session with the participant researcher. The profile, and role of the non-participant editor was described in section 4.2.

Blue cases 1 & 2 were conducted with volunteer university students, comprising of two groups of 3 participants each. The venues for the workshops belonged to the university, and were: in case 1, a common room with access to a kitchenette, in a research building located on-campus; and in case 2, a common room in the university's off-campus student accommodation. In both cases all the activities, including the shooting of media, occurred indoors, although there was easy access to the outdoors. Orange cases 3 – 5b were conducted in Cape Town under the auspice of the Sithengi International Film Festival, and within the framework of its Children's Festival[19]. The participants were children attending the festival who had been selected by the organisers of the same. The venue for all the cases was the Coffee Bar of a theatre in the premises of the Sithengi Film Festival, with access to an urban garden which was also used as the shooting location. Orange case 6 took place in a secondary school in suburban Cape Town. The arrangements for the session were made by the organisers of the Children's Festival, and the group of participants was selected by the school. The class teacher remained with the group for most of the time, although he did not participate in the activity. A classroom, and various indoors and outdoors areas in the school's grounds were used as shooting locations.

Green cases 7 -12 were conducted within the context of an outreach computer programme in the researcher's university. The participants, selected by their institutions, were from schools, in designated disadvantaged areas associated to the outreach programme. The

[18] Note: By mere coincidence all mentors were absent on week 8

[19] The Children's aims to raise provide children with hands-on experience of media production and raise awareness of the importance of media for children created by children.

programme runs in cycles of 8 weeks each, and approximately 40 -50 students, subdivided into groups of 8 -12 members according to activities, participated in each cycle. The participants for Green cases were randomly chosen from the cohort of attendees at the outreach programme. The 8 weekly sessions for the cases' context were held on Saturday morning, from 10 am to 1 pm. This required that the participants wake-up early, and travel to the venue. These two factors, together with the length of the cycle, raised concerns regarding attendance, and possible experimental mortality (Mertens, 1998). To combat this threat, the participants were asked to agree a code of conduct, to which everyone, including the researcher and mentors, was required to commit, and undersign. At the end of the cycle an Award Ceremony took place, during which the groups presented the work they had completed during the programme, and were presented with an attendance certificate. Parents and friends, as well as other interested parties, were invited to the Ceremony. This event was a strong performance motivator for the participants who did not want to arrive to it with nothing to present, or with something they deemed not 'good enough' to showcase.

4.3.2 DATA SOURCES

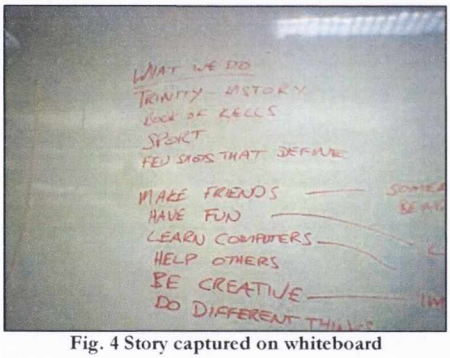

Fig. 4 Story captured on whiteboard

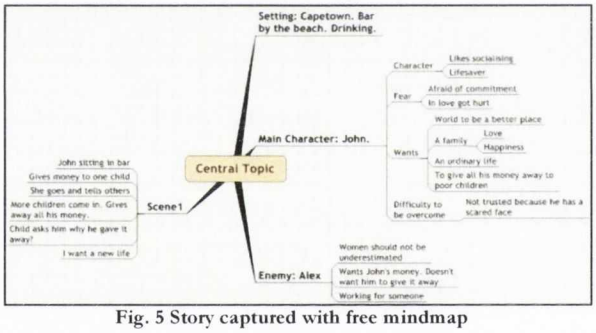

Fig. 5 Story captured with free mindmap

An overview of the data sets collected during the case studies is presented in Table 4. This includes: the participant researcher's observation collected in a journal; the stories, media (images, sounds, and videos), and movie editor projects, created by the participants; the final DNs; video recordings of sessions; and video recording of a focused group. A protocol (appendix B) was used for the observation journal which was completed at the end of each session incorporating notes made throughout the workshops. The entries of the protocol focused observation on aspects related to the units under investigation. The stories created by the participants were transcribed and a summary of these is available in appendix J. When sheets of paper, a whiteboard (), or a mind-mapping application () were used to capture the group's ideas record of the foregoing was kept for analysis.

The opportunistic samples, the itinerant venues and locations, and the logistical challenges faced to conduct the cases, for instance in Orange cases in Cape Town, prevented the systematic capture of video footage of the sessions and the possibility to gather the participants' opinions. While the researcher had no further access to the participants of Orange cases 3 – 6, the views of the participants in Green cases 7 – 12 were collected via initial and final questionnaires. Data obtained through these instruments did not contribute to the understanding of the phenomenon under investigation and was not included.

Table 4 Data Sources from Case Studies in Iterative Design Phase

	Logistical Implementation			Media Knowledge				Pedagogical Implementation				
Case Study Num.	Facilitator's Journal	Story	Media	Images Q.	Sounds Q.	Video clips Q.	Movie Editor Project	Project Q.	Finished DN	Finished DN Q.	Video Footage	Participants Opinion
1	✓	✓	✓	60	25	15	✓	1	x	0	✓	✓
2	✓	✓	✓	0	0	18	✓	1	x	0	x	x
3	✓	✓	✓	18	7	3	✓	1	✓	1	x	x
4	✓	✓	✓	49	17	0	✓	1	✓	1	x	x
5a	✓	✓	✓	53	8	[3][20]	✓	2	✓	1	x	x
5b	✓	✓	✓	65	11	[2][21]	✓	1	✓	1	x	x
6	✓	✓	✓	73	20	0	✓	1	✓	1	x	x
7	✓	✓	✓	33	0	0	✓	1	x	0	✓	x
	✓	✓	✓	18	8	0	✓	1	x	0	✓	x
8	✓	✓	✓	45	22	0	✓	2	x	0	✓	x
9	✓	✓	✓	72	21	0	✓	1	✓	1	✓	x
	✓	✓	✓	52	31	0	✓	2	✓	1	✓	x
10	x	✓	✓	11	6	4	✓	1	✓	1	x	x
	x	✓	✓	21	8	3	✓	1	✓		x	x
11	✓	✓	✓	23	7	4	✓	2	x	0	x	x
	✓	✓	✓	53	13	0	✓	1	x	0	x	x
12	✓	✓	✓	29	9	0	✓	1	x	0	x	x

4.3.3 PROCEDURE

At the granular activity level the objective of each case was to achieve the creation of a collective DN, from idea generation to final production, in two hours. Our vision of a DN was a moving media production which told a story created by the group. It could use a variety of, or a single type of media, for instance, video, images, sounds, and so forth. The vision was

[20] Videos were only capture to present the participants but not for the DN creation
[21] Videos were only capture to present the participants but not for the DN creation

purposely left open, and under-specified, given the exploratory nature of the research, and to avoid limiting the participants' possibility thinking (Craft, 2002, 2005).

In order to achieve this objective the researcher and MP devised a work plan (appendix K) with the following time schedule: 15 minutes for opening games & introduction; 20 minutes for creating the story; 5 minutes to raise the energy levels; 45 minutes for shooting and assembling the media; 10 minutes to fixing the media on the timeline; 15 minutes to add music or voice over; and 10 minutes to watch, and discuss the finished DN. The opening games were proposed by the MP and required participants to move around, and focus their attention on the group and its members. These games were targeted at making people present, and raise their energy levels. The MP also proposed asking the participants to bring personal objects to the sessions, to help them generate ideas for the story. After playing the improvisation games, the participants were asked to show their objects, and talk about them. The description of the objects and their history provided a pool of ideas for the participants to use during the story creation, which assisted with the combinational creativity model (Boden, 2001).

The story creation was guided by a story template devised by the researcher and the MP (appendix K). This addressed six elements of a standard story model (Table 5), and proposed a story taking place in ten parts or beats. The number of story beats was flexible, 10 +/ - 2, according to the emergent story; and three anchors were provided, the beginning, a reversal towards the end, and the end. The schedule and story template provided structure and guidance for the facilitators, but were not intended to be shared with the participants.

Table 5 Story Elements & Beats

Story Elements	Story Beats
1. Setting	1. Beat 1: The Beginning
2. A Character	2. Beat 2: ....
3. His/her Ally	3. Beat 3: ....
4. The Character's Want	4. Beat 4: ....
5. His/her Enemy	5. Beat 5: ....
6. Additional Characters	6. Beat 6: ....
	7. Beat 7: ....
	8. Beat 8: A Reversal
	9 Beat 9: ....
	10. Beat 10: The Ending

After creating the story the group had 45 minutes for shooting the media necessary to tell it. While all the participants were involved in filming and delivering the media from the shooting location to the EdS, the non-participant editor proceeded to assemble it. Once the shooting was over the whole group, using a data projector, participated in the editing to create the DN. The activity concluded by watching and discussing the final DN.

The technology used was: three camera phones (XDA II; Fig. 6) with capability to capture still images, video and sound, a laptop, a movie editor[22], and a data projector. A set of speakers was added to the toolkit from case 3 onwards. The laptop, data projector, and speakers were all highly portable to provide flexibility regarding locations and venues where the sessions could be conducted. Improving access to equipment was an important aspect of this study and the foregoing contributed towards that objective. For instance, it meant that the same toolkit could be used by different groups in various locations, or that access to the experience could be brought to location where no equipment at all was available as in the cases in Cape Town.

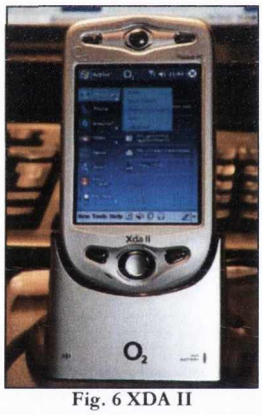

Fig. 6 XDA II


Fig. 7 Cradle & USB connection

During the 12 cases, media transfer from the phones to the PC was via cable. In order to retrieve the media from the phones and import it into the movie editor the following steps applied: 1. Place the phone with the media on its cradle (Fig. 6); 2. Connect the cradle to the PC via a USB connector (Fig. 7); 3. Establish connection between the PC and the phone using a synchronisation application[23] (Fig. 8 & Fig. 9); 4. Explore the phone to locate and retrieve the media (Fig. 10); 5. Copy the media over to the PC; 6. Import the media into the movie editor (Fig. 11); 7. Place the media on the timeline (Fig. 12)

[22] Windows Movie Maker 2
[23] Microsoft ActiveSync

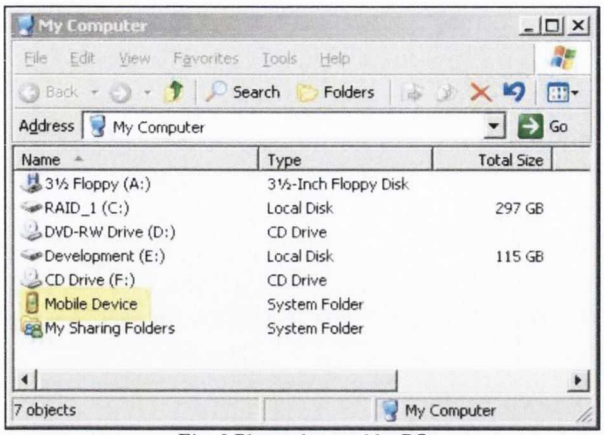

Fig. 8 Phone detected by PC

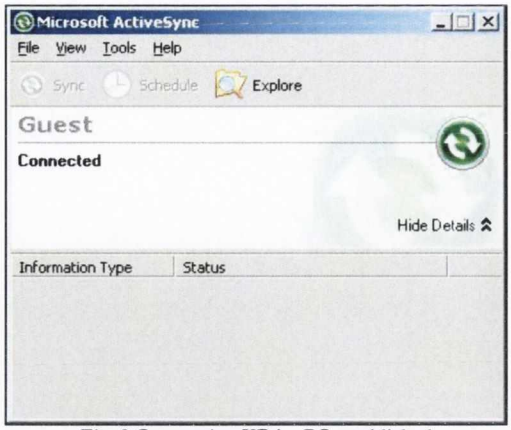

Fig. 9 Connection XDA - PC established

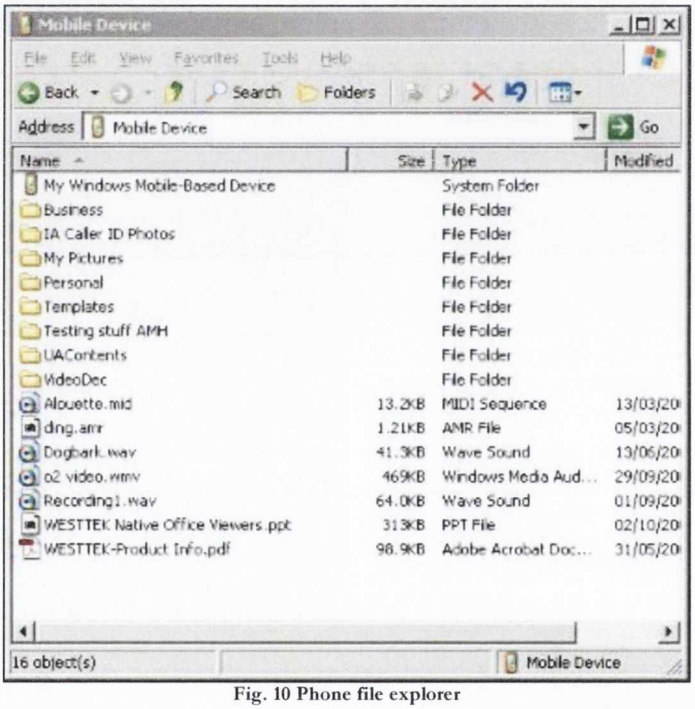

Fig. 10 Phone file explorer

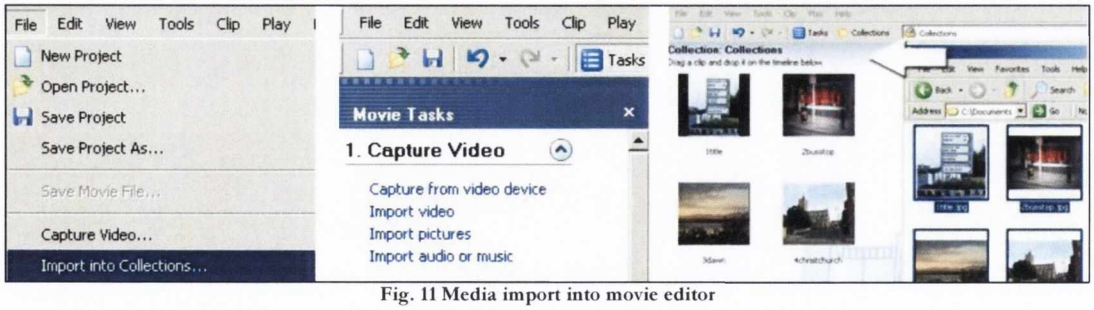

Fig. 11 Media import into movie editor

The movie editor chosen was freely available, and run on Windows OS. It provided an intuitive graphical interface, with the workspace divided into two halves. The upper part contained the menu bar at the top, the media collection window (where the media imported was displayed) in the centre, and the tasks available to the left. The preview window (where

the media selected was displayed) was on the right. The preview window had a player with the basic functions, play, stop, pause, and so forth. The bottom half of the workspace contained the timeline. This was divided into racks dedicated to different media types. To insert media into the timeline the media first had to be selected from the collections window, and dragged and dropped into the timeline. Media on the timeline could be shortened, trimmed or lengthened (only applicable to still images) by selecting the media unit, and dragging it to the right to stretch, and left to shorten. The data projector was at all times connected to the laptop and this enabled the group to participate in the editing process, and follow the non-participant editor's actions.

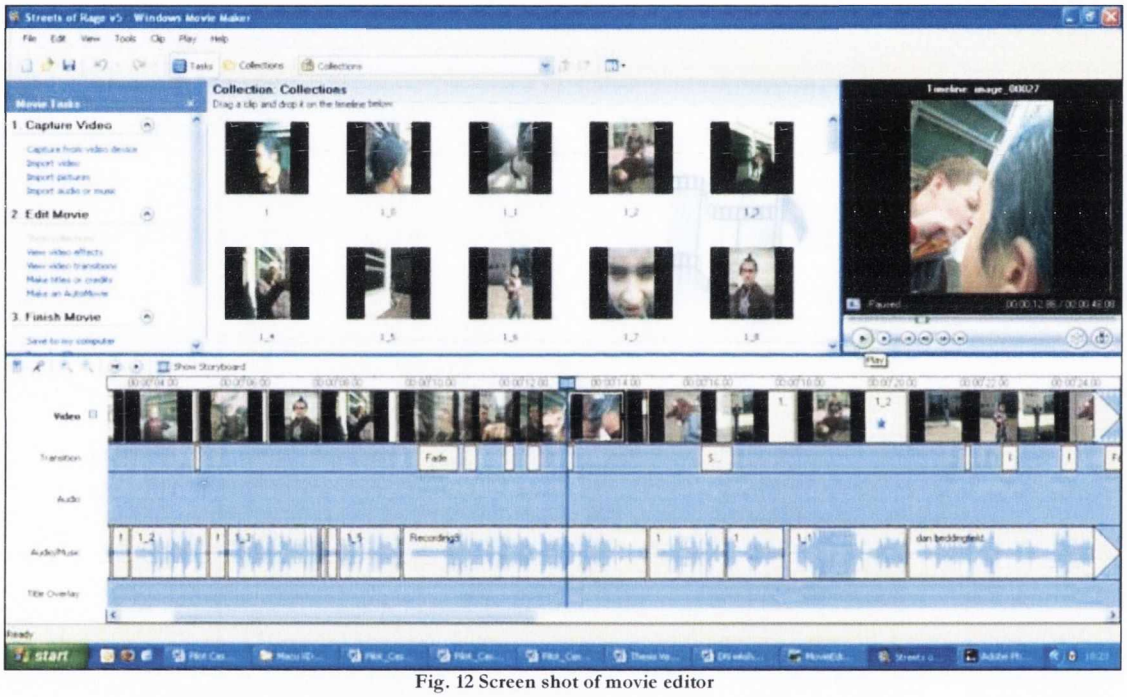

Fig. 12 Screen shot of movie editor

4.4 LOGISTICAL IMPLEMENTATION

Blue cases 1 & 2 were predominantly aimed at understanding: 1. whether phones could be used as envisaged and for the desired purpose; 2. whether 2 hours was a suitable length of time to achieve the objective; 3. whether the work plan and story temple were suitable for their proposed purpose; 4. Whether our agile approach to moving media production 'worked' to enable the creation of the story, the shooting and editing in the ways desired.

In case 1 the participants were asked to bring personal objects and after playing the games they started describing their objects which included a potato masher and juggling balls brought by the MP, an African tribal hunting stick brought by one of the participants, and an mp3 player among others. The researcher and MP led the story generation using the story

template, and the MP captured the ideas being contributed on a whiteboard (Fig. 13). The first four steps of the work plan scheduled for 85 minutes took 95. The story generation, and most of the shooting, happened in the room where editing was taking place (Fig. 13 & Fig. 14) although the kitchenette area adjacent was also used (Fig. 15). The whole group worked together and most of the time two phones were used to shoot for instance to take different angles (see Fig. 15). As the media was being created it was delivered to the editor who proceeded to importing and assembling it.

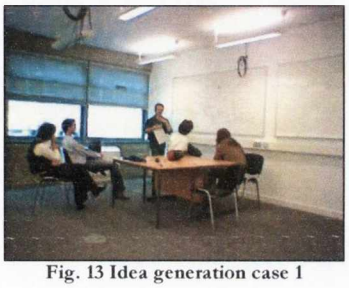

Fig. 13 Idea generation case 1

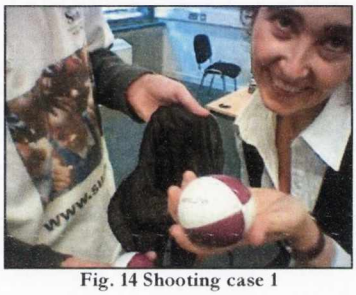

Fig. 14 Shooting case 1

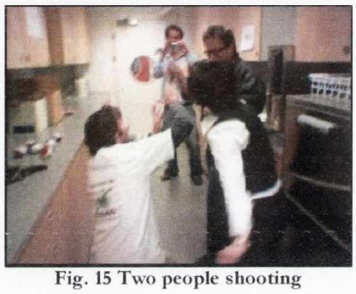

Fig. 15 Two people shooting

While shooting the DN three media types, still images, sounds, and video were created. The images were created first, then the sound files to match the images, and finally the video clips when the group was running out of time and a few story beats still had to be shot. Once shooting was completed the group gathered around the editor and participated in the editing. Excerpt 1 captures a moment in which the group was selecting sound files to match images and illustrates the kind of interactions that were taking place. The MP is leading the editing, the non-participant editor is unsure of what the story is, and the participants' input is limited.

MP: What is the next bit of sound?

Audio clip 1: In his nightmare, Máire Ní Prátaí, his ex-wife, had just won the Potato Association Award. Could Dr Blight defend his title?

Audio clip 2: At this year's ceremony, could Dr Blight defend his title?

Ed: The second one rather than the first one

MP: I think we... we have the nightmare one? Is that one in?

Ps: Grand, perfect, so...

Audio clip 1: In his nightmare, Máire Ní Prátaí, his ex-wife, had just won the Potatoes Association Award

P: That doesn't really work, does it?

MP: No, that's good, yeah. The screaming, that's fine. Cool, great.

Audio clip 2: At this year's ceremony, could Dr Blight defend his title?

Audio clip 3: (Sings 'doo-de-doo-doo'.) Flashback to last week
Ed: What are we flashing back to?

Excerpt 1 MP leading group editing case 1

Thirty minutes into the group editing the MP and researcher realised there is too much editing to be done and no time left (Excerpt 2). So, editing ceased and the researcher led a discussion to gather the participants' impressions of the activity.

MP: I don't think we're going to edit this. This actually takes too long. I think we should just lay the sound out so it plays reasonably well and pull the pictures out so that it roughly approximates. Do you know what I mean? So, let's be governed by the audio, basically. *(Audio continues.)*
Ed: So is that OK?
MP: Fine, great, yeah, so next we have the lab. *(Audio continues.)*. You might want to shorten the...We might need to pull those shots and make a cut so that the audio comes in sooner.

Excerpt 2 MP making editorial decisions case 1

The discussion focused around technology and time issues. In relation to the technology the participants felt the phones were *"...perfect for the project"* because they were *"...very mobile"*, everyone will *"...be familiar with camera phones"*, and using them *"It's not so intimidating"*. Regarding the movie editor and editing process different views were voiced. The participants and the non-participant editor thought editing in tandem with a person adept with the movie editor was an optimal choice. The researcher showed concern in relation to the passive role the participants had adopted when it came to the group editing. It was proposed training on the application was necessary if students were to do the editing themselves, *"Technical training, there's nothing like it"* (MP), *"...maybe if there was a brief description, if you're going to use a PC similar to that, describe how to use just the basic skills, at the very start"* (P).

In order to speed up the process the MP suggested "...could split the story up into two pieces and have two teams working on two pieces, but it still comes down to the same problem, which is the key piece of work is actually editing". Furthermore, he argued "...editing is not a group activity". The researcher argued for involving the participants in editing since she thought "...a lot of creativity goes on when you're actually pulling in your images and your sound..." The counterargument put forward by the MP outlined the qualities an editor required"... a sense of form..." since "...there's a feel to it". Regarding editing a participant highlighted it always came last in the process and one could "...get

caught up in the drama side of things...it could be the last of their priorities.... It'll always be the end".

The view of the participants, MP, and non-participant editor was that images and sound were not an appropriate medium to create DN; *"you're not doing what you should be doing with it because we're doing pictures. Are pictures necessary? ... If we were to do videos, the videos would be much better...they take ten seconds to put in... If you think the video was wrong, you re-shoot it. This means it's an easier way..."* (Ed). Elaborating on this, the MP proposed short-circuiting editing all together by asking participants to shoot the final media to be included in the DN, *"We're not doing it in process. It's like a kind of a shoot. It's what you shoot to be finished"*. Everyone thought the DN would have been completed had it been done with video clips *"we might have actually gotten it done if we had done video clips"* (MP) *"Because it has your audio and everything"* (P). These comments led one of the participants to underlying how much time it was used to shoot some beats with still images given the difficulty to convey the intent through this medium *"The stills (waving his arms.), the flashback. We spent about ten or fifteen minutes on that"*. The time required to create the story was also commented on. While participants thought it was *"brilliant"* that everyone had an input into the story and the way the story had evolved, *"...it is very time-consuming, especially if you have just one session to collect images"*. Suggestions to address this involved assigning stories instead of allowing the participants to create their own stories. However, the participants also acknowledge that *"It's better not to be told what to do"*.

Case study 1 indicated the appropriateness of the phones, movie editor, and data projector concerning their expected functions within the process. It suggested that the story template was suitable and enabled the participants to generate a story in approximately the time allocated in the work plan. Most importantly, it highlighted issues regarding the feasibility to complete the editing within the time scheduled for it. Factors contributing to the foregoing seemed to be the media type, in particular the use of images and sound versus video clips since they required more time to create and edit. Suggestion for time saving included short-circuiting editing by shooting the 'final' video clips to be assembled in the DN, and assigning a story rather than allowing the participants to collectively create their own story.

Case study 2 was conducted with three female undergraduate students resident in the college off-campus accommodation venue of the session. The participants were not asked to bring personal objects. Three phones were available to create the DN and only video clips were shot. The session lasted approximately 2 ¾ hours and the DN was not completed. After playing the improvisation games the group proceeded to the story generation however there

was not public space, for instance a flipchart or whiteboard, to capture the ideas being contributed and record of the contributions was kept. The final story beats where written on a piece of paper and used as a guide while shooting.


Fig. 16 Ultrasound story beat


Fig. 17 Zooming in ultrasound

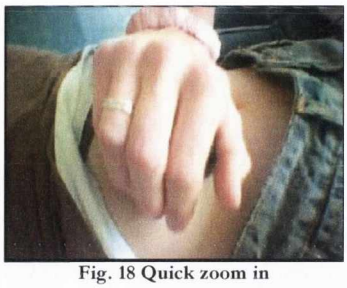
Fig. 18 Quick zoom in

The MP played an important role during the shooting stage guiding the participants on what to shoot and how to shoot it. For instance, in the ultrasound story beat at the GP's .clinic (Fig. 16, Fig. 17 & Fig. 18) the clip began with a long shot (Fig. 16) the camerawoman slowly started to get close to the target (Fig. 17) when the MP professional instructed her: *"Just in really quick. Just in close"*; she responded to the instruction with a quick zoom in (Fig. 18). The participant continued recording until the MP indicated they had enough footage: *"OK, are you recording? Great"*; and the participant stopped recording. These episodes were repeated throughout the session. The MP seemed to be putting into action the proposition he articulated during case study 1, bypassing editing by shooting the final video clips that would be assembled. This idea is further reinforced by the amount of retakes of the same story beats, some of which were reshot up to four times. For instance, video clips were retaken from different angles (Fig. 19 & Fig. 20) or due to the participants not getting their lines or acting right.

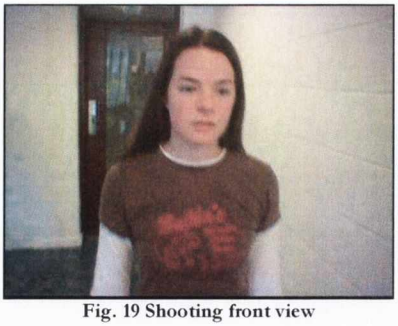
Fig. 19 Shooting front view

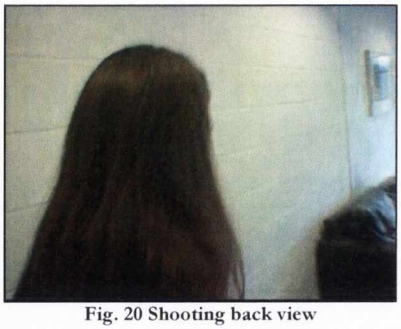
Fig. 20 Shooting back view

The emphasis on the 'finished' video clips involved much previewing right after shooting and meant a delay on the delivery of the videos to the non-participant editor. When the first media was eventually delivered and imported into the movie editor, file formats incompatibility emerged. The file format in which the videos were recorded by the phone was not compatible with the movie editor and the videos could not be used. While the editor

worked converting the video clips into a suitable format the researcher managed to change the phone settings to record video in a format compatible with the movie editor. However, all the story beats that had been shot had to be reshot. When the new clips were delivered to the editor another problem arose. The participants had turned the phones while shooting but did not change the orientation of the camera in the phone from vertical recording () to horizontal (). This resulted in video clips being recorded vertically () when meant to be horizontal. The issue was only identified once the video clips were transferred to the laptop because when previewing the videos on the phone, the participants turned the phone around to get the 'right' view and did not realise the underlying problem. The videos shot in the incorrect orientation also had to be reshot since, unlike still images, they cannot be rotated in the PC and used. Difficulties with file format, camera orientation; and the time invested attempting to shoot 'final' video clips to avoid editing impacted on the editing activity which was almost inexistent. After 2 ¾ hours the participants left without having participated of the editing process at all, and they only saw a very poor version of the DN in the making.

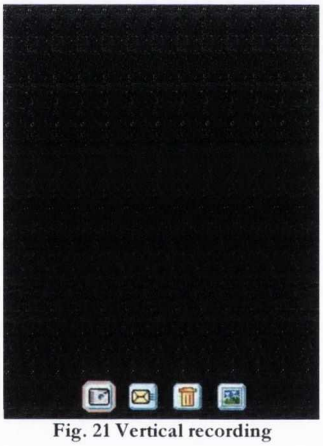

Fig. 21 Vertical recording

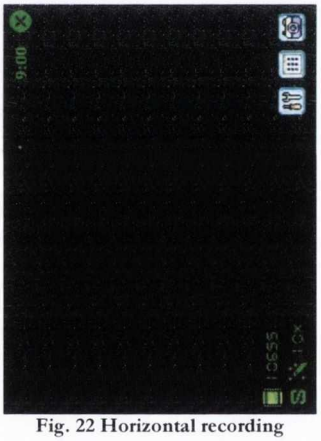

Fig. 22 Horizontal recording

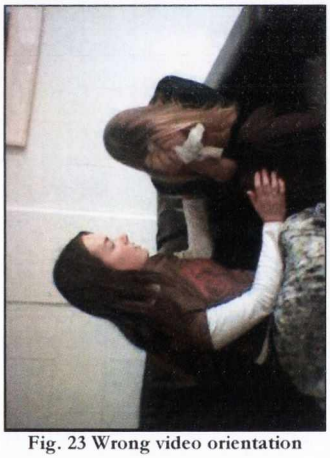

Fig. 23 Wrong video orientation

Case 2 highlighted issues in relation to training, technology, and time. Whether a certain level of familiarity with phones can be assumed, it is important to explicitly point out features that are crucial for the activities, such as the orientation of the camera. This is important regardless of the type of media, however, when creating videos it has a greater impact on time because they have to be entirely reshot. File format incompatibilities severely impact accessibility since, unlike initially envisaged, not every phone is suitable for shooting media. Only phones that create media in formats compatible with the movie editor used would be appropriate. This problem applies to video and sound, since phone manufacturers implement various formats, however, it does not affect images for which the JPG standard is used by most phones. Case 2 pointed to the need for more immediacy between shooting and editing. This would help with the early detection of potential unseen problems with the

phones, allow the group to get a sense for how the DN in the making is progressing, and inform actions needed to progress to completion.

4.5 MEDIA KNOWLEDGE

Orange cases 3 to 6, while still aimed at examining logistical implementation, focused on media knowledge matters. They particularly examined: 1. the type of media, or combination of, more suitable for the creation of DN with the present approach 2. the implications of using different media types; 3. Other media related factors that influenced the creation of the DN.

Cases 3 – 5b lasted 2 ½ hours each and within this time all the DNs were completed and screened to the participants. The work plan (appendix K) was used to structure the session and the story template (appendix K) followed to guide the story creation. The same technology used in Blue cases was utilised with the addition of loud speakers. These were incorporated to enable the group to share sound in the same fashion they shared visuals through the data projector. The venue for the workshops was a theatre bar (Fig. 24) with access to an urban garden (Fig. 25) through a fire exit (Fig. 26). While the story creation and the editing took place indoors, shooting happened both indoors and outdoors. The participants of these workshops were not asked to bring personal objects.

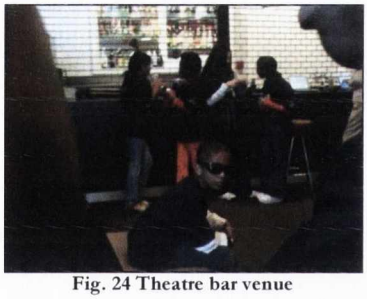

Fig. 24 Theatre bar venue

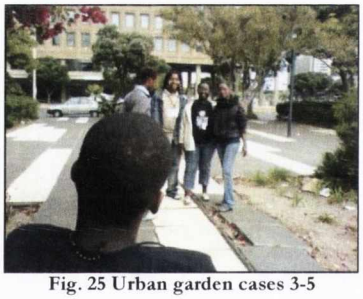

Fig. 25 Urban garden cases 3-5

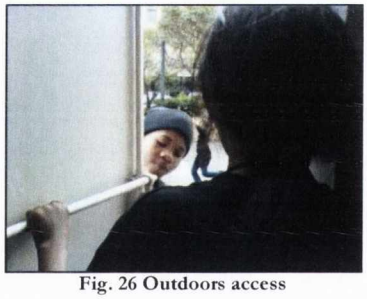

Fig. 26 Outdoors access

The researcher and MP led the games played with each group, and the story generation. For case studies 3 & 4, free mind-maps (Fig. 27) were created to capture the contributions made by the participants during the story generation. The projector was used throughout this activity to allow the group to share the pool of ideas, and facilitate the story creation. The creation of free mind-maps was abandoned in case 5a at the request of the MP who thought it was too time consuming. In cases 5a & 5b the ideas being contributed throughout the story generation activity were not captured or shared by the group in a public manner. The group created the stories drawing on their recollection of what had been said. In case 5b the story beats were written on paper and this was taken to the shooting location to guide filming.

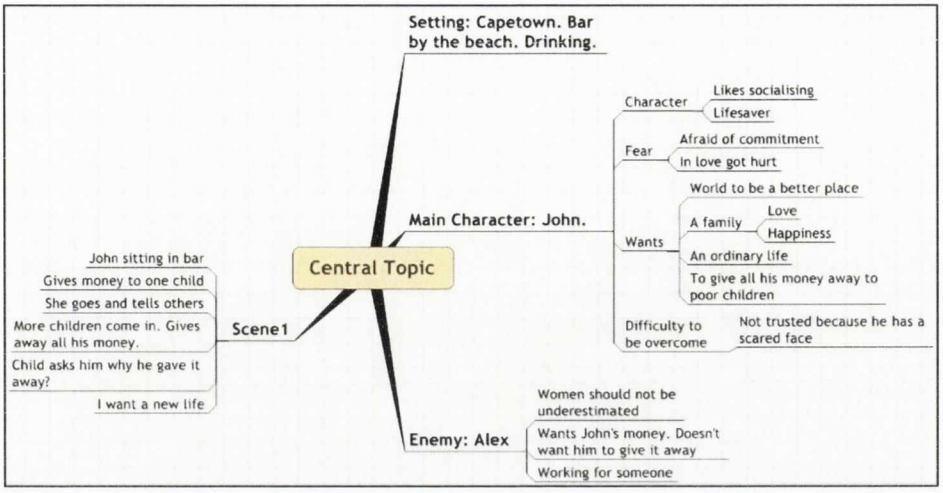

Fig. 27 Free mind-map of ideas for story

In case 3 the whole group worked together and captured three media types; images, sounds, and videos to create the DN. The images were created first followed by the videos, and finally the sound (Fig. 28). The MP assisted the participants in the same manner he did in Blue cases, and, for instance, he advised them when they had recorded enough video with utterances such as *"OK, great, lovely"*. The media was captured with different phones in rotation, and delivered to the editor by the participants. This created a media flow from the shooting location to the EdS, and enabled parallel shooting and editing. The data projector was used from the beginning of the editing and this allowed participants to follow the development of the DN in the making. Once all the images and videos needed for the DN were created the group returned indoors and gathered around the projection of the movie editor.

When the videos were imported into the movie editor the sound quality was found to be very poor. In videos recorded indoors, utterances were hardly audible due to the distance between the camera person, and actor. In those recorded outdoors, the problem was heightened by ambient, and background noise. Given the time constraints, a participant was asked to re-record the narration for the entire DN. The sound recorder incorporated in the movie editor was used to re-record, and the participant watched the DN while recording the narration. The sound was still hardly audible but at least the participants watched the final DN.

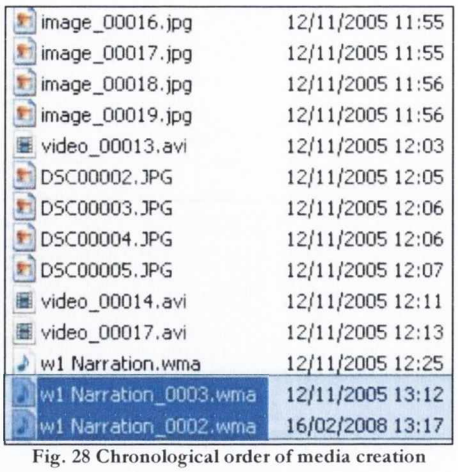

Fig. 28 Chronological order of media creation

Case 3 highlighted difficulties with videos. Contrary to expectations, they did not speed the process due to issues arising with sound quality which are inherent to equipment not intended for creating quality video sound. Mending the sound quality required much time, and a better movie editor than the freely available one used. Video recording did not accommodate the involvement of multiple participants in shooting. The use of multiple phones shooting in parallel provided more access, and potential for collaboration. However it had an impact on the time required for editing the various clips recorded for the same story beat. Attempting to shoot the 'final' video clip for the DN, bypassing the editing stage, as suggested by the MP, required an appreciation of media language uncommon in media consumers.

Regarding the collective story creation, capturing the group's ideas in a mind-map and sharing this through the data projector focused the group and allowed participants to keep track of what had been said. Seeing the pool of ideas allowed the participants to draw from these and incorporate them into the final storyline. A drawback of the mind-map was its lack of portability to the shooting location to guide filming. The assistance provided by the MP reflected his creative vision for the DN, and left limited room for participants to experiment and explore. This could have been as a result of the time constraints under which the group was operating, or as a result of adult-child coupling. In case 1, editing (Excerpt 1) provided scope for negotiating what media configuration best conveyed the narrative intent. The editing of video in this case study provided less scope for this kind of engagement. Furthermore, the recording of the narration by a single participant presented two difficulties: other members of the group did not participate in the activity; and there was no narrative creation but rather a description of the images assembled.

To address the difficulties identified in the media creation and editing phase in case 3, the following iteration was incorporated in case 4: only images and sounds were created for the DN; a sound track (singing and clapping) was recorded first, the shooting of the images followed, and the recoding of the narration came last. The use of images instead of video resulted in more participants being involved in the shooting since more images than video were needed to create a story beat. Additionally, the narration was recorded by several participants, who proceeded with the recording without watching the assembled images. The MP indicated when a re-recording was necessary *"Let's start again"*, and when they were acceptable, *"OK, done"*. The inversion in media creation order, sound before images, intended to counteract the mere description of images experienced during the recording of the narration in case 3. Although the narrations recorded in case 4 conveyed some narrative intent, it remained mainly descriptive. The lack of the visual anchor, watching the assembled images, translated into numerous re-recordings because participants were unsure or could not remember 'their parts'. This insinuated issues in relation to the participants' understanding of the story created, and their level of ownership of the same. In case 4, more participation in the media creation and editing was experienced, but participants still had little input into the creation of the narrative at the level of experimenting with shooting the media, and proposing possible configurations of media assembling during the editing. Using only images and sound made the editing procedure less time consuming than editing mixed media (images, sound, and video).

In case 5a, the narrations were recorded before the images were created, and video was not used. The intention was to get participants to create the 'audio' version of their story, as opposed to describing through audio the 'visual' story. In total only eight sound files were delivered to the editor. These were recorded in chronological order, from first to last, following the progression of the story beats. The narrations were recorded by different participants assisted by the MP, and they were the final recordings for the DN. The images were shot without listening to the assembled sound, and also in chronological order. The narration provided the editor with a good structure to assemble the images, and synchronise these to the sounds. Issues in relation to the editor's understanding of the story surfaced when he used media intended for one story beat in a different one. The lack of understanding of the editor 'forced' the participants to take an active role in the editing since they had to tell the editor where to place the images. The changes implemented in case 5a achieved more participation during the editing, in particular. This was brought about by the need to tell the editor where the different media 'belonged'. The sound recorded carried more narrative

intent. However, the level of participants' input into this activity remained low in that they were reciting a part assisted by the MP. Aiming for the final sounds to be included in the DN. left little room for experimentation.

Case 5b followed the same procedure and media creation order of case 5a. In case 5b the story beats were written on paper, and this was carried to the shooting location, and guided and structured filming. The structure provided by the portable story impacted on the efficiency of the group in carrying out the task. The level of participation during shooting was slightly higher since more images were captured, and more people experienced repeated exposure. The greater number of images also translated into more participation during editing, since the editor required more assistance from the participants to know where the media belonged. A more fluid media flow to the editor was found by rotating the phones. The more structured rotation of phones required the allocation of the media delivery task to specific participants to ensure the media flow to the editor. This pointed to a wider range of roles and tasks within the activity than initially conceptualised.

The final case, number 6, followed the same overall procedure, and media creation order of case 5b. In it the scope for participants' input and experimentation during the sound creation remained low. However, the participants' input into the image creation process was greater than in previous cases. This was due to the knowledge the participants had of the school grounds, and buildings. This knowledge allowed them to propose the shooting locations they thought best suited the story, and its different beats. For instance, one of the beats featured the main character waking up, and the participants suggested using a bed in the school nurse's room. The variety of shooting locations and the distance between these and the classroom, where editing was taking place, reinforced the need for a media messenger role. This role may not appear significant but it was crucial to ensure media flow to the editor, and for the completion of the collective task. The input into the creation of the media granted participants more ownership of the images, and their narrative intent which in turn transferred to the editing stage. While editing, the participants were vocal in relation to how different media units were to be assembled and synchronised. This workshop was longer in duration than the previous. This indicated that, although a DN could be completed in 2 ½ hours, to achieve more active engagement and greater levels of input from the participants, longer sessions seemed to be necessary.

Regarding the media, type Orange cases suggested that: the creation of images and sounds, versus video provided more scope for participation and input during shooting and

editing. The creation of mix media, images, sounds, and video, posed difficulties at the editing stage, and required more time than editing images and sounds. The quality of sound in video was not appropriate. The use of images and sounds forced the editor to request input regarding the intended media configuration, and the synchronisation of images and sounds. This in turn made the participants adopt a more active role in the editing, and have a greater input in to the creation of the DN. Aiming for 'final' sounds at the recording stage led participants to recite a part under the assistance of the MP, leaving little room for experimentation, and creation of the narrative through the medium of audio. The participants' knowledge of the shooting locations contributed towards endowing them with control and ownership of the media, and the DN. The lack of personal objects to discuss did seem to have an impact on the story creation. Using a public space to capture and share the ideas during the story generation phase focused the group, and provided a collection of tangible ideas to draw from when creating the actual story. Having a portable version of the story beats to take on location while shooting also provided structure to the group, and contributed to a more efficient completion of the activity. Finally, the use of multiple phones in rotation to create media, supported media flow to the editor, and parallel shooting and editing, which in turn accelerated the process.

4.6 PEDAGOGICAL IMPLEMENTATION

Blue and Orange cases provided valuable insights into the logistical implementation, and media knowledge aspects of the phenomenon under investigation. However, further understanding was needed regarding its pedagogical implementation, particularly in regard to the mechanisms and conditions necessary for the emergence of collaborative creative interactions among the participants. Green cases focused on understanding: 1. the roles, tasks, and resources involved in the activity; 2. a meaningful complementary labour division; and, 3. other aspects influencing collaborative creative interactions. Against this background two main changes in the procedure were incorporated to the Green cases: a) the editing activity was handed over to the participants themselves and the non-participant editor figure was eliminated; and, b) only images and sounds were to be used for the creation of DNs.

Green cases took place in two different venues. Cases 7 -8 were accomplished in a lecture room on the third floor of an off-campus building, with difficult access to the outdoors. The room was furnished with rows of seats and there was practically no furniture-free space besides a small area at the top of the room, between the seats and the whiteboard. There was a desk for the lecturer beside the whiteboard and a data projector mounted on the ceiling. This room presented a number of difficulties for the workshops: no free space,

difficult access to the outdoors because of a swipe-card security system, and location accessibility since the building was off-campus and on a main heavy traffic road. Cases 9 -12 were conducted in a large room with much more free space, furniture that could be easily moved according to the group's needs, and two large whiteboards. The room was in a building on-campus and had easy access to the outdoors. Case 7 only lasted 2 hours because it was the first day of the outreach programme and some time was dedicated to general induction to the programme.

At the beginning of case 7 the participants were briefed about the activity in the following way:

> ***"We are going to create movies with mobile telephones. You first need to think of a story you want to tell. When you have your story, you have to create the media for it: take pictures and record sounds with the telephones. Then you have to put your pictures and sounds together on the PC and you'll have your movie".***

Contrary to the suggestions received from the MP and the participants in case 1, a non-formal, experiential, and discovery-driven approach to 'training' on the use of the tools was adopted. The participants were shown how to access the functionalities needed on the phone, and they were asked to experiment taking pictures, and recording sounds. A similar approach was used for the movie editing application. This was deemed sufficient for the mundane and intuitive tools proposed, and more conducive to creative activities such as exploration and experimentation. In addition, participants were encouraged to ask their peers, mentors, and the facilitator when in need or in doubt. This set-up was considered more conducive to collaboration than a more 'formal' training oriented approach. Besides, the participant researcher and mentors were available at all times to provide assistance if needed, and the participants were encouraged to use each other as a resource.

Given the time constraints during case 7 the group was divided into two. One group created a story facilitated by the MP, and the other was given the phones with which to experiment. When the group working with the MP shot their media they started assembling, and editing it. Meanwhile the other group went over to the MP to create their story and shoot their media. By the end of the workshop all the participants had been exposed to the entire process. They created a story, shot the media for it, and started assembling it even if they did not manage to complete it. In addition, through informal training, experimentation, and use, they managed to operate the tools efficiently to achieve their objectives. Towards the end of

the session all the participants gathered around the editors to participate of the editing process, and watch the development of the DN in the making. When the time to leave arrived the participants wanted to stay longer to finish their DNs.

Case study 7 showed that formal training in the use of the tools was not necessary; when dealing with mundane technology people are generally acquainted with it. Thus, the operation of most mobile telephones is very similar, and changing models only requires learning where, and how to access the various functionalities needed. A similar rationale applies to the movie editor chosen, which is designed upon intuitive and familiar drag and drop graphical interfaces. The division of the group into two subgroups was effective to meet the objectives of the session. The DNs created were very simple, and one of them was only made up of images, resembling a silent movie. This justifies the fact that the groups almost completed the DNs in a two hour workshop. However, very little time was allocated to each activity, and more exposure to these was deemed necessary to engage participants in creative and collaborative interactions. The venue and general set up of the EdS was inappropriate. There was very little free room for the group to move comfortably, the seats had to be removed and pilled at the back by the group, and this consumed precious and scarce time. Prior to leaving the venue, the group had to rearrange the room back to its original layout, again consuming scarce time that could have been used for the DN activities. The data projector in the room did not work, and the participants had to gather around the screen of a small laptop. This was not conducive to complete group participation. Participants thoroughly enjoyed the session, and they were observed to peer-tutor on the use of the tools, and to collaborate during shooting and editing. The MP continued to play a relevant role during the story creation and the shooting. His knowledge of media language and influence was evident in the final DNs.

Case 8 was conducted in the same venue as 7, and the same logistical difficulties applied, however, a portable data projector was brought to the venue to facilitate whole group participation. During this case the group worked together and the participants were asked to bring personal objects, one of which, a small ceramic dragon, became a main character of the story. The ideas and story beats were captured into a free mindmap which was been projected. When the story was created the group decided on who was playing the different parts, and the group was divided into three subgroups according to the various task assignments. One group with two phones, and assisted by the MP, created the images, another with one phone and accompanied by mentors recorded the sounds, and the third supported by the researcher edited the media created by the other two groups. Although there was a degree of labour

division, all the activities were taking place in the same space, and the participants of different subgroups were working together. This also applied to the MP who, although, mainly supporting the group taking the images, also assisted the group creating the sounds. Excerpt 3, 4 & 5 are various snaps of interactions that illustrate the general atmosphere of the workshop at the media creation, and editing stages.

MP: Why don't you go back to the stairs and record the story

P1: Yeah, that's a good idea

F: It's a good idea, OK, for you to go away and record the story but you won't know how the story is going on.

P1: But we know the story

P2: We'll shorten the pictures to go with the story. (A few comments from the group.)

Excerpt 3 Editing group requesting sound case 8

F: Are you happy with that, guys? What else? (eliciting from the participants which media units need to be placed in the timeline)

P1: We have to get his foot getting closer.

P4: Yeah we have his foot through the banister there. That one there. (referring to an images that is displayed on the collections window of the movie editor)

F: Can you want play that? *(to the editors)*

Ps: Yeah, to see how it looks

Ed: Here we go (playing the DN which triggers laughter from the group)

P: We're getting an idea of the story

Excerpt 4 Group editing case 8

The group watches what they've done so far. (Comments: That's quite good…Great, it's great.). The facilitator makes them decide where the rest of the pictures go on the timeline.

The sounds group comes back and say they got half the work done as far as the attacking bit.(referring to one of the story beats)

P1: We did three different ones cause that's what we were told to do.

F: Where are the images? (while the editor is exploring the folders of the telephone through the file explorer on the PC)

P: The pocket PC (referring to a folder in the telephone)

P: The ones with us on the ground *(describing the images)*

Excerpt 5 Retrieving media from the phone case 8

Excerpt 3, 4 & 5 demonstrate a good degree of participant participation and control over the various tasks. In addition to what these excerpts illustrate, there was much peer-tutoring taking place in relation to the use of the technology. The editing was slow, and time consuming since participants were learning how to use the movie editor as they went along. This lack of knowledge and speed seemed to frustrate the MP who opposed to the idea of participants doing the editing. He argued one learns from watching a professional doing their work well, and not by attempting to do something one is not good at. The MP contested that it was a waste of time watching participants editing with difficulty. This episode highlighted a strong difference of opinions between the MP and the researcher that had not been articulated until this moment. While the researcher felt strongly about the participants' full engagement in all the activities because of the potential these afforded to support collaborative creative processes, the MP was not interested in that aspect. Their objectives seemed very different; process versus product, and concerns regarding whether or not these two objectives could be supported, and co-exist within the study arose. By the end of the 3 hour session the DN was not entirely completed, however, much media was assembled. Given the kind of interactions and level of participation experienced, the researcher deemed the outcome of the session very satisfactory. This was only the second time the participants engaged in the activity. Besides, the amount of media units created was higher than in the previous session, and hence required more editing effort. Time resurfaced as an issue, and longer sessions were needed. To address this, the participants were asked to stay an extra half hour during the following session, case 9.

Case 9 was conducted in the second venue on-campus and lasted 3 ½ hours in which two DNs created by two subgroups were completed. The MP was not present during this workshop and the researcher decided to handover the story creation activity to the participants and mentors. This was deemed important to understand to what degree the participants and mentors were able to generate stories independently. The approach also aimed at preparing the participants and mentors for the following session in which neither the researcher nor the MP were going to be present. The participants were not asked to bring personal objects and improvisation games were not played. Each subgroup had six members, two mentors and four participants. The researcher provided assistance to either group when needed but handed control over to the participants and mentors. A print of the work plan and story generation template (appendix K) was given to each participant (Fig. 29) and mentor and the facilitator explained how to use it. Each subgroup used a whiteboard to capture the ideas contributed during the story generation phase and to write the story beats (Fig. 30). A

participant, rather than a mentor, was in charge of capturing the group's contribution. When the stories were created the groups went on location to shoot the media for the DNs. At the beginning of the session, the researcher suggested and encouraged the participants to use the surroundings as possible settings and shooting locations. One of the groups went outdoors from the offset and the other staid in the room and ventured outdoors later.

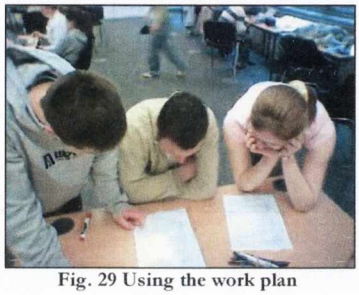

Fig. 29 Using the work plan

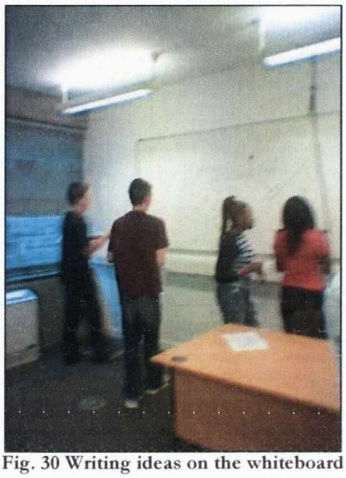

Fig. 30 Writing ideas on the whiteboard

Fig. 31 EdS set up

While shooting, the members of each subgroup worked together creating the images and sounds. This was partly due to the fact that only three phones were available and they had to be shared between the two subgroups. The limitations on devices implied that no media flow to the editor was possible and hence no need for an editor or media messenger arose at the beginning. Both subgroups shot the images first and subsequently recorded the sounds. In both subgroups a second 'round' of media creation (image capture and sound recording in one and only image capture for the other) took place after initial editing. The media was not created in chronological order according to the story beats but rather in the order locations were available to the groups. For instance, one group created a DN portraying what they did in the workshops. It started by showing a participant coming in through the main entrance of Trinity College (Fig. 33), walking through the campus (Fig. 34), and finally arriving to the room of the workshop (Fig. 32). When the media was created Fig. 32 was the first one to be shot, since the participants were in the room. They then shot Fig. 34 as they made their way to the main entrance of the College, and finally Fig. 33 when they arrived to the entrance. This mode of shooting contrasted with the chronological pattern following the order of story beats used when the MP assisted the participants. The time stamp recorded on the media files (Fig. 28), the video of the sessions, and the actual media projects at different development stages were used to reconstruct events and gain understanding of the history of individual media units and combinations of these.

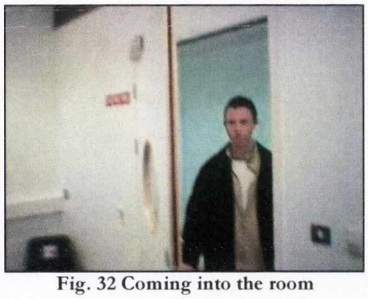
Fig. 32 Coming into the room

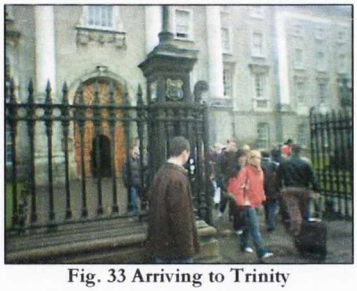
Fig. 33 Arriving to Trinity

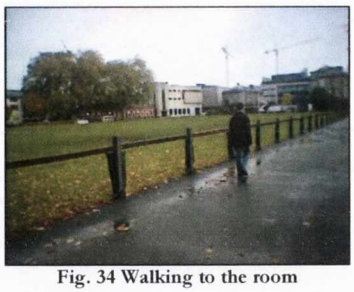
Fig. 34 Walking to the room

When the groups came back to the room each worked in an EdS (Fig. 31), editing their DNs. The participants move forwards and backwards from the whiteboard where the stories were captured (Fig. 30) to the EdS (Fig. 31), to check what came next. They ticked the story beats on the whiteboard as these were assembled on the DN. The participants edited their DNs alone with assistance from the mentors and they experimented with additional functions available on the movie editor. For instance, a group created a title slide for the DN, incorporated images not created by them, recorded a song, and added it as a soundtrack to the DN. None of these features had been pointed out to the participants while demonstrating the movie editor.

Case 9 seemed to indicate the participants, with assistance from the mentors, and the 'detached' guidance of the researcher, were able to create a DN. The tools provided: the work plan, the story template, the whiteboards, the phones, and the movie editor, seemed to provide sufficient support and scaffold to assist the collective process. Instances of experimentation and possibility thinking were observed during shooting and editing, as well as during the actual story generation. The non-chronological shooting and second round of shooting pointed to creative processes of productive engagement and reviewing. Through shooting the media, crosschecking this against the story beats, and seeing the development of the DN in the making in the movie editor's timeline, the participants engaged in tangible creation of the DN. They engaged in a fashioning process towards the pursuit of a concrete and valuable goal, and the immediacy of the movie editor supported them in doing so. This kind of behaviour had not been observed to be the same in extent in previous cases. It appeared the range of actions and the status bestowed to the participants by diminishing the assistance provided by the team endowed them with power and ownership. The division of the group into two subgroups was successful from the perspective of handing over control and responsibility to the participants. However, the limited availability of phones and group division affected the possibility to engaging in simultaneous shooting and editing. This aside,

the collaborative interactions observed during the group editing process were similar to the ones illustrated in Excerpt 3, 4 & 5 reported in case 8.

The workshop of case 10 was run by the mentors in the absence of the researcher and MP. Although there is no observations for this case, the media created by the participants, and data logged in this, for instance, time stamp, the movie editor projects, and the final DNs, were analysed. The case is included because it illustrates important points in relation to the type of facilitation necessary to conduct the DN activity as a framework for collaboration and creativity. Furthermore, it contributed to reinforce propositions regarding the implication of different media types identified in earlier cases. The venue, technology, tools and group division for this case were the same as for case 9. The subgroups created two productions within the 3 hours duration of the workshop. The productions were sets of interviews with tourists strolling through the grounds of Trinity College and the city centre. The interviewees were asked to list three things they liked and disliked about Ireland. One of the productions dealt with likes and the other with dislikes. Both groups followed the same shooting pattern: they started with video interviews in which the sound quality was extremely poor; they proceeded to audio recording of the interviews, and captured a few images to accompany the recordings. The final productions did not include any of the videos shot; they were an assembly of recording and images. One of the productions also incorporated images not created by the participants that matched the comments of the interviewees, and a musical sound track.

The analysis of the final productions highlighted that there was no real narrative or narrative intent conveyed in either production. They were both 'poorly' synchronised assembles of media (images and sounds) driven by the oral interventions of the interviewees. For instance, they showed single shots that stayed on display as long as was needed to 'cover' the length of the intervention or, changed from one image to the next out of synch with the audio. This highlights a number of issues in relation to the manner in which the groups seemed to have been facilitated. It appeared the story template was not used. This illustrates the lack of understanding on the behalf of the mentors regarding its importance to structure and guide the creative process. Without this structure and guidance the participants used the recordings as the base structure over which they laid images. The participants and mentors' lack of media language prevented them from maintaining a sense of the narrative while shooting/recording, which translated into footage/recordings they could not edit into a narrative. The mentors' lack of understanding in this regard appeared obvious, since they did not deter participants from launching into the endeavour. The proposition is further

reinforced by the fact that prior to capturing the recording the participants had created video interviews in which the same issues were evident. Furthermore lengthy sound recordings instead of shorter media units, are less conducive of collaboration either at the recording or editing stages, and require more time and skills to edit. The foregoing issues were also identified in Blue cases 1 & 2.

Case study 11 was conducted under the same conditions and in the same venue as case 9. The researcher and the MP facilitated the workshop, and it was the first session for the MP after two weeks of absence. With the return of the MP the improvisation games were played however, the participants were not asked to bring personal objects. After two weeks taking ownership of the story generation activity the participants were vocal about the story they wanted to create. They indicated they wanted to do a documentary of the outreach programme showing what the other groups did. The MP did not think this was an interesting idea, and suggested creating two stories instead of just one. The participants had the print of the work plan and story template but the MP led the idea generation for both stories. The group as a whole generated both stories: the documentary of the outreach programme and a thriller. The MP captured the ideas on the whiteboards, and a participant wrote the story beats on a sheet of paper to take on location to guide the filming. When the story were created the group divided into two subgroups for the shooting. The MP and one mentor worked with the thriller group and two mentors with the documentary one. The researcher facilitated either group as needed.

The thriller group shot a greater number of images, and recorded more sounds than the documentary group. These were also very different from an aesthetic and media perspective, and distilled the media professional's influence. The documentary group had created four videos and had longer sound reseedings than the thriller group. The members of the documentary group had more input into the media creation and editing while the participants in the thriller group tended to follow the indications of the MP. There was no possibility for media flow to the editor due to the limited availability of phones, however, all the members of both groups engaged in group editing when they were back in the EdS with the media. By the end of the session neither group had finished the DN, however, the documentary group was much closer to a completed creation that the thriller one. In general the session evolved in a very similar way to case study 9. The level of confidence and proficiency of the participants with the procedure and the technology had improved substantially from the first meeting, and even in the past two sessions. The MP commented on how proficient and independent the participants had become since he last attended a

workshop. The presence of the MP was felt in that it became clear that his expert knowledge of the language of media and his aesthetic value judgement substantially influenced the creation process. His expertise seemed to lead participants to adopt a more passive behaviour as reported, and to follow rather than lead, perform and recite rather than create, and produce rather than edit as a meaning making activity.

Case 12 was conducted under the same conditions as the previous cases. However it differed from them in that instead of creating a new DN, participants were asked to complete the DNs started in case 11. This case focused on engaging participants in critically reviewing their work with the view to completing it and improving it. In addition to the usual team, an improvisation theatre director had been invited to the workshop. He led the improvisation games with the MP, and played games that required very slow movements rather than energetic ones, as the ones played by the MP. The games came to pass without major relevance however, throughout the session the researcher observed that the two most 'energetic' participants continued these games on their own. Upon reflecting on the episodes, the researcher considered the appropriateness of playing any type of games without background knowledge of the students.

After the games the group sat around the projection, and started watching DNs. The documentary came first, and the participants facilitated by the researcher identified beats that needed further work, and made suggestions for improvement. These were annotated in the sheet of paper with the story beats from the previous week. The review of the thriller proved more difficult. The participants had problems identifying parts in need of further work, and providing suggestions for improvement. During the review of the DNs the first instance of 'tension' among the participants arose when one 'accused' others of not taking the work seriously, and not pulling their weight. No progress was made with the thriller so the researcher decided to drop this DN, and let the participants work on the one they had demonstrated more understanding of. Regardless of the good progress made during the case with reshooting of media and editing, the DN was not completed in the session. This was partly due to the fact that the DN contained mix media (images, sounds, and video), which required a substantial editing effort.

The case study highlighted the need for the participants to critique their work in a scaffolded fashion, to be able to engage in critical evaluation of their work. This in turn allowed them to literally see what worked and what did not work and devise ways forward. The movie editor and the projector were crucial tools in this process. The player functions of

the movie editor allowed the participants to pause, review, and so forth as needed. The projector focused, and grounded the conversation. During this activity the participants were very vocal, delivered intense participation, and collaborated richly. The first instance of 'tension' among the participants emerged, and this further supported collaborative interactions. The assistance of the MP was much more akin to Socratic questioning than to a director's creative vision. A debriefing with the invited theatre director revealed that in his view the participants were unsure of what they were doing in the DN workshop since they could not clearly articulate it while reviewing the documentary. This raised concerns, since clear understanding of the rules, tasks, and procedures of activities are important factors in setting up the conditions that enables collaboration to come about.

4.7 DISCUSSION OF RESULTS

This chapter presented the 12 embedded exploratory case studies conducted to inform the iterative design, and development of the mobileDNA. The cases were driven by a task-oriented objective:

> ***The creation of a collective DN, from idea generation to final production, in 2 hours.***

In particular, they aimed to address the research questions concerning the first phase of this study:

- What resources, tasks, roles, and activities engender conditions conducive to the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What group formation, task distribution, and sequencing enable workflows which trigger the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What kind of orchestration is appropriate to foster, and develop capabilities to engage in learning experiences based on productive, collaborative, and creative moving media production?

The examination of the cases evolved around three main areas of concern in moving media creation. These were: logistical implementation, media knowledge, and pedagogical implementation. The working proposition was that the investigation of variables within these three areas could contribute towards answering the above questions. The data from the cases, their thin description, and analysis has been presented under the three areas.

4.7.1 RESOURCES

Addressing the first question, the cases clearly indicate that the mobile phones are a viable and suitable alternative to video cameras in this kind of moving media production activity. Their cost, in comparison with that of video cameras, enables the provision of more devices, and hence increases access to equipment. This in turn provides participants with more access to filming, one of the activities credited with the greatest learning benefits (Becta, 2003b). The greater amount of devices, their portability, limitations in terms of storage capacity, and the fact that they output digital media, contributes towards shortening the time required for media production. The cases illustrate that multiple devices can be used in rotation for filming. This together with their portability means that a media flow from the shooting location to the EdS can be established. Additionally, the storage limitation of the phones is beneficial since it counterbalances the overemphasis on filming reported in the literature (Reid et al., 2002). This limitation, and the digital output of the phones avoids difficulties with digitalisation of video footage, and storage of the same given their large file size (Burden & Kuechel, 2004; Pearson, 2005). However, the phones, as capturing devices, are not without caveats. The quality of sound in video captured with phones is clearly not sufficient. Most importantly, the lack of standards in media file formats created by phones is a severe drawback. This impedes us from taking advantage of the ubiquitous presence of phones in society; thus, not just any phone is suitable for our activity. The cases demonstrated that in order to ensure compatibility and interoperability between the phones and the movie editor, the phones must create media in file formats recognisable by the editor. File format affects video and sound in particular; however, images are not affected by this issue, since most phones create them in the JPG format, which is compatible with most movie editors.

The cases highlighted that another important resource in supporting the activity was the story template. This enabled our approach to amalgamate into one, the four time consuming and sequential steps of traditional film making approaches: idea generation, planning, scripting, and story boarding. Authors argue the foregoing steps are important to structure the activity, ensure aesthetically worthy product, and provide authentic learning experiences (Holzwarth & Maurer, 2001; Kearney & Schuck, 2006; Reid et al., 2002). Notwithstanding the preceding, our cases indicate that when aesthetic value is not a priory, our approach provides structure and authentic learning experiences. Furthermore, it provides a framework for collaborative creativity in the construction of a common creative vision of the story (Clark, 1996; Mamykina et al., 2002). Findings from the cases illustrate, that in order for the story template to fulfil the foregoing function, a number of conditions apply. Firstly,

the ideas being contributed by the group need to be captured and shared in a public fashion, so that the participants can keep track of and revisit what has been proposed (Mamykina et al., opt. cit). This is important during the story generation, as portrayed by most cases, but also during the editing and reviewing of the work. In the first instance, collecting the contributions provides a pool of ideas which participants can use to create the story and in so doing, engage in combinational creativity (Boden, 2001). The relevance during editing was evident in case 9, when the participants kept on referring back to the story captured on the whiteboard to inform the editing (Fig. 30). The importance of recording the story for reviewing purposes was overt in case 12, when the participants used the original story (captured on a sheet of paper) to guide their activity, and annotate changes needed to improve the work.

Secondly, the analysis of the data indicates that using a mind-mapping application to capture the story may offer advantages over more traditional means, such as whiteboards or paper. Besides being a tool to capture, collect, and revisit discussions (Mamykina et al., opt. cit), which offers clear advantages in terms of provisionality, interactivity, automatic functions, (Department for Education and Employment, 1998 in Loveless, 2002, p. 12) and permanence, they are easily sharable through a data projector. In cases 3, 4 & 8, the use of a mind-mapping tool to capture the ideas and create the story was found to provide a focal point of reference to the participants, to create a shared pool of ideas, to provide structure, and to encourage greater participation, and thus to produce opportunities to indicate, formulate, offer ideas, and make connections (Craft, 2005). Drawbacks of the tool included the time it required to create the free mind-map, which in case 5a led the MP to request that the mind-mapping tool no longer be used, and the lack of portability of the story's mind-map created. Concerning the latter, in cases 5b, 6, 9 & 12, bringing the 'script' to the shooting location was found to provide structure and guidance for filming, and support to participants in maintaining a sense for what the story was meant to be while filming. The inability to sustain the vision for the production is a problem associated with lack of media language, and video filming (Reid et al., 2002). Additionally, providing the 'script' to the participants endowed them with greater power of decision (Jeffrey, 2006b), contributing towards handing-over control to allow them to become aware of and experience from different perspectives (Haringman, 2001). In cases where the participants did not have a 'script', they completely relied on the MP or researcher to guide the shooting. Both, the public creation of the story and the 'script' provided participants and facilitators with a self and group regulating tool,

which contributes towards the occurrence of productive collaborative interactions (Dillenbourg, 1999).

Lastly, regarding the amount of prescription and scaffold for the stories, three points are worth noting. First, disregarding the suggestion to provide the story, made case 1, the stories were not prescribed. Second, using personal objects to aid the story generation did not have an impact on the way the stories were created. Story creation happened in a comparable fashion in cases with and without personal objects. When personal objects were used the stories created had less resonance with the participants and their reality (see appendix J for summary of stories). For instance, in cases 1 & 8, the objects brought became main 'characters' of the DNs, and the stories were 'fictional'. On the contrary,, in cases where objects were not brought in, the stories mirrored aspects of the participants' lives. This was evident in case 2, all the Orange cases, and case 9. In cases 7 and 11 (Siblings – the thriller) no objects were brought and yet the stories were 'fictional'; this may have been due to the greater influence of the MP in the story generation. In case 12, when reviewing the DNs created, the participants had great difficulty discussing the thriller, and did not seem to understand the underlying story. The level of understanding and engagement of the participants appeared to be related to the relevance of the task, the degree to which the language and experiences at play were familiar to them, and the participants' confidence, and the degree to which control was handed-over (Keller, 1987a, 1988). Third, the basic story template was an efficient scaffold for the story generation. Cases 9, 10 & 11 highlighted the need to provide the participants with the story template to allow them to gain greater ownership, and control of the creative process (Jeffrey, 2006b), and to enter into a part-ownership with the view to promoting full-ownership in the participants (Haringman, 2001).

The analysis of the cases also underlines the importance of the media type used within our approach. Cases 1, 3, 9, 10, 11 & 12 unveiled issues concerning the use of video to support collaborative creativity. Firstly the use of mix media (video, images & sounds) to create the DNs, attempted in cases 1, 3, 10, 11 & 12, required much editing time, and skills beyond those of the participants, and the non-participant editor. Contrary to common belief voiced by participants in case 1, in our study it was not quicker to create DNs with video, rather than a combination of images and sounds. Undoubtedly problems with sound quality and file format incompatibly with the authoring tool severely impacted on time in cases 2 & 3. The skills required to edit the poor quality video were technical in the use of the authoring tool, and probably required a professional application. More importantly, they called for knowledge of media language beyond media consumers' reach (Reid et al., 2002).

In case 3, where only video was shot, the participants engaged in acting, following the MP's directions, rather than in creating the DN. The medium of video lent itself to more traditional filmmaking approaches, and many 'takes' of the same beat were shot to get different angles, good quality images and sounds, and due to the participants not reciting their parts 'properly'. Distraction with film making aspects, when media studies is not the objective, detracts from the underlying learning objectives of the activity (Kearney & Schuck, 2005). Furthermore, video offered no collaborative latitude (Dillenbourg et al., 1996) since a single individual engaged in filming and captured all the required resources for a DN (image & sound). Arguably multiple phones can film simultaneously, gathering footage for the same beat. However, more video required more time, and skills to edit and this defeated the time saving purpose of our approach. This was evident in cases 1, 9 & 11, and is confirmed in the literature (Hernández-Ramos, 2007). Issues with video also emerged during filming, particularly in cases 9, 10, & 11 (the documentary DN) when the MP was not assisting the participants. The videos created during those cases clearly demonstrate the participants' lack of media language in that they are not able to film and maintain and pursue the sense of the story. They gathered too much footage and attempted to capture everything that they could see rather than what they wanted to show. The foregoing are issues also reported in media studies-oriented film making projects (Holzwarth & Maurer, 2001; Reid et al., 2002).

Cases 4, 5a, 5b, 6, 8 & 9 demonstrated the numerous advantages of creating images and sounds instead of videos for our approach. Firstly, images and sounds offered latitude (Dillenbourg et al., 1996) for collaboration when shooting since the creation of resources required for the DN was distributed. This provided more access to filming to the participants, but also increased resource interdependence (Johnson & Johnson, 1994; Zurita & Nussbaum, 2004). The editor became dependent on the media created by different people, and each of these in turn became dependant on the media the others created. Additionally, with the higher number of single media units to assemble, the editor required greater input from the participants. In the Orange cases, the need for participant input was greater because the non-participant editor did not seem to 'own' (understand) the stories. However, the need to assist the editor also manifested itself in cases 8 & 9, when the participants were editing. This situation provided a very rich context for collaboration, and is illustrated in Excerpt 3, 4 & 5. The study also showed that overall, editing images and sounds was less time consuming, given that it was easier for novices to manipulate single media units than video. To this end, in case 9 the participants even engaged in a second round of shooting and editing after the initial one.

Concerning the order of media creation explored in the Orange cases, case 3 indicated that providing the visual anchor of the assembled DN to record the narration, led participants to describe the media rather than to tell the story. In case 5a & 5b, recording the sound prior to the images provided a good anchor for the non-participant editor, but did not make a difference to the level of participant involvement in the narrative creation. Case 9 & 11, and particularly 6, illustrated that participants' involvement in the narrative meaning making process of editing (Sefton-Green & Parker, 2000), depended on the level of ownership of the actual media. For instance, in case 6 the participants were in control of the media creation in that they decided where to shoot the different beats to convey the narrative intent. The MP and researcher were in a situation of asymmetry of knowledge in relation to the school and its grounds, and this benefited the participants. Only on two occasions, when the participants were editing, were the DNs completed. This happened in cases 9 & 10, when total control was handed to the participants.

4.7.2 TASKS, ROLES, AND ACTIVITIES

Three distinct activities or phases in the process emerged from the cases: story generation, shooting and editing, and production and screening. In order to support collaborative creativity it appeared participants ought to be in control of all three, and of the overall process. To engage in collaborative creative story generation they need to construct a common creative vision (Mamykina et al., 2002). Tools to capture, display, and store their ideas contributed towards this end (ibid). Given the participants' lack of media language, images and sounds rather than video, were mediums more conducive to enabling them to capture their narrative intent while shooting, and to enabling them to transfer this to the DN when editing. In fact, point and shoot filming, short filming exercises, and the use of PowerPoint, to explore the synchronisation of media and time, are recommended strategies as stepping stones for novices in moving media production (Burden & Kuechel, 2004; Reid et al., 2002). Step-by-step approaches are characteristic of novices (De Jong & Fergusson-Hessler, 1996), and in their progressive approximation dimension idiosyncratic of creative development (NACCCE, 1999). Productive engagement in the DN creation seemed to be supported by handing over control (Jeffrey, 2006b). Greater control over the story, the media, and the DN appeared to be influenced by the degree to which the participants owned the story, the media, and the DN in the making. The relevance of the task seemed to be linked to the degree to which the participants were familiar with the language, and the experiences to which they referred.

A clearer picture of the roles and tasks involved in the DN production process also emerged from the data. During the story generation, participants adopted the roles of story creators, or contributors, and critics. During shooting there were crew, camera and sound people, and cast, actors and 'voices'. In addition there were the editor/s and a media messenger/s, when media flow from the shooting location to the EdS was established. When reviewing, the roles were the editor/s and critics. The feedback from the independent observer in case 12 highlighted the need to articulate and share rules, roles, and tasks in a clearer fashion; suggestions consistent with literature in CSCL which recommends the over specification of collaborative rules based on scenarios with roles, and tasks allocation (Dillenbourg, 1999; Zurita & Nussbaum, 2002). The participants' confusion over the DN workshop, mirrored in the documentary (case 12), and reported by the independent observer, reflected the ongoing iterative process in which we were all engaged. This was an intrinsic characteristic of the research approach, and of the object of the investigation. However, systematic procedures clearly articulated, shared, and understood by all were needed to be addressed the second part of the research.

4.7.3 GROUP FORMATION, TASKS DISTRIBUTION, AND SEQUENCING

Apropos group formation, the data disclosed asymmetries of knowledge, and action (Dillenbourg, 1999; Johnson & Johnson, 2005; Meier et al., 2007), which impacted on the establishment of a context conducive to the emergence of collaborative creativity. Firstly, the acute asymmetry of media language knowledge, between the MP and the participants, witnessed the presence of two working patterns. The MP's expert large tacit knowledge units (Chi et al., 1981; Dufresne et al., 1992) enabled him to proceed in an almost automatic mode (De Jong & Fergusson-Hessler, 1996). This ability was insinuated in case 1, when he proposed to shoot the final media for the DN, and bypass editing; and overtly implemented in cases 2 & 5a when without a 'script' he sustained the sense for what the story was meant to be while shooting (Reid et al., 2002), and editing. In case 2 numerous re-takes of video clips were shot to obtain the final media for the DN, and in case 5a numerous re-recordings of narrations took place. In both cases, the assistance that the MP provided to participants was geared towards the achievement of final media, seeking a degree of aesthetic value. The participants' lack of knowledge in this domain clearly manifested in cases 9 & 10 when no MP assistance was provided, required a step-by-step working approach (De Jong & Fergusson-Hessler, 1996) (see case 8 and Excerpt 3, 4 & 5). Asymmetry of knowledge is not per se counter-productive, however, it led the least expert party, the participants, to adopt a weaker position (Dillenbourg, 1999). Case 11, in which the two subgroups were assisted by the MP and the

mentors respectively, the foregoing is illustrated in the records of the participant researcher's journal. The attainment of real world outcomes is important for creativity (Bentley, 2002), nonetheless, undue emphasis on creative outcomes, and aiming to achieve these in a single move can hinder it (NACCCE, 1999).

Asymmetries of knowledge in the participants' advantage were also found. In case 6 the knowledge of their school and its grounds allowed them to become the experts. The participants had ownership, it was their knowledge rather than the facilitator's that held control, and the power of decision, (Jeffrey, 2006b). This led the MP to adopt a 'less expert' role. In cases 9, 10 & 11 (the documentary) the participants completely owned the stories, and to this end they were the experts. Case 12 showed the participants' scarce understanding of the thriller, which denoted their lack of ownership brought about by the degree to which the participants considered the thriller relevant, and confidence they had in this DN. The opposite applied to the documentary, which they had created on their own. Although the difference in aesthetic value between the two DNs was undeniable, learners prefer poor aesthetic media created by them or their peers to professional work (Burden & Kuechel, 2004).

Asymmetry of action was found when generating the story, shooting, and editing. In cases 1 – 8, participants did not have the work plan or story template, and their actions were limited to following the facilitators' instructions. In cases 8 – 12 when they had the story template, their range of actions and autonomy increased, becoming comparable to that of the facilitators'. In cases 9 & 10 they had complete autonomy, and in case 11 they 'requested' freedom of action, and decision by choosing to make a documentary of the outreach programme. Asymmetry of action also occurred in cases 3, 4, 5a & 8, when a party other than the participants operated the mind-mapping tool. When there was no script to take on location, the participants' actions were limited to following instructions. When filming, although participants did hold the phones and press the button, they were not always in control of their actions. Instructions from the MP reported in cases 2, 3 & 4 portray this point. Asymmetry of action while editing was predominant in cases where the non-participant editor was used and less so, in the Green cases when the participants did the editing. Concerning the foregoing, asymmetry of action in TEL is not directly correctly correlated to tangible manipulation of tools. Division of labour, into low procedural and high cognitive processes, among peers manipulating tools, and providing instructions respectively has been reported (Buckingham et al., 1999; Issroff & del Soldato, 1996; Miyake, 1986).

Regarding the size of the group, in our approach and for our objectives, small groups of 3, as used in Blue cases, were insufficient. This contrasts with recommendations from DFM research proposing ratios of 1 EdS to 2 students as ideal and 1:4 as a maximum (Reid et al., 2002). The subdivision of groups into two, with 4 participants and 2 facilitators each (cases 8, 9, 10 & 11), was efficient respecting productivity, but presented difficulties regarding time for reviewing the work, the parallelisation of shooting and editing, and provided less latitude for collaboration. Working together as a group in all the activities (cases 1 – 6) lent itself to hierarchical labour division in which experts led, and novices followed. Group size depends on the task at hand, its duration, the group composition, and the context (Dillenbourg et al., 1996). Given the iterative nature of the study, a precise optimal size was not identified, however, groups of 8 – 12 (counting the mentors) as in case 7 appeared to work best.

Findings regarding the relevance of media type, the requirement for activities and a framework with latitude for collaboration, the advantage of parallelising shooting and editing for time saving, and the need to provide occasions for intellectual inquiry, productive engagement, and reviewing (Jeffrey, 2006b), led us to conclude that task distribution is paramount in group formation for our approach. When tasks take place as a whole group activity, for instance, story generation and editing, these need to be shared through a public display, and participants should be operationally and cognitively in the driving seat. Pedagogical rather than other types of orchestration should also be in place. When the group is working on different tasks, for instance, shooting and editing, these need to be collaboratively distributed, and interdependences should operate. Shooting should be limited to images and sounds, and two independent groups should perform these tasks separately and in parallel. Editing should be parallel to shooting, and media flow from the shooting location to the EdS should be established. Delays between shooting and editing (case 2) have an impact on time, but most importantly prevent participants from taking advantage of the immediacy of the movie editor to inform the fashioning process of creative production.

Summing up, results from the 12 cases point to a sequence of activities with three phases in chronological order: story generation; shooting and editing; and production and screening. The middle phase is in turn characterised by the parallelisation of shooting and editing in which three tasks: shooting images, recording sounds, and editing; take place simultaneously and independently from each other. In addition to providing a context for collaborative creativity, the foregoing ought to contribute towards time reducing investment, and combating the division of labour in a cooperative and hierarchical manner, rather than in collaborative fashion.

4.7.4 ORCHESTRATION MODEL

Data from the cases also provided insight into the type of orchestration, cognitive, and pedagogical, and the practical dimensions of CSCL (Dillenbourg & Fischer, 2007, p. 122), that appeared more appropriate for our approach. At a logistical level, a number of issues arose regarding the characteristics of suitable venues, the set up of the EdS, and the file management system. The Green cases indicated that furniture-free, opened-spaces, with ease of access to the outdoors, and other environments (offering potential for becoming shooting locations), was an important factor in stimulating exploration. For instance, in case 7 & 8 the difficulty accessing the outdoors deterred the group from attempting it. Instead in cases 9 – 12, which took place in a venue with easy outdoor access, all DNs had an outdoor beat. The Green cases also highlighted the relevance of the ergonomics of the environment to support collaborative interactions. Different technology and furniture arrangements led us to conclude that each EdS should be composed of a PC, a data projector, a set of speakers, a mouse, a table, and a few chairs. Most importantly, the public display rather than the EdS and PC should be the shared workspace, and the focal point of attention to encourage collaboration. Regarding the file management system, cases 7 – 12 illustrated unsystematic approaches on the part of the participants which generated difficulties when attempting to retrieve media. To this end, file management may be scaffolded by the facilitator by creating the folders required for the group.

Apropos of pedagogical orchestration, data clearly indicated the existence of contradictory approaches endorsed by the participant researcher and the MP. Respectively, these supported: process versus product, collaborative creativity versus media language, and experiential learning versus an apprenticeship model of learning by watching the master. Although both were respectable and worthy approaches, they could not co-exit. The difficulties with asymmetries of knowledge and action discussed in section 4.7.3 pointed to changes needed to adopt a systematic approach to supporting and scaffolding collaborative creativity. Regarding the role of the mentors, data from the 12 cases, but in particularly from cases 9, 10 & 11, indicated challenges. Their lack of media language to support domain learning, and of pedagogical understanding, to scaffold and support learning, led to experiences and production in which little underlying content or cognitive activity took place. They tended to celebrate the fact that something was produced, and hide lack of content under professional looking productions (Buckingham et al., 1999; Sefton-Green, 2005).

4.8 CONCLUSION

This chapter presented 12 embedded exploratory case studies conducted as part of the iterative design process to devise the mobileDNA. The cases aimed to examine, and identify conditions, workflows, and orchestration models conducive to the emergence of collaborative creativity in moving media production with mobile technologies. A set of statements of purpose informed by the literature were the starting point. Iterations to the cases were implemented in light of findings from previous cases. In total, 56 participants from different educational, and social backgrounds, and aged 13 – 21 took part in the cases. In conducting the cases the participant researcher was assisted by a non-participants editor, a MP, and mentors at different stages. Observations, video recordings of the sessions, and a focus group, the stories, media, moving media projects, and the final DNs created by the participants were the data sources. These were analysed to gain understanding of the phenomenon under investigation, and particularly to answer the research question for this part of the research.

To that end, findings indicate that images and sounds, instead of video, are resources that provide greater potential for collaboration. Arising from these, the main tasks identified in our approach are: idea and story generation, image shooting, sound recording, and editing. Roles associated with each of these tasks were identified. Additionally, a media messenger, and critics emerged as relevant roles. The overall task oriented activity is divided in three phases, or broader activities: Idea Generation, Shooting & Editing, and Production & Screening. Regarding the group formation, asymmetry of knowledge between the expert MP, and the novice participants created difficulties in terms of supporting novices in their step-by-step approach. This affected their level of ownership and control, and their level of participation in the production process from a pedagogical perspective aimed at supporting collaborative creativity. Asymmetry of action also diminished the participants' engagement. Although this is not strictly correlated to tangible manipulation of tools, access to self and group regulation can contribute towards balancing this asymmetry. The task distribution, and workflow emanating from these cases suggests a group collective co-present task (Story Generation), three independent but simultaneous, and interdependent tasks (image shooting, sound recording, and editing), and a collective co-present editing phase. The foregoing design provides latitude for collaboration and creative production engagement. Contradictory objectives between the researcher and the MP need to be eliminated.

CHAPTER 5: DESCRIPTION OF THE MOBILEDNA

5.1 INTRODUCTION

Chapter 4 presented the iterative design process carried out to devise the mobileDNA, a novel pedagogical methodology designed to support and scaffold collaborative creativity among a group of distributed people engaged in the creation of collective moving media productions with mobile technology. Findings from the design process provided information regarding requirements and features to take into consideration to achieve the proposed aim. EAch of the case studies carried out highlighted areas requiring improvement in the initial design, such as the need for a systematic implementation of clearly articulated and shared rules, definition of activities, tasks, and roles, and a solution to establishing media flow between the shooting location and the EdS; a mechanism to mainstream the parallelisation of shooting and editing. This chapter presents the outcome of the iterative design process, that is, the final form given to the mobileDNA.

Tough informed by traditional film making approaches, the mobileDNA differs, from these in two ways. Firstly, it short-circuits their planning, scripting, and storyboarding phases. Secondly, it parallelises shooting and editing. Namely, the mobileDNA enables the synchronous participation of a group of people in all phases of the process and lowers the time required to achieve a finished production. To address issues raised by the iterative design process, the CSCL macro-script model (Dillenbourg & Hong, 2008; Tchounikine, 2008; Weinberger et al., 2008) and its components (participants, activities, roles, resources, and groups) (Kobbe et al., 2007) was adopted to articulate the conditions, structure, and sequence of activities involved in the mobileDNA. To mainstream the parallelisation of shooting and editing, the communication capabilities of the phones were utilised, and Multimedia Messaging Service (MMS) used to transfer media from the shooting locations to the EdS.

The mobileDNA is instantiated in a three-phase task-oriented activity: *Story Generation*, *Shooting and Editing*, and *Production and Screening*. Initially the participants, scaffolded by a Scripting Tool (Fig. 35) and a facilitator, collaboratively create a story. They are then divided into three groups: the *Image Group*, responsible for creating the visuals and acting the parts; the *Sound Group*, in charge of recording the audio -be it dialogues, narrations sound effects-, or soundtracks; and the *Editing Group*, who assembles the media created by the other two groups. With the Script in-hand, the Image and Sound groups, separately go on location to shoot the story while the Editing group stays in the EdS. As the media is captured with the phones it is transferred via MMS to the editors, who can start editing shortly after the Image and Sound

groups arrive on location and start filming. By the time crew and cast are back in the EdS, a first version of the DN is ready for viewing. While viewing the DN in the making, the participants engage in a critical review of their production. Once a satisfactory level is reached, the DN is ready for screening. The following sections describe the three phases of the mobileDNA and present the related activities, social structures, roles, tools, and sequencing.

5.2 STORY GENERATION

The Story Generation phase involves the participants collectively creating a story for the DN (enabled by a data projector) and generating a script with succinct descriptions for each story beat. At a procedural level, this phase is designed to cater for, and short-circuit, the scripting, planning, and storyboarding stages of film making procedures. At a pedagogical level, it aims to bank on a potentially creative activity to construct a context and conditions for collaborative creative interactions to occur. The activities involved in the phase are chronologically described in Table 6. This illustrates the *phase* of the mobileDNA to which the activities belong, the *stage* of the sub-activities within the activity, the *social level* at which they take place, and provides a brief description of what they entail.

Table 6 Activities of the Idea Generation Phase

Phase	Stage	Social Level	Activity
1	1	Group	The facilitator introduces the Story Generation Phase and the Scripting Tool; informs the participants of the objective of the activity and requests a Scriber.
1	2	Group	The group scaffolded by the facilitator and the Story Wizard contributes ideas for the Story. The Scriber notes them on the Story Wizard and this automatically incorporates them into the script.
Steps 1 & 2 are repeated until the group has populated with ideas all the Story Elements they want to cover in their DN.			
1	3	Group	The facilitator introduces the second stage of the Story Generation Phase, and scaffolds the participants with the assistance of the Scripting Tool to create the story beats.
1	4	Group	As the Story Beats are created the participants engage in the construction of common ground through comments, questions, explanations, and so forth.
Steps 3 & 4 are repeated until the group has created a Story			
1	5	Group	The participants divide themselves into the three groups: Image, Sound and Editing and allocate characters, tasks and roles.
1	6	Group	The Image and Sound group, equipped with the script and the phones go on location. The Editors stay in the EdS.

The social structure of the Story Generation phase is designed to promote whole group participation. Although the group is the core social unit, there are roles such as the Facilitator, Scriber and Contributor. The social structure develops around the notion of the people involved in the Story Generation and the various configurations into which they are arranged. Nonetheless, there are other elements that influence it, as for instance the roles people adopt and the tasks associated to them, the tools and resources allocated to tasks and roles, the products generated by the people and the extent to which they perform tasks at an

individual, subgroup, or whole group level. illustrates the foregoing elements for the Idea Generation phase. The stage correlates with the stages of the sub-activities in Table 6.

Table 7 Social structure for the Idea Generation Phase

Roles	Tasks	Tools/ Resources	Product	Social Level	Stage
Facilitator	Orchestrates: Scaffolds & encourages participation	Public display Scripting Tool Pool of ideas Emergent Script	Pool of ideas Script	Individual/ Group	1-5
Scriber	Captures the ideas with the Scripting Tool	Public display Scripting Tool & PC Pool of ideas Emergent Script	Pool of ideas Script	Individual	2-4
Contributor	Contributes Ideas & creates the story	Public display Scripting Tool Pool of ideas Emergent Script	Pool of ideas	Individual/ Group	2-4

5.2.1 THE SCRIPTING TOOL

The Scripting Tool (Fig. 35) was designed and developed by the author with a commercial mind-mapping application[25] and its purpose is to support and scaffold the Story Generation phase. Currently, it runs on PCs and it is intended for co-present scenarios. To achieve its pedagogical objectives, the Scripting Tool requires the orchestration of a facilitator mindful of its purpose. It comprises two main features, the Story Template and the Story Wizard. The Template structures and constraints divergent and convergent thinking while the Wizard guides participants through the Template and provides flexibility within the constraints set by this. The combination of these two features is aimed at holding the paradox between freedom and form, which is important for creativity (Craft, 2000a).

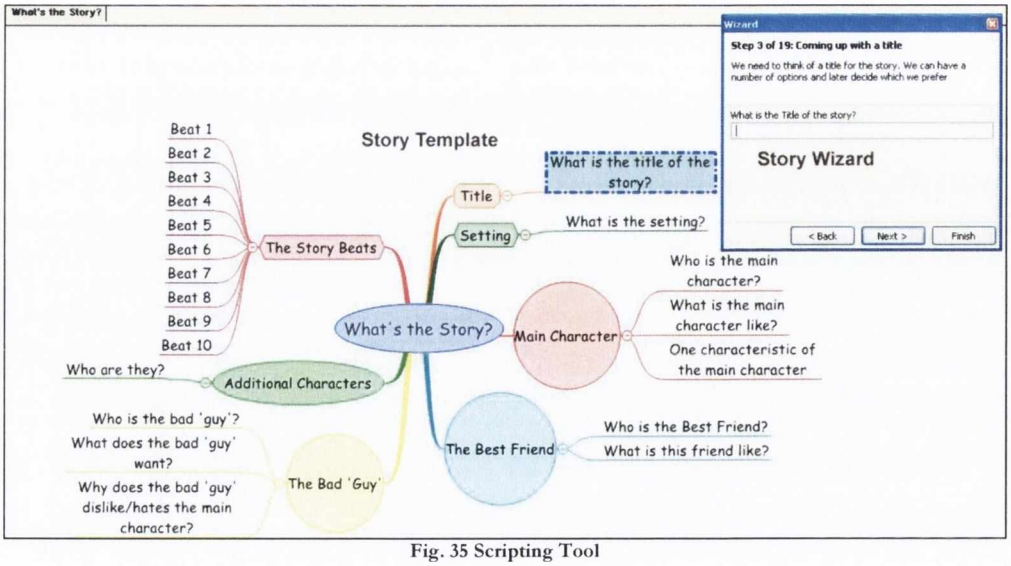

Fig. 35 Scripting Tool

[25] MindManager http://www.mindjet.com/uk/

The Template involves two stages: 1. Divergent Thinking; 2. Convergent Thinking. The first develops around six elements of a standard story model: Title, Setting, Main Character, The Best Friend, the Bad Guy, and Additional Characters. It is intended to prompt participants to think about these elements and to help them contribute as many ideas as possible under each category. To scaffold this ideation activity, and tease the participants' imagination, each element asks prompting questions. The second evolves round the Story Beats, which provide a framework for the story.

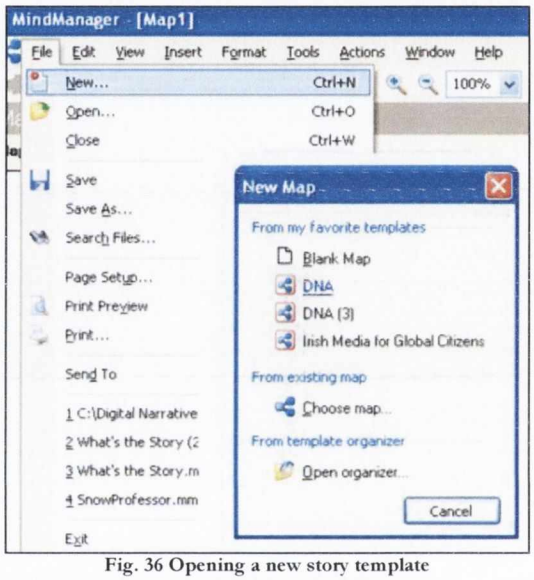

Fig. 36 Opening a new story template

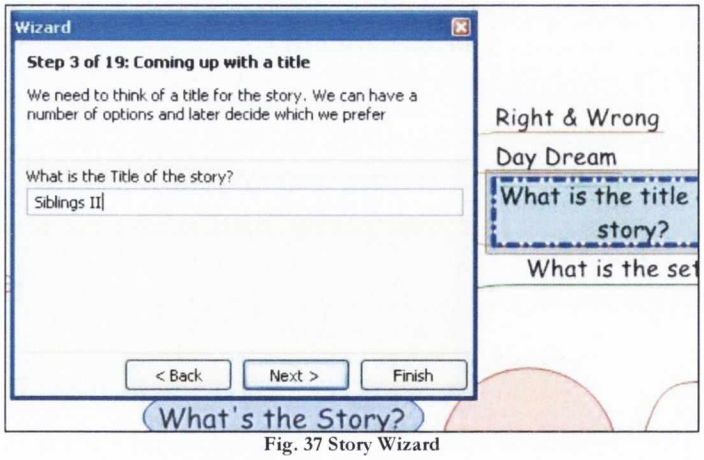

Fig. 37 Story Wizard

To create a new story, participants open the mind-mapping application, select *New* from the *File* menu and *DNA* from the favourite templates (Fig. 36). The Story Template and associated Wizard, created by the author, appear (Fig. 35). The Wizard is a small window superimposed on the Template. It can be dragged and dropped and provides a navigation bar with three buttons: Back, Next, Finish (Fig. 37). Progression through it is sequential and clockwise starting at the Title node and finishing at the Story Beats. To add ideas to the

Template and raise awareness of the node being addressed, the Wizard provides a text box and highlights the node on the Template in a light blue colour (Fig. 37). After inputting the contributions in the text box, participants click *Next* and the ideas are automatically incorporated to the Template under the corresponding node (Fig. 37).

To hold the paradox between freedom and form (QCA, 2008a), and allow participants to contribute as many ideas as they want under the same story item, the Wizard provides a potentially infinite loop (Fig. 38). This allows users to readdress the same question they have just answered; if they chose *Yes* a new text box for the same question appears; if they chose *No* they are presented with the question corresponding to the next element on the Template. As the group progresses through the Divergent Thinking Stage, they populate the Template with a pool of ideas which can be used to create the story in the Convergent Thinking stage (Boden, 2001). The semi-structured interfaces of the Template and Wizard scaffold the activity and provide guidance (Shapiro, 2008; Suthers et al., 2008).

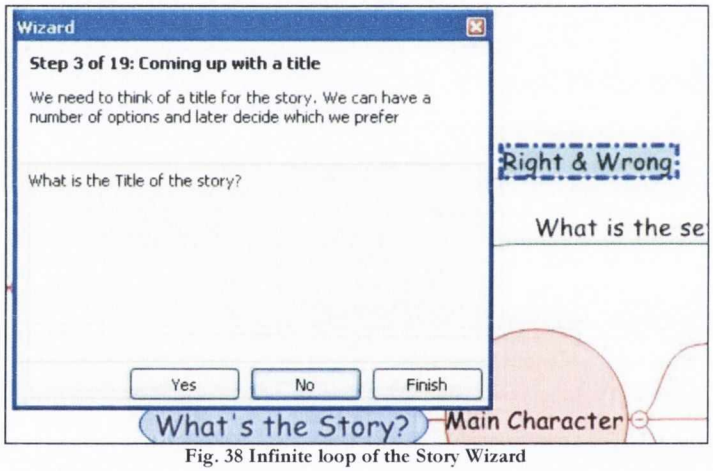

Fig. 38 Infinite loop of the Story Wizard

To encourage Convergent Thinking while creating the Story Beats, the infinite loop option is withdrawn (Fig. 39). However to still hold the paradox between freedom and form, users can decide on the number of story beats. The prompting questions for the beats mirror notions of narrative suggesting a beginning, middle and end, connections between events and the achievement of a closure (Wertsch, 1998).

When the beats are created, the resulting script is printed using the printing functionality of the mind-mapping application. Prints of the script are distributed to the participants who carry it in the next phase to guide the Shooting & Editing.

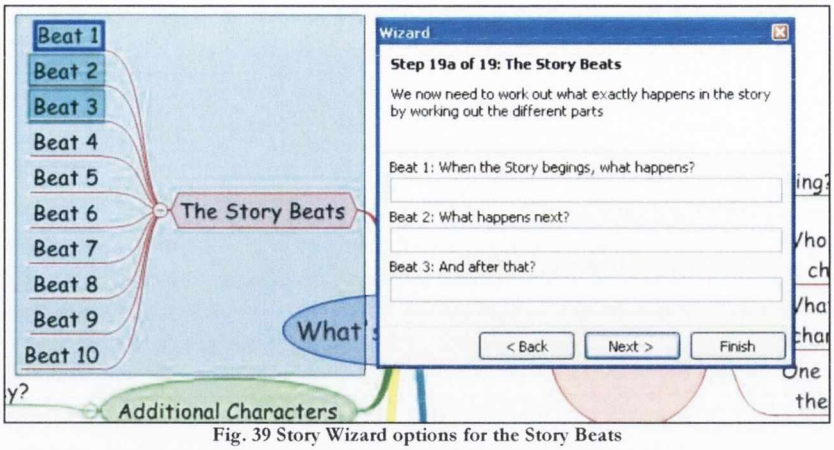

Fig. 39 Story Wizard options for the Story Beats

5.2.2 THE ERGONOMICS OF THE ENVIRONMENT

An appropriate layout and technology set up for a space to conduct workshops with the mobileDNA is illustrated in Fig. 40. The focal point is the public display where the Scripting Tool, and subsequently the movie editor, is projected. The projection enables whole group participation but also focuses the group on their shared workspace. To further emphasise the display as the sole workspace, the Scriber and the PC are slightly displaced to a side and all the participants face the projection. To create a context conducive of interactions among learners, physical barriers between these, for instance desks, are removed. Negating access to individual workspaces such as PCs and desks is also a subtle design decision to support collaboration.

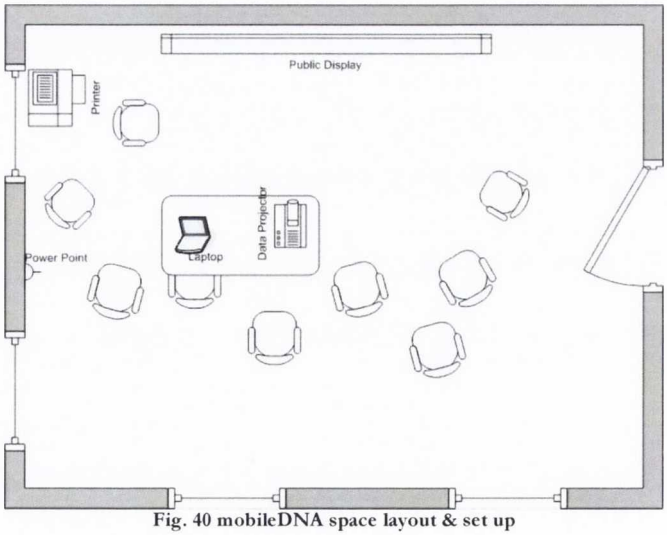

Fig. 40 mobileDNA space layout & set up

Other elements that influence the ergonomics of the space are the size of the room, the lighting, and the availability of power supply. Any space that comfortably fits a group of 8 -12 people is suitable. A 'clean' wall for the projection and means to darken the room to improve visibility are recommended. The availability of at least one power socket is required to power the data projector and PC unless these run on long-life batteries. The mobileDNA is

conceived as a nomadic experience to be conducted wherever there is a cohort of interested participants or in whichever location participants find interesting. The technology used should support mobility. The itinerant mobileDNA 'lab' is composed of a light weight laptop, a portable data projector, a portable set of speakers, and a few mobile telephones. When the experience is conducted in venues equipped with technology a printer may also be available.

5.3 SHOOTING AND EDITING

The Shooting & Editing phase involves all participants synchronously creating and assembling the media required to construct their DN. At a procedural level, it is designed to cater for and parallelise the filming and editing stages of traditional moving media production while engaging all participants in the activities. At a pedagogical level, its aim is to engineer the use and design of the activities, tools, social structure, and ergonomics of the environment to create conditions for collaborative creative interactions to occur. A characteristic of this phase is the limitation imposed on media type participants to create only images or sounds; and the way in which they have to create them, one group independently from the other. As a consequence of the media restrictions, the Shooting & Editing Phase involves the parallel activities of three subgroups: Image, Sound, and Editing. Shooting is subdivided into two distinct activities, image shooting and sound recording and it is guided by the script.

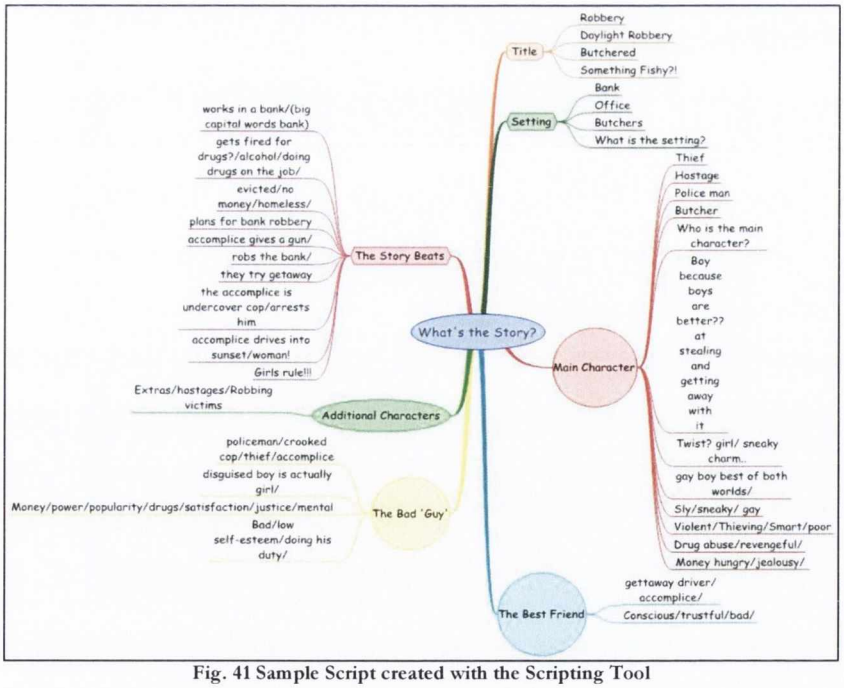

Fig. 41 Sample Script created with the Scripting Tool

The script used while shooting (Fig. 41) is the outcome of the Idea Generation Phase and the tangible output of the Scripting Tool. It encapsulates the story created by the participants and to be told by the DN. Its purpose during this phase is to guide the Image, Sound and Editing groups and to provide a nexus among these while they are working

independently. Although the script shows both the pool of ideas generated during the Divergent Thinking Stage and the Story Beats, only the latter are relevant to guide the Shooting & Editing Phase. The provision of all the ideas in the Script responds to limitations imposed by the mind-mapping application rather than to pedagogical design.

With the script in-hand, the Image and Sound groups go shooting, while the Editing group stays in the EdS. As the Editing group creates a new project, the Image and Sound groups look for suitable locations and artefacts or voices to shoot the images and record the sounds. As these two groups start capturing media, they send it back to the EdS with the phones via MMS. While waiting for the first media to arrive the editors commence working on the title and credits for the productions and look for suitable additional sound tracks. As the media is delivered, the Editors transfer it to the movie editor and, using the Script, they start assembling it. The three groups continue capturing, sending, and assembling media in parallel. Once the Image and Sound groups have completed shooting and recording all the Story Beats, they return to the EdS where the Editing group continues assembling the media. The last stage of the phase is the viewing of the DN that the Editors have managed to assemble so far. This takes place when all the groups are back in the EdS and through the public display to enable whole group participation. An intrinsic part of the viewing process is the participants' engagement in critical appraisal of their work. Table 8 provides a chronological description of the activities in the Shooting & Editing Phase, it shows the social level at which they take place and their stage within the phase.

Table 8 Activities of the Shooting & Editing Phase

Phase	Stage	Social Level	Activity
2	1a	Image G.	Participants briefly discuss their plan of action.
2	1b	Sound G.	Participants briefly discuss their plan of action.
2	1c	Editing G.	Participants create the DN project with the movie editing application
2	2a	Image G.	The group looks for suitable locations to shoot the DN.
2	2b	Sound G.	The group looks for suitable artefacts to create sound effects & voices for the narration.
2	2c	Editing G.	The group starts working on the title and credits
2	3a	Image G.	Using the script the group starts shooting the DN
2	3b	Sound G.	Using the script the group starts recording the DN
2	4a	Image G.	The images shot are sent via MMS to the EdS.
2	4b	Sound G.	The sound files recorded are sent via MMS to the EdS.
2	4c	Editing G.	As the media arrives the Editors assembles it following the Script.
Stages 1-4 are repeated until the Image and Sound groups have created the media for all the Story Beats of the Script or until their allocated time is up.			
2	5a	Image G.	The Image group returns to the EdS
2	5b	Sound G.	The Sound group returns to the EdS
Stage 4c continues beyond the conclusion of 4a & 4c and throughout 5a & 5b			
2	6	Whole G.	The group views the DN & engages in critical review of their work.

The Social Structure makes the rules of a phase explicit and can be understood as a contract which stipulates terms and conditions. The elements at play in this structure are social levels, roles, tasks, tools, resources, and products. Roles define the contributions required to accomplish the activities of the phase and are articulated around the tasks associated to them. In the Shooting & Editing phase the roles are: cameraman, image cast, soundman, sound cast, editor, and facilitator. The cumulative achievement of tasks under the various roles leads to the collective completion of the activities. The execution of tasks occurs within specific social levels (individual, subgroup, group) and are conditioned by the tools and resources made available to each role. **Error! Not a valid bookmark self-reference.** illustrates the social structure of the Shooting & Editing phase in which the *stage* refers to the stages described in Table 8.

Table 9 Social Structure of the Shooting & Editing Phase

Roles	Tasks	Tools/ Resources	Product	Social Level	Stage
Cameraperson	Shoot images; Input regarding shooting location & interpretation; Transmit media to EdS	Phone & Camera; MMS; Cast; Images; Surroundings;	Images	Image G.	1a 2a 3a 4a 5a
Image Cast	Interpret characters; Input regarding shooting location & interpretation;	Camera; Cast; Images; Surroundings;	Images	Image G.	1a 2a 3a 5a
Soundperson	Record audio files; Input regarding sound creation & interpretation Contribution to sound creation; Transmit media to EdS	Phone & Recorder; Sound files; MMS; Cast; Surroundings	Sounds	Sound G.	1b 2b 3b 4b 5b
Sound Cast	Interpret characters; Create sound effects Input regarding sound creation & interpretation	Recorder; Cast; Sound files; Surroundings	Sounds	Sound G.	1b 2b 3b 5b
Editor	Create DN project; Receive & assemble media;	Laptop; Public display MMS Gateway; File explorer; Active Synch; Movie Editor; Speakers; Images & Sounds	Movie editor project Emerging DN	Editing G.	1c 2c 4c 6
Facilitator	Scaffold & encourage participation; Provide support;			Image, Sound & Editing groups	1a - c 2c 4c 6

5.3.1 THE MOBILE PHONES

Mobile phones are the capturing devices utilised in the mobileDNA to replace video cameras. The features used during the Shooting & Editing phase are standard in camera phones and include: the camera, audio recorder, album, and MMS. An XDAII (Fig. 42) was used for this study and through it relevant features and procedures for this section, and for the discussions, will be illustrated.

The camera and recorder are accessed through two means: the phone's native interface (Fig. 43) and buttons on the side of the device (Fig. 42). External buttons are important because they provide access without having to navigate unfamiliar menus and are easier to manipulate for participants with limited motor skills; a problem reported with video cameras (Reid et al., 2002). The MMS is accessible through shortcuts on the phone's main menu (Fig. 43) and automatically provided, as an option, through the camera immediately after media has been shot (Fig. 47).

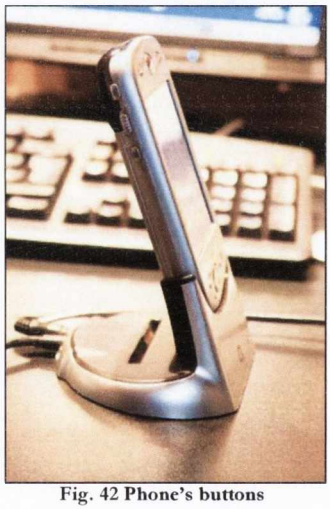

Fig. 42 Phone's buttons

Fig. 43 MMS access

To send an MMS, through the first two means, the media must first be selected through the *New* menu (Fig. 44 & Fig. 45) and then sent (Fig. 46). To send an MMS directly after an image is taken the option automatically appears on the screen (Fig. 47). To opt out of sending after taking a picture the icon-menu at the bottom of the screen (Fig. 47), with revert to the camera, send, delete and view album options, is used. The *Tools* menu (Fig. 46) also provides preview and send functionalities. Additionally, before sending an MMS media can be textually annotated (Fig. 45 & Fig. 46).

Fig. 44 Create new MMS

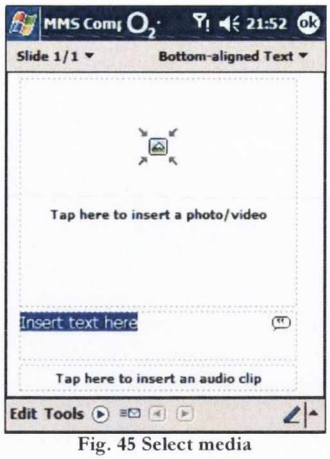

Fig. 45 Select media

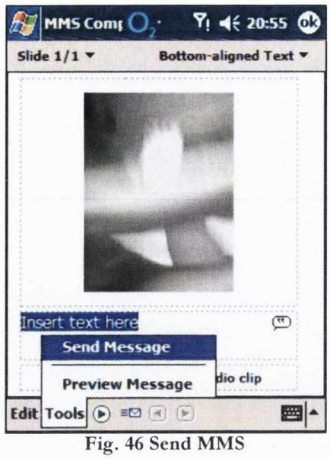

Fig. 46 Send MMS

Upon sending users provide the recipient's number that can be input (Fig. 48) or selected from a contact list which eases and speeds the process. The status of the messages can be monitored through the MMS composer interface and its *Outbox*, *Sent, Drafts*, and *Inbox* (Fig. 49) folders which keep a history of the phone's MMS traffic. Items in these folders can also be opened and view which further supports participants to review and keep track of their actions.

Fig. 47 Sending after shooting

Fig. 48 Inserting number

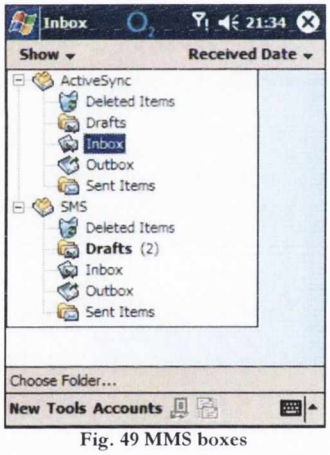

Fig. 49 MMS boxes

The camera is accessed from the phones' external button (Fig. 42). When active three icons appear on the screen (Fig. 50): the first (from the left) accesses the *Camera Settings* (Fig. 51), and the second opens the *Album* (Fig. 52). The foregoing were not used and will not be discussed. The third icon evidences if the camera is in still image (Fig. 50) or video mode (Fig. 53). The position of the icons on the screen indicates whether the camera is in horizontal (Fig. 50) or vertical (Fig. 53) orientation. Participants are required to pay attention to the orientation feature to provide consistency throughout all the media captured.

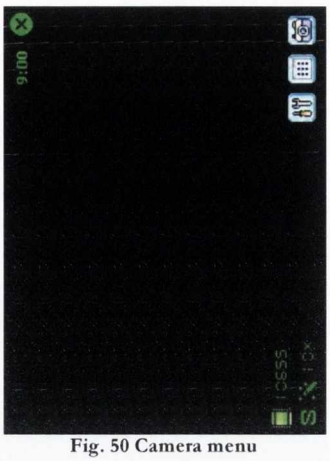

Fig. 50 Camera menu

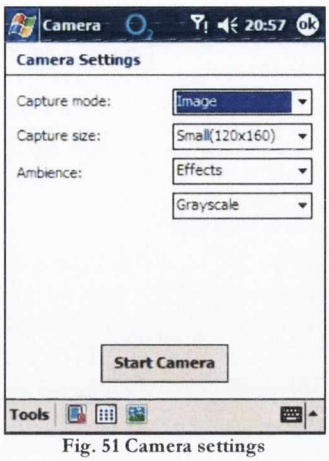

Fig. 51 Camera settings

Fig. 52 Album viewer/menu

The recorder is accessed via an external button (Fig. 42) which also controls the volume. Alternatively, this can be adjusted through the phone's interface (Fig. 55). Although sound quality is not a prime concern, making participants aware of these features is important to ensure files are audible. The recorder screen displays the recorded files, including information such as file name, date of creation and duration in seconds, the *Recorder Toolbar* and the *New* and *Tools* menus (Fig. 56). These were not used and will not be discussed.

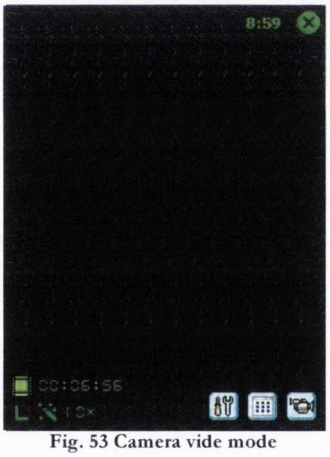

Fig. 53 Camera vide mode

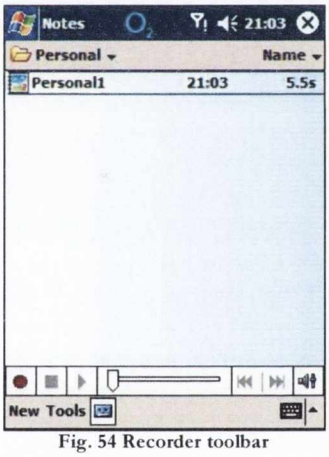

Fig. 54 Recorder toolbar

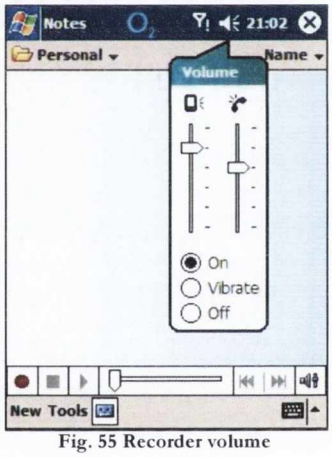

Fig. 55 Recorder volume

The recorder is operated through the record, stop, play, forward, and backward buttons on the *Recorder Toolbar* (Fig. 54). When a file is recorded this is automatically named with a default file name followed by an ascending number, stored in the default folder and display on the recorder's screen (Fig. 54). By taping and holding on a file options such *delete*, *rename*, and *transmit via email* or *infrared beaming* become available (Fig. 57). However sending via MMS is not directly available through the recorder so create and send an audio file two tools are required: the recorder; and the MMS composer. This contrasts with the seamless transfer mechanism afforded by the camera's interface. Once the MMS tool has been access the same sending procedure described for images applies (Fig. 45). Although recording facilities which provide a single tool for recording and sending are provided by the MMS composer (Fig. 58),

these are not suitable due to file incompatibility between the MMS composer's recorder and the movie editor.

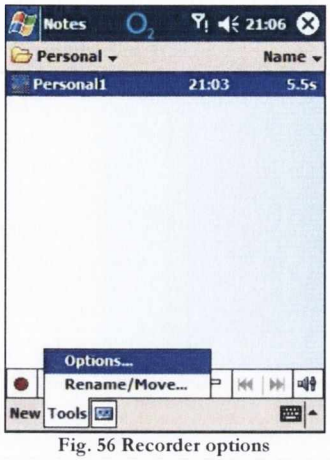

Fig. 56 Recorder options

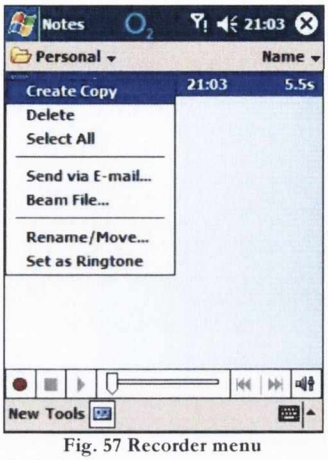

Fig. 57 Recorder menu

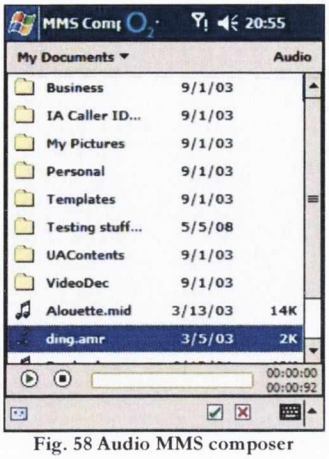

Fig. 58 Audio MMS composer

Prior to each mobileDNA workshop additional setup procedures on the phones are required to facilitate the participants' engagement in the activity with the least possible distraction arising from the technology. These include: the creation of dedicated folders to default storage media created, verifying all the setting and connectivity, and ensuring the phones have credit.

5.3.2 THE MOVIE EDITOR

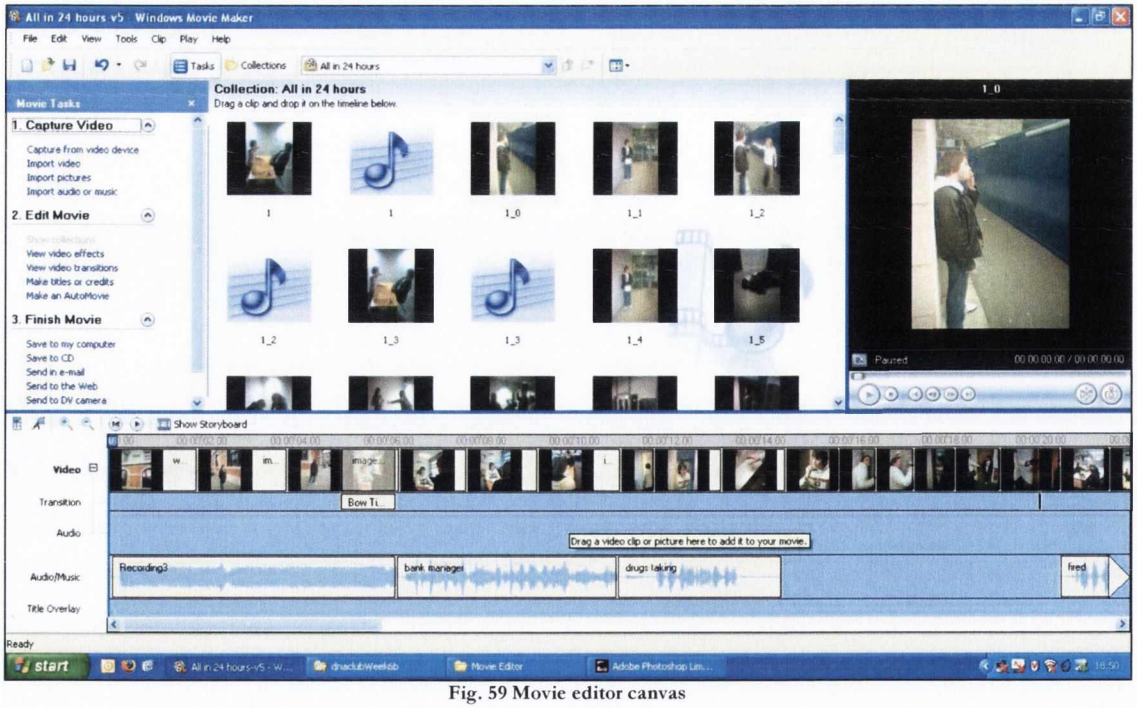

Fig. 59 Movie editor canvas

To receive the messages in the EdS an MMS gateway is installed in the editor's PC. When the media arrives to the gateway it is manually transferred to a folder on the PC and imported into the movie editor. The editor enables the Editing group to assemble the media

created by the Image and Sound groups. The specific editor used for the mobileDNA was Windows Movie Maker 2[26] chosen because it is free and runs in common windows OS. More sophisticated editing tools were not necessary given the lack of emphasis on media language in the study. The editor provides numerous tools and functionalities however, this section will only describe those that were utilised during the research and that are relevant for the process.

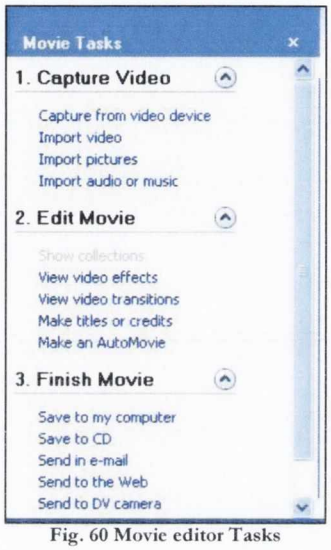

Fig. 60 Movie editor Tasks

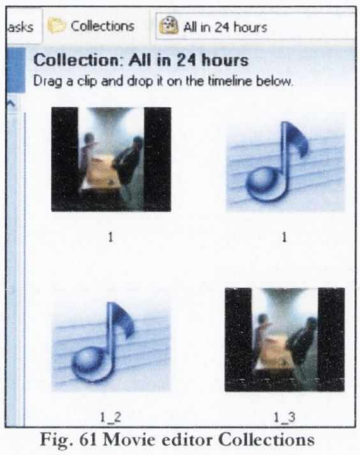

Fig. 61 Movie editor Collections

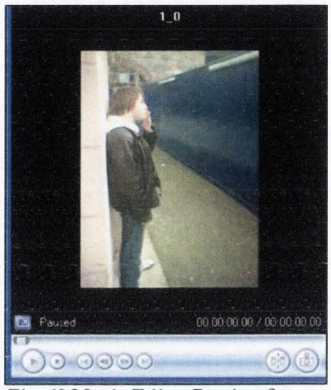

Fig. 62 Movie Editor Preview Screen

When a new project is opened users are presented with a canvas divided into four areas (Fig. 59): the *Movie Tasks* (Fig. 60), *Collections* (Fig. 61), and *Preview Screen* (Fig. 62) window occupy the top half while the *Timeline* (Fig. 63) is displayed in the bottom half. The *Movie Tasks* provides the *Capture Video*, *Edit Movie*, and *Finish Movie* menu. *Capture Video* allows users to import images and audio into the project and automatically displays these in the *Collections*. Media can also be imported by dragging and dropping it from a folder to the *Collections*. The *Edit Movie* menu enables users to preview and add visual effects via *View Video Effects*, to preview and add visual transitions with *View Video Transitions*, and to make and add titles and credits to a production using *Make Tittles or Credits*. The latter can be placed at the beginning or the end of the movie or on, prior or after selected media. Additionally this feature offers limited text editing and animation options. Prior to inserting an effect, transition, or title into the production, these can be previewed in the *Preview Screen*. The *Finish Movie* menu allows users to render their project into a movie and save it or send it to various locations.

The *Timeline* is divided into five horizontal tracks: *Video*, *Transition*, *Audio*, *Audio/Music*, and *Title Overlay*, for different media type. Still images and video are kept in the *Video* track

[26] http://www.microsoft.com/windowsxp/downloads/updates/moviemaker2.mspx

however, audio from video and audio files have two distinct tracks: *Audio* and *Audio/Music* respectively. To insert media into the *Timeline* this is dragged and dropped from the *Collections*. *Video Effects* and *Transitions* are inserted into the same way. Alternatively, *Video Effects* and *Transitions* can be inserted from the *Show Storyboard* view (Fig. 64). To move media horizontally along the *Timeline*, this is selected and dragged along the track.

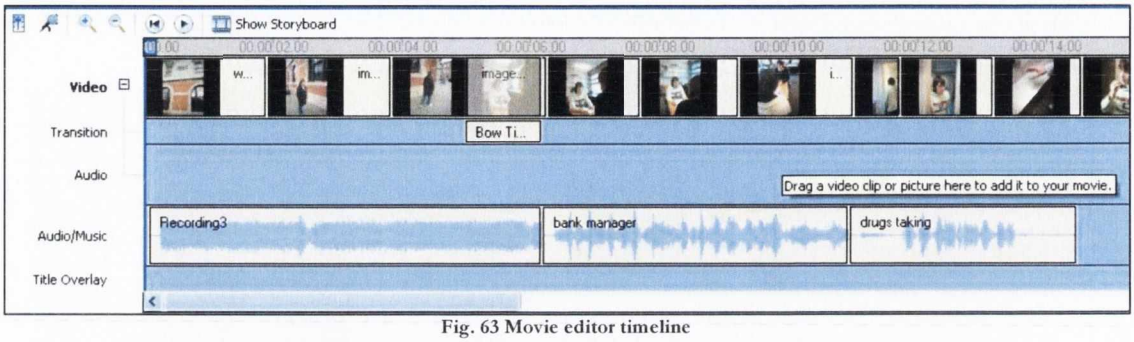

Fig. 63 Movie editor timeline

Fig. 64 Movie editor Storyboard view

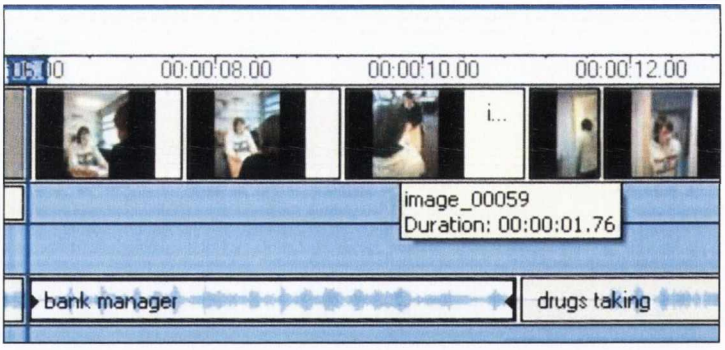

Fig. 65 Movie editor time ruler & duration

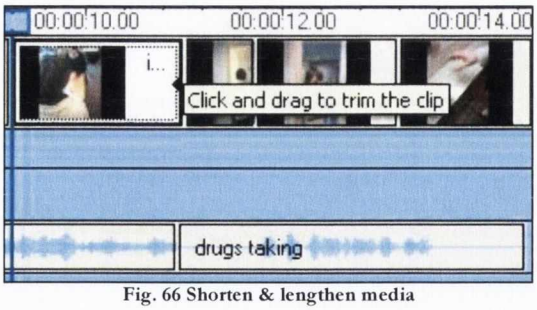

Fig. 66 Shorten & lengthen media

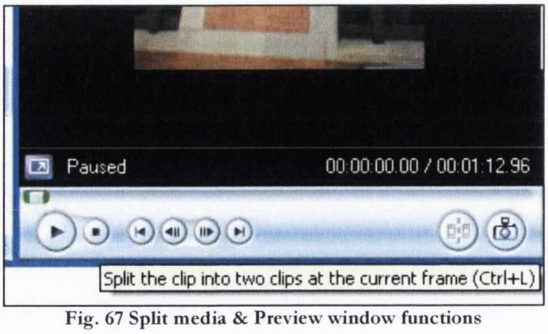

Fig. 67 Split media & Preview window functions

Additional features of the *Timeline* include a ruler (Fig. 65) at the top that displays time, and zoom in and out functionalities (Fig. 63). The duration is disclosed by placing the curse over it (Fig. 65). The time media stays on the screen can be modified by selecting the

media and dragging the red arrow forwards (to shorten) or backwards (to lengthen) (Fig. 66); audio files can only be shorten. All media can be chunked with the *Split* functionality in the *Preview Screen* menu (Fig. 67). Audio clips can be mute or their volume adjusted by right clicking on the audio clip (Fig. 69), or by using the *Select Audio Levels* control (Fig. 68). The production can be played and previewed in the *Preview Screen* either in its default window size or in full-screen mode. All media held within the editor's canvas can be preview in the *Preview Screen* once selected. Finally, the *Preview Screen* provides a control panel with standard play, stop, pause, and so forth buttons (Fig. 67).

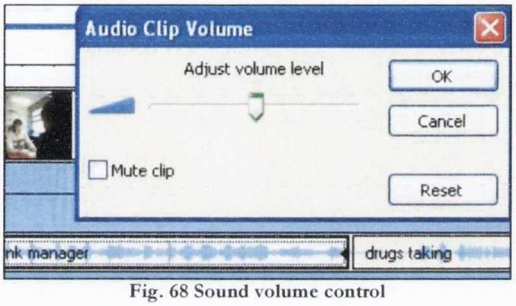

Fig. 68 Sound volume control

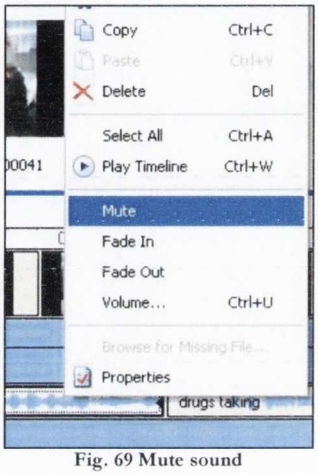

Fig. 69 Mute sound

5.4 PRODUCTION AND SCREENING

The Final Production & Screening Phase of the mobileDNA involves the group collectively editing the final DN; constructing a tangible representation of the story created during the Story Generation Phase. At a pedagogical level, it aims to support the emergence of collaborative creative interaction. At a practical level, the activities (Table 10) of the phase are to perform detailed editing and engage in an ongoing critical review of the DN in the making.

Table 10 Activities of the Final Production & Editing Phase

Phase	Stage	Social Level	Activity
3	1	Whole G.	The group watches and critiques the initial DN created by the Editing group during the previous phase and identifies actions needed to complete the DN.
3	2a	Whole G.	The group engages in collective editing and critiquing of the DN.
Stages 2a to 2c are repeated until the group is satisfied with the production and the DN is ready for screening or until the time available is up.			
3	3	Whole G.	The group screens the final DN.

The phase begins with the group watching the initial DN that the Editing group assembled during the previous phase. This is the first time the Image and Sound groups watch the media they created in action and in interacting with the media created by the other group. It is also the first time the Editors expose their DN in the making to the other groups. On the

one hand, this first group viewing provides the context for verifying the collective common ground in relation to the story and for identifying potential deviations that may have taken place during the Shooting & Editing phase. On the other hand, it enables the group to monitor the development of the DN and to establish the media and actions required to complete it. Generally, the initial DN is an incomplete production that may present all or a variety of the following scenarios: story beats complete of images but missing the sound clips or vice versa; story beats with an incomplete assemble of mixed images and audio; story beats containing all the available images and audio but requiring further work in order to synchronise images and sounds. Regardless of the stage of development of the DN, the relevance of the collective initial viewing is that it supports learners' critical appraisal of their DN. It allows them to identify the areas in need of further work, to establish the nature of the issues at hand, and to devise plans of action to address these. The foregoing involves processes associated with creative thinking and sets conditions for collaboration. Thus, the initial DN brings together three perspectives of the story, that of the Image, Sound and Editing Groups. For the first time, it confronts narrators with their emergent narrations, not as a set of abstract ideas or disjointed media assets, but as a coherent whole in the making. In so doing, the initial DN allows learners to verify their common ground, to assert the extent to which this may have deviated, and to re-establish a common understanding by means of augmenting and repairing their common ground in light of the emergent DN.

Table 11 Social Structure of the Final Production & Screening Phase

Roles	Tasks	Tools/ Resources	Product	Social Level	Stage
Editor	Edit the DN; Receive, manage & assemble media; Incorporate editorial input contributed by the co-editors	Laptop; Public display Speakers; MMS Gateway; File explorer; Active Synch; Movie Editor; Script; Images & Sound Emergent DN	DN	Whole G.	1-3
Co-Editors	Review the DN Provide editorial input	Public display Speakers; Script; Images & Sound Emergent DN	DN	Whole G.	1-3
Facilitator	Scaffold & encourage participation; Provide support; Fade;	Public display Speakers; Script; Images & Sound Emergent DN	DN	Whole G.	1-3

The tools used during the Final Production & Screening phase, the movie editor and the public display, are aimed at supporting collective editing and creative interactions. They support the collective narrative creation at a conceptual and tangible level by making

individual and group processes and actions transparent, by providing immediate feedback, and by supporting immediacy of actions. The Social Structure of the phase develops around its activities and identifies three roles: editor, co-editor, and facilitator. While the editor/s has access to the movie editor and the media among other tools, the co-editors have access to the public display of the DN in the making and the media displayed on the *Collection*. To this end, the editor can manipulate the media and DN in the making but the co-editors provide editorial input.

5.5 SUMMARY

This chapter presented and described the mobileDNA, a pedagogical methodology to support and scaffold collaborative creativity in moving media production with mobile technology. The method presented was articulated informed in the literature and findings from the multiple exploratory case studies conducted to device it. The chapter presented and described the three phases of the process: ***Story Generation***, ***Shooting & Editing***, and ***Production & Screening.*** The activities, tasks, roles, resources, and stages of each phase of the mobileDNA were articulated using the CSCL macro-script model. Additionally, the tools used for the creation of DN and their relevant features were described in the chapter. The next chapter is concerned with the evaluation of the mobileDNA methodology presented in this one.

CHAPTER 6: EVALUATION OF THE MOBILEDNA

6.1 INTRODUCTION

Chapter 5 described the mobileDNA which was designed and developed through an iterative process involving the 12 exploratory case studies discussed in chapter 4. This chapter provides a thick description of 2 out of the 9 case studies conducted to evaluate the mobileDNA. The cases attempt to immerse readers in the authentic context, and complexity of a DN creation process. In so doing, vignettes and images extracted from the video transcripts and footage, together with the scripts, images, sounds, and movie media projects, created by the participants, reconstruct the chronological narrative of events. Additionally, the chapter presents data from the Diary Room commentaries made by the participants, as well as the semi-structured interviews conducted with them. The description of the cases, the Diary Room commentaries, and interview data are intertwined with discussion and analysis, which will be further elaborated upon in chapter 7.

6.2 CONTEXT AND PARTICIPANTS

The context for the cases was the outreach computer programme described in 4.3.1. In particular, a 7 week cycle of the programme running from January to March 2006. The cases are named after the title of their DNs, and are: 1. *All in 24 Hours!*, conducted in weeks 4 and 5; and 2. *Streets of Rage,* conducted in week 6 and 7. The participants' profile, their selection criteria, the location, ethical issues clearance, code of conduct, award ceremony and other relevant matters, were as outlined in 3.3.2 & 4.3.1 for the Green cases. The sessions were conducted on Saturday mornings from 9am to 1pm, although during most weeks the participants stayed back until 1.30 pm. For the 2 cases, the population was stable and remained the same throughout the 7 weeks. Its membership was: 9 participants, 2 mentors, and the participant researcher. The participants, here identified by their initials, were 5 females (AL, KK, ND, RD, and JJ), and 4 males (AM, DD, JB, and JO). They were all aged 16, did not know each other and attended different schools. They all owned a camera phone, and had used them to take pictures and videos, but had never considered using them as an alternative to a video camera to create movies. Their media language was that of a standard 16 year old media consumer. The 2 female mentors (CC and FF), were university graduates who had volunteered to assist in the outreach programme. They had been briefed on the mobileDNA concept, and their role was to provide logistical assistance and chaperon the participants when they were shooting in different locations. One of the mentors had amateur experience in moving media production, and some of the participants had had exposure to media projects

in school. Neither the participants nor the mentors had used a XDAII before, but they were familiar with Windows Office applications. The profile of the participant researcher was provided in 4.3.1.

The venue for the cases was an open plan research lab (Fig. 70) which met the requirements identified during the iterative design process. It was a spacious room with a meeting area in the middle, and space for participants to move around. The room had natural light, and it could be darkened to view the DN in the making. It was in a building within the college's campus, and provided easy access to the outdoors (Fig. 71). The building itself was a rich environment, with interesting features and places in which to set stories. The campus is located in heart of Dublin city centre, and it also provided a rich context for setting stories. All the necessary equipment to run a mobileDNA workshop was already in the room. Additionally, there was a mounted interactive whiteboard (IWB) that was used in the 2 cases. Within the room there was a small office which became the Diary Room.

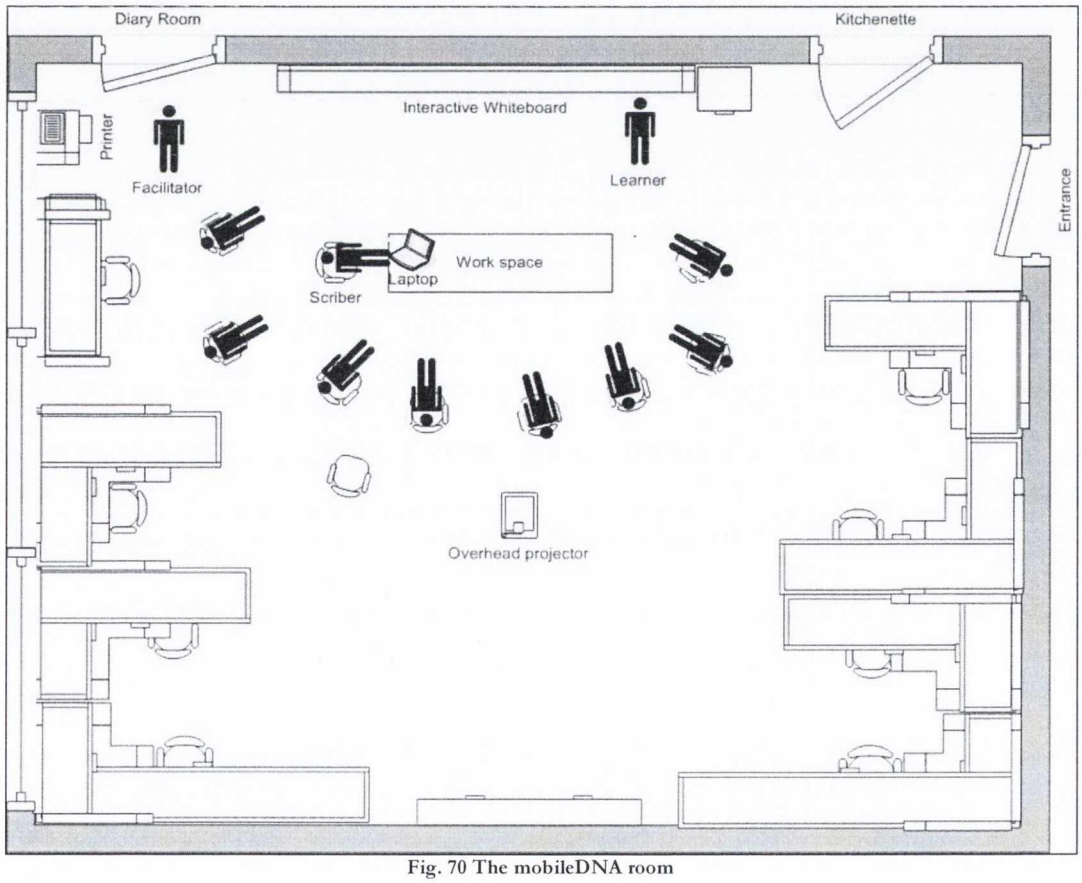

Fig. 70 The mobileDNA room

When the first case under discussion was conducted, the participants had already been in the programme for 3 weeks. They had been introduced to the mobileDNA, and the tool set to use; they had experienced the entire process, having created a DN called *The Scientist*. By week 4, this DN had not been completed, and the participants had lost interest in it, so they

were asked to start a new one. In week 4 the participants started and concluded a DN called *All in 24 Hours!* In week 5, however, they reworked *All in 24 Hours!,* and created another version of it. In week 6 the participants created *Streets of Rage.*; in week 7, they revisited and improved it. These two cases have been selected because they are highly representative of all the other cases conducted, and they exemplify well the phenomenon under investigation, in its full complexity. While *All in 24 Hours!* provides insight into how the mobileDNA supports collaborative creativity, *Streets of Rage* points to the participants' development after repeated exposure to the methodology.

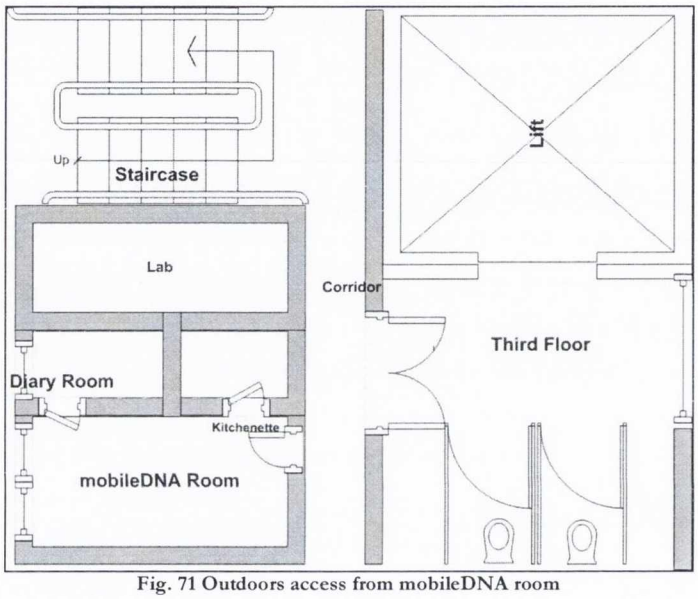

Fig. 71 Outdoors access from mobileDNA room

6.3 DATA SOURCES AND ANALYSIS

The data sources for the two cases presented in this chapter include: video recordings of all the sessions comprising the cases, all the scripts, images, and sounds created by the participants, the movie projects at different development stages, the final DNs, the Diary Room recordings, and the semi-structured interviews with 6 participants. In *All in 24 Hours!* the participants created 2 versions of the script, 70 images and 35 sound files. Additionally, 5 versions of the movie project at different development stages, the final DN, and over 5 hours of video footage were collected. In *Streets of Rage* the participants created 1 version of the script, 44 images and 24 sound files. Furthermore, 4 versions of the movie project at different development stages, the final DN, and approximately 4 hours of video footage were collected. In relation to the Diary Room, after removing the footage which did not contain commentary, 51 minutes of face-to-camera dialogue were available. The footage accounts for 26 interventions, 25 of individual participants, and 1 with a pair of participants. The commentaries were recorded throughout 5 weeks of the programme, from week 2 to 6

inclusive. The average duration of each Diary Room session was almost 2 minutes with the shortest being 30 second, and the longest lasting nearly 7 minute. In relation to the interviews, 6 participants AL, AM, DD, JB, KK, and RR, randomly chosen, were interviewed by the researcher during the last session of the cycle. The interviews were conducted in the Diary room, and wereaudio recorded. On average each interview lasted 20 minutes, with the longest being 28 minutes, and the shortest being 17 minutes. The other 3 participants were not interviewed on account of time constraints on the day, and difficulties in gaining access to the participants after the cycle was completed.

Table 12 Explanatory case studies participants & data sets

				Outreach Programme Cases							Single Session Cases				
Case Study Name	Num. Participants	Age Participants	Gender[27]	Num. Sessions	Duration of Session (hours)	Mentors	Script	Images Q.	Sounds Q	Movie Editor Project	Music Sound Track	Finished DN	Video Footage of sessions	Diary Room Num. weeks	Interviews
The Scientist	9	15-16	5f; 4m	2	4	2	1	53	54	4	x	-	✓	✓	✓
All in 24 Hours!	9	15-16	5f; 4m	2	4	2	2	70	25	5	x	2	✓	✓	✓
Streets of Rage	9	15-16	5f; 4m	2	4[28]	2	1	44	24	4	✓	1	✓	✓	✓
Safety Rules	8	15-16	8m	1	4	2	1	108	23	1	✓	1	✓	x	X
Sterile Johnny	8	15-16	8m	1	4	2	1	48	29	5	✓	1	✓	x	X
The Chase	9	15-16	9m	1	4	2	1	54	27	4	✓	1	✓	x	x
Christmas Crisis	6	15-16	2f; 4m	1	4	2	1	119	43	5	x	1	✓	x	x
Hans	11	15-16	4f; 7m	1	4	2	1	52	23	1	✓	1	✓	x	x
John the Homeless	9	15-16	5f; 4m	1	4	2	1	61	19	2	x	1	✓	x	x
TOTAL	60	-	16f; 44m	-	48	-	10	609	267	31	-	9	-	5	6

The remaining 7 explanatory case studies (except *The Scientist*) were conducted with 6 different groups of youths of the same age and profiles similar to those of the participants in the outreach programme. These groups met only for a single session, which was always facilitated by the participant researcher. The cases were conducted in the researcher's institution, and under the same conditions as the outreach programme cases. Table 12

[27] Legend: f: Female; m: Male

[28] In the second session the group only worked on the DN for approximately 2 hours.

provides a summary of the explanatory case studies, the names of the cases, the number of participants, their age and gender, the number of sessions attended, and the data sets available for each case. Although it was not possible to interview the participants of the single sessions, the workshops were video recorded, and the footage transcribed (appendix F). Furthermore, all the artefacts created by the participants were collected, collated, and analysed. The data available for the remaining 7 exploratory cases includes: approximately 18 hours of video recordings for all the sessions of the cases; 495 images averaging, 70 images per case; 218 sound files, with an average of 31 sounds per case; 7 scripts; and 6 final DNs (one of the DNs, *The Scientist,* was not completed).

Although the mobileDNA comprises three phases: Idea Generation, Shooting & Editing, and Final Production & Screening, video data was only collected for those activities that took place in the EdS: the first and last phases, and editing. Recording the shooting activity required two video cameras, in addition to the two already in use (in the Diary Room, and the EdS), people adept at operating them, and external microphones to ensure the audio content was accurately captured. The foregoing human and logistical resources were not available within the limitations of this research. The sessions were recorded with the camera pointed towards the projection, since the emphasis was on capturing the conversations, and interactions taking place in relation to the common task. In the Diary Room the camera pointed to the participants who turned it on, and off as they went in, and out of the room. Ethical issues regarding the Diary Room were addressed by the consent form outlined in 3.1.1. Additionally, the privacy of the commentaries made in the room was guaranteed, and preserved by the researcher who was the only person with access to the recordings. Upon completion of the cycle, the researcher created a DVD for each participant containing only their personal commentaries. The DVD was played to each interviewee prior to the semi-structured interview. The objective was to refresh their minds, and persuade them to elaborate on comments made with a perspective gained over time, and with experience. This proved a very powerful strategy in securing the participants' commentary on, and examination of, their development.

The data analysis rationale, and procedure was outlined in 3.3.2. The development of case descriptions, and explanation building (Yin, 2003) were the predominant strategies employed. However, these were informed by theoretical propositions from the literature discussed in chapter 2, and from models used to evaluate CSCL and creativity. In particular, the scheme proposed by Meier et al. (2007), which examines the process dimension of CSCL (Table 13), and the NACCCE framework for creativity (1999) (Table 14), extensively applied

to study creativity (Craft et al., 2006; Craft et al., 2007), and the interplay between creativity and technology (Loveless, 2002; Loveless et al., 2006), were used.

Table 13 CSCL process evaluation scheme (Meier et al., 2007)

Communication
1) Sustaining mutual understanding
2) Dialogue management
Joint information processing
3) Information pooling
4) Reaching consensus
Coordination
5) Task division
6) Time management
7) Technical coordination
Interpersonal relationship
8) Reciprocal interaction
Motivation
9) Individual task orientation

Table 14 NACCCE Framework for Creativity (NACCCE, 1999)

Using imagination
A fashioning process
Pursuing purpose
Being original
Judging value

6.4 ALL IN 24 HOURS!

All in 24 Hours! is a story set in a bank. The main character, a security guard in the bank, is caught by his boss taking illegal drugs while working. He gets fired, has no money to pay the rent, and gets evicted from his home. In order to make money, and take revenge on his boss for firing him, he resolves to rob the bank. His accomplice, an undercover policeman, gives him a gun, and helps him make his getaway. At the end, his accomplice arrests him, and drives away with the money.

The following sections provide a thick description of the 'making of' *All in 24 Hours!*

6.4.1 THE STORY GENERATION PHASE

Prior to starting on the Idea Generation phase for the new DN, the group watched *The Scientist*. AL was at the laptop, and JB at the IWB. The rest of the group; KK, ND, AM, DD, and JO, the mentors, and the facilitator were looking at the IWB, and partaking in the process. AL and JB tangibly shared the applications, and the workspace through the IWB, but had not yet found a suitable collaborative agreement in relation to their technical coordination. Their behaviour towards each other was competitive, fighting over the tools, rather than collaborative. For instance, AL took advantage of JB's distraction to take control of the tools (Excerpt 6). Before addressing JB, AL had already positioned the cursor over the X icon, to close the authoring application. At the same time that she addressed JB, with the apparent intent to ask him whether he would like to close the application, she proceeded to close it without even giving him the opportunity to reply. AL's behaviour is reciprocated by JB, who, looking at the Task Bar at the bottom of the IWB, realises that a project is still open,

and quickly proceeds to close it. He shouted yes, to indicate victory over AL. This type of competitive behaviour, and absence of technical coordination between AL and JB reoccurred several times throughout the case.

AL:	Sure, you don't want to?
JB:	What?
AL:	Sure you don't want to. No? Ah, I'll be happy to
JB:	YES!

Excerpt 6 AL taking advantage of JB's distraction to control the shared tools

After the initial lack of technical coordination between AL and JB the facilitator provided instructions to create a new Script Template with the Scripting Tool. AL and JB were both in a position to implement the instruction; however, JB took the initiative. AL, not pleased with this, reengaged in competitive behaviour with JB, stopping him from interacting with the application by performing actions simultaneous to his. She identified a limitation of the IWB, and pointed her advantage to JB (Excerpt 7). She seemed to use this asymmetry of actions to create asymmetry of status to her advantage. The rest of the group was partaking of the episode, and this is illustrated by the suggestion made by FF, and by AM's laughter, when AL wondered what had happened.

AL:	What was that?
AL:	Ja, ja, ja you can't type
JB:	I know how
JB:	Stop!!
FF:	JB, try writing, just try writing on the screen
JB:	No wait, I know how but, she
AL:	The girl always wins get over it

Excerpt 7 Asymmetry of action & competitiveness between AL & JB

With a new template finally opened, the facilitator led the participants to engage in the idea generation process, and encouraged them to take the facilitator role; to guide the group using the Script wizard, and to elicit contributions. She attempted to recruit DD for the job, but he declined with an excuse that suggested unwillingness to take risks, and expose himself (Excerpt 8).

F:	Let's come up with the story. DD is going to be in charge of this. Come on DD. DD!
DD:	It's a Saturday morning, I'm not good

Excerpt 8 DD unwillingness to take risks

The facilitator then tried ND who was willing, and not afraid to take on the role (Excerpt 9). ND demonstrated readiness, and willingness to take risks, and perform new tasks. She stepped into the role without apparent difficulty, and was able to use the Wizard to steer her peers from giving themes for the story, to proving a title. Excerpt 9 also illustrates the level of group participation, with four people providing contributions, and the fact that interactions were not limited to the participants tangibly interacting with the tools.

ND:	Right. What's the title of the story? What are we trying to do a story on?
JB:	I'm a vampire
JO:	A Robbery
ND:	A robbery. Right, give us a title
JB:	Day robbery
KK:	The robbery
AL:	Daylight robbery

Excerpt 9 ND using the wizard to guide the group

The group scaffolded by the Template and Wizard, and led by ND proceeded with the divergent idea generation. KK and FF realised that no-one was noting the contributions on the Script, and they asked ND to step in and do so. KK and FF allocated the Scriber role to ND who, although unsure about what to write, accepted, and consulted her peers on what to note. The idea generation continued, and AL contributed a complete story. The group liked the story, and agreed on producing it. The facilitator, counteracting what seemed a less collaborative effort, steered the group back to divergent thinking and collective idea generation (Excerpt 10).

JO:	We should just do that
KK:	Yea!
ND:	Yea!
F:	Just like that? You don't want to change anything of it?
JB:	No

AM:	Follow it word for word
FF:	What about the robbery idea?
JB:	We can do it next week
F:	OK, what's the setting? It's a robbery. The title could be daylight robbery
JB:	Bank; Office, bank

Excerpt 10 Facilitator counteracting less collaborative effort

As the group proceeded with the idea generation, ND relinquished the facilitator role, the flow of ideas contributed intensified, and AL and JB reached a coordination agreement over the use of the shared tools and labour division (Excerpt 11). This could have been as a consequence of a greater flow of ideas, and AL's difficulty in keeping up with the Scriber role, and the operation of the wizard at the same time. Regardless, she understood the advantage of utilising the resources available to share the workload, and became more efficient. AL also adopted the language of the Wizard, using *Next,* to move the conversation along, and let the group know she was ready and waiting for contributions (Excerpt 11).

AL:	Can you click? You click so I can just type
AL:	Next!

Excerpt 11 AL & JB reaching agreement over shared tools and labour division

The activity continued, and various propositions by different participants were offered for the main character. ND stepped back into the facilitator role when AM made a contribution of which she did not approve (Excerpt 12). Like AL, ND adopted the language of the Wizard to move the conversation along. However, her use of the Wizard's language was different, in that the intent was to boycott, or truncate a line of thought proposed by AM. ND's strategy mirrored that of the facilitator (Excerpt 10) when she led the group back to divergent thinking. Nonetheless, the underlying objective was very different, since the facilitator aimed to promote collaboration and creativity, and ND's action sought to discourage exploration of ideas, and block peers from exercising reciprocal symmetry of interactions.

AM:	Wanted a zombie in
ND:	No don't start with zombie & ninjas today I can't go through that again. No, no, next one
DD:	He wants a zombie in
ND:	Right. What's the main character like?

Excerpt 12 ND using the wizard to boycott AM's proposition

The participants continued to navigate their way through the wizard, addressing the questions, and revisiting the main character wondering about its gender (Excerpt 13).

JO:	A boy
F:	A boy?
JO:	A girl wouldn't steal. So, we should make it a boy
KK:	But a girl stole
AL:	What do you mean a girl wouldn't steal?
JO:	It's mainly for a guy to steal
AL:	Have you seen Mr. & Mrs Smith?
DD:	In most films they do. It is always the guy who is the robber
JB:	Just bring in the girl

Excerpt 13 Convergent thinking during the divergent thinking stage

Excerpt 13 illustrates the participants' tendency to engage in convergent thinking. JO's second contribution provided a rationale which denoted thought process prior to the contribution being made. However, this may have been triggered by the facilitator questioning his first contribution. Other instances regarding collaborative creativity are worth noting in the excerpt. JO's contribution generated controversy, and triggered the group's engagement in joint information processing by externalising opinions, and questioning the coherence of JO's contribution. AL drew from her previous knowledge, and put forward evidence to rebut JO's proposition. DD also attempted to draw from his previous experience to support JO's idea however, he failed to provide concrete evidence. The reconciliatory middle ground was provided by another participant, JB. As the conversation continued the group revisited again the gender of the main character, which reinforces the proposition that they experienced difficulty staying within in divergent thinking mode. This time around, the group elaborated the idea further, and JB suggested having a gay main character: "*The best of both worlds*". This episode is representative of instances of convergent thinking during the divergent thinking stage of the Story Generation Phase.

Twelve minutes into the Idea Generation phase, the group was more comfortable with the activity; they freely contributed ideas, and exhibited more divergent thinking. They provided characteristic attributes of the main character such as sly, sneaky, and gay.

F:	Do you want to say more things about the main character?
DD:	Violent

KK:	He is smart
AM:	He likes stealing stuff
JB:	Poor
F:	Smart, poor, why are you saying poor? if someone is violent
JB:	Drug use
JB:	Yea, because some people steal for
F:	And other people?
AL:	Addicts
F:	Do people only steal because they are drug addicts or poor?
JB:	Revenge

Excerpt 14 Divergent thinking and idea exploration

Excerpt 14 illustrates divergent thinking, and exploration of ideas. Although all the contributions explored possible characteristics of the main character, they were unrelated. The facilitator's elicitation may have led JB to associate violence, and drug use. Nonetheless, his contribution can also be considered explorative since it provided an idea that had not been previously proposed. Although AL's contribution seemed to further pursue association of ideas between drug use, reasons for stealing, and addiction, the facilitator's elicitation, and JB's final contribution rerouted the conversation towards exploration, and divergent thinking. As the activity continued, these kinds of predominately divergent thinking episodes were more frequent than the one discussed in Excerpt 13.

Addressing the Best Friend, and Bad Guy prompts, the participants decided the main character did not have any friends. However, the idea of a crooked cop was proposed, and the group decided to amalgamate the Best Friend, and Bad Guy into one character. The articulation of this idea generated much confusion, and JB attempted to clarify it for the group (Excerpt 15).

JB:	Well if the bad guy in the main film is actually; if the good guy is actually the bad guy which is who is going to rob the bank but then the bad guy is going to be the good guy so if the good guy is a cop

Excerpt 15 JB attempting to explain an idea to the group

JB's explanation did not clarify the idea reflecting his own lack of understanding, or his inability to verbally articulate the concept. The group expressed the lack of understanding in two ways: firstly, the Scriber wrote *MENTALS* on the script; secondly, the participants verbally voiced their concerns (Excerpt 16).

DD:	It's confusing
F:	What is the problem with that?
AL:	How are you going to portray it?
DD:	It's confusing

Excerpt 16 Participants voicing lack of understanding regarding

KK attempted to re-elaborate JB's contribution, trying to achieve common ground (Excerpt 17). This episode highlights the mechanisms, and efforts made by the group in order to communicate, and achieve common ground. JB provided a summary of the discussion in an attempt to assist his peers, and his own understanding. He did not succeed, and the group made him aware of it via its feedback. KK re-elaborated JB's contribution trying to tailor this to the group's level. JB's feedback indicated understanding, and AM's positive feedback confirmed it.

KK:	Because if it is in the eyes of the main character he is a thief. He is going to think that he is the good guy & the policeman is the bad guy
JB:	That's what I said but said simpler
AM:	Yea

Excerpt 17 KK re-elaborating contribution to achieve common ground

No further competitive incidents between AL and JB over the shared tools had taken place since they reached an agreement (Excerpt 11), however, their difficulties were not resolved.

F:	OK. Now, who is the bad guy?
AL:	Uhum
AL:	Uhum
JB:	I can't reach that far!
AL:	You can walk!

Excerpt 18 AL requesting JB to fulfil his role

The facilitator's question (Excerpt 18) had a double function: to elicit the participants to contribute ideas; and to prompt the Scriber to move the wizard forward. AL understood the facilitator's communicative act, and in turn asked JB to fulfil his role, click *Next* on the wizard. JB persisted in not performing his task, and AL insisted. Excerpt 18 highlights the fact that AL was not longer confronting JB over power of action, but rather she requested that he fulfilled his role, and held him accountable for it.

To this point, the shared tools were predominantly manipulated by AL and JB. The group was still somewhat timid, and participants were not volunteering to take on roles. The facilitator was the only person besides AL, and JB interacting with the shared tools.

The F intervenes asking AL to stop typing so that she can interact with the IWB. She moves forward to the IWB with a pen, and taps on the node above 'Boys' so that AL can type in it. However, she doesn't manage to select it the first around so she tries again. Once the F has selected the right node, she tries to move the cursor to the end of the sentence to enable AL to write there. She doesn't succeed and taps again on the node. At this stage JB intervenes with his pen and taps on the *BACK* button on the Wizard which takes the Scripting tool to the previous window where the F wanted to go.

Excerpt 19 Non verbal interaction and coordination with the Scripting Tool

Excerpt 19 exemplifies a typical non-verbal interaction among the facilitator, and the participants manipulating the shared tools. Firstly it illustrates AL did not exhibit a competitive, or confrontational attitude towards the facilitator. Arguably this can be accounted for by AL's possible perception of asymmetry of status between her, and the facilitator. However, this behaviour towards the facilitator was consistent throughout the cases, and occurred with different participants. Further exploration unveiled that, prior to interacting with the shared tools, the facilitator always communicated her intent to the participants, allowing them to prepare and to oppose. Secondly, the excerpt portrays the seamless, and effortless collaboration among JB and the facilitator which materialised in the achievement of the goal.

The group reached the convergent thinking stage, and decided to set the story in a bank. Story beat one was intended to show the main character with the bank plans planning the bank robbery. Much controversy arose around three issues: 1. the story was revealed on the first beat, and there was no appeal for the audience to keep on watching; 2. there was no logical explanation for the guy to have the bank plans in his possession; and 3. there was no justification for the guy to walk into the bank in the first instance. Regarding the first issue raised by ND, the group proposed reasons for watching the movie for instance, *"see how it all began"*, or *"see how it fits with the end of it"*. Concerning the thief having the plans, original ideas provided included the main character being an architect, working in the bank or being a security guard in the bank, and having access to the plans because of his job. The third issue was addressed by combining ideas previously contributed: the main character worked in the bank as a security guard, which provided a logical explanation for him being in the bank, and having access to the plans. The ideas were developed collectively, and through negotiation,

but coming to the end of the interaction episode, AM summarised the consensus, and elaborated on it. (Excerpt 20);

AM:	No, How about: he is the security guard working in the bank & he knows all the maps & plans. And he knows his way around. And then he gets fired. And then he wants like to get back at his boss. And so, he steals the bank

Excerpt 20 AM's summary and elaboration of the group's consensus

The first part of the episode demonstrates that the participants were engaging in convergent thinking by selecting ideas, connecting these, and critically evaluating them. At the same time, they engaged in focused divergent thinking to overcome the three issues that arose. The foregoing proposition is further supported by AM's intervention (Excerpt 20), which coherently connected ideas, and explored a justification for the robbery. He engaged in a convergent – divergent thinking fashioning process.

As the conversation, and shaping of ideas, took place the Scriber noted the contributions on the script. The script was the focal point of attention, and all the participants were carefully following the contributions added and changes made to it (Excerpt 21).

KK:	Get rid of all that & say he works in a bank

Excerpt 21 KK instructing the Scriber on what to note on the script

Excerpt 21 portrays KK addressing the scriber regarding a contribution: *"Robber has the bank plans/Plot begins";* she noted on the script. It illustrates that, although the Scriber controlled the input to the script, she was not in a power position of asymmetry of action and/or status in relation to the group because the group monitored her. Furthermore, the episode indicated that the notes made by the Scriber were an accurate reflection of the group's consensus, and they encapsulated the group's common ground. When the foregoing was not the case, as in Excerpt 21, the group voiced their disagreement. The episode depicts an additional point; the various dimensions at which the Scriber, and the group interacted. For instance, they interacted verbally when contributions were made, predominately by the group, and non-verbally when the Scriber annotated her contributions directly on the script. Both types of interactions were enabled, and mediated by the public display.

During the divergent thinking stage, the group agreed the main character had an accomplice, an undercover policeman, who helped him plan the robbery, rob the bank, and get away. However, when creating the actual story they revisited the idea of the double identity (Excerpt 15 & Excerpt 17), and decided on a twist for the end. The accomplice turned the main character in, and drove away with the money (Excerpt 22).

KK:	When they are trying to get away, this guy is like: *"Oh yea we'd got the money".* And his friend is like: *"Ja, ja, ja"*
F:	You are arrested, OK
AM:	Where are we going to get a car?
JB:	No problem we just
AL:	That's fine there is lots of cars in the road
KK:	You don't need to. You just need him like running away or something

Excerpt 22 'Seeing', 'hearing' & acting narrative events during the convergent thinking stage

Excerpt 22 illustrates behaviour characteristic of the convergent thinking stage. Firstly, the participants adopted a more imaginative approach by 'seeing', 'hearing' and acting events from the narrative as shown by KK's intervention. Secondly, they demonstrated an increased awareness regarding the resources required to execute their ideas. In so doing, they identified problems, and devised solutions for these. Furthermore, the solutions proposed availed of the resources provided by the rich real world environment which surrounded them, as evidenced by AL's contribution.

JB:	Here he is going to rob a bank
F:	He wants to rob a bank & plans to rob a bank
KK:	He tells his friend & his friend says: *"Oh, I can get you a gun"*
AL:	Subtitle: "I'm going to rob a bank"
JB:	What about a voice over?

Excerpt 23 Discussing production matters during the convergent thinking stage

The group's appreciation of production matters predominated in the final stage of the Story Generation when the group was narrating the story to ensure common ground (Excerpt 23). During this activity the emphasis of the conversation shifted. The group was no longer concerned with what the story was going to be, but rather with how they were going to execute it. For instance, they discussed whether to use subtitles, or voice over for different beats (Excerpt 23).

The Story Generation Phase concluded with the participants dividing themselves into the three groups: Image, Sound, and Editing; and allocating roles within each group. Rotation was the criterion used to divide them. The final group division was: Image group AM and AL, the prior playing the robber, and the latter the accomplice, JO, ND, and CC; Sound group

KK, JB, and FF; and Editing group DD joined by the facilitator. The final script is provided in Fig. 72.

The allocation of roles within the groups was to some extent conditioned by the characters in the narrative, however, the camera, and soundperson roles shifted as required by the script. For instance, when AL was not acting, she took on the cameraperson role. The alternation of roles was further enabled by the availability of multiple devices which allowed more than one person at a time to be the cameraperson, or soundperson. The difference in medium supported the adoption of a dual simultaneous role in the Sound group.

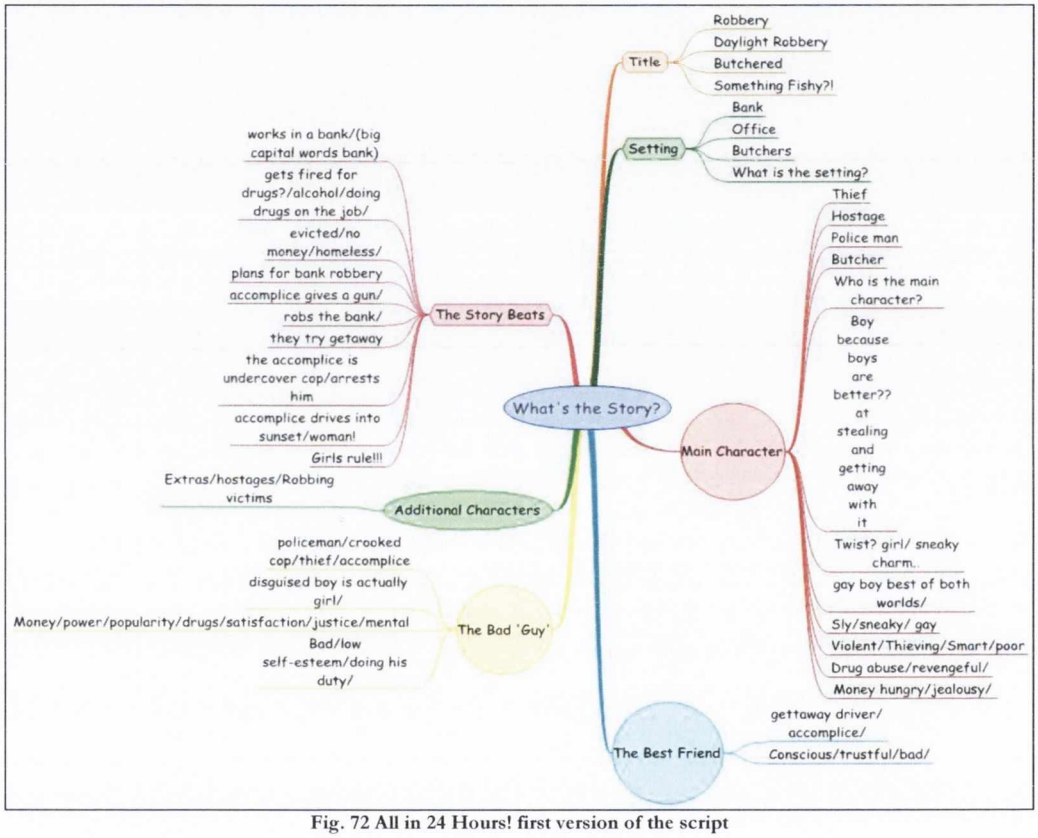

Fig. 72 All in 24 Hours! first version of the script

Before leaving the EdS to embark on the shooting the participants were handed a print of the script (Fig. 72), and they voiced their concern regarding the unusual and incoherent group division (Excerpt 24 & 26).

JB:	I think we should do sound on set, we get it done quicker & we know what we are doing
F:	On the set?
AM:	Oh, yea
F:	No

Excerpt 24 Group proposing to create the images & sounds together

KK:	You see, we can't make sound effect when we don't know what is happening in the pictures
F:	You should all know what is happening in the pictures
KK:	Yea but we don't know where are they going to fake it
F:	I think we should be doing everything in parallel
ND:	Well then we'll all have to work together

Excerpt 25 ND articulating the need to work together

Excerpt 24 & 26 portray the group's reaction to the 'counter intuitive' labour division proposed by the facilitator. Given their experience with creating *The Scientist*, the participants were cognisant of the difficulties with the proposed workflow: it required more effort, it took more time, and it forced them to work together as articulated by ND. This episode revealed the group's tendency to adopt a less collaborative effort approach, as had already been illustrated in Excerpt 10.

6.4.2 SHOOTING & EDITING THE FIRST VERSION OF ALL IN 24 HOURS!

As outlined in 6.3, video footage of the Image and Sound groups while creating the media was not available however, interaction taking place in the EdS were video recorded. While the other two groups were creating the media, the editor was assembling it. At a procedural level, this involved: 1. Waiting for the media to arrive via MMS; 2. Retrieving it from the MMS gateway; 3.tansfering it to a folder in the PC; 4. Importing it into the movie editor; and 5. Assembling it. This procedure had to be repeated for each media unit received unless a few units were processed together.

In the EdS DD, and the facilitator commented on the amount of media received while examining the movie project DD had assembled so far (Fig. 73). They noticed the imbalance in media received, since only one sound file had arrived, as he proceeded to Skype the Sound group (Excerpt 26).

DD:	KK, did you send any sounds? Alright, because we only got two of them here. Alright, OK
DD:	Yeah. She's sent two; she's just gone upstairs to record more
(DD reporting to the facilitator on the conversation he just had with KK)	

Excerpt 26 Phone call from the editor to the sound group

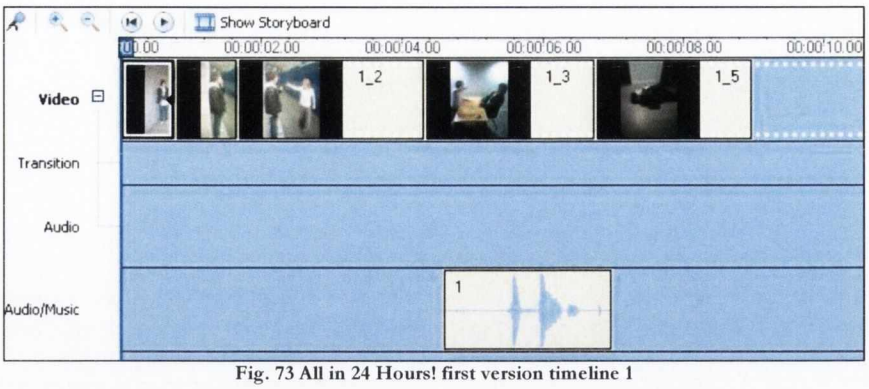

Fig. 73 All in 24 Hours! first version timeline 1

Records of the amount of time the groups were out creating the media was not kept. However, examination of the timestamp on the media captured, from the first media item created to the last, (Fig. 74 & Fig. 75) shows that both groups invested approximately 30 minutes in the effort. In total 13 images (Fig. 74), and 14 sounds (Fig. 75) were created by each group.

Name	Date Modified
1.jpg	18/02/2006 13:35
1_0.jpg	18/02/2006 13:37
1_1.jpg	18/02/2006 13:38
1_2.jpg	18/02/2006 13:39
1_3.jpg	18/02/2006 13:39
1_4.jpg	18/02/2006 13:39
1_5.jpg	18/02/2006 13:40
1_6.jpg	18/02/2006 13:55
1_7.jpg	18/02/2006 13:55
1_8.jpg	18/02/2006 13:56
1_9.jpg	18/02/2006 13:56
1_10.jpg	18/02/2006 14:03
1_11.jpg	18/02/2006 14:04
Thumbs.db	03/08/2008 17:23

Fig. 74 Image list V1 All in 24 Hours!

Name	Date Modified
you're fired.wav	18/02/2006 13:12
wat u doin.wav	18/02/2006 13:25
office talk 2.wav	18/02/2006 13:30
lose job.wav	18/02/2006 13:31
streets.wav	18/02/2006 13:35
fast money.wav	18/02/2006 13:36
1.wav	18/02/2006 13:39
Recording1.wav	18/02/2006 13:47
stick up.wav	18/02/2006 13:49
hand over money.wav	18/02/2006 13:52
1_0.wav	18/02/2006 13:56
1_1.wav	18/02/2006 14:04
1_2.wav	18/02/2006 14:04
1_3.wav	18/02/2006 14:07

Fig. 75 Sound list V1 All in 24 Hours!

6.4.3 PRODUCTION & SCREENING OF THE FIRST VERSION OF ALL IN 24 HOURS!

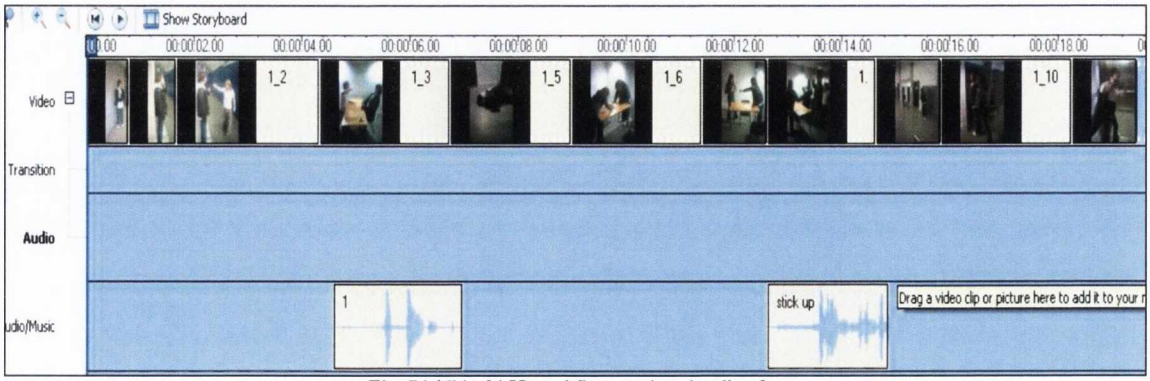

Fig. 76 All in 24 Hours! first version timeline 2

By the time the groups were back in the EdS, the editor had 11 images, and 2 sound files assembled in the timeline (Fig. 76). The whole group was focused on the making of the

DN when the facilitator asked them to watch the entire project. As a result of this activity comments regarding the media available, and that apparently missing, were made. For example, DD referred to a sound: *"You need money fast"* for which there were no matching images. Instances of the group's critical evaluation of their work were predominant throughout the production. The immediate feedback provided by the editing tool supported the participants in identifying areas in need of further work, and in so doing informed their actions. DD kept on editing, and elicited information from the group while he co-edited (Excerpt 27).

DD:	That's supposed to be the guy (Fig. 77) saying: "*what are you doing?*"
AL:	No, it's not
AM:	Yes it is
AL:	The manageress catches him
DD:	No because we already have something for that. For the arrest
AL:	No, that's not for the arrest
DD:	Well, it kind of has to be
AL:	Well, that was meant for when they got that bit (Fig. 78)

Excerpt 27 The Editor & sound group arguing over the appropriate order of sounds

Fig. 77 Accomplice running away with money

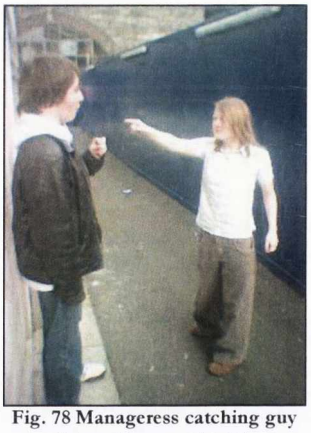

Fig. 78 Manageress catching guy doing drugs on the job

Excerpt 27 highlights two matters in relation to information synchronisation, and joint information processing between the editor, and the Image and Sound groups, and among the three groups. Firstly, it illustrates deviations from the group's common ground reached at the end of the Story Generation phase. Though the groups were working from the collective script, personal interpretations occurred, and DD used a sound intended by the creators for a particular story beat, in a different one. The participants were confronted with a mismatch, or a potential match, of media according to whether the creators' original intent, or

the editor's interpretation was endorsed. Secondly, it illustrates the language the participants developed to communicate about their collective production. They referred to the characters by their shared names: *the guy* and *the manageress*. They adopted the language of the story to discuss the different beats. For instance, they talked about *the manageress catching him* and *the arrest*. Furthermore, AL demonstrated how communication occurred through a mixture of verbal and non-verbal interactions. She also showed that the media created and the meaning they had given it, played a crucial communication function.

In the twenty minutes the group was together post-shooting, they were busy editing, viewing, and analysing the DN in the making (Fig. 79). Many instances of collective editing, reflecting joint information processing, as exemplified by Excerpt 27, occurred. Collaborative production-based editing episodes also took place, and, for instance, JO asked the editor to *"stretch out the pictures a bit"* because they *"go off too quick"*, KK highlighted they were *"missing a picture where he says: Oh, a really need some money"*, and DD stated they were *"missing lots of audio"*. Episodes overlapping analysis in relation to production, and narrative intent were also found. For example, JB asked DD to move the streets, referring to the sound by that name in the timeline (Fig. 79) *"...back where he is on the streets"*, referring to the street's image in the timeline (Fig. 80).

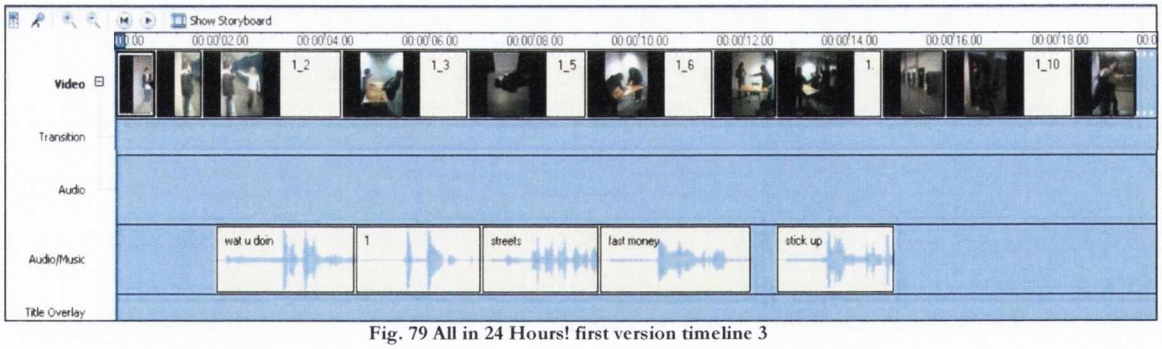

Fig. 79 All in 24 Hours! first version timeline 3

Conversations regarding the analysis of the production to evaluate to what extent the DN in the making, and the media created, conveyed the narrative intent, included those related to establishing the job of the main character: security guard; and executing the drug taking beat. The facilitator contested the effectiveness of the image to establish the security guard (Fig. 81). JO argued it was not clear because he was not dressed up, and the facilitator asked for solutions within the limitations in which they operated. Suggestions to solve the problem included: using an ID card proposed by JB; taking a *"shot of him dragging someone...like if he's holding someone's arm and pulling him out"* offered by AM; and staging an arrest advanced by AL. Concerning the drug taking beat, the group agreed the picture taken (Fig. 82) did not convey the idea of someone smoking drugs. Propositions to convey the narrative intent

included: picturing him taking pills, proposed by KK, and elaborated upon by JB, who suggested they could use Tic, Tacs; and using a layer and a spoon offered by AL.

Fig. 80 Main character homeless

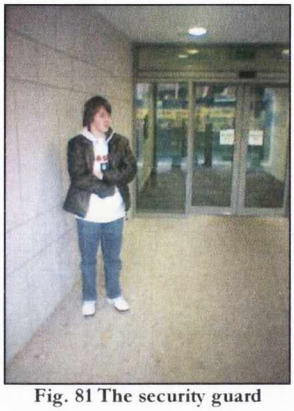

Fig. 81 The security guard

Fig. 82 Smoking drugs

The scaffolding of the facilitator, her feedback and that of the group, the contributions made by the participants, the media itself, and the immediacy afforded by the movie editor enabled meaning making conversation in relation to the collective creation in which divergent and convergent thinking interplayed. Excerpt 28 is representative of these types of conversations throughout the cases.

F:	Guys, what's wrong with this?
JO:	Sound. That's all
KK:	There is pictures missing as well
F:	What sound and how many pictures. Can you play it again?
JB:	Play from the place
AL:	From the street picture
DD:	This is not going to work
JB:	It will work
AL:	We need more photos in different angles
AM:	Say, there just bits where there is nothing, you know? It's just happening really fast so you mightn't be able to follow it

Excerpt 28 Collective critical review of the DN in the making

6.4.4 CRITICAL REVIEW OF THE FIRST VERSION OF ALL IN 24 HOURS!

The second workshop of the case was conducted on the Saturday after the first. RR and JJ, who were absent the previous week, were back but JO was away. In total there were 8 participants, 2 mentors, and the participant researcher. The group briefed RR and JJ on what they had done, showed them the uncompleted DN (Fig. 79), and the Script (Fig. 72). The

facilitator took advantage of the occasion to get the opinion of an 'objective' audience, and asked RR and JJ to tell the group what they had understood from watching the DN (Fig. 79).

RR:	He got caught smoking in his job. He obviously got kicked out of his job. He held up the bank
F:	How do you know that?
RR:	Because all theirs hands are up
F:	And how do you know is a bank?
RR:	Because it basically is in a bank. Because she said the setting was a bank
F:	But from the pictures, do you get the idea it was in a bank?
R:	No

Excerpt 29 RR telling the group what she understood from watching the DN

The feedback provided by RR (Excerpt 29) was ratified by JJ, and coincided with the group's evaluation of their work.The foregoing led to a critical review of the DN in the making scaffolded by the facilitator, and the movie editor. The activity made the group identify areas in need of further work, and, for instance, RR suggested *"...him in the toilet with tin foil"* could work to convey the drug idea, and JB proposed changing his profession to *"...a behind a desk kind of guy. It'll be easier" "...than a security guard"*. Elaborating on the idea contributed by JB, AL imagined how it could be executed, and suggested to portray the guy at one end of a desk handing a € 20 note to someone. CC, commented that the bank plans were not distinguishable in the picture (Fig. 83), and RR suggested to *"go closer on that one"*, referring to taking the picture from a closer range. Referring to the 'holdup' beat, RR commented that the hands up really worked (Fig. 84). Responding to the facilitator's elicitation on what would make it more dramatic, DD suggested *"Expressions"*, AM *"Get real close ups"*, AL *"Close up of faces"*, and RR *"...every angle"*, meaning taking pictures from various angles. Finally, AL argued that Fig. 85, included in the DN project (Fig. 79) was: *"...not meant to be the one, because he had different ones"*. However, Fig. 85 was the only picture delivered to the editor for that beat. This indicated that a pre-selection, and deletion of images had taken place on set.

Following the critical review of the DN, the participants divided themselves into the three groups: Image, Sound, Editing. The characters remained the same as in the previous workshop for consistency sake. Changes made involved RR taking over as editor from DD, JJ joining the Sound group, and DD filling in for JO in the Image group. The groups were again instructed to work separately, and one mentor was allocated to each group to ensure the instructions were followed.


Fig. 83 Checking the bank plans


Fig. 84 Holding up the bank


Fig. 85 Running with the money

6.4.5 SHOOTING & EDITING THE SECOND VERSION OF ALL IN 24 HOURS!

During the second Shooting for *All in 24 Hours!* the group created a total of 50 images and 23 sounds, in addition to the 28 media items created in the first workshop. Furthermore, during the collective editing, as the need arose from the DN in the making, 6 images were 'targeted shot' to fill in gaps, and three sound files were 'borrowed' from the recordings made for *The Scientist*. In total 56 images, and 26 sound files were created for the second version of *All in 24 Hours!* However, only 41 images, and 12 sounds were used in the final DN. The timestamp on the images revealed that these were not shot in the order in which the story beats appeared in the script. Shooting took place as the real world context provided suitable sets, and resources. For instance, the first picture created was of a Bank of Ireland office (Fig. 86), and the second was of the homeless beat (Fig. 88), which was set in the railway station beside the bank. The indoor pictures were taken last. First, the bank plans (Fig. 92); then the bathroom beat (Fig. 89, 90 & 91) for which the toilets in the building were used; later the firing beat for which the researcher's office was used; and finally the robbery beat (Fig. 93). A similar pattern took place with the Sound group. Features noted on the sound files included the names participants gave the actual files consistent with the narrative event they conveyed (Fig. 75, 76 & 79).

The way in which the participants explored and incorporated the feedback, and analysis arising from the critical evaluation of their work was overt, and is illustrated through a few examples. For instance, Fig. 86, clearly intended to address the need to establish the bank highlighted by RR (Excerpt 29). Fig. 87 disclosed experimentation taking advantage of the real world resources. As AL walked pass the bank window she saw an advertisement for a motor loan, and decided to take a picture for the mortgage beat. Fig. 88 addressed two issues: firstly, the homeless pictures taken indoors; and secondly, different shot angles as the image is taken

from the top, and in a slight angle which demonstrates that the participants explored, and incorporated feedback.

Fig. 86 Establishing the bank


Fig. 87 Loan advertisement


Fig. 88 Outdoors homeless shot


Fig. 89 Using arm to establish drug use


Fig. 90 Using tablets to establish drug use

Fig. 91 Taking the drugs

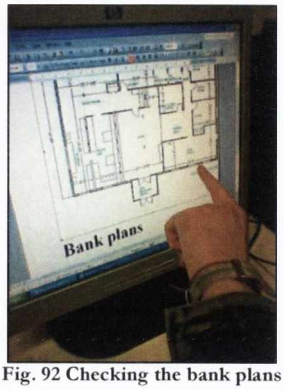

Fig. 92 Checking the bank plans

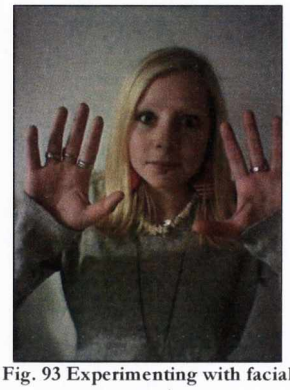
Fig. 93 Experimenting with facial expression

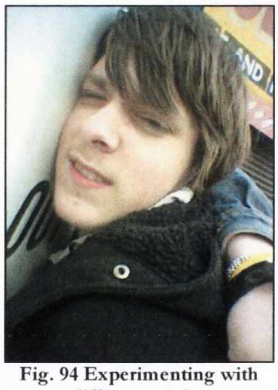
Fig. 94 Experimenting with different angles

Fig. 89, 90 & 91 illustrate the different ideas the group executed to deal with the drug taking beat. They all mirrored contributions made during the evaluation of the work. Similarly, Fig. 92, 93 & 94 also addressed issues highlight during the review. They demonstrated how

feedback was incorporated into the participants' actions, and how they experimented with distance, angles, and facial expressions in order to convey narrative intent.

6.4.6 PRODUCTION & SCREENING OF THE SECOND VERSION OF ALL IN 24 HOURS!

By the time the Image and Sound groups were back in the EdS the editor, RR, had added images from the previous workshop to the project. She was at the laptop, DD was working with her, and AL and JB were at the IWB with a pen each. The rest of the group was focused on the IWB, and partaking of the process through it. The group was deciding on the media to keep and delete from the first version of *All in 24 Hours!* (Excerpt 30), and advising RR on how to perform various tasks with the movie editor (Excerpt 31).

RR:	Keep that one?
AM:	We have the robbery as well
DD:	We already have it
AL:	No we already have the stick up and everything
AM:	Get rid of that
DD:	Get rid of that
JB:	Get rid of that
RR:	And we'll get rid of Santa Claus as well? (referring to Fig. 85)
RR:	Oh, will you stop it?

Excerpt 30 Group editing – deciding on media to keep & delete

Excerpt 30 & 32 re-illustrate points already encountered: firstly, the need for technical coordination between peers working at the laptop, and the IWB; secondly, the asymmetry of knowledge regarding the media intent between the Image and Sound groups, and the editor; and thirdly, the language of the story developed by the participants to communicate. However, the excerpts revealed additional dimensions. For instance, the editor consulted the group prior to deleting Fig. 85, this was common behaviour throughout the cases, but RR consulted on every single move she intended to make. This denoted her lack of confidence, and this was in clear contrast to the confidence exhibited by DD, AM and JB. They knew exactly the media they had, and where it was intended to go in the DN according to the story. Additionally, RR developed her own parallel language to describe particular beats. For example, she referred to Fig. 85 as *Santa Claus* rather than *"the getaway"*, the name used by the group for that beat which reflected its narrative intent. The fact that RR was not present the

previous week when the story was created seemed to be a contributing factor reflected in her behaviour and language.

DD:	Is it not *Shift*?
JB:	No, *Control*; *control* next item. No, no
AL:	You let go of *Control*
RR:	Oh, you are confusing me!
JB:	OK, just *Right Click* on it, and *Delete*, and then go to the next. Let's make it easy-peasy

Excerpt 31 Advising the editor on how to perform tasks with the movie editor

The last sentence in Excerpt 31, Excerpt 30, and Fig. 95, 96 & 97 portray issues concerning technical coordination. AL, JB, and RR were all interacting with the movie editor, the first two via the IWB, and the latter through the laptop. DD, JB, and AL were instructing RR on how to delete images from the timeline. RR was getting confused, and JB attempted to help in two ways: firstly, he adapted his explanation to her, and made it as easy as possible *"easy-peasy"*; secondly, when the first approach failed, and regardless of his frustration (Fig. 95), he coordinated with RR. He clicked on the image to be deleted (Fig. 96), and RR proceeded to delete it. The foregoing was his strategy to overcome the difficulties entailed with verbally communicating the procedure to RR.

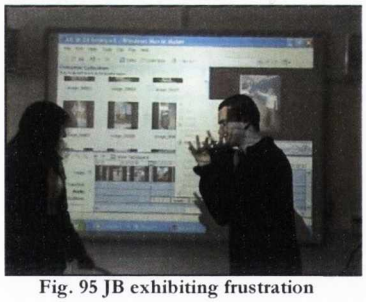

Fig. 95 JB exhibiting frustration

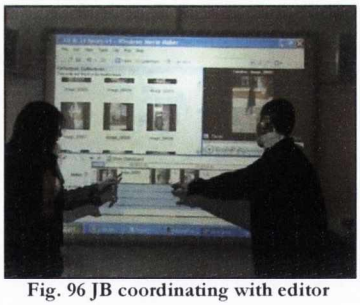

Fig. 96 JB coordinating with editor

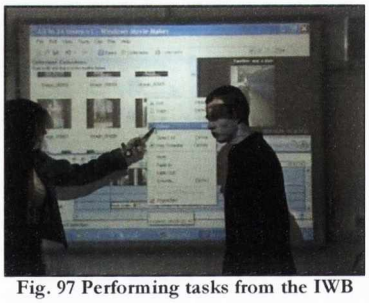

Fig. 97 Performing tasks from the IWB

JB's strategy to coordinate with the editor was adopted by AL, however, on one occasion RR failed to perform the task she was asked to, and AL proceeded to do it herself from the IWB (Fig. 97). The foregoing created tension, and frustration for RR who, in an abrupt manner, asked AL to stop. The technical coordination required during editing was more complex than during the story creation in two ways: firstly, there were three people instead of two using the tools; and secondly, unlike with the Scripting Tool which only allowed the person at the laptop to write, the movie editor afforded the full range of actions to people at the laptop and the IWB. The latter generated a situation of double frustration: on the one hand, RR was frustrated by the unexpected incursions from AL and JB in the

timeline; and on the other hand, AL and JB were frustrated by RR's performance and her veto over them performing tasks from the IWB. Tension between RR, and the participants at the IWB persisted, and resulted with RR resigning from her role (Excerpt 32).

AL:	Right so you have him walking up to the bank
RR:	I have that and that (Clicking on the images)
AL:	Put in another of him walking to the bank
RR:	I was told to put the three of them
AL:	That's grand. What's next? Give me money!
RR:	How about this?
AL:	Oh, that's a picture of the bank. We don't need that
AM:	Why not? We need that
AL:	Because he has to be caught first. Go down
DD:	They are the ones we need. Stop
RR:	Here, do you want to do this? (asking AL if she wants to take over the Editing)

Excerpt 32 Group editing & RR's resignation as editor

Excerpt 32 captures the final moment of tension leading to RR's resignation, and highlights three points, contrasting her behaviour, and that of the group. Firstly, her language was generic using *"that"* to refer to various media. AL's instead demonstrated a deep understanding of the narrative and its event; secondly, she used the passive voice *"I was told to"* to justify her editorial decisions, which denoted lack of ownership over her own actions, and the DN as a whole. Ownership however was strongly felt on the part of rest of the group; and thirdly, from the moment in which she resigned RR disengaged from the activity, and the group.

As the group proceeded with editing, they realised the toilet's beat did not work. They had images for the main character walking out of the toilet after doing the drugs, but none of him walking in. JB and AM decided to go and shoot the missing images while the group continued editing (Excerpt 33).

JB:	Yeah. Do you have anything entering the bathroom?
AM:	No, we never go it
JB:	Gives us a camera, I'll get you the photos
AM:	But we need a bathroom

F:	What is it that you need now?
AM:	We don't have any of me walking into the bathroom, we only have of me inside
DD:	We don't need of you walking in
AM:	Oh, yes you do
JB:	How does he get there?

Excerpt 33 JB & AM leaving to target shoot missing images

Excerpt 33 illustrates facets of the role the tools, and medium exerted in two ways: firstly, they provided immediate feedback; and secondly, they afforded immediacy of action. The movie editor allowed the group to evaluate their work, and identify inconsistencies which led to an assessment of the resources available, and to determine the ones needed. The phones afforded immediacy of action allowing part of the group to go and shoot the media, while the rest continued editing. The use of images translated into a seamless, and simple act of adding the new shot to the DN without delays due to media digitalisation, processing or editing. Furthermore, alternation of roles occurred, and JB, who was in the Sound group, assumed the role of cameraperson, and shot the pictures. The foregoing evidenced the flexibility, or permeability of roles, even within a single workshop. Additional episodes of 'targeted' shooting as a result of editing and evaluation included: shooting images for the mortgage beat, and recording sounds for the toilet beat, when the manageress knocked on the door (Fig. 98), and when the guy unwrapped the drugs. Regarding the sounds, although new sounds were recorded, at the end the sounds from *The Scientist* were reused as suggested by FF (). The reusability potential pointed to further advantages of using small media units.

AM:	We need an audio clip like banging noise or someone knocking on the door
ND:	Sure we can do that now
FF:	Sure there is banging from the 1st one

Excerpt 34 Identifying need for knock sound and possible reusable resources

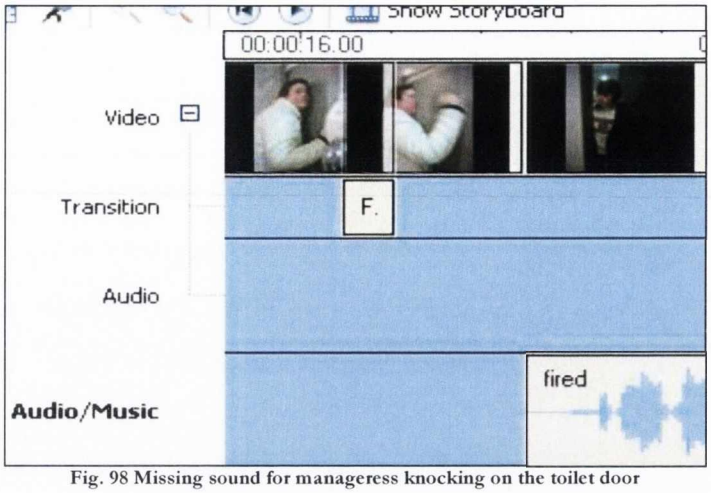

Fig. 98 Missing sound for manageress knocking on the toilet door

Additionally, the feedback provided by the DN in the making, and the flexibility of the tools, supported the group in constructing the narrative. For instance, Fig. 99 demonstrates an early version of the timeline with the arm and tablet images for the drug beat. At a later stage the arm image was removed because it did not align with the narrative sense.

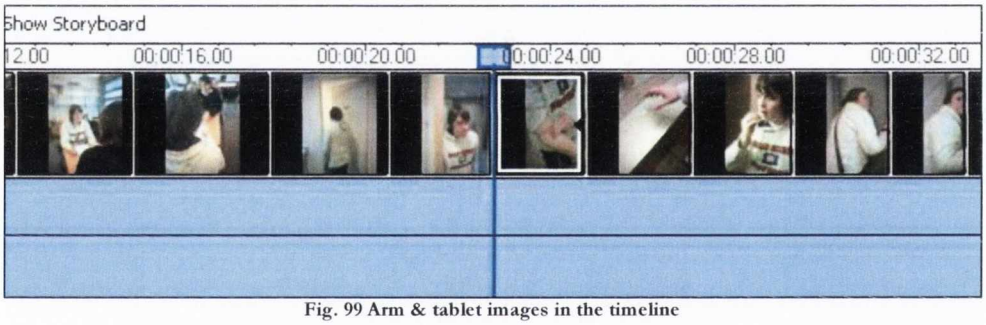

Fig. 99 Arm & tablet images in the timeline

The lack of technical coordination between participants at the laptop, and at the IWB persisted on an on/off basis, but increased awareness regarding working together towards coordination was appreciated. For instance, JB consulted his peers prior to interacting with the DN through the IWB with utterances such as *"Let's stop for two seconds"*. The group's recognition of the dimensions of the collective endeavour, and the need to collaborate also became patent while editing, and sharing tools (Excerpt 35).

AL: Right we have all our images
JB: Do we have the next one? Do you want to get another close up of the money? Like this one (Fig. 100)
AL: No, you know this (As she is speaking she deletes the image she has just dropped into the timeline & continues speaking to explain to her peers her intentions)

DD:	Get read of one of them
AL:	This is going to go at the very end.
DD:	Why?
AL:	The two of them are running off and then you (addressing AM) show me the money

Excerpt 35 Coordinated actions during collective editing

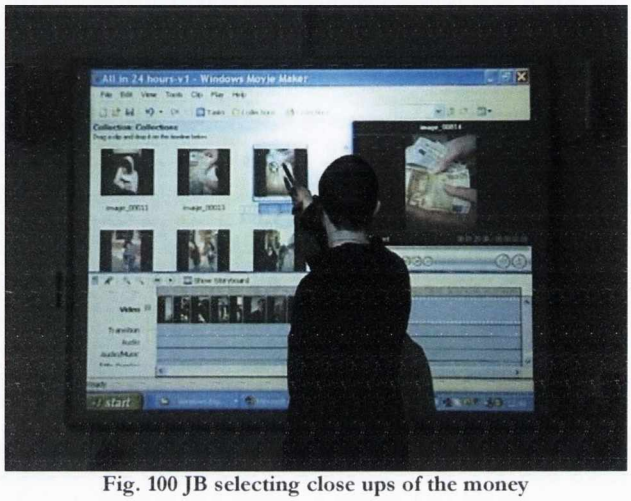

Fig. 100 JB selecting close ups of the money

6.5 STREETS OF RAGE

Streets of Rage tells the story of Daniel, a violent guy with blue hair, who is not accepted by society. One day Daniel is walking down the street, and people are staring at his hair. Daniel notices them, and gets angry. When he walks pass a girl she comments on his hair, and Daniel starts shouting at her. Another guy defends the girl, they get into a fight and Daniel kills him. The DN comes to an end with Daniel running away.

The following sections provide a thick description of the 'making of' *Streets of Rage.*

6.5.1 THE STORY GENERATION PHASE

At the start of the Idea Generation Phase the facilitator challenged the participants to complete the entire DN by themselves, and by the end of the workshop (Excerpt 36).

F:	I'm not sure that you guys are going to be able to do this
JB:	Are you just saying that to make us do it more so?
ND:	Yeah
F:	I don't know. KK you drive this & speak up so that everyone can hear you

Excerpt 36 Facilitator challenging the group

The facilitator's objective was to fade her scaffolding, and make the group take complete ownership, and responsibility for the DN. The group did not hesitate to accept the challenge (Excerpt 37).

ND: Come on, we'll prove her wrong & we really do it. We get it all done, right? So, what are we doing? What do you want to do it on?

JB: Don't bother with that. It's going to take too long. We are going to be here for ages (Addressing KK as she starts using the Script Wizard)

AM: Just forget the title

ND: Yes, forget about it

JB: Let's go to the Beats (referring to the last phase of the Script Template)

AM: Oh! To the Beats? (in a surprised tone)

KK: No. Well, let's do the setting first

DD: Forget the main character for the moment. We can go back and do that. What's the setting of the story?

Excerpt 37 Group accepting the challenge & deciding on how to use the script template & wizard

Besides illustrating the group's determination to prove the facilitator wrong, Excerpt 37 uncovers the participants' perception of the Scripting Tool, and how this should be used. For instance, JB was concerned about the time it required, and suggested bypassing the divergent thinking stage. AM and ND agreed to bypass the title, however, AM was uneasy about moving directly to the story beats. Similarly, KK insisted on addressing the story elements before the story beats. The episode revealed that although there were discrepancies as to where in the template they should start, no-one suggested ignoring it. This attitude was in clear contrast with the opposition towards using the template exhibited by the group on the first week (Excerpt 38).

F: Where is this story going to take place?

KK: But we don't know what the story is yet

F: We are deciding the story, are we not? We have different elements here. Do you think that if we come up with all these different elements we will have story?

KK: I think you have to think of story before you can come up with a setting

RR: Yea. We wouldn't have a story

F: So, do you want to know what the story is before you decide on a setting? Is that the way you want to do it?

JO: Because if you don't know the story line, you can't choose where the setting is going to be

JB: You don't know what the story is

F: OK. Could it be that if you had a setting, a main character, a friend, a bad guy; that then you would have a story?

KK: I think you need to think of a story and then make people to fit the story instead of making the story fit the people

ND: Yea, that's what we did

F: OK. We'll do this: would you be happy to go along with my idea for this week and we change for next week?

JO & RR: Yea

Excerpt 38 Group opposing to the use of the Story Template on the first week

The group proceeded with the idea generation, and while suggesting settings DD contributed *"...a street flight?"* This led JB to suggest a story set in the riots. JB's contribution was connected to a series of incidents that took place in Dublin the previous week. Excerpt 39 captures part of this conversation, but most importantly, illustrates how KK focused the group back to the task when this deviated from it. The episode exemplified the group's capacity to self-regulate, stay on task, and pursue the objective of the activity.

JB: True story in the riots

DD: We should have taken the camera to them riots

AM: Yea, that would have been great

DD: I was there

KK: We are going off the subject

ND: Yea, exactly right!

AM: Yea

Excerpt 39 Group self-regulating

As the group continued contributing ideas for the setting, KK suggested a lift but DD stated the lift was off the agenda because the previous week the building's attendant called their attention for playing with it. In order to use the lift idea the group suggested solutions. For instance, KK imagined alternatives to entering the lift, and JB explored the on-going idea of duality, and gender that emerged throughout the cycle, and connected this to the lift. Excerpt 40 illustrates that although the facilitator was not scaffolding the process, the

participants engaged in similar imaginative episodes as those experienced with the facilitator's intervention.

KK:	Yea, but the lift. I suppose we wouldn't need to stay in the lift at all. Just go in, press three & then end up on four
AM:	How do we do that?
JB:	A guy gets stuck in a lift & a woman appears

Excerpt 40 Imagining solutions for the limited access to the lift

The self-regulatory capacity of the group was further manifested by the intervention of ND who autonomously took over the facilitator role (Excerpt 41). The episode also revealed an unprecedented allocation of participants to characters, in very early stages of the story generation phase, even before the group had created the story. This reiterated the group's tendency to operate in convergent thinking mode.

ND:	Go next! Who's the main character?
DD:	Me!
ND:	Right DD. Does anybody else want to be the main character?
KK:	I think you really have to be the main character of this movie (addressing Daniel)

Excerpt 41 ND Scaffolding the group

The facilitator intervened in an attempt to bring the group back to divergent thinking mode, however, DD elaborated on his contribution, further operating in convergent thinking mode. Instead of contributing ideas regarding the main character, he provided a full story (Excerpt 42) as AL had done in *All in 24 Hours!* at the beginning of the story generation phase. The episode corroborated the group's tendency to gravitate towards convergent thinking.

F:	But wait on a second, if you say DD is the main character
DD:	I can be the very violent type
F:	That's fine but, what does it mean DD is the main character?
DD:	Say it's a street fight, I'm the bad guy who starts the fight, kills someone & runs away

Excerpt 42 DD providing a full story in the divergent thinking stage

Eventually the group oriented towards contributing ideas for the main character, and providing characteristics for the same. KK, the Scriber, captured the contributions on the script, and, for instance, she noted *Violent/Angry & Super fast*, and *Evil/bully*. ND played the facilitator role again, and encouraged the group to continue. However, she shared the role

with DD, who also asked leading questions (Excerpt 43). Besides reiterating the group's capacity to self-regulate, the episode highlighted the affordances of the Scripting Tool, and the public display that supported the group's self-regulation. The transparency of the medium invited participation, and the structure of the wizard supported participants stepping into the facilitator role.

ND:	That basically sums the character, doesn't it? Right, come on!
KK:	Because it can't be too complicated
DD:	One characteristic
ND:	He is weird

Excerpt 43 Alternation of facilitator role between ND & DD

The exploration of *The Bad Guy* story element provided novel contributions regarding the enemy of the main character. For instance, AM suggested the enemy was *"himself"*, DD and JB proposed *"everybody"*, and leading from this, KK contributed *"society"*. However, ND raised the issue of the difficulty with portraying those ideas in the DN (Excerpt 44). The episode illustrated the group awareness of production issues. This was not present when the group was at the same stage of the story generation in *All in 24 Hours!* In *All in 24 Hours!* awareness concerning production only started to emerge as the group viewed the DN in the making, and the movie editor provided feedback. Furthermore, DD and KK's interventions (Excerpt 44) discussed more specific production issues, such as whether to have a sign, or a dialogue. Although this behaviour was also appreciated during *All in 24 Hours!*, it emerged during the second week of the case, and only after the first version of the DN was created and viewed.

ND:	How are we going to show that?
KK:	Right, here is myself
DD:	Get a big sign over his head: society is against me
KK:	You can have someone looking at you & you would be like: *"what are you looking at?"*

Excerpt 44 Exploring production issues during early stage of the story generation

The participants continued to address the question of what did the enemy want. Given society was a possible enemy, KK suggested *"They want him to have regular hair"*. KK was fulfilling a double role: Scriber and participant; so her attention was divided. When she was more engaged in contributing to the Story Generation, she 'forgot' her Scriber role and did not note contributions as they were made. When the facilitator reminded KK to note her own contribution she wrote *"Want him to fit"*. The note was revelling, because rather than

transcribing the utterance, it captured the higher level idea underlying the intervention. As the conversation continued, KK elaborated her idea, and explained that what society wanted was for the main character to change, and be normal. DD then instructed her to write on the script *"/normal hair"* next to *"Want him to fit"* to clearly capture the concept. This collaborative use of the Scripting Tool to capture the common ground was modelled by the facilitator in previous workshops, and was adopted by the participants. The episode between KK and DD also illustrated the group's change in behaviour during this case. While in *All in 24 Hours!* the group's comments on the Scriber's notes predominately voiced disagreement, and requested changes, in *Streets of Rage* they were aimed at augmenting and clarifying contributions. Other examples besides DD's included: ND requesting that *"Smart"* was added as an attribute of the main character, JO asking KK to note *"Stop bullying"* as something the character wanted to stop, and DD telling KK to write *"different/violent"* as the reason why society did not like the main character.

When the group reached the story beats, the facilitator asked the group to consider what kind of shots they would have to convey the narrative intent of a beat (Excerpt 45). AM and KK provided contributions in which it was clearly observed they were imagining the scenes. Additionally, they both demonstrated some awareness of media language by addressing how different angles, and different objects contributed to conveying their narrative intent. The episode showed development on the part of the participants in relation to the activity, and the medium.

F:	So, what kind of shots do you think you may have? Just ideas
AM:	Like say out in the street; show him walking down the road from different angles. Say you have a shot of people walking by looking admired & staring at him as he is walking pass
KK:	I say make it kind from far away so that you can see people & then just blue hair

Excerpt 45 AM & KK imagining the story beats

Excerpt 46 illustrates a different dimension of the same phenomenon highlighted in Excerpt 45. KK also engaged in imaginative thinking to convey how people reacted to the main character as he walked down the street, however, she acted the scene. This type of acting episode was also observed in *All in 24 Hours!,* but in this case they occurred during the story generation, rather than after the story creation. The episode also evidenced how the participants used the DN activity, and narrative creation to bridge between worlds, the real and the fictional, and the internal and external.

KK: You can have a little kid to be like

(KK is acting the little kid part. She is pointing with her finger at the same time that she shows a surprised faced)

DD: You wouldn't even have to get people here to do that, like people stare at me when I walk down the road

AM: You can just ask strangers

DD: Stare at that one

Excerpt 46 KK acting a story beat during the story generation

Excerpt 47 exemplifies the group engaged in joint information processing by contributing additional information to each other's interventions, and filling information gaps. For instance, JB provided the action to be staged, and DD filled in the missing information by identifying whom the action was done to. KK took her peers' contributions a step further, and created and acted the dialogue for the scene. However, ND identified inconsistencies in their narration in terms of a logical sequence of events, and indicated the need for an additional character, which they had initially decided against.

F: What happens next JB?

JB: He attacks him. He gets angry

F: He attacks who?

JB: Someone

DD: The person who is staring at him

AM: The person staring

F: Someone who is staring at him & he

KK: He kind of snaps: "What are you looking at?"

ND: That person would have to retaliate. He would have to say something because lots of people are being stared at. So, this person would have to answer at or shut at you in order to have a fight

DD: Or while he is staring: *"Oh you freak!"*; or something

ND: Yea, in other words you are going to have to have a second character

Excerpt 47 Group joint information processing

After settling on three characters the group proceeded to create the beat in which the fight broke out. Excerpt 48 illustrates how, in *Streets of Rage*, the story generation became a collaborative acting, and narrative exercise. The creation of the story took place as the participants collectively acted, and personalised their parts.

JO: And someone comes in

DD: JO comes in and intervenes

KK: And he doesn't leave so?

JO: A boy comes in; I come in man.

A boy comes in and says: *"Why are you hitting a girl?"* and then he goes: *"Because I want to"* So, they start a fight and then he kills the guy, and he runs away

KK: Oh! He is shutting at the girl so the guy comes in and says: *"What are you doing?"* And then; Yea, OK

DD: "What are you doing?" Yea, OK

KK: So, he doesn't attack the girl; he just snaps at the girl

Excerpt 48 Acting the fight beat & repairing misunderstanding

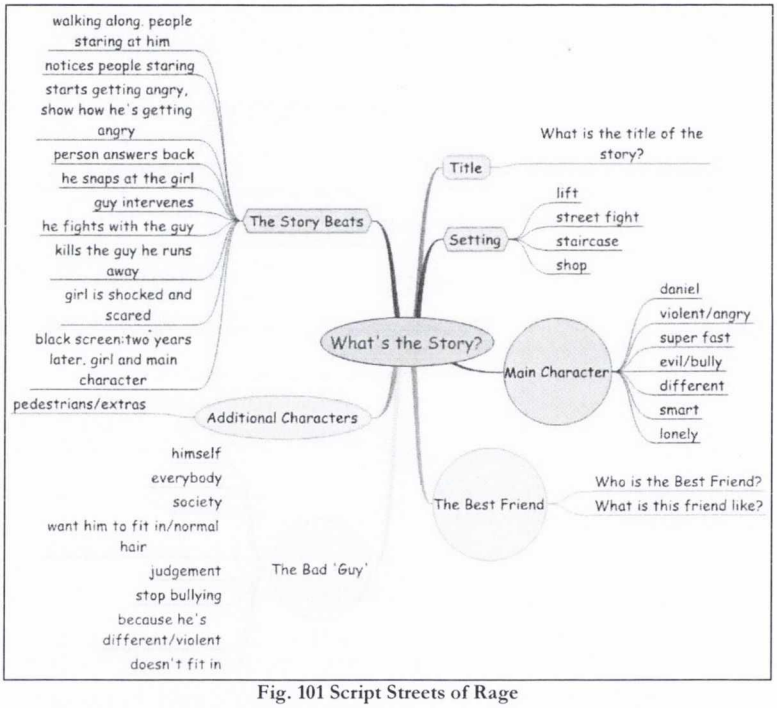

Fig. 101 Script Streets of Rage

The Scriber captured the group's contributions, and in a first instance KK noted on the script: *He snaps and attacks the person.* As the conversation developed, and the group elaborated on the ideas, KK modified the script to mirror the conversation, and reflect the group's common ground, writing *He snaps and attacks the girl".* In light of further developments in the narrative, and KK's understanding, she further changed the script ending up with two separate beats: *He snaps at the girl* (beat 5) and *Guy intervenes* (beat 6) (Fig. 101). KK had difficulties with articulating the following beat, and AM intervened *"He fights with the Guy".* KK elicited further information, *"Kills the guy?"* AM and ND replied positively, and finally KK noted on the script: *he fights with the guy* (beat 7), and *kills the guy he runs away* (beat 8) (Fig. 101).

The use made of the Scripting Tool by the Scriber, and the group demonstrated how it helped collect, and mirror the joint information development of the group and their collective narrative. Additionally, it was a shared artefact to guide, and ground the group's collaborative creative story generation.

The creation of the final beat also illustrated negotiation, and joint information processing. The participants m`oved from a position of disagreement towards KK's contribution, to firm opposite stands between KK and DD, to finally a consensus proposed by JO, in which KK & DD's suggestions were incorporated. The episode indicates that participants were more capable, and comfortable with this collaborative mode of narrative generation, and it clearly indicated development on their part (Excerpt 49).

KK:	And she goes: *"Nooooo"* And that is the end
AM:	No
DD:	She is there holding the dead body
F:	OK, you need an ending now
KK:	OK she just goes: *"Noooo"*
DD:	She would be there holding the body
JO:	The guy is lying on the floor & there is a screaming: *"Noooo"*
DD:	He runs away & she is there holding the body, screaming

Excerpt 49 Negotiating & reaching consensus over last story beat

At the end of the Story Generation, KK recited the narrative to the group to ensure the group's common ground, and to repair any misunderstanding, or make modifications if needed. In her intervention KK did not merely summarise the story, but, in her own way, and within her limited expertise and experience, she engaged in storytelling (Excerpt 50).

K: Anyway so, he is walking along so he kind of notices that he is different. People are looking at him and that is kind of showing that he is different as well. And then he is kind of: "Why are these people staring at me?" And he starts thinking that everyone is against him. He is getting kind of agitated and this one girl is kind of: *"Oh! The state of your hair"*. And that sets him off and he gets really angry and he starts shouting back at her.

Then this guy comes in & says: *"What are you shooting at the girl for?"* Because people do that. Then he gets really, really angry at the guy because he is already angry and he starts fighting with him and then he kills him and then the girl is all shocked and scare and then that end part

Excerpt 50 KK Telling the story to the group to ensure common ground

The labour division, and role allocation happened without incident, and the participants decided on what to do, considering the groups they were in previously, and the roles they had performed. The only difficulty experienced during the labour division concerned one of the mentors, CC, who suggested: *"Why don't they all go together & so they can sort the images with the sound"*. This suggestion was warmly welcomed by JB who argued *"Because we are short of people someone can do the acting & the talking"*. This episode highlighted issues regarding appropriate facilitation for the mobileDNA. In particular, it indicated the need for a deep understanding of the underlying pedagogical objectives, and design principles of the activities' workflow. Failure to understand, and implement these will result in an activity that, although entertaining, will probably not lead to participants engaging in collaborative creative processes. As illustrated by JB's intervention, when presented with the opportunity, participants will follow a natural tendency, and adopt less collaborative effort behaviour.

6.5.2 SHOOTING & EDITING STREETS OF RAGE

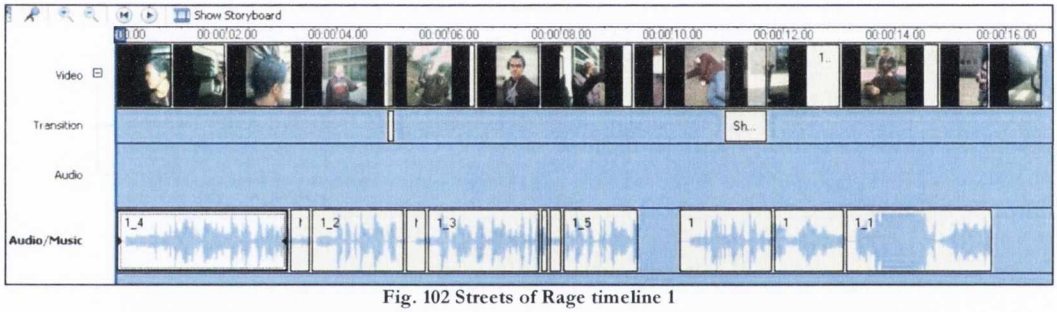

Fig. 102 Streets of Rage timeline 1

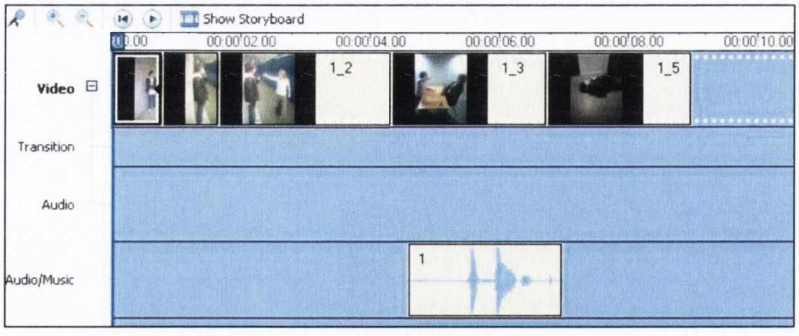

Fig. 103 All in 24 Hours! first version timeline 1

In total, during the Shooting & Editing Phase 43 images were delivered to the editor. Out of the 43 images, 6 were copies of other images meaning that in total 37 images were created. The duplication of images was due to two reasons: the multiple transmission of the same image via MMS; and the transmission of an image through two channels, MMS, and cable from the phone to the PC. By the time the groups were back in the EdS, the editor had received 23 images, and assembled 13 in the timeline (Fig. 102). The final DN used 23 images out of the 37 created. The Sound group created a total of 24 sound files, which included 4

general sound tests for the volume and background noise, 5 different versions of the scream acted by different participants, and a couple of versions of different dialogues. By the time the groups got back to the EdS the editor had assembled 11 sounds in the timeline (Fig. 102). The final DN had 13 sounds in total.

6.5.3 PRODUCTION & SCREENING OF STREETS OF RAGE

When the Image and Sound groups returned to the EdS, KK had an almost complete version of the DN. The difference in elaboration of the first version of this DN (Fig. 102), and its equivalent version of *All in 24 Hours* (Fig. 103) was overt to the naked eye. *Streets of Rage* had more images, and sounds, and had achieved an almost complete synchronisation between these two media types. The group's comments after watching the DN in the making indicated its completeness. The only critique regarding the coherence of logical events in the narrative was AM's (Excerpt 51). The facilitator's reference to missing images highlighted an issue encountered with MMS transfer latency. Thus, the delay experienced in MMS delivery from the time it was sent by the image and sound groups, to the time it was received in the EdS. In the instance illustrated by excerpt Excerpt 51, KK had not included the images (Fig. 104), because these had not been delivered. In effect, the inconsistency in relation to image and sound synchronisation highlighted by AM, did not reflect lack of narrative understanding by the editor. It was the closest possible media assembling she could achieve with the media resources available to her at the time of editing.

F:	OK. Let's see what KK has. Come on shows us. Shhhhh
FF:	Oh, that's brilliant!
F:	We have pictures missing
DD:	Yeah, punching & heads (Fig. 104)
AM:	There is a little problem. Just a little thing, just one thing. When he is saying: *"Don't talk to the girl like that"*; you see a picture of JO but then you see me on the ground

Excerpt 51 Group's feedback to the first version of Streets of Rage

Fig. 104 Punching & heads shots

An additional difference in the level of elaboration of *Streets of Rage* was the incorporation of visual transitions in the first version of the DN (Fig. 105 & Fig. 106). Although effects were used in *All in 24 Hours!*, the incorporation of transitions only occurred during the production phase of the second version of the DN. Furthermore, in *Streets of Rage* experimentation with the transition was observed since different types of effects, to those used before, *Shatter, in* (Fig. 105), and *Fade* (Fig. 106) were used. The differences observed between the two equivalent versions of the DNs (Fig. 102 & Fig. 103) indicated development of the group on a number of dimensions. The editor was more proficient with the movie editor. The group was quicker, and more efficient creating the story. Most importantly, it demonstrated a greater level of collaboration in terms of joint information processing, which led to an increased level of shared understanding. The foregoing was reflected in the media the group created, which portrayed a much clearer narrative intent. This in turned lowered the scope for multiple interpretations, and allowed the editor to understand where different media was intended to go within the DN.

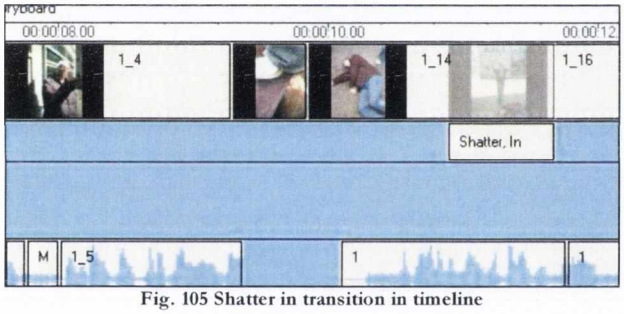

Fig. 105 Shatter in transition in timeline

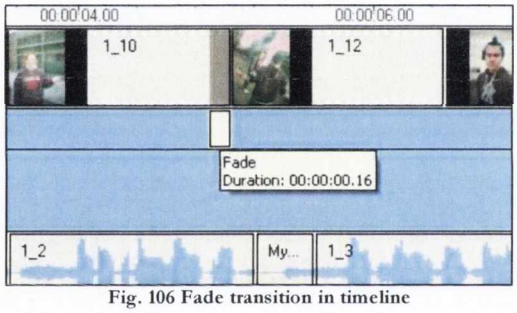

Fig. 106 Fade transition in timeline

6.5.4 IMPROVING STREETS OF RAGE

In week 7 the group decided to improve their DNs for the showcase taking place later on that same day. As KK was browsing through the different media folders to locate the images needed, RR spotted fight images that had not been used, and pointed them out to KK. KK proceeded to import these images from the folder in which they were, into the movie editor *Collection* (Fig. 107). The default view of the *Import file* window in the movie editor is *List* (Fig. 109) which provides the list of all the files available to be imported but does not display the actual images. Thus, unless the participants knew the file name of the media file they wanted to import they could not select the desire media from the list. When the import window displayed (Fig. 109), KK realised the difficulty in selecting the media, and proceeded to change the view from *List* to *Thumbnail* (Fig. 108 & Fig. 110). This provided a view of the actual images, and allowed KK and her peers to identify the media they wanted in a more intuitive fashion.

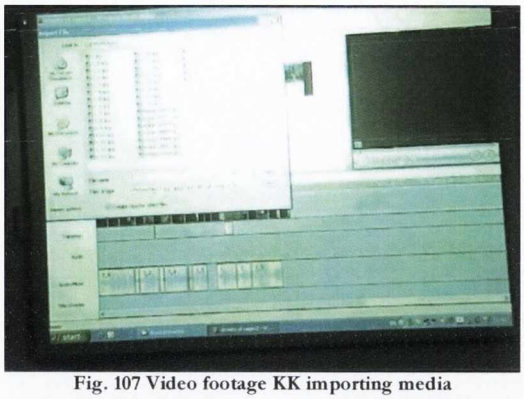

Fig. 107 Video footage KK importing media

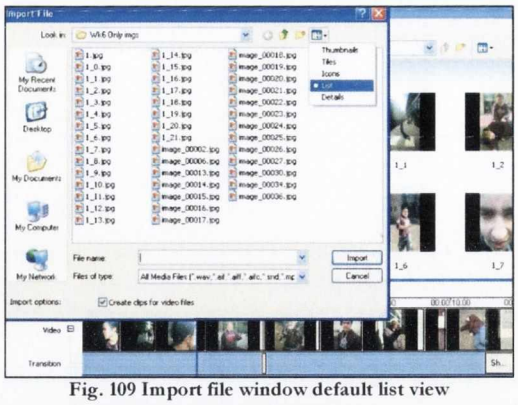

Fig. 109 Import file window default list view

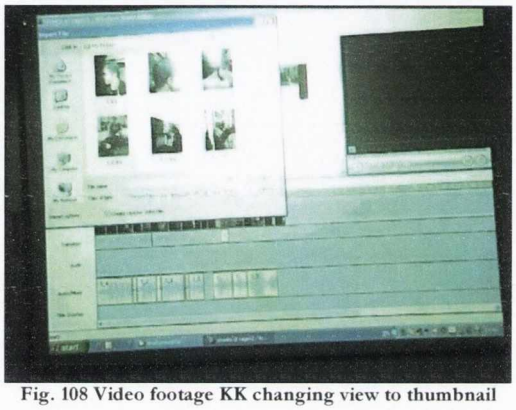

Fig. 108 Video footage KK changing view to thumbnail

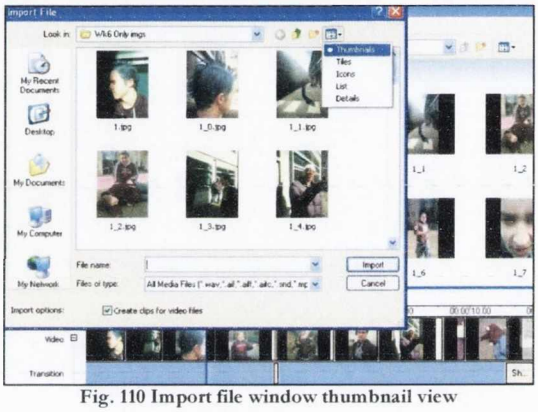

Fig. 110 Import file window thumbnail view

The episode illustrated how the participants engaged in information exchange when RR told KK where the images she was looking for were located. It also demonstrated instances of grounding embodied in the editors' actions. When KK changed the view of the import window from *List* to *Thumbnail* she adapted the content to the participants' knowledge level. KK understood that the *List* information was not appropriate for the groups' knowledge, since they could identify the image but not its file name, and modified it to something they recognised, and could work with. In fact, within four seconds of KK changing the view[29] JB, and AM were actively co-editing with her in the IWB.

JB:	The ones up there (Fig. 111). That one (Fig. 112)
KK:	Those are all in it though. It's these other ones that
(as she scrolls down in the image collection window to show her peers)	
RR:	Go up let me see that picture, / (slash) 4.
That one yeah (Fig. 113)	

Excerpt 52 Successful coordination between editor & participant at IWB

[29] video footage counter at which KK changed the view 0:24:41 and video footage counter at which JB and AM started co-editing with KK at the IWB 0:24:45

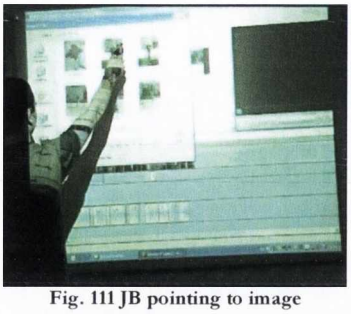
Fig. 111 JB pointing to image

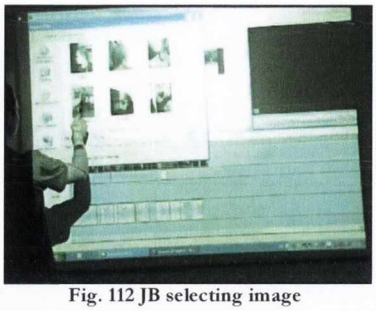
Fig. 112 JB selecting image

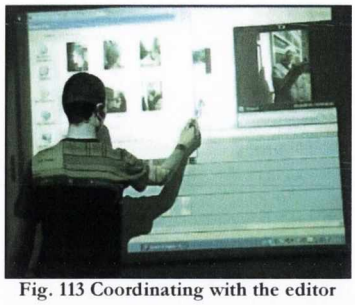
Fig. 113 Coordinating with the editor

Excerpt 52 demonstrated efficient, and successful technical coordination between the editor, and the co-editor at the IWB, in clear contrast with the interactions observed in *All in 24 Hours!* The episode illustrated how JB, and KK entered a reciprocal symmetrical partnership in which they were respecting each other, and joining effort to support joint information processing. Although Fig. 112 & Fig. 113 may mislead the onlooker, JB was not actually touching the IWB, or images with the pen but rather just pointing at them in order to ground his intervention and make it clearly understood to his peers. Unlike in earlier episodes with AL in which he interacted with the shared tools without providing prior notice to the editor, he developed alternative mechanisms to still support his interventions with share resources, but not take possession of them.

The language used by RR was also important, in that in order to ground her intervention she used the file name '/4' (meaning _4) (Excerpt 52). Although JB understood RR, which demonstrated she successfully used the information available to her through the public display to communicate with her peers, she did not use the language of the narrative. The episode exemplified how RR could still partake of the editing without sharing the language of the narrative. This was possible because the group was using small media units that were easily associated to story ideas. Additionally, the public display provided a scaffold for her, JB, and KK. After locating the missing images in the media folders, and importing them into the movie editor, the group was ready to tackle the editing of the fight beat.

JB: Are we doing the fight scene then?
KK: Yeah
JB: See, there is a picture of him (JB is sitting on a table in front of the IWB and point with his arm to an image on the IWB)
And then it goes to that one. So, put that one in there (pointing to the exact images he means in the IWB and the exact place on the timeline)
AM: Should we not start off with that one? No? (Walking to the IWB & pointing to an image)

JB: I know but look. Watch, because when you go from;

See, when you go from; let's see. Watch (selecting the image AM has pointed to & dragging in into the timeline) (Fig. 117)

And if we can get that one (overlapping one image over the next in the timeline)

AM: Yeah. Juts get them all to fade into each other

JB: Now. Just play that from there (pointing to the exact point in the timeline from which he wants the DN to be played)

Excerpt 53 Collective editing through verbal interaction & enactment of editorial suggestions

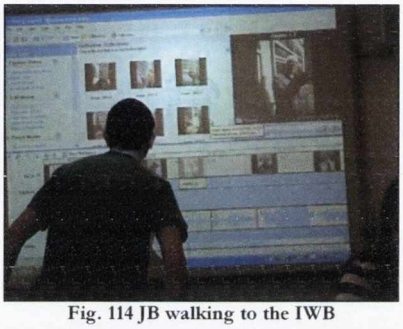

Fig. 114 JB walking to the IWB

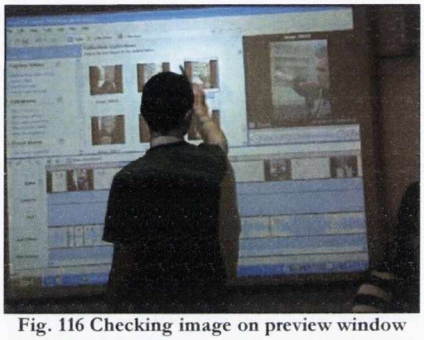

Fig. 116 Checking image on preview window

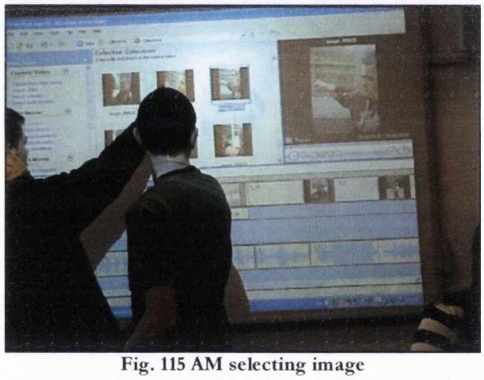

Fig. 115 AM selecting image

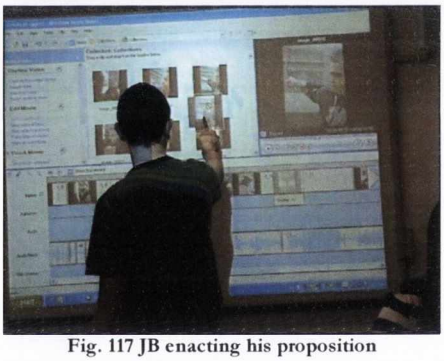

Fig. 117 JB enacting his proposition

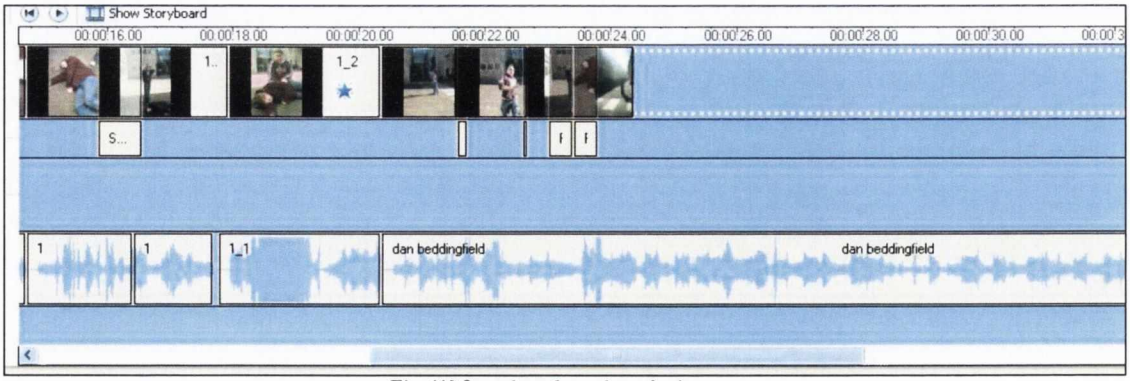

Fig. 118 Sound track too long for images

When the fight beat was edited the DN was complete, however, the group decided to add a sound track. When they dropped the recording on the timeline, and played it they realised it was too long for their images (Fig. 118). AL suggested doing credits to fill in the

'missing' images space, and the idea was warmly welcomed by her peers and executed (Fig. 119).

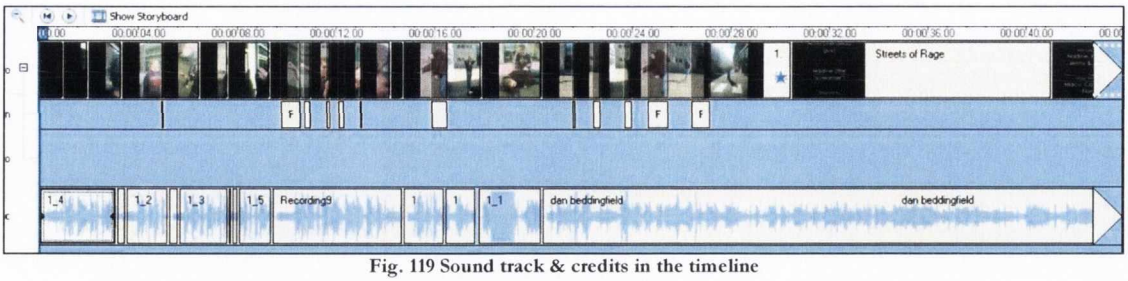

Fig. 119 Sound track & credits in the timeline

When *Streets of Rage* was completed with the sound track, and credits, KK screened it for the group, who gave it a big round of applause. The group's sense of pride, and achievement in the DN, in which they had complete ownership, and for which they were completely responsible, was strongly felt. Comments such as *"It is the Best. I love this one"* by RR, *"...very proud"* by ND, *"Yeah, I'm really proud of this one"* by JB, and *"Yeah, I like specially this one"* by JO indicated as much.

6.6 THE DIARY ROOM

In order to capture the participants' perspectives, and opinions in an unobtrusive and progressive manner, a Diary Room was implemented. This involved the participants recording video face-to-camera comments on the DN activity at the end of each weekly session.

The Diary Room procedure was simple, and only partially structured: the participants were asked to comment on their experience, and the use of the technology. The Diary Room was available to the participants throughout the entire session cycle, and they were free to enter it at any time. However, participants only used it at the end of each session. Though the Diary Room was optional, every participant made use of it at the end of each session they attended.

The actual Diary Room was a small independent office situated within the Digital Narrative room. The door to the office had a circular glass window (Fig. 122), which was covered to preserve the participants' privacy while in the room. The office was furnished with a desk, an office chair, book shelves, and a whiteboard mounted on the wall behind the chair (Fig. 120 & 123).

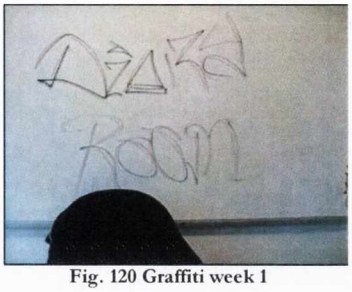

Fig. 120 Graffiti week 1

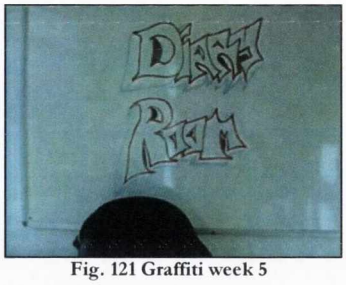

Fig. 121 Graffiti week 5

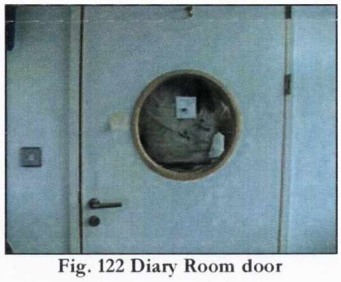

Fig. 122 Diary Room door

6.6.1 THE DIARY ROOM WEEK 2

During this first session, the participants mainly commented on social aspects in relation to the group, and group members. In general, they were all happy with the experience, they felt the group was good, they liked the people in it, and thought they were getting on well. Some participants mentioned initial shyness, and not knowing the people as aspects affecting their behaviour, and interactions within the group. JB said that coming to do DNs was: *"...better than staying in bed"*, and even those participants such as JO, who had not selected the DN group as their first workshop choice commented positively on it: *"I thought it would have been rubbish and I wouldn't have got into it. But eh I'm getting into it"*. All the participants commented on how much fun it was, and on how much they were enjoying the experience. AM already on the very first day said: *"you know I'd like to do something like this again"*.

In relation to the Story Generation activity the participants' opinions were contradictory. While JB thought that: *"Everyone has their own say in the thing"*, and AM highlighted the collaborative nature of the activity, and how his peers helped him (Excerpt 54), RR thought that only two people had a say on the story (Excerpt 55). Although JJ did not comment on the level of input different participants delivered, she did refer to the actual story the group created: *"...I didn't really like it. I hope I will be able to do one of my ideas next week"*. The comments made by JJ, and RR indicated some level of discontent with the activity, but most importantly they illustrated that both participants would like their ideas to be incorporated, and executed in the DNs. Although their comments can be regarded as natural, in that everyone would like to, and should, have an input into the story, they may also indicate a lack of awareness regarding the need to negotiate, and reach agreements when in team work situations. Contrary to RR's perceptions, the transcripts of the Story Generation Phase clearly illustrate RR's contributions to the narrative.

AM: When we were coming up with the ideas for the film well I mean everyone listened and they helped expand on ideas, any ideas I had. So it was easy to come up with what we wanted.

Excerpt 54 AM commenting on collaboration during the Story Generation

> RR: I kinda got a bit pissed off earlier on with the fact that people were throwing in their ideas and when they says their ideas they wouldn't go up. But yet like there was people, certain two people that just kept throwing ideas and they were going up, it was basically, the whole story is based on, its basically their story.

Excerpt 55 RR commenting on Story Generation monopoly by two people

6.6.2 THE DIARY ROOM WEEK 3

In week three the group continued working on *The Scientist* with the view to completing the DN. The group as a whole was productive with many images, and sounds created, and progress made on the assembling. However, the participants' comments did not reflect a sense of achievement, and indicated that they were aware the group was not going to complete the task. The comments by KK: *"Eh, kind of know the film won't be finished"*, DD: *"...we are not sure if we are going to get the film finished"* and RR: *"I don't think that we are actually going to be able to finish it by today because there's too much to be done at the moment and we need more pictures"* demonstrate this awareness.

The participants also made comments in relation to the actual activity, the media, and tools they were using to create the DNs. DD voiced a preference for the medium of video *"I'd like to use digital cameras for our movies"*, but was aware of its downside *"...I know if you had a digital camera it would take forever..."*. AL, in a similar vein thought, posited that they should use video because *"...the still photos are a bit, just dumb, if they ran in it would have been more interesting and stuff"*. However JO, who was editing, identified the challenge of the medium, and labour division *"...the sound wasn't recorded at the same time as the image so it was kind of hard for me to put together."*, and the interdependencies these bring about *"So I needed someone there to tell me where, which pictures were in order because I mixed them up"*. DD instead, highlighted how the actual editing contributed to team work *"...like instead of using just a video camera to make the film, that putting the pictures actually helps everybody work together as a team..."*.

On a social plane, the participants commented that they were getting over their shyness (AL), getting to know each other (JB), and getting on well with everyone (AM). The participants also felt that although the technology was all new they were *"...starting to get to grips with it"*. In terms of the actual activity, what they were intended to do, and how, DD stated that *"everyone is progressing so I'd say like now that we know what we're doing we should have it done by next week"*.

The Diary Room sessions of week three leave little room for imagination. The participants clearly identified the challenges, and the resources available to them to overcome these. They evaluated their performance, identified the reasons leading to the unsuccessful completion of the task, and put forward solutions to tackle the problem. In addition, they

highlighted the need to become familiar with the technology, the workflow, and the social environment.

6.6.3 THE DIARY ROOM WEEK 4

In week four, the group started *All in 24 Hours!* The comments made this week were in clear contrast with those made the previous week. Overall the participants felt that this workshop was *"...so much better right...we're having a lot more fun with it, we're experimenting a lot more. We have a new story and everything else so it's a lot better"* (AL). KK agreed with AL, and they both stated the same reason for it being better; it is *"...more fun"*, and overall, *"...we know exactly what we're doing, we're working together a lot more as well" "...the group is working a lot better together"*. The greater understanding of the activity was mirrored in the kind of comments made by the participants. These were focused on aspects of the task such as the roles they played *"I was doing a very different job, I was putting the whole thing together"* (DD), *"I took over the pictures"* (JO), the tools they used, and the implications of these for the fulfilment of the tasks.

Regardless of the improvement in the group's work procedure, and performance *"...this week we've done what took us two weeks to do last week"*, DD's comment indicated that there was still room for improvement: *"I was putting the whole thing together and when everybody came back we realised we were missing a lot of stuff, a lot of pictures, a lot of audio."*. To this end, JO, and ND respectively indicated the areas to be addressed: *"...we mess about too much, it's not getting the work done", "work a little bit harder and stop the messing"*.

In relation to the tools used, AM underlined the steady improvement regarding their utilisation *"I'm getting more used to using everything like the technology, the PDAs which are pretty cool"*. KK pointed out difficulties with the MMS *"...kind of annoying because when we were trying to send, I'd send like six of them and DD got two so mm that's not really, its just the network or something"*, and ND pointed to challenges with the phones *"the teachers are great, technology yeah can be sometimes when it does freeze on us.* On the positive side, JB referred to the Scripting tool, and comparing the experience of creating a story with it, and without it, during one of the initial cases studies in which he participated, he said *"I think that's handy for getting all our ideas down because last time we were only writing them down on a piece of paper and nobody really knew what we were doing, now it's a bit more coordinated and we know pretty much exactly what we're doing, I think that's handy."*

On the social plane, the group's cohesiveness, and accountability started to emerge. For instance, JO commented on how the group was coming together *"I feel the group is getting used to what they do and getting used to, all getting used to each other and being around as well";* while AL, and ND explicitly mentioned the absences of RR *"ND is here and poor RR is sick"; "This week*

RR is not here, she's horribly sick. But I miss her". In this regard, ND in her intervention stated her absence the previous week, and explained the reason why she was away *"I wasn't here last week, I was sick".* Interestingly JB mentioned the effect the experience had on him *"I seem to kind of change personality when I get in here, become a bit more probably funnier, not smart, not being rude or anything but just general funny, like people think I'm funny, which I think is great, I'd like to be like that all the time".*

6.6.4 THE DIARY ROOM WEEK 5

In week four, the group had successfully completed *All in 24 Hours!* However, after viewing, and evaluating the DN, the group realised their production did not successfully convey the intended narrative, and agreed to attempt improving it the following week. Week 5 was then dedicated to reworking *All in 24 Hours!*

The commentaries of the participants did not provide any details in relation to the experience. The initial hype illustrated in the first Diary Room sessions seemed to have faded away. The comments in relation to group work, and coordination or lack of it, loomed by their absence. The participants seemed to have reached a comfort zone in which the day was marked by the seamless, and 'uneventful' creation of the DN as suggested by AM *"Right, we are almost finished the second movie but its going pretty well, got a load of new pictures, a lot of audio, we put it all together. That's really it",* and JB's comments *"But the rest of the day, surprisingly enough, the rest of the day was pretty easy".*

6.6.5 THE DIARY ROOM WEEK 6

The last Diary Room session took place on week six, the second last week of the programme, and the week before the Award Ceremony. At this stage the participants had created two stories, *The Scientist,* and *All in 24 Hours!*, started three DN projects, and completed two versions of *All in 24 Hours!* Their Diary Room comments leading to Week 5 reflected steady development of the participants' understanding of the task at hand, the workflow, the labour division, the interdependencies among the groups and group members, the need to coordinate their efforts, talk and work together, the familiarity with the tools, and their ease on a social plane with other group members.

The general tone of the comments left in the Diary Room in Week 6 was very positive, and for the first time the participants made explicit references to their overall progression as illustrated by KK: *"...it's been good and we've come a long way and it's a lot better"* and JB's comments *"...this is our 2nd last week now and there's after been tremendous changes from the first week we came in here...".* Also, the first occurrences of evaluation of a single production took

place. All the participants except DD compared the two versions of *All in 24 Hours!,* and were quite articulate in doing so. For instance, AM (Excerpt 56) referred to the progression from a 'mechanical' production process: creation and assembling of media; to a thoughtful process of storytelling, that required participants to pay attention to the creation of each individual media piece, and their holistic configuration.

> AM: we finished our second movie. It took a while to get that done properly because for the first shot we just weren't thinking. The shots, it was all just one shot and then onto the next one, then when we started to take it from this angle it was going to different places, going outside, doing a lot more dialogue and its after turning out great it is.

Excerpt 56 AM articulating their development from not thinking when shooting to thinking

ND (Excerpt 57) insinuated similar issues when she described how they followed the procedure, and created a movie, but it did not work. She referred to the mismatch between the story they had created during the Story Generation phase, and the story, or lack thereof, conveyed in first version of *All in 24 Hours!* ND's comments also illustrated an increased awareness of the medium, and how this may be used to convey narrative intent. Both, AM and ND, referred to the moment of realisation: it is not working. The foregoing occurred during editing, when the media types created by the two groups came together. Furthermore, ND explicitly articulated how the learning was taking place: *"from our mistakes".*

> ND: Well, about 2 weeks ago we done a movie and like it was about a guy getting caught smoking drugs outside a job but like it just didn't work because what happened was like we made a movie, everything was grand but when it came to the movie it just didn't work. So we had to do re-do the film but as we re-done the movie we actually seen from an audience point of view and it was actually progressing really well now. We are actually learning very well from our mistakes.

Excerpt 57 ND articulating their kind of learning: from their mistakes

The evaluation of the second version of the DN, made by the participants who were involved in the 'remake' was 'validated' by JO (Excerpt 58), and KK who were absent that day. In addition to factors such as those mentioned in the previous excerpts, KK highlighted a fundamental factor: effective collaboration between the image and sound groups (Excerpt 59). Although not explicitly articulated, her statement necessarily implied a third player in the successful collaborative endeavour, the editing group.

> JO: But the one that was re-done of the same story line was much better, we had more images and more details to it. Even without the sound you could understand what was going on so I feel it was better than the first one anyway

Excerpt 58 Understanding story of DN even without sound

> KK: The last time I was here we did that movie that we made, that they made last week but they make it again, and they make it a lot better. I'd say they would have had to work with sound and pictures and stuff really well together.

Excerpt 59 KK articulating collaboration as reason for success

The collaboration was not effortless as illustrated by JB (Excerpt 60). However, it was successful in the end.

> JB: Like DD and ND were just getting, getting on my nerves because they weren't focusing they were the two lead characters and I was taking the pictures and they wouldn't have sit down and do it, you know what I mean. They wouldn't do it, I was going to lose my nerve but I didn't, I'm pretty good at keeping calm. But I began to get frustrated but in the end we did get it done.

Excerpt 60 JB describing an effortful collaborative interaction

DD and JB highlighted additional factors at play during the workshop, their level of independence, and ownership of the project. DD thought it was *"...a hell of a lot different than the rest of the weeks because we all went out without the help of FF and CC helping us."* His comment was charged with underlying connotations since he had mentioned that the researcher CC always told them what to do when creating *The Scientist.* JB had a partially contrasting view of the level of independence, control and ownership they could successfully deal with, and argued that the group did not successfully complete the first version of *All in 24 Hours!* because *"We were left on our own....I think that was the problem".* However, he too demonstrated willingness, and readiness to take on responsibility, and full ownership *"I think now is probably the right stage to let us go on our own and see what we come out with".*

At a social plane, the group was formed, normed, and established *"The group, we get on really well and like we are kind of being friendly, people that didn't know each other before"* (KK). Although the membership's 'rights, and obligations' were not explicitly articulated, implicit 'rules' applied. For instance, accountability towards the group, and the work to be undertaken under this obligation emerged in JB's comment (Excerpt 61), where he explained the difficulties encountered due to the absence of three members of the group. In addition, DD described the implicitly acceptable behaviour, and what this entailed *"Nobody is messing, like we all still have a laugh but like still we get the work done".* And finally, ND reported on how failure to adhere to the rules impacted the group's performance *"I like RR...she's a great bit of craic and all but with her not been here this week we are all pulling together, whereas when she's here it's not that we are not pulling together but like there seem to be a bit more messing going on"*

> JB: We needed people, extras, I was kind of in charge, there was about 40 students coming out of the building right beside us, they didn't like.... 1st year or

> freshers or whatever. It was just like would you like to take part in this small movie and they were like, no, get stuffed, no offence. So we were a bit short on extras so a few people who weren't in today kind of let us down, JJ, RR and AL.

Excerpt 61 JB on group members' accountability

The increased awareness of the members' accountability towards the group, and regarding the fulfilment of their duties and roles, were further suggested by the explicit association of participants to roles made by ND *"I've worked with DD and JB this week"* (Image Group) *"KK is on the computer putting the film together now...We are all really pulling together"*. Furthermore, accountability, and responsibility are also indicated by JB's comment in relation to time keeping, and being able to complete tasks on time: *"...we got the audio done within 45 minutes... the visual group was, well it was out for a similar length of time they got every picture they needed...1.25 and we have to be out by 2, loads of time.."*

6.7 THE INTERVIEWS

In order to explore the participants' perspectives, two data collection tools were implemented: the Diary Room, and individual interviews with the participants. While the Diary Room provided an ongoing unstructured commentary by the participants, the interviews were conducted at the end of the seven week Digital Narrative experience. They were semi-structured, and aimed at collecting the participants' opinions on a number of concrete aspects relating to the mobileDNA approach. The analysis of the interviews aimed to understand whether the participants felt the mobileDNA supported them in engaging in collaborative creative processes, and if so, what elements of the approach helped them, and how. The broad areas identified in the interviews were: The Social Plane; Accountability, Ownership, and Interdependencies; Workflow and Labour Division; The Stories and the Scripting Tool; Media, Shooting & Editing; The Technology; and The Learning Experience.

6.7.1 THE SOCIAL PLANE

In the Diary Room recording, the participants made numerous comments in relation to the social interactions that took place during the DN workshops. These were particularly focused on the participants' impressions of their peers, likes and dislikes, and their perception on how they were getting on as a group. While the Diary Room commentary seemed to provide weekly snapshots of their social environment, in the interviews the participants made a retrospective analysis of the social group formation process. Comments regarding personal experiences were few and only in reference to the very beginning of the experience. For instance, KK recalled her initial considerations: *"God, I don't want to get up on Saturday mornings and have to go up for like in six weeks or whatever, but then after the first day, I was like, ok, well this isn't*

that bad at all." The participants agreed that they had most problems at the beginning because they did not know each other as AM put it: *"I was kind of nervous because I didn't know anybody…I was a bit quiet and I didn't really say too much at the start because I didn't know anybody".* Their comments unanimously recognised the need to get to know each other, and become a group prior to being able to function efficiently, but once they did, the results were overt. AM highlighted peer-tutoring *"it was easier for us to talk to each other and you know give each other a hand and tell each other what to do and all"*, JB, improvement in group performance, and common ground *"…we work harder, we work quicker, not quicker but we all kind of understand each other and so we kind of say ah yeah I know what you're talking about instead of trying to explain word for word…"*, and DD, collective creation, and most importantly, collective recognition for the work done *"…you can say like; ah, yeah, we all did this together as a team… So, everyone gets like an equal praise for it."*

There is sufficient evidence to assert that the group did form, and that overall the participants had a very positive experience being part of it. Their Diary Room comments, and their interviews reflected that the participants felt an intrinsic element of the group, and they perceived their group environment to be equitable. However, the interview with RR further ratified her contrasting views in this regard. As already highlighted in one of her Diary Room commentaries, she did not feel part of, accepted or liked by the group. What could have been a single snapshot in time portraying reflections on an isolated event, emerged in the interview as RR's overall perception of her relationship with the group. RR reiterated her belief that other members of the group had more say than her during the Story Generation phase. She asserted that her peers did not listen to her, and that she had no input into the stories. However, when elicited to outline the ideas that she contributed to *All in 24 Hours!* she listed a number of ideas, she articulated how her ideas contributed to the narrative, and how these were incorporated in the final DN. Furthermore, she described the collective idea creation process with her peers (Excerpt 62).

F:	Which ideas did you give?
RR:	About the drug part, make it quite obvious they are in a bathroom, make sure people stood at the door, and take the hall, when she was running off, make it look like she actually has the money.
F:	So you gave all those ideas.
RR:	Yeah
F:	And do you think those ideas are in the film.

RR:	Mm yeah
F:	Mm, very good, do you think they made a difference to the film.
RR:	It kind of helped with the story line. Like helped you understand the story.
F:	Okay and where did you get all these ideas from?
RR:	Because it was just me and AL, yeah she was, and JJ, and we were just talking. It was the three of us that came up with them.

Excerpt 62 RR Outlining her contributing to the stories

During the interview, RR described her embarrassment when contributing ideas, and how *"...expressing me feelings and expressing what I wanted to do. I just thought that was a bit hard to do"* She mentioned how she did not *'get into it'* as much as the others, because she was *"a bit held back"*. RR admitted that *"...sometimes I wasn't bothered. Other times I did, it was really dependent like on everybody else"*. RR's overall evaluation of the group's development was: *"I wouldn't say working better as a group but we were working better just at the film"*. She felt she did well at trying to *"...get along with one another"*. RR's group experience was without a doubt influenced by the events that took place during the actual DN workshops. Nonetheless the reasons behind the difficulties that emerged, which inhibited her affiliation to the group, could have been related to her broader social context, and the perception that her close circle of friends had of her participation in the DN project. Her comments, extracted from the *All in 24 Hours!* case transcripts, regarding the reaction her boyfriend would have if she invited him to attend the Award Ceremony seemed to point in this direction (Excerpt 63).

RR:	My fellow would laugh at me if I asked, he would. He laughs at me for coming here every day

Excerpt 63 RR's boyfriend opinion of her participation on the DN project

6.7.2 ACCOUNTABILITY, OWNERSHIP, AND INTERDEPENDENCIES

A related theme to the Social Plane that emerged from the interviews was that of personal, and group accountability, ownership of their process and products, and Interdependencies among group members, tasks, and resources.

During the interviews the participants described the activity as *"...tough but 'cos of the challenge and toughness it was a lot more fun"*, and they understood that the challenge required a certain attitude from them *"...you had to be responsible"*. Their level of ownership over the process, and product was also evident from the comments made. For instance, DD recalled the disappointment felt when they did not complete the DN and the need to *"pull up our socks and pull our own weight like to get the movie finished, or else we would have nothing for the end"* (referring to the Award Ceremony). DD also described the opposite feeling *"Yeah, it's a great satisfaction,*

like knowing that you finished it." Although all the participants indicated the importance, at a personal and group level, of accomplishing the task, RR had a slightly different opinion, and stated that not completing the DN *"...didn't bother me"*. This kind of comment reflected detachment on her behalf and little ownership.

The interviews highlighted two distinct attitudes regarding the participants' ownership of the process, and products: lack of ownership and ownership. AM's comments illustrated this point *"...our first one...we weren't really sure what like of everything we needed. Now when we done then 2nd and 3rd movies...we knew what we wanted and we knew like what kind of pictures and like what audio we needed, so it was easier to put them together"*. The level of ownership was influenced by the degree to which the story was the participants' creation, as KK revealed when commenting on the collective story creation *"...in a group of people that come up with the story, it's better, like everybody puts their input in cause then everyone likes it as much as everyone else"*. The difficulties highlighted by AM regarding ownership of the first DN, *The Scientist*, may have been related to the fact that one of the mentors CC had strongly influenced the storyline.

Though the identification of the starting, and end points regarding ownership are in itself interesting, the participants' reflection on how they progressed from one to the other are more so. It seemed ownership came about through the realisation that the work needed to be done, and that it was their responsibility to get it done, as AM indicated *"...when you gave us the camera and sent us off... we got a bit hyper and all messing... after we did all that we all just, we kind of calmed down, we just sort of come together and we just say to each other right we have to start this now, we have to get it done"*. Nonetheless, the participants' understanding of their roles and tasks, and of the implications that not fulfilling these entailed, played a major role. Even RR demonstrated awareness of this *"Yeah it was coordinated because what I had to do had to fit with what other people had to do because they were all working as a group"*. RR described failure to do her part as being *"... major like"*. DD and AM, respectively, provided clearer articulations of 'major' indicating the interdependencies among the participants, and the groups *"...without one person doing a certain thing then the other, maybe another person wouldn't be able to do their part"*, *"Well if one of the groups didn't work well, well then we'd have to like wait for them..."*. Indication as to other factors influencing accountability, and ownership were provided by JB, who highlighted the need for someone to take leadership *"I don't think anybody decided to take leadership, but then we were all just kind of floating about"*.

6.7.3 WORKFLOW AND LABOUR DIVISION

The mobileDNA workflow, and labour division are specifically designed to create interdependencies among groups in order to bring about collaborative interactions. The interviews revealed how these interdependencies were overt to the participants, and how they contributed to bring about a sense of accountability, and ownership in the group. Seamless and successful workflow is conducted by group members that collaborate in accomplishing a task. However, a prerequisite for this to occur is a clear understanding on their behalf of the actual workflow, and their function within it. Awareness of the workflow, and labour division is highlighted in the participants' comments, when, for instance, they referred to actions occurring in parallel (shooting: image and sound creation, and editing).

In two concrete occasions throughout the seven-week DN project, the participants, and one of the mentors had clearly suggested an alternative workflow, and labour division. During the first session of *All in 24 Hours!* the participants argued that it was best if the images, and sounds were created together. Instead, during the first session of *Streets of Rage* it was CC who suggested that the groups worked together during the shooting stage. Regardless of the facilitators' negative reaction to the participants' request, it transpired from the transcripts, and media created that for at least part of the shooting of the first version of *All in 24 hours!* the groups created media together. Against this background, the revelations made by the participants during the interviews were very gratifying, and encouraging in that, through engaging in the mobileDNA, they too had come to realise the importance of its workflow, and labour division.

AL referred to the amount of work, and difficulty of the work, and how this was eased *"The amount of work you had to do it was a lot better to have a group and have different people get different things and it's a lot quicker to do it and it makes it a lot easier"*. Time saving seemed to be a recurringly cited benefit of the labour division, which was intrinsically associated with the mechanism used for the media transferred, MMS. To this end, AM described the Shooting and Editing phase workflow as *"one person getting them put in there but we were all like off..., taking the pictures, getting the sounds and sending them back here like you know we didn't have to keep going back and forth, wasting all the time"*. AL provided her own explanation of how the mobileDNA was transferrable to situations beyond the outreach programme *"... well if you're in the middle of town and then your base is back in the house it's gonna be a lot harder to, it's gonna take a lot longer to go into town and take pictures then come home and then edit... it's a lot easier cos you just send them back and they sort it out for you"*. In the same vein, KK imagined a different scenario, *"Well, you can go off*

wherever you want really and just send whatever pictures back, because it doesn't make a difference if, you can be in England and you're sending pictures back to here, if you wanted to".

In describing the moment in which the three groups reconvened in the EdS, after the Shooting and Editing Phase, JB provided a somewhat naïve, though perfectly accurate, accounting of events *"Well, nearly by the time you're finished taking pictures, like someone already has most of the stuff on the timeline, it's just a matter of adding it on if it's being sent or last minute adjustments".* He failed to mention the difficulties with media mismatch underlined by KK *"...sometimes it was hard because the sounds were different from the pictures and you couldn't really fit the pictures in...",* and the importance of knowing the storyline emphasised by RR.

6.7.4 THE STORIES AND THE SCRIPTING TOOL

One of the main tenets of the mobileDNA is an agile approach to collective DN creation, in which flexible scaffolds and structures are provided to support creativity, and collaborative interactions. The mobileDNA encompasses an entire media creation process, from idea generation to final production, and foresees the involvement of the entire group during all phases of the process. To this end, the interviews attempted to gain an understanding of the extent to which participants felt that the narratives created were truly collective. They also aimed to discover the participants' opinion on the role the Scripting Tool played in supporting the narrative process. Areas of particular interest were the degree to which the Scripting Tool supported divergent, and convergent thinking, and enabled the participants to establish a common ground regarding their emergent story.

The interviews illustrated an overwhelming consensus among the participants in relation to the usefulness of the Scripting Tool to create stories. They emphasised the importance of having a unique, and central placeholder to focus their attention, as JB described *"So everyone is focusing on the one part and no one's like gazing off like, like when you're looking at one point, every one can hear the person speaking...",* because according to AM *"...it's easier when you can actually see what you are talking about".* In particular, JB, who had participated in one of the initial cases, when the Scripting Tool had not yet been implemented, provided a good comparison of the two experiences (Excerpt 64);

F:	If you didn't have mind manager, to come up with your ideas and to kind of create the story line, what do you think would happen?
JB:	Well we didn't have mind manager last time.
F:	Yeah, and what do you think happened then?
JB:	It was kind of messy.

F: Messy.

JB: We were kind of scribbling it down on pieces of paper or on a board, on a white board, and it was like going everywhere, we knew what we were doing but it wasn't as clear and we didn't have copies to kind of look back and see 'oh that's what we're doing next', like it's kind of handy actually glancing at the page that we worked on.

Excerpt 64 Comparing the Story Generation with & without the Scripting Tool

The value of the Scripting Tool extended beyond its capacity to visually capture, and centralise the ideas contributed by the participants. It actually structured, and guided the participants' ideation, and story creation processes, bringing them from divergent to convergent thinking. This is evident from the participants' descriptions of what happened, how they first pooled their ideas together, and then selected them; *"You didn't just go out and find your one idea and do that story you had kinda loads of different things..."* (AL), *"Because you are able to just put everybody's different ideas all together so you can look over them and you know try and decide which ones are the best or which ones go together"* (AM), and *"...everyone kind of put down their own ideas, so we kind of just chose or mixed them, so"* (JB).

In the interviews the participants described the nature of the ideas which range from *"... kind of immature"* as JB described his contributions, to *"...complex for people to do..."* (DD). JB further elaborated on the meaning of 'immature' *"...kind of making a joke...you kind of think back on them and they're kind of stupid, but people like understand"*. JB's comment reflects a willingness on his behalf to take risks on contributing ideas, but also awareness of the fact that his behaviour would be understood, and accepted by his peers. This kind of attitude, and environment is reported as paramount in fostering creativity, and is also in clear contrast to the attitude reported by RR during the interview.

In their reflections, the participants also emphasised the collective elaboration of ideas that took place once these had been contributed, and they underlined how it was much better to create a story in this way, because of the richness of the ideas available to them. For instance, AL articulated the limitations of individual story creation *"You do it on your own then you only have your own ideas and if you're kinda focused on one idea you won't be able to think of others but if you have a group then you have their ideas and other people's ideas so then they all come together rather than just your own little ideas on it"*, and AM related the way peers influenced each other's ideas, *"if I had an idea I would say to somebody you know and they would tell me like their views on it, and that might change your idea or make it better and all"*. Furthermore, they explicitly articulated how *"...you see the people's ideas and then they get ideas from that"* (KK). All the participants interviewed, except

RR, felt that everyone had an input in the story creation, and that the final story was, in DD's words, *"All ideas like, were kind of moulded into one, so.*

In relation to the Story Template, which they had strongly opposed during the first session, the participants had mixed views. They came to terms with the fact that they did not *"actually realize that the story is the setting and all the characters until you do that, when you're brainstorming and doing all your mind maps and all the questions you realize you are making the story we just, we were in denial"* (AL); and that *"It was easier to do those kinds of stories, like knowing to find like, to choose the main character and then, all the other things before making up the story..."*. However, they also articulated the desire for alternative templates that would allow them to explore story creation in different ways.

The guidance the Script provided was highlighted by KK *"...not mixing all the beats up, you know exactly which part comes first and what happens next and then after that"*. In addition to providing guidance regarding the sequence of events, KK articulated how the Script provided 'detailed' information on *"what to take the picture of and what the sound needed to be and, where they needed to be and what needed to happen and things like that"*. To an outsider's naked eye, the Script would probably not provide that much information; however, for the story creators that was indeed the case. Instead, AL described the flexibility of the Script to cater for participants' input, even after this was agreed *"You knew the outline of the story and then once you had the outline you were able to put more of your opinion into it and make it your own story or make it your own film instead of just someone still in that point down on paper and then you had to make it or whatever."* AL seemed to point to the differences between the mobileDNA Script, and traditional film Scripts, where cast and crew are instructed on exactly what to do.

6.7.5 MEDIA, SHOOTING & EDITING

Another distinct characteristic of the mobileDNA is the media choice, namely, the use of still images and sounds, as opposed to video. The rationale of media choice is grounded on conceptualisations of collaboration, such as creating interdependencies, and implementing horizontal labour division. However, the media choice also has implications for creativity, and making moving media production accessible to participants, and facilitators with no prior media language beyond media consumer's level. The interviews aimed to gain the participants' opinion on how the media choice supported creative collaboration in the DN creation process. Insights into the mobileDNA process, the media production process, and the implications of the media choice for the foregoing were also sought in conducting the interviews.

It was evident from the interviews that the participants had changed their initial opinion regarding the creation of DNs from images, and sounds created by independent groups who did not work together during the shooting. During the first session the participants voiced their discontent with working independently, arguing that it was not possible to create the right media. However, during the interview AL described how it worked in actual practice, not only stating the procedure, but also articulating the creative process endowed by media mismatch (Excerpt 65).

> AL: Initially we were like no we have to be together to put the sound and the pictures together. Otherwise you'll end up with the wrong sound and then wrong pictures and everything but it was a lot different when we did it. It was, when we actually went out and we took the photos and we made the sounds, we came back and we put it all together, even if you made a sound for a picture and that sound didn't go with the picture you're bound to find another sound that would've gone with the picture so you could mix and match and everything you know and it turned out a lot better.

Excerpt 65 AL describing the creative processes involved in media mismatch

The realisation that the narrative intent was conveyed through both media in an independent fashion was highlighted by JO, who, in judging the second version of *All in 24 Hours!,* commented that the story could be understood from the images alone without even the sound. The opposite was also reported by JB, who, during the interview, recalled how they remade the audio for *All in 24 Hours! "...we decided to scrap every audio that we'd done and we started from the start again and we kind of just sat down and we looked at the sheet and we went nowhere near the image...".* Besides coming to understand that it was actually feasible to create a DN from images, and sounds created by different groups, the participants also become aware of the value of the approach, in terms of enabling participation. DD, who had had experience with a video project in his school, articulated the idea in the following way *"...it's one person to get the whole video, whereas if you'd have like, let say three, three other forms, everyone gets to do a separate thing, so everyone is, has input to it.".* In fact, in commenting on his experience in school, DD recalled it was not really fun because they were doing their projects, and one person was going around with the video camera recording. To this he added *"we couldn't get it all finished in one day, because we only had like double classes which is forty minutes a piece".*

When asked which was easier to do, video or images and sounds, the participants had a very clear unanimous opinion, video was definitely easier. KK articulated the idea in terms of being able to see more with video *"with the video, you get the sound and the movements and all, you can see more and it explains itself kind of"*, AM commented instead, in terms of it getting all done

faster *"You manage to get it all done faster...its just one big moving thing, like it all gets done real quick you know"*, and DD highlighted how video avoided the hardship of selecting each image *"...it's not selecting like separate images and put them all together, you have just one straight movie, and it's much easier that way..."*. It is precisely the point made by DD that his peers were underlying as the difficulty with still images and sounds *"you need to think about it more, the right position and all, the right pose and stuff"* (AM), and *"...cause you just have that one picture so you have to explain what's supposed to be happening and why that picture is on the screen..."* (KK). The difficulty not only arose at the editing stage as indicated by KK, but much earlier at the media creation stage as indicated by AM.

Regardless of the difficulties images and sounds presented, which in actual fact worked to the advantage of collaborative, and creative processes, the participants also articulated the advantages of the medium. Firstly, the overt and immediate feedback provided by the match or mismatch of images and sounds supported the development of the participants' understanding of the DN in the making *"...say if you are in the image group you will see what sounds people have got and then like you know you will see if your images go with the sound. If they don't like you know you will just have to work as a group to get it all"* (AM), and informed necessary actions *"Well, when we got all the pictures back we were like, this is where we close the door, and we were like, "oh, we don't have a noise for that"*.

KK's comment on the missing sound is very revealing, in that she initially stated *"We didn't think we would need like banging doors and things, we were just like, oh, we just use the voice"*, and subsequently remarked *"Um, the sound wasn't that interesting"*. The facilitator puzzled by this comment, enquired why, and KK replied *"You were just like sitting around the table just making the voices"*. KK was referring to the first day of the project when FF 'facilitated' the Sound group just as KK described. This raised serious questions in relation to the involvement of facilitators, or mentors who lacked awareness of core concepts at play, when teaching creatively, for creativity, or both.

Though the participants overwhelmingly referred to video as an easier medium with which to capture media, clearly indicating their naïve perception of moving media language, they recognised the supremacy of images, and sounds at rendering the procedural editing process less time consuming, and much more accessible, and achievable for them. DD described the concept like this *"I'd say it probably take you longer... Because there's a whole video and you gonna have to edit them, like to cut out certain parts and then run them into each other, so there's not a big gap in between them, whether if it's pictures you can put them beside each other so they actually run straight*

into each other, so there's no gaps". In addition to the actual editing process, KK highlighted the ease with which images and sounds could be retaken, and so did DD: *"Yeah, that actually did help us a lot, because the pictures, if we took the pictures and made a mistake, we could delete them and re-take a picture"*. He further elaborated the idea, articulating the implications of making a mistake with a video recorder, *"if we had a video recorder, we were recording it and if we made a mistake towards the end, we had to start the whole thing"*

6.7.6 THE TECHNOLOGY

The mobileDNA is distinct from other similar media production activities, in terms of the technologies it proposes to achieve the completion of the tasks, namely the Scripting Tool for the collective Story Generation, mobile phones for shooting and transferring media, freely available movie editors, and the public display to enable whole group participation. Although an IWB was used during the cases, this is not necessary in the mobileDNA. However, the IWB ended up playing a major role in enabling co-editing. To this end, the interviews with the participants attempted to gain an understanding of the role these tools played in enabling the collaborative creative endeavour. An additional objective was to identify difficulties the participants encountered with the tools beyond those observed by the researcher.

The advantages of using phones over video cameras, in terms of time saving, and enabling greater levels of group participation, were articulated in a previous section. However, during the interview DD further elaborated on the benefits of the phones in terms of being 'mundane' technology they were all acquainted with *"We're all used to using our own mobile phones…so it'd be much easier for us, than using like some high tech equipment"*. The almost universal access youth in Ireland have to camera phones was also highlighted by all the participants as an enabling factor to engage in this kind of activities. The interviews stated that everyone they knew already had the technology required. However, the use of the phones also presented difficulties, mainly related to MMS transfer. In general participants were annoyed by the delay in media transfer from the Image and Sound groups, to the EdS. Although they understood that the solution to the problem was beyond their control, and they found efficient workarounds, transferring the media through a cable connection directly from the phone to the PC, delay in media transfer had an impact on the successful completion of a DN in a single session. In addition to the foregoing, AM found a *"…bit confusing at first …the way you have to send them one at a time and all that"*. In relation to the same, JB described difficulties with media sending *"…backlogged"*, and with trying to do two things at the same time *"…when you're kind of taking a picture and then you try to send it at the same time it's kind of juggling two things, but if you get use to it…"*. From the Editor's perspective, using phones had the additional communication

advantages as outlined by KK *"...you know if someone is like taking pictures somewhere and they send them back and I go like; 'they don't really work, do something else', and they'll be like; 'oh, ok', and they don't need to come back and find out that and then go back out again"*. KK's comment referred to the potential phones offered to maintain, and repair common ground among distributed members of the three groups.

In relation to the immediacy of feedback endowed by the movie editor when assembling the two media types, all the participants underlined how seeing helped them understand, and create. For instance, KK ,and AM respectively, described seeing what did not work *"...You kind of just see what needs to be put in instead of what you've done..."*, *"...we saw what we were doing wrong and we just stopped like... we played it like we saw like you know we didn't have enough pictures..."*. Further elaborating on how the movie editor supported the development of their understanding of the DN in the making, AL pointed to the difference between the narrative they had created during the Story Generation phase, and its visual counterpart *"you have to watch to say well that's not working out. You have to change that cos if you don't watch it you don't exactly get the outside view"*. 'The outside view' being how effectively, or not they conveyed their narrative in a different medium.

The advantages of the IWB, and the data projector were intertwined in the participants commentary; however, it was clearly articulated that they enabled collaboration in at least three distinct ways: firstly, through providing transparency, and inviting non-tangible participation *"everybody could see what was happening or what you were doing, and if you're the computer they could put in their input and they could see exactly what was going on"* (KK); secondly, through tangible participation *"...it was handy having one person at the laptop like you know working on stuff and then someone else could come along and try to explain something and its handier for them to show, if they could just use the Smart board to show what they are talking about"*; and thirdly, through 'passive' peer-tutoring *"...if we weren't, like say, a particular person wasn't doing the editing, everyone else could see what they're doing so it would help them when they get a chance to do it."*

6.7.7 THE LEARNING EXPERIENCE

Another area of interest for the researcher was to understand the participants' perspective on their learning experience, and indeed assert if the participants thought they had learned anything at all. To this end, during the interview the interviewees were explicitly asked if they had learned anything, and if so, what.

The participants' replies to questions regarding learning were insightful, in that they clearly indicated a particular understanding of what learning is. This seemed to be intrinsically

related to content-driven learning, in that when listing what they had learned this is what they had to say *"...how to use infrared and take pictures, send pictures, edit it, put it into a movie, add sound, add different things, add effects, transitions and everything"* and (AL), *"how to use like, use different kind of technology, like all that sound, the when you change the format and stuff"*. Eventually, after the facilitator prompted the interviewees in relation to other things they learned, the participants mentioned *"Personal skills"*, being more critical of one's own work *"When you're watching them it's not like you're sitting watching a film, you kinda more critical about it"* (AL), and *"I learned stuff like making up story lines and not to make them too complicated for when you, you know you only have a certain amount of time, and time management and that kind of stuff"*.

In general the participants felt that the DN project would not be a suitable activity for school, because it was fun and not focused (Excerpt 66).

> AL: It's different. When you're in school you have to focus on your subject and you're getting your grades and everything, whatever you're doing debating or anything else. Whereas this is kinda like your spare time, it's something fun. It's not really focused. You don't have to do it, it's kinda just a leisure thing, a hobby, you can just go out and make a movie and then you're watching yourself in this picture or you're listening to yourself and you're going oh my God I'm crazy for doing that but it's so funny at the end of the day.

Excerpt 66 The mobileDNA is fun & not suitable for school

Regardless of the difficulties the participants had articulating their learning experience, beyond producing a list of tools' functionalities they mastered, or content information learned, the evaluations of DNs they produced during the interviews (Excerpt 67), and the explanation of the difficulties with performing different roles (Excerpt 68) indicated critical thinking, and complex cognitive processing took place.

> AL: The first one was all indoors, you don't even know it's a bank, we don't have, well have pictures of money but we don't have an actual picture of the bank robbery and you just, I'm running away but into an elevator instead of out the door and it just didn't make any sense at all but the last one was kinda you have the bank robber pictures, you have the money, why have the like pretend gun with your fingers, and like you have all the people that all chose up the people getting money

Excerpt 67 Evaluation of the different DNs

> AL: The sound was probably harder, the hardest because you have to think the background noise and you have to find the right place and whether like in the corridors you'll hear an echo and then you put that in the film all you hear is an echo and you're like where is that coming from? It doesn't sound as good as it would if it was just the sound and the picture. Then different voices and different sounds and the effects

Excerpt 68 Difficulties with creating the sounds

6.8 SUMMARY

This chapter presented a thick description of 2 out of the 9 explanatory case studies conducted to evaluate the mobileDNA. The studies, *All in 24 Hours!* and *Streets of Rage*, were selected because they were representative of the remaining 7. While *All in 24 Hours!* illustrated the interactions, and behaviour typical of a single, or initial exposure to the methodology, *Streets of Rage* evidenced the development that takes place with repeated exposure to the mobileDNA. The sessions were reconstructed through their video transcripts and artefacts, and were presented in a chronological narrative to allow the reader to 'experience' a mobileDNA workshop. The episodes presented were selected to illustrate relevant issues regarding the ways in which the mobileDNA supports collaborative creativity. To this end, the vignettes were intertwined with the researchers' reflections, and analyses of the events under investigation. The next chapter elaborates on the data provided in this.

CHAPTER 7: DISCUSSION OF THE EVALUATION OF THE MOBILEDNA

7.1 INTRODUCTION

Chapter six presented a thick description of 2 out of the 9 explanatory case studies conducted to evaluate the mobileDNA. The narrative of the cases was intertwined with analysis regarding the relevance of the episodes portrayed as they concerned collaboration and creativity. This chapter elaborates on the results presented in chapter 6, in particular, addressing the two remaining research questions of this study:

- How does the mobileDNA support and scaffold collaborative, and creative processes in moving media production?
- What are the design implications for tools to support collaborative creativity in moving media production, with mobile technologies, arising from this study?

The first part of the chapter is organised around the three phases of the mobileDNA: Story Generation; Shooting & Editing; and Production & Screening. Additionally, the CSCL macro-script model, adopted to articulate the description of the mobileDNA, still applies. The clear categorisation of results under one of the foregoing phases was not always possible, since there are core principles, underpinning the approach, which run throughout the three phases. For instance, the overarching design of the activity, which stipulates the creation of a single collective outcome through productive engagement (Jeffrey, 2006b), in which actions influence each other (Baker et al., 2007), within a framework of improvisational production (Reid et al., 2002) which holds the paradox between freedom and form (Craft, 2001a, 2005; QCA, 2008a).

Table 15 provides a schemata of the main themes regarding collaborative creativity emerging from the evaluation of the mobileDNA. These are classified under the three phases of the methodology: Story Generation, Shooting & Editing, and Production & Screening. Furthermore, the phases and emerging themes are presented together with their most relevant processes, outcomes and the tools and individual who facilitate them. The results of the evaluation are discussed in the following sections.

Table 15 Key themes on collaborative creativity emerguing from evaluation of the mobileDNA

Phase	Emerging Theme	Process	Outcome	Supporting Tool/ Person
Story Generation	**Divergent & convergent thinking**	Collaborative divergent thinking	- Risk taking - Expanding possibility - Seeking alternatives	- Scripting Tool: Semi-Structured interface Wizard prompts Wizard infinite loop - Facilitator real time orchestration
		Convergent thinking	- Providing full stories in divergent thinking stage	Facilitator questioning of contributions
	Collaborative interactions	Productive collaborative interactions	- Argumentation - Explanation of ideas & relationships - Checking for inconsistencies - Reorganisation & classification of ideas - Negotiation - Consensus reaching	- Scripting Tool: Semi-Structured interface Wizard prompts Wizard terminology - Emerging Script - Public display
		Group self-regulation	- Leading & focusing idea generation	- Scripting Tool: Semi-Structured interface Wizard prompts - Participants interventions
Shooting Editing	**Productive engagement**	Direct involvement in creative production	- Ownership - Development of own knowledge - Development of own creative vision	- mC^2 macro-script: Group division Role rotation - Symmetry of knowledge, power & status
		Development & execution of own creative vision	- Ownership - Control - Development of creativity through successive approximations	- Symmetry of knowledge, power & status - Step-by-step approach - Small media units
	Creative interdependence	Development of shared creative vision encapsulated in the script	- Production interdependence - Augmentation & repair of shared creative vision	- Script - Media created - Emerging DN
		Development of group cohesiveness	- Sense of responsibility to the group - Ownership	- mC^2 macro-script: Social, role, task & resource interdependence - Symmetry of knowledge, power & status
Production & Screening	**Cognitive synchronicity**	Development of share meaning & understanding based on joint history	- Development of group own language - Implicit understanding of group's work practice - Coordination in co-editing - Social affinity	- Script - Media created - Joint history - Shared tools
	Productive fashioning reviewing	Reviewing, stepping back, observing, evaluating & making decisions on next step	- Productive engagement - Making decisions & enacting them - Adhering to plan/modifying it - Operating within interplay of freedom & from	- Public display - Movie editor - Emerging DN - Script - Over specification of rules

7.2 STORY GENERATION

The Story Generation supported participants to engage in collaborative collective divergent, and convergent thinking (Goldstein, 2001; NACCCE, 1999), enabled by the public display, scaffolded by the Scripting Tool, supported by the facilitator, and aimed at the pursuit of the common objective.

7.2.1 DIVERGENT AND CONVERGENT THINKING

All the cases provided evidence of the participants' engagement in episodes of divergent thinking, as exemplified in excerpts 9, 12, 14 & 41. This was reiterated by the commentaries made in the Diary Room, and by the interviews in which, for instance, JB discussed his contribution of 'immature ideas'. The ideas provided indicated attitudes of risk taking (Craft, 2001b), as for example the vampire suggestion, or the zombie one (Excerpt 9 & 12 respectively), which was made after ND had already opposed that type of idea. Contributions also expanded possibilities (NACCCE, 1999), for example by providing a range of characteristics for the main character (Excerpt 14), and sought alternatives (ibid) for instance, by suggesting not to go into the lift, but to 'pretend' that they did (Excerpt 40). Data from *Streets of Rage* illustrated that after repeated exposure to the divergent thinking stage, the participants' contributions, although still divergent, were more production and 'performance' focused. Excerpt 44 portrayed this behaviour, when the group discussed using signs to convey that society was against the main character, and when KK recited the dialogues engaging in processes of behaving (NACCCE, 1999). Although both the aforementioned behaviours were also observed in *All in 24 Hours!,* and the other cases, in *Streets of Rage* the behaviour was exhibited earlier in the process. A plausible explanation for this is the fact that learners only tend to imagine those things that they know how to do (Buckingham et al., 1999). Hence, in earlier exposures they were not aware of what was needed to create a DN following the mobileDNA.

Divergent thinking was scaffolded by the Scripting Tool, in particular, by its semi-structured interface (Baker & Lund, 1997), which provided representational guidance (Suthers et al., 2008) designed to lead the conversation (Roschelle, 1996). The semi-structured interface provided the main elements of a story, which to a basic level, reflected the epistemic of expert (Lave & Wenger, 1991) story makers, and guided the participants to provide ideas on those elements. This was illustrated in *Streets of Rage* (Excerpt 37), when the group was deciding on where to start contributing ideas in the story template. Regardless of their starting point, they considered the various elements that were offered by the template. The 'expert' domain knowledge structure, implied in the elements that constitute a story, was recognised by AL

during the interview, when she articulated that they did not realise the story was the setting, and all the characters, until they did it. The wizard modelled the conversation through its prompts, and forced the group to go through all the questions, and elements through its sequential navigation. This was portrayed in instances when the groups opted not to include a story element, for example a best friend, but still had to go through that step to proceed to the next stage. The infinite loop in the wizard supported divergent thinking by allowing the group to add as many ideas as it wanted for one story element. This was illustrated in the scripts (Fig. 72 & 92). The overall design of the Scripting Tool embodied divergent thinking, since it presented an unusual way of addressing the creation of a story. The atypical approach to story creation proposed by the tool was opposed by the participants, who argued they could not know where the story took place until they knew what the story was (Excerpt 38).

Regardless of the design features of the Scripting Tool to support divergent thinking, the data indicated a clear tendency on the part of the participants to gravitate towards convergent thinking, while in the initial stage of the story generation. This was observed in all the cases, and portrayed in chapter 6, when participants provided full stories (Excerpt 10 & 43), and elaborated rationales for ideas contributed by, for instance, JO, in *All in 24Hours!,* with the male/female thief dilemma (Excerpt 13). To this end, the real time orchestration of the facilitator proved paramount to redirect participants to divergent thinking. An example was provided in *All in 24 Hours!,* when the facilitator 'ignored' RR's full story, and proceeded following the structure of the wizard (Excerpt 10). Nonetheless, there were other episodes such as the aforementioned with JO, or DD in *Streets of Rage* (Excerpt 42), in which the facilitator's elicitation could have prompted convergent thinking. The orchestration model for the mobileDNA was a recurring theme throughout the cases, and an area in need of further research, since it was out of the scope of this study.

7.2.2 COLLABORATIVE INTERACTIONS

Effortful productive collaborative interactions in the pursuit of a story occurred. There were episodes of argumentation (Kobbe et al., 2007) as a means to resolve socio-cognitive conflict (Dillenbourg et al., 1996). This is, for instance, illustrated in excerpt 13, when KK, and AL provided evidence, drawing from their previous knowledge (Sternberg, 2006b), to support the proposition of a female thief. Numerous occasions in which participants provided explanations to share ideas, and relationships (Roscoe & Chi, 2008), to check for inconsistencies, reorganise, and classify ideas, and meet the target audience levels (Kobbe et al., 2007) were observed. For example, when JB in *All in 24 Hours!* explained the idea of the best friend turning into the bad guy because he run away with the money, and KK

had to re-elaborate the explanation after the group failed to understand JB's account (Excerpt 15 & 17). Through repeated exposure to the mobileDNA, the participants exhibited development in their collaborative skills, as illustrated in *Streets of Rage*. For instance, joint information processing (Meier et al., 2007) was captured in excerpt 49, when 5 participants collaborated to create a story beat, and in so doing, also concluded that they needed an additional character. As DD articulated in the interview, they moulded all the ideas into one. Negotiation, and consensus reaching also occurred, as evidenced in excerpt 52, when three participants had different positions, and JO reconciled them. Elaboration to verify, and repair common ground (Baker et al., 1999), and to increase understanding by adding details, was also present, as illustrated by excerpts 51 and 53. Furthermore, the group exhibited capacity for self-regulation, as, for instance, in excerpt 40 when KK, ND and AM refocused the conversation to the story generation.

The Scripting Tool, and the public display also played a paramount role in enabling, and scaffolding collaborative interactions. The semi-structured interface (Baker & Lund, 1997) of the tool guided the conversation (Roschelle, 1996) by providing prompts, and 'navigational' direction. This was evidenced in all the cases when the participants used the language of the template to focus the conversation around the story creation (Excerpt 12), and the language of the wizard, for instance *Next,* to make the group move forward (Excerpt 11). Besides providing a common language (Mamykina et al., 2002) to scaffold the story generation, the Scripting Tool provided a means to capture, collate, and revisit the conversation (ibid). The foregoing was observed throughout the cases, and was illustrated in *Streets of Rage* through the description of the changes the scriber made to the script following the conversation in excerpt 51. The importance of the Scripting Tool as a shared workspace was highlighted by the participants in the interviews. JB's comments on the tool, in the Diary Room, and in the interview, were significant, since they compared his experience of creating a story with, and without the Scripting Tool (Excerpt 64). He concluded that without the tool it was messy because you did not know what you were doing. Other participants commented on how it was easier seeing what you were talking about by referring to the public display of the tool.

The public, and transparent nature of the Scripting Tool, or the emerging script, enabled by the data projector, was a dominant factor in supporting the development of common ground (Baker et al., 1999; Clark, 1996), and symmetries of actions and status (Dillenbourg, 1999; Meier et al., 2007). The limitation of input mechanisms to the script from the IWB brought about episodes of asymmetry of procedural action between the scriber and

the contributors, for instance, between JB and AL (Excerpt 6 & 7). However, cognitive symmetries of actions, and status did not take place. Although the scriber had the power of tangible actions, the group had equal power of status and decision, and regulated the scriber's actions. This was evident when the contributors asked the scriber to modify notes made to the script, because they were not accurate, or clear, or ideas had changed. On occasions, contributors provided the scriber with the 'exact' wording for annotations, and asked him/her to move ideas (nodes) around in the script to better reflect the creative common vision (Mamykina et al., 2002). The collective public tool, and its semi-structured interface also invited participants to step into a facilitating role. Initially, this required encouragement from the facilitator, as in *All in 24 Hours!,* but eventually the participants stepped in, and out of the role, and shared the roles in an 'organic' way as the need arose. Evidence of this was provided by excerpt 44 in *Streets of Rage,* where ND and DD alternated the facilitator role.

7.2.3 THE SOCIAL STRUCTURE

The evaluation of the cases revealed that the social structure of the Story Generation Phase was more complex than initially articulated in the description of the mobileDNA in chapter 5 (Table 7; p. 129). The original proposition included the roles of *Facilitator*, *Scriber*, and *Contributor*. Since in macro-scripts (Dillenbourg & Hong, 2008) tasks are associated to roles, a re-conceptualisation of roles in this phase was needed to accurately reflect the tasks executed during it. Table 16 illustrates the augmented social structure of the Story Generation Phase in the mC² macro-script emanating from this study.

Table 16 Social Structure of the Story Generation Phase in the mC² macro-script

Roles	Tasks	Tools/ Resources	Product	Social Level
Facilitator	Orchestrate: Scaffolds & encourages participation, ideation, narration, critic; and induces roles	Scripting Tool Pool of ideas Emergent Script	Pool of ideas Script	Individual/ Whole G.
Ideator	**Contributes Ideas**	**Scripting Tool Pool of ideas Emergent Script**	**Pool of ideas**	**Individual/ Whole G.**
Scriber	Captures the ideas with the Scripting Tool	Scripting Tool Pool of ideas Emergent Script	Pool of ideas Script	Individual
Narrator	**Constructs the narrative**	**Scripting Tool Pool of ideas Emergent Script**	**Script**	**Individual/ Whole G.**
Critic	**Critiques the ideas & the emergent narrative**	**Scripting Tool Pool of ideas Emergent Script**	**Refined ideas Script**	**Individual/ Whole G.**

As illustrated in Table 16, the roles of *Facilitator* and *Scriber* remained as they were. However, the *Contributor* role was divided into three: *Ideator*, *Narrator*, and *Critic*; to reflect the functions the *Contributors* were observed to fulfil. The roles can be classified as natural (Dillenbourg & Hong, 2008), because they reflected natural behaviours expected to occur from the activity at-hand, and from the differences among members of the group, and induced (ibid), since they were proposed by the pedagogical model adhered to. For instance, the *Facilitator* role embodied the *a priori* 'natural' difference between the participants, and the researcher. However, when the researcher intentionally relinquished her *Facilitator* role, for example by inviting a participant to lead the group or by fading, she elicited the participants to assume the *Facilitator* role. In this case, the role was induced rather than natural. Similarly, the *Scriber* role was induced because it was determinate by access to the Scripting Tool and the PC, but it emerged from the natural need to capture the ideas and their connections.

The *Ideator*, *Narrator*, and *Critic* roles also possessed the aforementioned duality. Firstly, they arose naturally from the Story Generation activity. Secondly, they were induced by the facilitator's orchestration, and the Scripting Tool. For example, during the divergent thinking stage the participants were encouraged to contribute as many ideas as possible, and adopt the *Ideator* role. However, they were discouraged from critiquing each other's ideas, and assuming the *Critic* role. During the convergent thinking stage the contrary applied. Participants were inducted into the *Narrator* role, implying the need to connect disjointed ideas into a coherent whole. They were praised for their critical judgement of the emergent narrative, and consequently drawn into the *Critic* role. Regardless of the pedagogical intent underpinning the social structure of this phase, of the identification and definition of roles, of the control exerted over access to resources and tools, and of the facilitator's orchestration, the emergence of participants' natural behaviour could not be suppressed. Throughout the entire phase the participants organically drifted in, and out of roles which implied the 'artificial' allocation of roles to the divergent, and convergent thinking stages was not totally robust.

The Facilitator's tasks were multidimensional, and complex encompassing all the interventions required to orchestrate the phase. Among others, she scaffolded, and supported participation, ideation, narration, and critique, induced the adoption of various roles at different stages, handed over control to the participants, and ensured the progression through the stages towards the completion of the overall task. The role initially defaulted to the researcher; however, it was not limited to her, and neither was it a solo activity. As the participants engaged in the story generation, they gained confidence and experience, and *Ideators*, *Narrators*, *Critics*, and the *Scriber* stepped into the *Facilitator* role. Furthermore, at times

the group, rather than individuals adopted the role. Notwithstanding the foregoing, the extent to which participants were able to fulfil the *Facilitator*'s tasks, and the degree of competence with which they could accomplish them, varied. For instance, inducing specific roles at different stages required an understanding of the pedagogical objectives which learners were unlikely to have. This was illustrated in excerpt 12 when, during the divergent thinking stage, ND boycotted AM's ideas by adopting the *Facilitator* role. Encouraging peers to contribute ideas, or requesting someone's opinion were functions that participants were more likely to complete successfully, as illustrated by multiple examples throughout the cases in chapter 6.

7.3 SHOOTING & EDITING

The Shooting & Editing phase led the group to parallel synchronous productive engagement (Jeffrey, 2006b), towards the achievement of a common goal (Johnson & Johnson, 2005). This was underpinned by strong interdependences of tasks, roles, and resources (Johnson & Johnson, 1994), which provided horizontal labour division (Dillenbourg, 1999), maintaining complexity in the activity to cater for broad participation (Barkley et al., 2005).

7.3.1 PRODUCTIVE ENGAGEMENT

The division of the group into three sub-groups: Image, Sound, and Editing; provided all the participants with direct involvement in the creative production (NACCCE, 1999). The level of participation, and rotation of roles was patent in all the cases and well exemplified in the two described in chapter 6. This was also reflected on the Diary room commentaries on the tasks and roles performed, and on how the media supported participation. The interviews mirrored similar reflections. DD, in particular, compared the DN experience, where everyone got to do something and had an input, with a video project in his school, where one person did everything, because he got everything (meaning image and sound).

Direct involvement also provided the participants with ownership, a means to use their own knowledge as distinct from that of the facilitator, or the mentors (Jeffrey, 2006b). This was overtly illustrated in the first version of *All in 24 Hours!,* when the participants created, and assembled media portraying their naive media language. Although the DN, and media did not efficiently convey the narrative intent, the commentaries left in the Diary Room that week reflected the participants' perception of ownership of the story, and the process. Ownership was also indicated by DD in the Diary Room in week 6, when he explicitly mentioned the non-intervention of the mentors during the shooting. As was illustrated in the iterative design process, and reiterated in *The Scientist,* when CC told the participants what to

shoot, ownership was not gained through mere access to production tools. Ownership came about when the group developed, and executed its own creative vision regardless of whether this had, or did not have aesthetic value. The participants' power of decision, or control (Jeffrey, 2006b) over the process was also demonstrated in the cases, and illustrated in a progressive manner in the commentaries left in the Diary Room. These reflected how the participants decided to move from an attitude of unproductive and unfocused behaviour, evident in the early weeks, to a playful but focused behaviour, in which achieving their objective became paramount. The same attitude was observed in the other cases.

Control, the participants' intent in the making of the production (Jeffrey, 2006b), was exhibited in the three groups. For instance, in the first version of *All in 24 Hours!* the images shot were underpinned by a clear intention to convey different story beats. Equally so, the intent in the sound group was reflected on the naming of the sound files according to their corresponding story beats (Fig. 75). Control was also illustrated by the image, and sound groups deleting media on the set once they decided it was no suitable for the production. This was illustrated by AL's comment in relation to Fig. 85, where she was portrayed running away with the money, and the missing images for the same beat. The control exerted by the editor was highlighted, particularly, in excerpt 28, when he, and a media creator argued over the mismatch of media the editor had assembled. Learning by doing, and through discovery further supported control, because it informed, and guided the participants' actions. A good example is the realisation that they were missing the media necessary to convey the story, as described by DD in the Diary Room in week 5, and in excerpts 29 and 54, as well as the understanding of what worked, as outlined by RR with the 'hands up' image (Fig. 84) in excerpt 30. In sum, as ND reflected in the Diary Room (Excerpt 57), they were learning well from their mistakes. More sophisticated illustrations of intention were exhibited in the media created for *Streets of Rage,* and on its editing.

The productive engagement afforded by the small media units provided scope for the development of creativity through successive approximations (NACCCE, 1999). This was illustrated by the participants' comments on the difficulty in creating the images, and sounds that conveyed the intended meaning. According to them, one needed to think harder, not only while editing, but also while shooting to ensure the 'pose' was right, and the image conveyed the meaning. The media choice was consistent with the participants' lack of media language, and the novice step by step approach articulated by De Jong & Fergusson-Hessler (1996), and recommended in moving media production (Reid et al., 2002). Repeated exposure

to the mobileDNA brought about development in media language awareness as illustrated by *Streets of Rage,* and the second version of *All in 24 Hours!*

7.3.2 CREATIVE INTERDEPENDENCE

Creative interdependence during the shooting & editing phase arose from the shared created vision (Mamykina et al., 2002) developed during the story generation phase, and encapsulated in the script. For instance, in the interview KK described the script as a very detailed artefact that provided the exact order of events, and detailed information about the beats. The amount of information the scripts provided was a function of the richness of the conversations that occurred during their elaboration. The scripts were meaningless to outsiders, since their richness was not annotated, but rather experienced by the participants through their creations. Similar findings concerning the richness of narratives created through conversation while editing have been reported in the literature (Sefton-Green & Parker, 2000). Additionally, the script was a flexible structure which provided form, but also catered for freedom (Craft, 2001a, 2005; QCA, 2008a). This paradox was articulated by AL in the interview, who described how the script was a guideline rather than something fixed on paper that you had to do. Although that was the case, variations to the script were subject to the grounding criterion (Baker et al., 1999), a level of common ground, sufficient to allow collaborators to complete the task at hand. In instances when substantial deviations from the script occurred during shooting, the media creators had to repair the common ground by augmenting the group's understanding on the media item/s. JO commenting on his role as editor, mentioned this issue, and described the need to have someone to tell him where the different media went.

Production interdependences arose from the labour division, and the media choice. The foregoing supported the emergence of social, role, tasks, and resource interdependence. Resistance towards the labour division proposed was clearly articulated during the first session of *All in 24 Hours!* (Excerpt 24 & 26). In it, the group argued that it was not possible to create sounds without knowing what was happening in the images, and vice-versa. The same opposition was not observed in the first session with this same group, neither was it evident in the cases where participants only had one mobileDNA session. The experience with the uncompleted *The Scientist* DN made the group aware of the difficulties of working together, and on that occasion they opted for a less collaborative effort approach (Dillenbourg, 1999). However, the researcher's determination made ND conclude that they would have to work together. The participants' awareness of the various dimensions of the group's interdependence was clearly articulated in the interviews. For instance, RR commented that

failure to do her part had a major effect for the group. Similarly, DD and AM described the implications, for the group, and the production, of people not fulfilling their tasks, or groups not working well. It was obvious that the proposed labour division provided complementary activities to be performed by different groups (Johnson & Johnson, 1999a).

Group cohesiveness, and sense of responsibility towards the group (Johnson & Johnson, 2005) was evident in the outreach programme cases, where the participants worked together for 7 weeks. There were weekly comments left on the Diary Room by participants reporting on their absent peers, and by participants themselves explaining why they were away, or why they had to leave early. Additionally, comments were made in relation to the accountability of participants towards the group. For instance, JB (Excerpt 61) remarked how the group was let down by those who were away. The only exception to the foregoing was RR who did not feel part of the group at all. Her case is most interesting, and further research is required to understand this phenomenon; this, however was outside the scope of the current study.

The evaluation of the cases unveiled two additional interdependences which played a major role: creator-editor narrative intent interdependence, and media delivery interdependence. The first concerned the possible misinterpretation by the editor of the narrative intent of the media creators. This was clearly exemplified in excerpt 28, when the editor, DD, and the media creator, AL, argued over where a particular piece of media should go. Thus, AL had created the sound file with a particular beat in mind, but DD had assembled it with an image for a different beat. This room for mismatch, and newly found matches plays to the advantage of collaboration and creativity, and it represents an additional advantage of using images and sounds, versus video. During the interview (Excerpt 65) RR described the creative processes endowed by matching, and mismatching media units. The second interdependence was a technological one, and was beyond the control of the researcher. It referred to delivery latency, the delay in the delivery of the MMS by the mobile service provider. This clearly frustrated the participants, and comments to this end where left on the Diary Room, made in the interviews, and captured in the cases. Latency was a major issue that affected the completion of the production, so a work-around was found. When MMS were not being delivered promptly, media transfer from the phones to the PC was made via cable connection, as described in chapter 4. This, although it resolved the delivery issue, generated others, such as the duplication of media described in *Streets of Rage* or file naming scheme conflicts, and information overload.

7.3.3 THE SOCIAL STRUCTURE

As it occurred during in the Story Generation Phase, the social structure of the Shooting & Editing Phase was rearticulated, in light of the findings from the evaluation of the mobileDNA, to accurately reflect the roles, tasks, and functions executed during it. Table 17 presents the augmented social structure for this phase;

Table 17 Social Structure of the Shooting & Editing Phase in the mC² macro-script

Roles	Tasks	Tools/ Resources	Product	Social Level
Cameraperson	Shoot images; Advice on shooting location and interpretation; Transmit media to EdS	Phone/ Camera; MMS; Cast; Images; Surroundings;	Images	Image G.
Image Cast	Interpret characters; Advice other cast and Cameraman;	Camera; Cast; Images; Surroundings;	Images	Image G.
Soundperson	Record audio files; Advice on Sound cast; Contribute to audio creation; Transmit media to EdS	Phone/ Recorder; Sound files; MMS; Cast; Surroundings	Sounds	Sound G.
Sound Cast	Interpret characters; Create sound effects; Provide advice to cast and Soundman;	Recorder; Cast; Sound files; Surroundings	Sounds	Sound G.
Media messenger	**Deliver media to the EdS; Advice editors on media;**	**Phone; Images; Sound files;**		**Individual/ Image , Sound & Editing Gs**
Editor	Create DN project; Receive, manage & assemble media;	PC & Public display MMS Gateway; File explorer; Active Synch; Movie Editor & Speakers; Images & Sounds	Emerging DN	Editing G.
Facilitator	Scaffold & encourage participation; Provide support; Fade;			Image , Sound & Editing Gs
Audience	**View DN**	**Public Display; Emerging DN;**	**Review**	**Whole G.**
Critic	**Critic Production**	**Public Display; Emerging DN**	**Critique**	**Whole G.**

The initial roles identified for this phase were: *Cameraperson*, *Image Cast*, *Soundperson*, *Sound Cast*, *Editor,* and *Facilitator.* Additional roles include: *Media Messenger*, *Audience,* and *Critic.* The *Media Messenger* role arose from latency difficulties with MMS delivery. The role is induced (Dillenbourg & Hong, 2008), since it emerged from the labour division adopted in the approach; however, it was natural (ibid) since there was a 'natural' need to deliver the media to the editor in order to assemble the DN. Though the *Media Messenger* role may seem logistically relevant but cognitively insignificant, it played a major part in the group's grounding process during shooting and editing. The *Media Messenger* became the link between

the media creators, and the editors, and contributed towards efficient creator-editor narrative intent interdependence. *Media Messengers* not only physically delivered the media, but also provided information regarding media management, and conveyed media meaning, and intent. *Media Messengers* advised editors on the files to be transferred from the phone to the PC, and described which story beats they were created for. The *Critic* and *Audience* roles emerged as the DN unfolded, and were enabled by the public display. This invited participants, and others, to step out of their roles, and into the foregoing. The transitions took place in an almost unconscious manner, as the participants' attention was caught by the unfolding DN, or they were consulted for information, or requested to provide an opinion. The difference between the two roles is subtle, and hinges on whether the viewer offers a critique, or simply watches without providing an opinion regarding narrative intent, or production issues.

7.3.4 THE ERGONOMICS OF THE ENVIRONMENT

In order to shoot the DN, whether creating images or sounds, the participants required two tools: the phones, and the script. Manipulation of multiple tools during mobile learning experiences disturbs the participants, and detracts attention from the task at-hand. This was reported by JB during the interview, when he refers to juggling two things at the same time. Additionally, both AM and JB commented on the procedure to send MMSs, and on how it was a bit confusing, and detracted from media creation. The need to attend to two tasks at once may have been the cause for multiple media copies being dispatched via MMS, as reported in *Streets of Rage*. The cases also revealed that, although the phones offered multiple functions, amongst which was voice call functionality, the participants on-the-move, or creating media did not pay attention to or use these. The only functions, and tools used were those necessary to create, and send media. This was quite apparent when the editor called the groups on location, and they did not reply to their phones. Also, the fact that the Image, and Sound groups never made any attempt to establish communication with the editor further reinforces the foregoing proposition. This is also an area in need of further research, and out of the scope of this thesis.

On the positive side, the phones presented a number of features that supported the participants' mobility, and accessibility to various functions. These included physical characteristics such as size, and weight, which made the devices highly portable, and the battery lifespan, that supported uninterrupted nomadic activity throughout the duration of a mobileDNA workshop. The camera, the recorder, and its volume control, as well as the zoom, camera orientation, and camera settings, were all accessible through individual external

buttons. These made applications accessible, and easier to operate while on the move. External buttons also enabled participants to undertake the main tasks involved in image capture, and sound recording without having to navigate the phones' native interface, an activity that has been reported to be disorientating for people not acquainted with those particular devices (Reid et al., 2002). Additionally, the lightness, and portability of the devices supported bodily kinaesthetic focus, and volume control. The participants zoomed in, and out by increasing or reducing the physical distance from their objective, rather than by using the camera's zoom. Similarly they intensified, or softened the volume via tactics similar to the aforementioned.

An additional important feature of the XDAII for the activity at hand, ease of use, and accessibility was the size of its touch screen. The size of the screen facilitated participants in the image group to frame their images, and allowed them to gain a better sense for their creation. It also supported collective review of the images created, since the screen was big enough for small groups to look into, and provide a reasonable view to all.. Difficulties, however, with screen display in bright outdoor environments pervaded. The tactile interface enabled participants to interact with the applications, and the phones' native interface in a more intuitive fashion, and without having to manipulate small external numerical pads. Instead of external numerical pads, the XDAII's input mechanisms were tactile interfaces encompassing a keyboard, stylus, freehand writing, and a numerical pad. Though these input channels can present difficulties for users not familiar with them, all the user-interface interactions required to complete media capture, and transfer were performed in a tactile fashion using a finger tip. Other characteristics of the phones that made them particularly suitable for this kind of activity, and facilitated the participants' experience were its 125.86 MB memory, and SD card slot, and the wide range of connectivity mechanisms it supported: 3G, cable, Bluetooth, infrared, and wireless. Though memory capacity in any standard phone would be sufficient for the mobileDNA, the availability of more storage may further support experimentation during media creation. In terms of connectivity, the mobileDNA was designed with 3G data transfer in mind; however, alternative connection mechanisms proved important, given MMS delivery latency issues.

7.4 PRODUCTION & SCREENING

The Production and Screening phase engaged the group in productive (Jeffrey, 2006b) fashioning (NACCCE, 1999), and reviewing (Jeffrey, 2006b), underpinned by cognitive synchronicity (Crook, 2000), mediated by the movie editor, and the DN in the making, and characterised by the participants' full ownership (Haringman, 2001).

7.4.1 COGNITIVE SYNCHRONICITY

The evaluation of the mobileDNA revealed that during the Production and Screening Phase the group's collaboration was characterised by cognitive synchronicity (Crook, 2000). Their shared meaning making, and understanding was founded, and relied on their joint history (ibid) of creating the story, and the media for the DN. This was apparent from observing the mechanisms they used to successfully coordinate the content, and process of their conversations (Meier et al., 2007). For instance, the groups developed their own language based on the narratives to discuss their content, as exemplified in excerpts 28, 31, & 34 in *All in 24 Hours!,* when they used terms such as the *'the stick up', 'give me the money',* and *'the manageress'* among others. The foregoing was a consistent phenomenon throughout all the cases. The groups also benefited from their shared history, by utilising their resources, and their implicit understanding of each others', and the groups', work practices, (Issroff & del Soldato, 1996; Vass, 2002). For example, when co-editing, they used the resources they had created to ground their conversation, as illustrated in excerpt 54 and Fig. 104, when they refer to the *'punching & heads'* images. A further example of the groups using their resources, and shared history was evidenced in excerpt 35, when they suggested incorporating media they had created for a different DN in the one they were editing. Their shared history of working together brought about implicit understanding of their work practice, as illustrated by comments left in the Diary Room by JO, KK, AM and others. JB, during the interview also mentioned how they knew what they meant, and there was no need to spell things out. This cognitive synchronicity was also illustrated through the coordination, when co-editing through the IWB, as in excerpt 57, when the editor, and two other participants, without 'having to spell everything out', successfully shared the tools and resources, and co-edited.

Social affinity (Issroff & del Soldato, 1996) in the groups developed, but was strongly felt, and more evident with the outreach group. The Diary Room commentaries provide clear, and progressive evidence of that development, with participants consistently referring to the group, and their development in grouping together. Comments made on absent members of the group, or the 'perceived' need to explain why one was away, further reinforce the proposition of social affinity. An exception to the foregoing was RR, who clearly articulated her detachment from the group. RR was absent when the group created the story for *All in 24Hours!,* and this may be a factor contributing to her lack of affinity with the group. Other factors, such as the perception her close group of friends had of her involvement in the DN project, were also mentioned. This is an area in need of further research.

Group editing was a language-rich context, in which participants developed collaborative skills (Reid et al., 2002), and intra-personal reflection, since it forced them to make their thinking explicit (Burden & Kuechel, 2004). An example of the aforementioned is excerpt 36, when a participant was asked to explain her editorial decision. In all the cases, group editing was a rich collaborative activity, with substantial evidence of collaborative interactions portrayed in the two cases presented in chapter 6. Additionally, editing, and the movie editor contributed to creating the narrative that, although carried in the story, came alive when the movie editor made the participants' intentions visible (Reid et al., 2002; Sefton-Green & Parker, 2000). For instance, this was illustrated in excerpt 57, when after collective editing, and tangible manipulation of media, without exchanging verbal interactions that explained the intent of the editorial decisions, JB asked the editor to play the DN to see if his intentions would come to live.

7.4.2 PRODUCTIVE FASHIONING REVIEWING

Reviewing, stepping back, observing, evaluating, and making decisions on the following steps (Jeffrey, 2006b), was observed in all the cases. For instance, excerpts 29 and 54 captured episodes in which the group evaluated their work. Episodes of evaluation were also patent in the commentaries left in the Diary Room, as, for example, in excerpts 62 and 63 in which AM and ND respectively evaluated their DNs, and made good analyses of the things that worked, and those that did not work. Furthermore, the reviewing involved in the mobileDNA, implied productive engagement (ibid) guided by deliberate actions of fashioning, and refashioning (NACCCE, 1999) in the pursuit of the completion of the DN. The groups not only engaged in reviewing, but rather they made decisions, and enacted them. Instances of these episodes were reflected in *All in 24 Hours!,* when, after watching the first version, the group re-shot, and re-recorded media, which clearly demonstrated they had incorporated the outcome of the review (Fig. 86 - Fig. 94). At times, reviewing implied adhering to the original plan, and, at others, modifying it (Jeffrey, 2006b), according to the need arising from the DN in the making. Examples of the aforementioned were illustrated in chapter 6 through *All in 24 Hours!* Particularly, with: the plans of the bank (Fig. 83 & Fig. 92), and the stick up (Fig. 84 & Fig. 93) beats where the idea was maintained but the images were re-shot; and with the drug taking beat (Fig. 89 – 80 & Fig. 99) where the shot with the arm was initially included in the timeline, but eventually deleted, since this was coherent with the tablet taking images.

The productive-fashion reviewing process took place within a framework of freedom and form. Form was provided by the original story encapsulated in the script, the actual layout of the timeline in the movie editor, and the media resources available to the group. Freedom

was afforded by the possibility to change the script if the need arose, the feasibility of moving, deleting, and adding media in the timeline, and the prospect of creating new media if needed. Examples of all of the foregoing were provided in the cases in chapter 6; however, targeted shooting, and parallel editing are a unique characteristic of the mobileDNA. This was clearly illustrated in excerpt 34, when JB and AM took a phone, and left the EdS to shoot the images of the main character walking into the bathroom. The mobileDNA not only supports parallel shooting and editing, but in so doing provides scope for more improvisational production, which has been recommended in moving media production for learning (Reid et al., 2002). The improvisational behaviour afforded by the mobileDNA is multidimensional, and also supports the alternations of roles. Examples of participants adopting various roles during one same workshop were observed.

Factors that contributed towards the productive, and effective performance of the group were the over-specification of collaborative rules (Dillenbourg, 1999; Zurita & Nussbaum, 2004), and some level of prior appropriation of the tools (Baker et al., 1999). The participants' comments left in the Diary Room, and made in the interview, clearly demonstrated that they knew what they were doing, and that doing things according to the 'rules' yielded positive results. Examples of the foregoing were AL's comment referring to how they knew exactly what they were doing, and KK's, which reflected on the fact that the groups must have been working well together because the DN was good. Concerning the use of familiar tools, in the interview DD mentioned they all knew how to use their phones, and that these were easier to use than 'sophisticated' equipment. The choice of movie editor also contributed towards minimising process losses due to familiarisation with the tool. The participants had previously encountered, and used Windows applications, and were observed to avail of the translational effect of these (Sefton-Green, 2005).

Through the clearly stipulated, and shared set of collaborative rules encapsulated in the mobileDNA, the participants acquired the procedural knowledge necessary to work together, which authors (Weinberger et al., 2008) report they often lack. Furthermore, though instances of experimentation with the functionalities of the movie editor were observed as part of the learning process (Burden & Kuechel, 2004), for instance, in *Streets of Rage,* when the editor used different visual effects, extended, or unfocused futzing behaviour (Pearson, 2005) was not observed. The collective, public nature of all the activities at-hand prevented such attitudes from emerging, since the group exerted a monitoring role. Finally, it was observed that when editing was not performed as a meaning making act (Pearson, 2005), as in

the episode with RR's and her resignation portrayed in excerpts 33 and 60, the participants did not perceive they had acquired the technical skills to edit.

7.4.3 ACTIVITIES & SOCIAL STRUCTURE

The evaluation of the Production and Screening Phase revealed that the definition of activities presented in chapter 4 fell short. A redefinition of the activities involved in the Production and Screening phase was needed to capture the participants' productive engagement arising from the reviewing activity, thus the targeted media creation. Table 18 illustrates the augmented activities for the phase in the mC² macro-script where the re-shooting and/or targeted shooting of media takes places, as the need arises from the DN in the making.

Table 18 Activities of the Production & Screening Phase in the mC² macro-script

Phase	Stage	Social Level	Activity
3	1	Group	The group watches and critiques the initial DN created by the Editing group during the previous phase and identifies actions needed to complete the DN.
3	2a	Group	The group engages in collective editing and critiquing of the DN.
3	**2b**	**Subgroup (Image)**	**The Image group re-shoots and/or targeted shoots images as required to complete the DN.**
3	**2c**	**Subgroup (Sound)**	**The Sound group re-records and/or targeted records audio clips as required to complete the DN.**
Stages 2a to 2c are repeated until the group is satisfied with the production and the DN is ready for screening or until the time available is up.			
3	3	Group	The group screens the final DN.

The initial DN is an incomplete production that may present all, or a variety of the following scenarios: story beats with images but missing sounds or vice versa; story beats with an incomplete assembly of mixed media, images and sounds; story beats containing all the available images, and sounds, but requiring further work in order to synchronise the two media types. The reasons for the foregoing vary, and include: the editors' preference to assemble one media type first, and proceed with the other once this is completed; the availability of only one media type, for example if one of the two groups delayed transferring media; the availability of mixed media out of chronological order in relation to the script, for instance due to media shooting, recording or transfer timing; the inability of the editors to associate media to story beats due to the quality of the media, for example, if the recordings are not audible, or understandable, or if the images are fuzzy, too dark/bright or close/far; in addition, media may be missing from the DN's story beats, because it is still in transfer, the editors have not yet managed to assemble it, or simply because it has not yet been shot.

Regardless of the stage of development of the DN, or the reasons that account for this, the relevance of the collective initial viewing is that it supports the groups' critical appraisal of their DN. It allows the group to identify areas in need of further work, to

establish the nature of the issues at-hand, and to device plans of action to address these. The initial DN brings together three perspectives of the story, that of the Image, Sound and Editing Groups. For the first time it confronts narrators with their emergent narration, not as a set of abstract ideas, or disjointed media units, but as a coherent whole in the making. The initial DN allows the participants to verify their common ground, to assert the extent to which this may have diverged, and to re-establish a common understanding. The detailed editing, re-shooting, re-recording, and targeted shooting are mechanisms to enable and scaffold meaning making.

In light of the augmentation of activities, the social structure of the Production and Screening Phase was also rearticulated to reflect all the tasks, and roles within it. Table 19 illustrates the social structure of the phase in the mC^2 macro-script. In terms of the activities, it encompassed all the tasks executed during the preceding phases since the phase required the participants to elaborate on their narrative, to shoot, and record additional media, and to edit the DN. It so doing, it also put into action, and in interaction, all the roles identified in the previous phases. For instance, the narrator who elaborated on the DN in the making, the members of the Image, and Sound groups who re-shot media, the editors who assembled, and edited the DN, the critics who critiqued the production, and so forth. This last phase depended upon the earlier two, in that it used the products created during these to construct the DN. Thus, the Story, and Script created in the first phase, and the media and DN assembled during the second. Furthermore, this final stage combined the co-present operational mode of the Story Generation Phase, and the predominantly distributed one of the Shooting & Editing Phase. As in the previous stages, the roles were both natural and induced, they defined the contributions expected from the learners, and were influenced by the tools, and resources available to them to execute the tasks.

The social structure of the Production and Screening Phase is the most complex of the three phases, since, with the exception of the Scripting Tool, and the Scriber, all the participants, operational modes, activities, roles, tasks, tools, and products converge in it.

Table 19 Social structure of the Production & Screening Phase in the mC² macro-script

Roles	Tasks	Tools/ Resources	Product	Social Level
Editor	Edit the DN; Receive, manage & assemble media; Incorporate editorial changes contributed by other participants	Laptop; Public display/ Speakers; MMS Gateway; File explorer; Active Synch; Movie Editor; Script; Images & Sounds Emergent DN	The DN	Editing G.
Narrator	**Constructs the narrative**	**Public display & Speakers; Script; Images & Sound; Emergent DN**	**DN**	**Individual/ Whole G.**
Critic	**Critic Production; Suggest editorial changes**	**Public display & Speakers; Script; Images & Sound; Emergent DN**	**Critique**	**Whole G.**
Audience	**View DN**	**Public Display & Speakers; Emerging DN;**		**Whole G.**
Cameraperson	**Shoot images; Advice on shooting location and interpretation; Transmit media to EdS**	**Phone/ Camera; MMS; Cast; Images; Surroundings;**	**Images**	**Image G.**
Image Cast	**Interpret characters; Advice other cast and Cameraman;**	**Camera; Cast; Images; Surroundings;**	**Images**	**Image G.**
Soundperson	**Record audio files; Advice on Sound cast; Contribute to audio creation; Transmit media to EdS**	**Phone/ Recorder; Sounds & MMS; Cast; Surroundings**	**Sounds**	**Sound G.**
Sound Cast	**Interpret characters; Create sound effects; Provide advice to cast and Soundman;**	**Recorder; Cast; Sounds Surroundings**	**Sounds**	**Sound G.**
Media messenger	**Deliver media to the EdS; Advice editors on media;**	**Phone; Images; Sound files;**		**Individual/ All Groups**
Facilitator	Scaffold & encourage participation; Provide support; Fade;	Public display Speakers; Script; Images & Sound; Emergent DN		Image, Sound & Editing G.

7.5 DESIGN PRINCIPLES FOR THE DNT (DIGITAL NARRATIVE TOOL)

The explanatory cases conducted to evaluate the mobileDNA also provided information regarding the tools used. In particular, the data highlighted difficulties with the lack of integration, and interoperability among the applications required to create a DN (Arnedillo-Sánchez, 2008). These were: the Scripting Tool used to create the story; the phone's native applications used to capture, and transmit the media; the MMS gateway which received the media; and the movie editor used to assemble the media.

Given the lack of seamless integration among the tools, the mobileDNA completely relied on the participants to manually manage, and transfer media, as described in chapter 5, and illustrated in the cases in chapter 6. Although the foregoing provided opportunities for collaboration, the manual transfer, and management of media was time consuming, and became an arduous, and cognitively disorienting process, in particular for the editor. This role was required to undertake a long series of steps to transfer the media from the gateway to the movie editor prior to being able to perform his/her tasks. The granularity of the media used aggravated the situation, since the same procedure had to be undertaken for each piece of media, unless a few were delivered at the same time, or the editor found alternative arrangements to import media in 'batches'. Regardless, the media management, and transfer required time from the participants, even those on location who had to alternate between creating, and sending the media, and detracted from the most important objective of the activity, the creation of a DN.

In light of the findings emanating from this study, a design for the DNT, aimed at addressing technical, and practical issues, is proposed (Arnedillo-Sánchez, 2008). It specifies a shared integrated application, which offers the suite of tools, and services required to support the mobileDNA. It comprises a PC version with the full range of functionalities, and a mobile version in which the functionalities diminish in relation to the device's capabilities and the user's requirements. The integration of the tools: the Scripting Tool; the Editor; and the File Manager; enables the creation of an explicit connection between the Scripting Tool, the Scripts, the media capture activity, the Editor, and the DN in the making. The possibility to share information, and resources implies that changes enacted by a participant, or sub-group will be mirrored on all the devices.

The creation of a DN with the DNT would proceed as follows (ibid): ***Story Generation*** – after the creation of the story with the Scripting Tool, the script is distributed directly to the phones. The Image, and Sound groups equipped with phones go on location, and start shooting and recording. ***Shooting*** - The Script is the central point of reference, and from it the participants select the story-beat they wish to shoot. Once a story beat is selected, all the media created is automatically associated to that beat, and also automatically sent to the editor without requiring the cameraperson or soundperson to do anything. ***Editing*** – when the media is delivered to the editor, this arrives directly into the movie editor, and into the particular story beat for which it was shot. Thus, the editors are not longer required to alternate between different tools; but rather they are only required to operate the movie editor, and concentrate their efforts on the editing. The pre-editorial decisions are made by

the Image and Sound groups, when they select a story beat and shoot for it, not only ease the media management burden for the editor, but most importantly conveys the media creators' intent. By so doing, the room for misinterpretation or mismatch of media diminishes; however, decisions regarding media matching still have to be made. ***Production & Screening*** - the same procedures found in the Shooting and Editing phase reoccur.

Additional functionalities of the DNT involve the provision of the following elements: A Wizard for the creation of additional Story Templates, and a Story Creation Wizard to enable the customisation of the stories to be created; Interactive Scripts on the phones to allow the participants to make small changes to the script, and convey these to the other groups; a mini-editor on the phones, to allow the groups on location to sequence media, and by so doing convey complex narrative intent. An up-dater, that sends versions of the DN in the making from the EdS to the Image and Sound groups to inform them of the status of the DN in the making; and a data logging service to keep a history of all the interactions, as well as information on the media created, for example, time and location information. This would be particularly relevant for research, and evaluation purposes, but also for the participants who would be able to review their actions.

7.6 SUMMARY

This chapter elaborated on the findings from the explanatory case studies to address the two remaining research questions. Regarding the ways in which the mobileDNA support collaborative creativity, the chapter has outlined the processes characteristic of each phase. The chapter has also presented the mC²macro-script arising from this research. In relation to the design implications for tools to support collaborative creativity in media production, the chapter has presented the DNT.

CHAPTER 8: CONCLUSION

8.1 INTRODUCTION

This thesis examined the use of mobile technology to facilitate, and scaffold collaborative creativity among distributed learners engaged in moving media production. In so doing, it addressed the need for pedagogical methodologies for this practice, outside the domain of media studies, and contributed a method called the mobileDNA. In particular the thesis' objective was to undertake:

> ***The design, development, implementation, and evaluation of a pedagogical methodology to support and scaffold collaborative creativity in moving media production with mobile technology.***

To achieve the foregoing an ethnographic study in two stages was conducted:

1. ***Iterative design process to devise the mobileDNA***
2. ***Evaluation of the mobileDNA***

The first stage of the research involved conducting 12 exploratory case studies, with 56 participants, guided by statements of purpose which were grounded in the literature on collaboration, creativity, and moving media production. The cases allowed the author to address the first three research question of this thesis:

- What resources, tasks, roles, and activities engender conditions conducive to the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What group formation, task distribution, and sequencing enable workflows which trigger the emergence of collaborative creative interactions in moving media production with mobile technologies?
- What kind of orchestration is appropriate to foster and develop capabilities to engage in learning experiences based on productive, collaborative and creative moving media production?

The second stage of the study entailed conducting 9 explanatory case studies, with 60 participants, following the mobileDNA method distilled from the findings of the first phase of the research. This part of the investigation addressed the remaining two question of the thesis:

- How does the mobileDNA support and scaffold collaborative, and creative processes of moving media production?
- What are the design implications for tools to support collaborative creative moving media production, with mobile technology, arising from this study?

Error! Not a valid bookmark self-reference. provides a summary of study's phases, their main objectives, methodologies and key results regarding the scaffolding of collaborative creativity in moving media production.

Table 20 Schemata of the study stages, objectives, methodoly & main results

Phase	Objective	Methodology	Result	
Iterative Design Process	**Devise the mobile DNA**	12 Exploratory Case studies (56 participants)	The mobileDNA	- Three phased task-oriented workflow: 1. Story Generation 2. Shooting & Editing 3. Production & Screening - Macro-scripts collaborative creativity in moving media production with mobile technology
Evaluation of the mobileDNA	**Investigate how does the mobileDNA support collaborative creativity in moving media production**	9 Explanatory case studies (60 participants)	Story Generation	- Supports participants to engage in collaborative collective divergent & convergent thinking - It is enabled by the public display, scaffolded by the Scripting Tool, supported by the facilitator, & aimed at the pursuit of the common objective.
			Shooting & Editing	- Engages the group in parallel synchronous productive engagement towards the achievement of a common goal. - It is underpinned by strong interdependences of tasks, roles, & resources which provide horizontal labour division, maintaining complexity in the activity to cater for broad participation.
			Production & Screening	- Engages the group in productive fashioning & reviewing. - It is underpinned by cognitive synchronicity, mediated by the movie editor, & the DN in the making, & characterised by the participants' full ownership.

8.2 CONCLUSIONS

In conclusion the exploratory case studies provided evidence to conclude that collective moving media production activities designed upon horizontal labour division, which is based on strong interdependences of resources, tasks, and roles, create conditions for the emergence of collaborative creativity. In particular, this thesis has contributed a novel way of designing the aforementioned type of activity, by restricting the media type to still images and

sounds, and allocating the roles, and tasks associated with their creation to different, and independent subgroups.

Furthermore, this research offered a new approach to sequencing moving media production, which resulted in a collective workflow where all the participants contributed to all the activities involved. The group created a story which subgroups filmed, and edited independently, synchronously, and in parallel. Mobile technology, in particular mobile telephones, enabled this workflow by providing media dispatch mechanisms from the sets to the EdS via MMS. The distribution of participants, roles, and tasks created an interdependence of resources, and narrative creative intention, which forced participants to engage in collaborative creative interactions in the pursuit of their common goal.

In relation to orchestration models, the exploratory cases, in accordance with the literature, revealed that first and foremost, facilitators must give participants room for productive engagement with, and critical review of their work. They have to empower the group to take control, and ownership of their creative production. However, given the different modes of operation between novices, and experts, a marked asymmetry of media language knowledge between the facilitators, and the participants was found to be counterproductive for collaborative creative interactions. In asymmetrical situations, novices adopted a weaker position, and, unless the facilitators orchestrated with pedagogical collaborative creative objectives in mind, the participants adopted less collaborative behaviours, and relinquished ownership and control.

The above is a synthesis of how this thesis answered the three first research question of the study. The following paragraphs do the corresponding with the remaining two research questions.

The mobileDNA supports collaborative, and creative processes of moving media production throughout its three phases. In particular, the Story Generation supported participants to engage in collaborative collective divergent, and convergent thinking (Goldstein, 2001; NACCCE, 1999), enabled by the public display, scaffolded by the Scripting Tool, supported by the facilitator, and aimed at the pursuit of the common objective. The Shooting and Editing phase engaged the group in parallel synchronous productive engagement (Jeffrey, 2006b) towards the achievement of a common goal (Johnson & Johnson, 2005). This was underpinned by strong interdependences of tasks, roles, and resources (Johnson & Johnson, 1994), which provided horizontal labour division (Dillenbourg, 1999), maintaining complexity in the activity to cater for broad participation

(Barkley et al., 2005). Finally, The Production and Screening phase engaged the group in productive (Jeffrey, 2006b) fashioning (NACCCE, 1999) and reviewing (Jeffrey, 2006b), underpinned by cognitive synchronicity (Crook, 2000), mediated by the movie editor, and the DN in the making, and characterised by the participants' full ownership (Haringman, 2001).

Regarding the design implication for tools to support collaborative creative moving media production with mobile technology, this study revealed difficulties brought about by the lack of integration, and interoperability among the various tools used to enable and scaffold the mobileDNA. Findings from this thesis inform the design of a single integrated tool, on PC, and mobile versions, which seamlessly supports the collaborative creative data, and workflow underlining the creation of DN following the mobileDNA. In particular the tool uses the script analogy as a gateway to selecting story beats, and associating media to these. In so doing the tool automates data transfer, and manages the files. For instance, it relieves the editors from media overload, and provides an indication of the creator's narrative intention, since single media units are created for, and delivered into specific story beats in the movie editor. Additional desirable functionalities of the tool which were identified through the case studies were, a wizard to create different story templates and a history which would keep track of the interaction, and would allow participants, for example, to re-review their editorial changes. This functionality would be particularly interesting from a research point of view.

8.3 FUTURE WORK

While this research has contributed a novel methodology for moving media production with mobile technology, and provided a detailed account of how the mobileDNA supports collaborative creativity among the participants, a limitation of the research is the understanding of the facilitator's roles, tasks, perspectives, and general practice. The focus of the thesis was on the collaborators rather than on the conductor. However having identified a suitable orchestration model for the mobileDNA, it is now necessary to pose *How* questions to zoom into it. In relation this, the research was also limited on the amount of facilitators that it employed. Wider adoption of the method by a variety of teachers is needed in order to discern to what extent the same episodes take place with different facilitators. This line of investigation should provide sufficient grounds to articulate a mC^2 macro-script for orchestrators, where the focus should be on pedagogical strategies.

The development, and implementation of the DNT is an obvious area for further research. The design for the application has been extracted from observing the participants in

action, identifying their needs, and difficulties, embracing their input into the process, and welcoming the variety of unexpected ways in which they have appropriated the tools, and practices. Once the DNT is developed a similar investigation to the one presented here would be required, to assert whether and to what extent, the DNT supports, and scaffolds the emergence of collaborative creative interactions. Although automation of certain functions appears beneficial, there is a very fine balance between doing too little, and doing too much for the participants. Either would be detrimental for collaborative creative processes.

Although the mobileDNA was not designed, or implemented with media language objectives in mind, it is clear from the cases that participants gained an increased capacity, and awareness in media language. It would be interesting to further enquire into the merit of using the mobileDNA as a stepping stone into more media language-oriented activities. A worthy challenge would be to examine how the approach could be applied to other media types, for instance, video. The complexity of this medium, the difficulties it presents for novice media makers, and for horizontal labour division would be interesting research starting points.

The mC^2 macro-script requires further elaboration, and it would benefit from its application to creative processes other than movie media production. For instance, the mC^2 could be applied to music composition, or other subject areas. In a related theme, the scripting tool, and the present story template are limited. More story templates to cater for different types of story, and the needs of the participants and the facilitator are required. The most efficient way in which this may be implementable is by providing a wizard to create story templates. Furthermore, a bank of templates should become available to users.

Lastly but also importantly, is the requirement to undertake further studies to understand the mechanisms by which the participants engaged, and disengage from the mobileDNA, and what factors are at play when either occurs. The incident with RR, although isolated in a cohort of 116 participants, and 21 case studies, revealed the facilitator/methods' inability to make her reengage. It is important to understand this type of phenomena better to devise strategies and tactics to affect it positively.

In sum, the contributions made by this thesis are:

- The design, development, and implementation of the mobileDNA.
- The evaluation of the mobileDNA.
- The mC^2 Macro-script (mobile collaborative creative).
- Design principles for the DNT (Digital Narrative Tool).
- Insights into the teaching, and learning implications arising from this study.

APPENIX A: CODE OF CONDUCT & CONSENT FORM

CRITE 'Computer Clubhouse' Scheme

To ensure that everyone has a great time at this new and exciting Computer Clubhouse we would ask students to comply with the following ground rules:

- Students will attend the full 7 weeks of the clubhouse and will be on time every morning, if a student cannot attend they will endeavour to contact the Trinity Access Programmes before Friday of that week.
- Students are not to leave the campus during the workshops, without a leader and/or without receiving permission.
- Smoking and the possession or consumption of alcohol and drugs are strictly forbidden
- TCD does not accept responsibility for loss or damage of personal property or for personal injury
- All students understand that the work they create at the clubhouse is the property of the clubhouse and no copyright can be made of any work produced during the 7 week sessions. Students also agree that their work can be published and photographs displayed for the advertisement of the clubhouse and access programmes as well as for the use of researchers in CRITE.
- **Failure to comply with these ground rules will lead to exclusion from the Computer Clubhouse.**

If you are in agreement with the above ground rules please sign and return the form overleaf to XXXXXX (TAP) by October 29th, 2005.

****

Student Details:

Name: _____

Address:_____

_____

Telephone Number: _____

School Name:_____

Age: _____Year in School:_____

In case of an Emergency:

Parent/Guardian Name:_____

Parent/Guardian Telephone Number: _____

Health Notes:_____

_____

_____

Student Contract:

We, _____& _____ (name of student and parent in print) have read and agree with the TAP/CRITE Computer Clubhouse ground rules.

I,_____ (student name) agree to participate fully in the programme, I promise to attend all Saturday workshops and to comply with these ground rules.

Student Signature: _____

Parent Signature: _____

Representative from TAP /CRITE Signature:_____

Date:_____

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APPENIX B: PARTICIPANT RESEARCHER SAMPLE JOURNAL ENTRY

Participant Researcher Journal Entry

Title: Spud

Date: 7th October 2005

Duration: Over 2 hours

Participants: Participant researcher; MP; 3 female university students; non-participants editor
The participants had no prior experience in film making or media production of this kind. They were computer literate to user level. They all owned mobile phones & had never contemplated the idea of creating a movie with their mobile phone.

Objects: Participants were asked to bring objects (one that they really liked & one that they disliked) these were used to trigger ideas. An initial discussion, description of the objects in a group took place. The final Story had one of the objects brought: a potato masher (brought by MP) as the main element of the Story & trigger of many of the main ideas in the story.

Games: A series of improvisation games were played at the beginning of the workshop.

Devices: 3 XDAs (used alternatively so that while media was being downloaded to the laptop the group could keep on capturing)

Technology: 3 XDAs, a laptop, Data projector & Movie editing software
The data projector was only used at the end to view what the non-participant editor had been editing but not throughout the editing process as the movie was unfolding. This is due to the fact that the participants were not involved in the editing at all until the very end. There were no speakers or Concept-mapping software. The media was being downloaded to the laptop by docking the Xdas.

Training: No training was provided to the participants in terms of the technology apart from a very brief demonstration on the operation of the XDAs.

Media Type: Combination of still images, sound files & video

Media Order: Still images first followed by video & then a combination of still images & video. The dialogues, narrations & sound effects were recorded last but without having viewed the still images first. It was almost done in a vacuum & almost bypassing the editing phase in which the participants get immediate feedback from the movie editor. This was partly due to the fact that the non-participant editor was to take care of the editing in order to facilitate the rest of the process. At this stage we were trying to evaluate the structure generated for the idea generation phase, whether it was valid or not. In addition the emphasis on this implementation was more on assessing if it would be possible to create a DN from beginning to end in 2 or 3 hours. It was thought at the time that over simplifying the activity for the participants, by having someone taking care of the technology & the editing, was going to make things easier for them. In fact it appears that it would be best to engage participants in the editing process even if they are not actually doing the editing. By doing this it appears that participants gain more control over the creation/process, they get a better sense of where is the story going & where they want to take it, it provides more structure but as well more flexibility in that they are not entirely committed to the initial Script. There seems to be a need for more participant involvement throughout the entire process, less control on the part of the facilitator & hence a flatter structure environment in which the participants feel freer, less afraid of participating because of being daunted by the facilitator's expertise.

Product: Not completed

Setting: This was neutral for the participants & played a very important role in the deciding the actual setting of the Story. The Story was set in a Lab & the actual room & adjacent kitchen area invoked this.

Storyline:

Grouping:

Structure: This was achieved by writing the Story ideas on the whiteboard & by keeping close to the map at all times. In fact the Story was shot in the same room where the whiteboard with the map was.

Structured was also provided by the Story Work Plan that the facilitator had & that she kept at hand. This was a hardcopy that could be carried around.

Collaboration: There was collaboration in terms of creating & developing the Story and sound effects. To some extend also in terms of capturing shots & acting.

Creativity:

MP is directing at all times. During the Idea Generation Phase he is actually aiming for a Script/Storyline while the participants should be engaging in a Free Divergent Thinking process. While the participants are shooting the MP is in fact telling them how they should pose/act & where they should be taking the shots from. Furthermore he at times is actually shooting the scenes & engaging in retakes of the scenes. This kind of behaviour is more akin of a professional who is aware of the need for multiple shots of the same scene however is not found much in novices

On Editing & Traditional Film making process: The process that we followed was very much the same as the Traditional film making one in that we: 1. generated Story; 2. Shot the images; 3. recorded the sound; 4. post produced with the editor that had been doing the editing.

The mobile capabilities of the mobile devices were not used neither was the traditional sequential model of film making being challenged. Furthermore, the participants very much felt into their traditional roles in that there was a MP who was directing throughout the entire process; actors that were performing according to the director's requests; an editor who was doing the editing & at the post-production stage again a director who is directing the editor to do edits according to what he thinks. At this stage the participants are invited to watch but not so sure to actually partake in making decisions in relation to the production.

The editor had been present throughout the entire process but it is not obvious how well he was aware of the storyline or how much of Common Ground he shared with the other participants. It seems there was some level of common ground in that the media was organised in terms of different 'beats' or scenes in the movie.

APPENIX C: SAMPLE IMAGES CREATED DURING THE CASE STUDIES

Fig. 123 Images from The Scientist DN

Fig. 124 Images from The Scientist DN

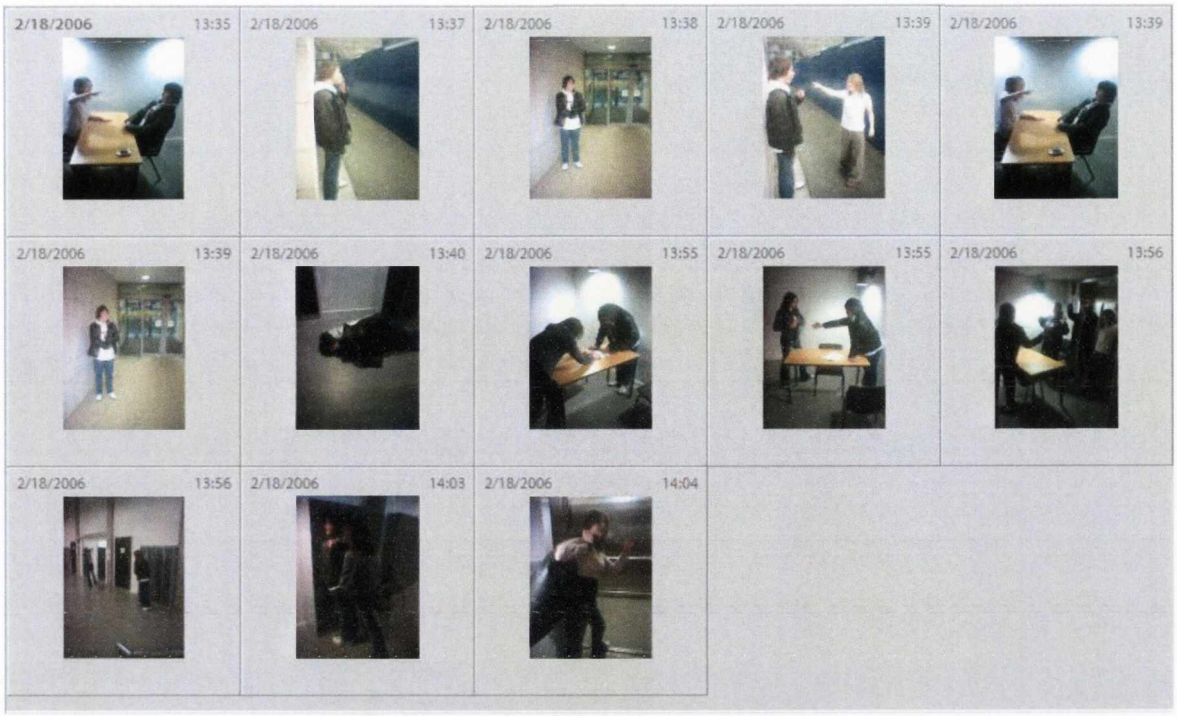


Fig. 125 Images from All in 24 Hours! 1st version

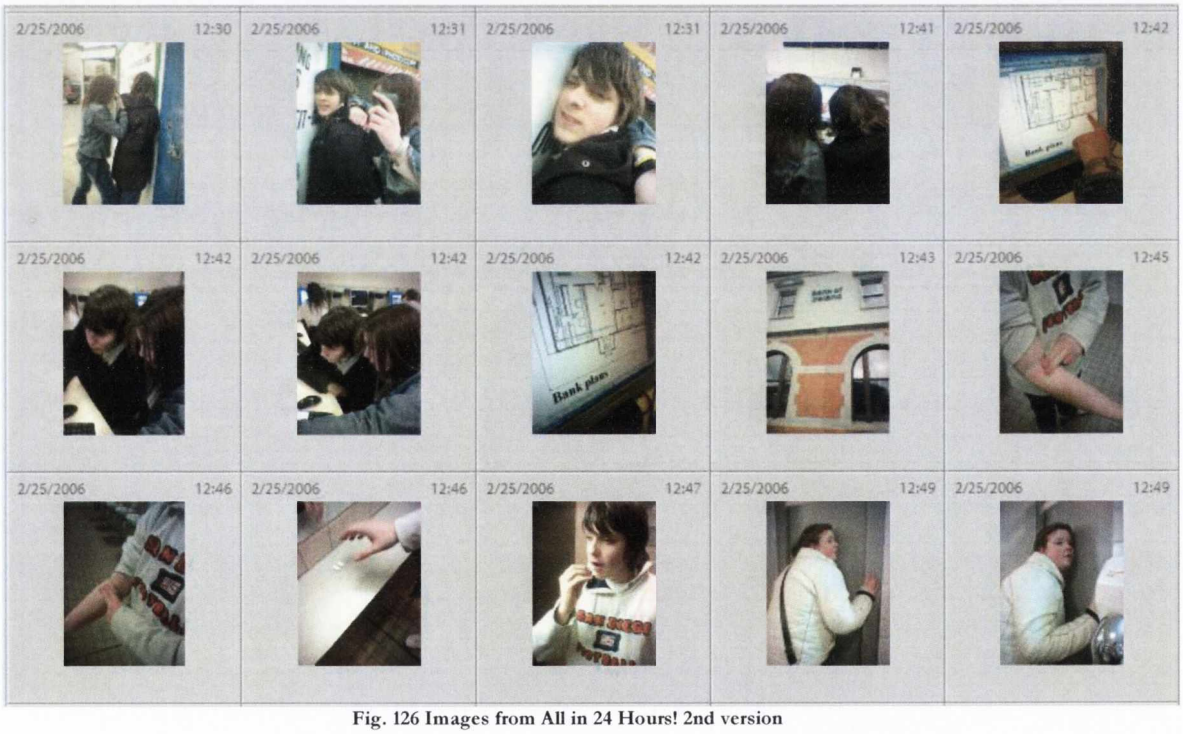
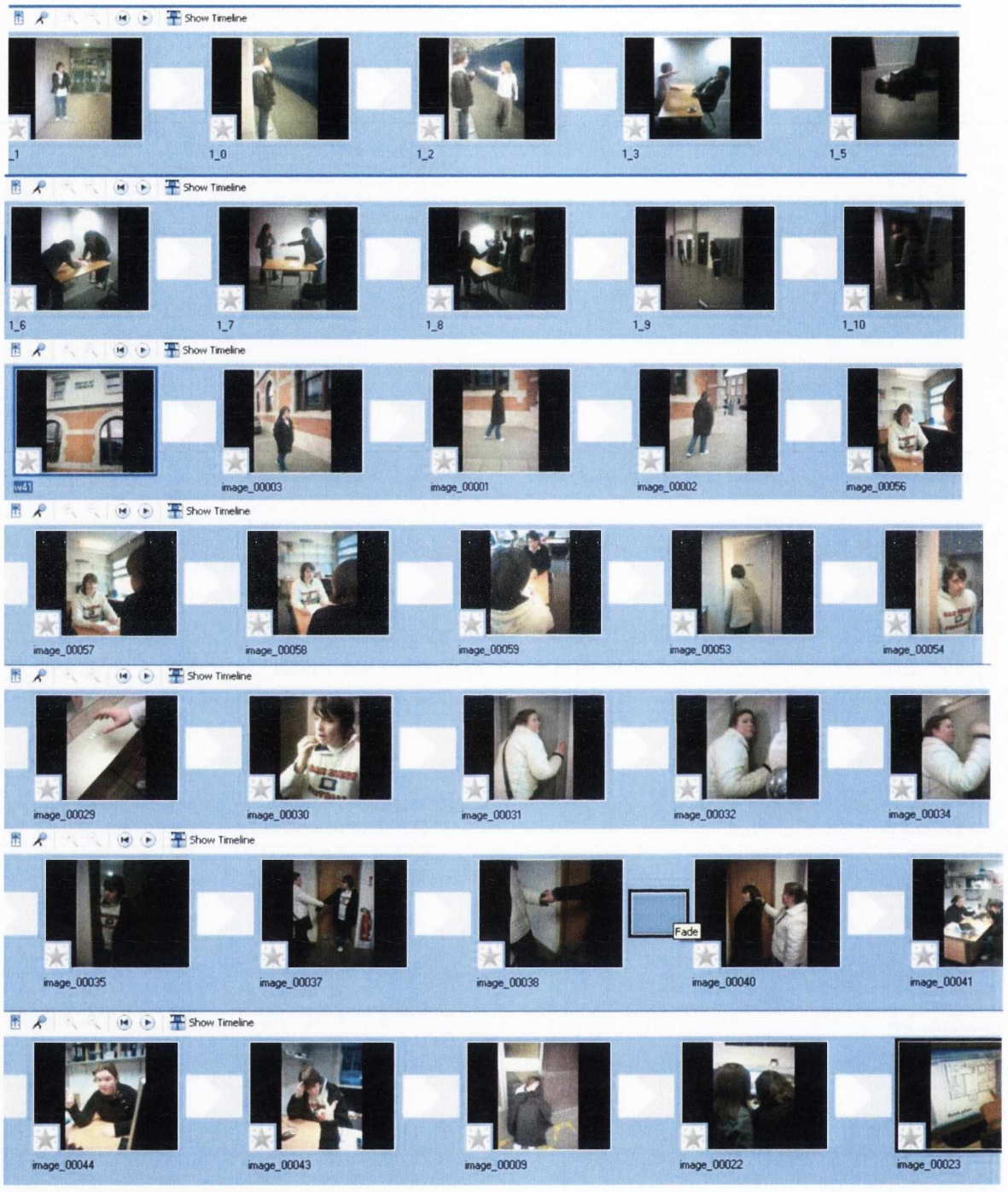
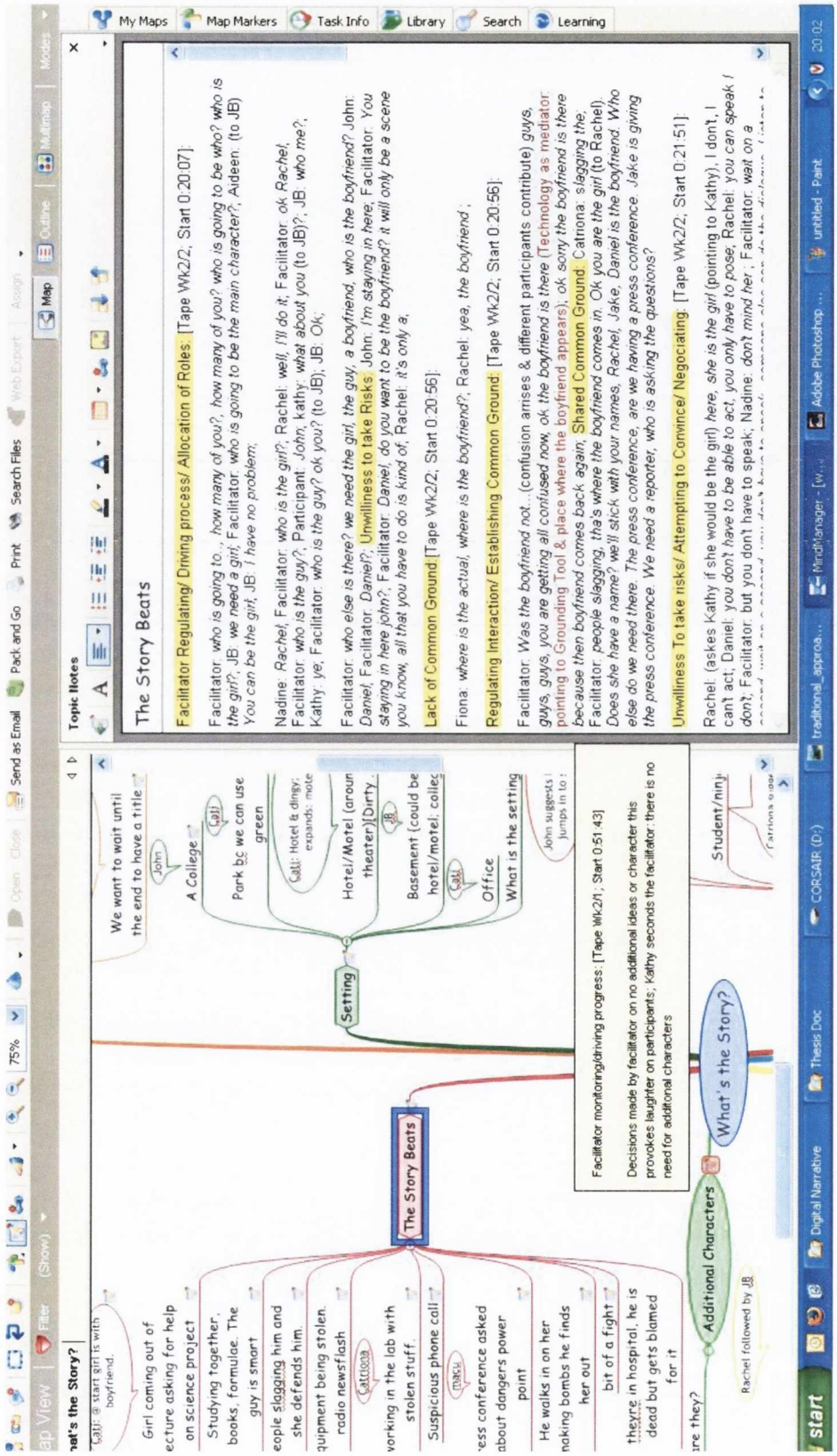


Fig. 126 Images from All in 24 Hours! 2nd version

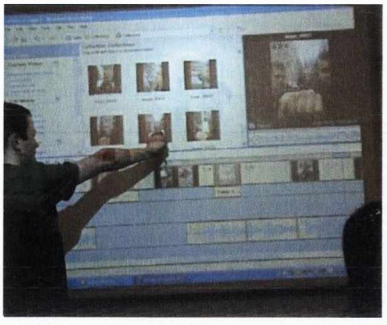
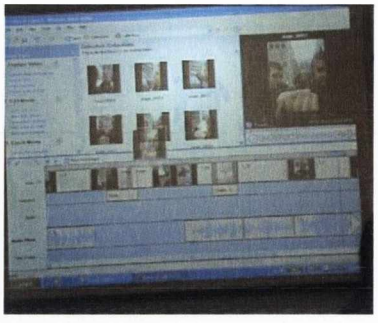
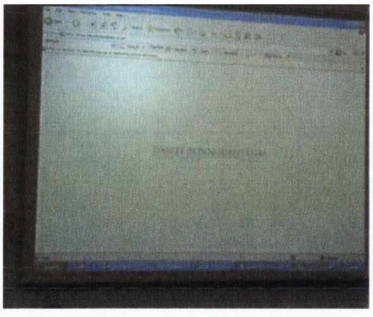
APPENIX D: DN PROJECTS AT DIFFERENT STAGES OF DEVELOPMENT



APPENIX E: ANNOTATED SCRIPTS WITH DATA FROM THE VIDEO RECORDINGS



APPENIX F: SAMPLE TRANSCRIPTS BY THE PARTICIPANT RESEARCHER

Technology mobility = supports interplay verbal, non-verbal & bodily kinaesthetic interactions & discourse Public display bridges technology mobility & technology-less Audience	*The above interactions highlight a number of things: 1. the constant interplay between verbal & non-verbal/ kinaesthetic interaction that the technology supports. This is quite obvious in JB when he actually stops speaking until he has manipulated the media; 2. the amalgamating power of the Public Display that allows peers to participate in a technology-endowed & technology-less fashion; 3. the collaborative editing displayed in this particular instance was not clear in other instances. Prior to this, Aideen & JB where more engaged in a power fight over editing control than on a collaborative relationship. In this occasion Kathy & JB seemed to be much more coordinated; there didn't seem to be power fight.* **Tape Wk7 Start 0:32:20– End 0:34:37**	

	Tape Wk7 Start 0:36:10– End 0:42:16 *Sean walks in the room as he usually does once his workshop is finished. When he comes into the room JB updates him on the news.* JB: we got a really cheesy song for the end of it A: that's the song we got for the end *(to Sean)* JB: when he is running away [laughter] *(to Sean)* A: is it cheesy or what? Is [quite long though C: the thing is how many shots do you have? A: lots; we have like four, three or four shots] *It is extremely interesting to note the way in which the participants recorded the sound track for the end of the movie. They actually went to the internet & found the site of the singer where the song was available. It appears that there was no way to download the file so the participants played it & used the phones to record the song. In fact, JB*	
Story cohesion = temp & causal connection between elements Technology mobility = physical (virtual real world) mobility = cognitive mobility (from editing to problem solving) Creative problem solving Technology mobility = hampers seamless		

process Public display = group participation Technology mobility = cumbersome + need of appropriation of different technologies Public display = focal shared workspace = see difficulties of editor= invites participation Public display = editors' voice = no need to verbally interact BC peers can SEE Technology mobility = disorienting (difficulties with file management & retrieving media) Physical mobility = not inductive of file naming	*stood on a chair & placed the phones against the Interactive board speakers to record better quality sound. This is again an instance that shows their creative problem solving skills but also the flexibility of the devices that they are utilising.* *Kathy runs into difficulties when trying to important the sound file that won't play once in the Timeline. [Anto & JB become aware of this & put forward possible reasons & solutions]. Eventually [Kathy decides to change the file name on the Phone & then re-import the file into the computer to subsequently import it into the Movie Editor].* *Throughout the whole process JB is focused on what she is doing & this is obvious through the video footage of him.* A: [Is not going on, no? JB: what's wrong? A: it won't play JB: where? JB: we did imported, it's the other one *(after he sees Kathy trying to import the recording)* A: oh, that's the other Recording 1]	

Story cohesion = temp & causal connection between story elements	*Kathy tries playing the recordings that she has in the Collections in the Movie Editor but non of them are the one they want. She then plays the recording from the folder where they keep the movie media. She has finally located the song. She ends up opting for changing the file name.* *This highlights the difficulty with File Management that this kind of on the move activities posses for users. They are too engaged in shooting & don't actually think much about File Management which is in effect getting on the way of what they want to do.* **Tape Wk7 Start 0:42:16 – End 0:43:35** *As they play the movie with the sound track they realise that the audio clip is quite long in relation to the images they have & the following conversation takes place*	

Streets of Rage Version? Group Editing: Run Away Scene Version 1

APPENIX G: SAMPLE DIARY ROOM TRANSCRIPT

AL: This is embarrassing, I basically had no idea what was going on today, I came here to meet new people, to have a bit of a laugh and apparently use computers which I'm kind of good at. Mm, I think people are mental in here. Cati seems to be a nice person, I get on well with her. Nadine is crazy. The lads are kind of all right, they're grand. AM is mad, he is crazy. That's pretty much it, yeah, had a ball today, today was fantastic making up eh, I'm going to be a voice of one of the characters. That is going to be embarrassing. Pretty much, that's about it.

AM: Well my name is AM, me first time ever been here and I wanted to do it because I have a good interest in computers. I didn't really have much of an idea of what it would be like, but now that I'm here I'm really enjoying it like, making movies just sounds great. I'm getting on well with the people in here, they're really sound and its great, like they are easy to get along with. When we were coming up with the ideas for the film well I mean everyone listened and they helped expand on ideas, any ideas I had. So it was easy to come up with what we wanted. That's pretty much it, they're all really nice and I get along fine with them. we only kinda just met, and, you know I'd like to do something like this again.

JB: Hello, I'm JB, I'm here in the digital art group, I done it last term I thought it was great. We are making a film today on, well a ninja thing we were going with first but people kind of opted against it. So now we're doing a thing where the person falls in love and then likes to, and a girl tires to blow up the world or something stupid, well not stupid, I like it actually, I think its great. But mm I'm the lead character which I like, I like being centre of attention sometimes. Not for the wrong reasons now but mm I think its pretty cool. But mm I have no problem with the group, today I thought it was pretty cool and this is my first day back from, since last term. I liked last terms group but I seem to get on pretty well with this group, they think they are pretty funny. I think they are a lot like me, I think we have a lot like in common. Everyone has their own say in the thing. Its hard to get to know people's names and stuff but it went reasonably well. hope tomorrow is like today, I hope we get more done now, we didn't get a chance to go into the lab, we kind of trailed on a bit with the ideas. But mm no, I thought it went pretty well, its fun, its grand, its better than staying in bed. I must admit I was a bit late this week. But mm no, I thought it was cool. I'm JB if I forgot to tell you, I can't remember, thanks.

JJ: I'm JJ and I started today and eh I think it good, I only started because Daniel is doing it but I think its good and the people in it are real nice. I love mm Nadine and

Rachel, they are lovely. And eh we done a story today but I didn't really like it. I hope I will be able to do one of my ideas next week. That's all.

JO: My name is JO, when I came here I was going to do like animations but I didn't get my first option so I'm here doing film making. The film making is actually good, I thought it would have been rubbish and I wouldn't have got into it. But eh I'm getting into it but mm, its sometimes complicated because like you have to get ideas under one minute and the people I'm working with yeah they're good as well. Macu is good, she is a good coordinator, she talks very loud and she's clear with everything she says. At the end of this I would love to be able to mm make the films and put things in the right order with the right sounds and things you could learn with it here, that's it, bye.

ND: My name is ND, I'm here in the diary room at Trinity College Dublin, I really enjoy coming here, I love doing eh film, movie making like. mm, this is what I thought I'd be doing, I done this course before Christmas and I came back to do more. I really enjoy it. The people I'm doing it with are different people all the time and people come and people go, but all the people I've worked with I've enjoyed working with, we got on very well, I'm a very easy person to get on with. So basically I enjoy coming here, I enjoy the people I'm with and I really enjoy having a tutor like Macu. Thank you. See'ya now diary room.

RR: My name is RR. I'm in the film production group. Its good and all but I liked everything I done but it was quite embarrassing today because I had to hold hands with DD for one of the shoots so it was quite embarrassing. I get on with everybody in the group, they're real nice, real friendly. Nobody is bitchy about each other, just real nice. I kinda got a bit pissed off earlier on with the fact that people were throwing in their ideas and when they says their ideas they wouldn't go up. But yet like there was people, certain two people that just kept throwing ideas and they were going up, it was basically, the whole story is based on, its basically their story. That's all but other than that I'm grand, I've nothing against anybody because they are all real nice people. That's it. Bye now, talk to you next week.

APPENIX H: SAMPLE INTERVIEW TRANSCRIPT

Duration: 25:11

Q. Ok AL hello. Thanks a million and I just want to have a little chat about what we did here last term and what you thought about it and ok nothing so do you have any kind of general memories and recollection of what the whole thing was? If you have to say to someone, this is, what would you say?

A. Work wise it was tough but 'cos of the challenge and toughness it was a lot more fun. But and outside of work, running around about and you had to be responsible but walking around doing all the pictures and taking all it down and clattering things, the different noises that was funny, it was just great.

Q. So did you have fun?

A. Yeah it was deadly

Q. Well and did you learned anything from doing it?

A. I'm getting a lot more confidence. I'm sorry I wouldn't do anything. No I came out when I was supposed to come out with my friends but I came alone because she couldn't find the place so then I just then move on there you seen her in the diary room on the first week and the second week was kinda…

Q. The first week you said the, who was it, CC or FF you never go anywhere alone.

A. No, unless I'm going for a walk on my own or something I'd never go to a function or an event or challenge or anything on my own.

Q. Today you came on your own and you were the first one here.

A. But I knew people

Q. But the first time you came you didn't know anyone.

A. The first time I was supposed to come with somebody but didn't. That's why I was sat in the corner and I was just like yeah we could do that.

Q. Ok so in terms of working with other people yeah because you all had to work together in a team, so it wasn't just you doing one thing, someone else doing another thing, the story was something you all came up with, each of you needed to do your work in order for this thing to happen, how did you find working with other people?

A. The amount of work you had to do it was a lot better to have a group and have different people get different things and it's a lot quicker to do it and it makes it a lot easier then for you know sitting there pulling your hair 'cos you can't do any work and a lot easier…

Q. And is it also difficult to work in a group, do you think?

A. In terms of difference of opinion yeah. People some of them will say I'm gonna do it this way, do it this way, do it this way, you have to kinda argue with them while sitting on the side on it and then that can lead to problems and arguments but the group did it.

Q. So now if we kind of think when you came up with your ideas, ok in the beginning and you had the concept map and the wizard, you know its asking you questions and he was saying to you who's the main character and you had to think of what is the setting and first week you all kind of said to me - F we can't what the setting is if we don't know what the story is, we can't say what the character, what the people are going to be if we don't know what the story is. What do you think of that?

A. You don't actually realise that the story is the setting and all the characters until you do that, when you're brainstorming and doing all your mind maps and all the questions you realise you are making the story we just, we were in denial.

Q. You didn't believe me!

A. We'll go out and do the story and come back and see what happens.

Q So do you think that the concept map help you to get your story?

A. The map?

Q. Yeah.

A. You didn't just go out and find your one idea and do that story you had kinda loads of different things and then like if you, like a fire extinguisher thing that's off the wall like and then that kinda of led onto crazy scientist and then blowing the world, and that just kinda led on to a big huge story.

Q. Ok so even if you didn't have the extinguisher, the extinguisher kind of triggered ideas like this scientist, and then exploding up and in terms of because you were doing that as a group, did you think that in any way doing it in a group is better or worse or…

A. You do it on your own then you only have your own ideas and if you're kinda focused on one idea you won't be able to think of others but if you have a group then you have their ideas and other people's ideas so then they all come together rather than just your own little ideas on it. So it's a lot better when you're with…

Q. And did you feel that you're ideas were incorporated in the story?

A. Um

Q. You did?

A. Well I missed the first one but the hype and running around, that was somewhat…

Q. So you have you contributed to that somehow, obviously it cannot be the story of any one single person because you all doing it together but did you feel you had a contribution and your ideas in the end and that being really of some help.

A. Yeah.

APPENIX I: SAMPLE TRANSCRIPT BY A PROFFESIONAL

There is a concept map projected onto a screen. The room is in darkness. F is speaking to a group of people who are not seen. In the transcription below, F is speaking all the time unless otherwise stated. She appears on screen a few times.

This is what we are going to do. We need to come up with a story, OK, off the top of our heads, but in order to help ourselves to come up with the story we are going to be using a concept map. Yeah? That is going to be our script without actually having to write a script. We're just going to jot down ideas. The idea here is that, and you're going to have to work with me on this one, yeah? You need to help me. So the idea here is, on this half of the map here *(indicates the right hand side and calls out the headings)*the title, the best friend, that guy, additional characters, we throw out as many ideas as we can, OK? And you should not be thinking "well that's really stupid or…" Whatever passes your mind, whatever you think will be a cool thing to do, just say it, yeah? Because we're not actually going to decide our story here, yeah? Once we've got loads of ideas then we've got to decide exactly what our story is going to be on that other (?) there. OK? This is something I developed with a film director's scriptwriter, yeah? You may agree or disagree with it. It's just another way of developing a story. Normally there is a title, there is a setting, a person, (?). This is a kind of story type. We don't necessarily have to stick to that. We can use it as a… Does it make sense? (Voices: Yeah.) Cause you're awfully quiet and I'm now … This is NOT school. I kind of have this idea that when I was in school I was always quiet and the teacher was the one doing the talking and that makes me nervous, yeah? So this is about you and (?) story. Yeah? You don't actually need to do anything to the video. Do not worry about it. It will do what it needs to do by itself, yeah? OK, so. Give me titles. Give me titles for your story. (Voice: We should come up with a story.) Will you be willing to go along with me? Just give me titles. I know what you're saying; I hear what you're saying that you want to know the story before you know the title. But will you be willing to go along with me and see the titles? We know it's forgotten and we miss it every single time… this is not going to be, like "this is actually the title for the story." We're brainstorming.
Title. (Voice: The Quiet Class.) "The Class, The Quiet Class" And you need to speak loud, because we have here, em, the first title. Next, yeah? Yes? Come on, give me another title. (Voice: Title 1.) OK. Quick. You're not very quick now. (Voice: "Kung Pow Chicken" .) (Other voice: How do you spell that?) *(Someone spells it.)* OK? Are you happy with that? OK, you're doing something *(muffled.)* it doesn't really matter. (Voice: *(muffled.)* the last one we got, "Kung Pow Chicken".) Another title? (Voice: "Murderer in the Campus.".) Can we have another title? Quick, quick, quick, quick. (Voice: "Lost".) OK, "Lost".

00:05:00

I'm going to take two more titles and then we move on. Two more titles. (Voice: "Title 2.".) *(He laughs.)* One more? (Voice: "Title 3".) No? (Voice: "The Man Who Nicked an Electric Wire".) F: The Man Who Nicked an Electric Wire". This is something that James said the other day. He said, "whatever you do don't nick anything that is electrical". *(F laughs.)* OK, so can you do it back now because… Do you have any more titles that you want to give, or… No? So we'll move this here so that people can actually see what we have so far. *(Calls out the titles.)* Where does this story happen? (Voice: Trinity College.) Trinity College. OK, Dublin *(muffled…Greystones?)* OK we can slow down. Where does it happen? But you see we have lots of possibilities out there. Different titles. We have many different ideas. We said Trinity, we said… *(muffled.)* Any other setting that might come to mind? (Voices: A roof, an island.) A roof, an island… Still making connections here. Any other setting? (Voice: A back alley, computer lab…. *(muffled.)* .) OK, I think we've got enough settings for the time being. What do you think? (Voices: Yeah.) So, next, who is, em, who is the main character? (Voice: Him.) *(muffled.)* OK, but who is 'him'? Who is the main person? Can we have more possibilities? If I say to you, "who is this person?" I understand there's a name on this character that I don't know… *(Muffled response.)* More? More? (Voice: A chef… a new student at Trinity.) *(Muffled ideas.)* We're only talking about the main character. He's the main character. Possibilities. We're only talking about different possibilities, really

(Voice: A chicken, a rubber chicken.) A rubber chicken. This is what you've got. Can you see? *(F points to what she's typed on the screen.)* Can you say something that you'd like to have that you don't have there? No? OK. We have this main character, but when we start describing this person, the other thing that you have to be reminded of all the time is that you are actually going to be working with, you're going to do still images, yeah? I mean that's a challenge (?), huh? And we're going to be doing sound on the other. Two different groups are going to be doing this. Yeah?

00:10:11

So, when you do a video, you make a lot of decisions, capture an event and dialogue and you can convey a lot more meaning. Yeah? When you are doing still images it's very difficult. Yeah? So you have to think in terms of, OK… (Voice: If you have to use a really large number of still images, you kind of….) You're allowed to use as many as you want, OK. There is no limitation on anything at all here. You need to make what you want it to be. We're only giving you tools, OK? We're only giving you the process. You need to make of it whatever you want to make of it. There is no limitation on what you can do. The only limitations we can pose on this right now are still images and sounds, yeah? And these are not limitations. Within that there are no limits at all. If you are to have six (?) pictures, sure. OK, the only intention now is… are your pictures good enough? Are they really conveying the meaning that you want them to convey? Did you take enough pictures? …. A picture every two seconds, or whatever. But you see, we have no pictures right now. We need to take them. Are you going to take them? So if you don't take them, you don't have them. Do you understand what I am trying to say here? (Voice: yeah.) What you can use and what you want it to be. OK, so, em, sorry, someone said something to me and I completely… (?) If you think of the main character you had in mind, what would be…? This is about… or this person… (Voice: This guy.) *(Very muffled.)* OK… this guy, he's going to play… an actor. Who is this character going to be? Will you share that with me (?) (Voice: We could have a chicken and a chef and the chef is chasing the chicken.) (Another voice: And music da-da-da-da-da-.) Very good. OK, now, who is going to play the chicken? *(A lot of voices. They mention paper. Laughter... unclear comments that are too loud to pick up.)*…. If we don't get this, you won't be able to get your story, alright? *(muffled.)* The chicken is the main character, yeah? What do we convey so that people can understand what this chicken is? OK, this chicken is… (Voice: Doesn't want to be food.) Sorry? (Voice: He doesn't want to be food.) OK, how do you describe…? This chicken doesn't want to be food? *(Voice makes muffled comment.)* Is that fear? Is he afraid? Or is he a survivor? Or, how can you describe this chicken? OK, when you see this chicken running away, what is it that he is trying to convey? This is the main thing that I want people to take away about this chicken. (Voice: He doesn't want to be eaten.) OK, so the chicken is fast, so how do we convey… (?) *(Voice makes muffled suggestion.)* (Voice: the chicken popping out…, the chef in one room and the chicken in the other, just keep changing (?) I can't….. the chicken story…. I thought you wanted it. *(Voice: That's enough with the chicken story.)*(Voice: Very good.) *(Very muffled interchange between F and another student.)*.Hey, hold it there. OK fast, the main thing is that the chicken is very fast. This would be a main character, with the chicken. OK, bird, bird. Maybe we could put down bird. (Voice: A peacock is a chicken. We have no peacock there. Put it down.) Right. The whole idea about doing this the way that we're doing it is that you will be out and about and not able to find a bird. *(Long, muffled interchange of ideas.)*(Voice: What we could have, as well, and it might look a bit better is... forget that one…I like chicken….)

APPENIX J: SUMMARY OF THE DN STORIES CREATED DURING THE EXPLORATORY CASE STUDIES

Logistical Implementation | **Media Knowledge** | **Pedagogical Implementation**

Case Study Num.	Story Title	Story Description
1	**Spud**	Dr. Blight and his ex-wife, Nora Neurotic, both researchers investigating potatoes, and Hector the potato squarer. The plot evolves around the desire of Dr. Blight to win over the Potato Association Award from his ex-wife at whatever cost. In order to achieve his goal Dr. Blight breaks into Nora's lab to tamper with her research and avoid her winning the Potato Association Award. In his incursion he encounters Hector the hero who would give his life to safeguard Nora's research. The two men engage in a fight and when everything seemed lost for Hector Nora appears to rescue him armed with her anti- starch potato masher. The story concludes with a happy Nora, accompanied by Hector, receiving the Potato Association Award and a very crossed Dr. Blight literally pulling his hair.
2	**Robert**	Christine and Cecilia are two teenagers who meet in the GP's waiting room. While Christine is attempting to conceive to keep her beloved boyfriend by her side and is devastated to find out that she is not expecting, Cecilia is shocked to discover that her tummy ache is nothing more than an unplanned pregnancy and that she is expecting a perfectly healthy baby boy. Both women offer each other comfort and discuss the irony of their respective situations while Cecilia awaits the arrival of her boyfriend who is fetching her from the clinic. The situation precipitates when Robert enters the waiting room and the two women realise that beyond sharing this instance in time they also share a boyfriend.
3	**Money**	John, a very rich but unhappy young man who was tired of the life style he was leading. One day when John was sitting at a bar he gave money to a poor child. This made the child very happy but also made John realised that giving money to the poor made him happy too. Soon all the children in the area had heard about the young rich man in the bar who gave mney away. The stream of children seeking John in the bar was continuous and John was only delighted to give them money. One day a young child asked John why was he giving his money away to what John replied he just wanted a new life.
4	**The Dancer**	Katz, the main character is a young girl who loves dancing and aspires to become a professional dancer. While dancing Katz notices a man constantly staring at her. She decides to tell her boyfriend, Chad the bouncer, about her stalker. Chad tells Katz men staring at her and stalkers is all that she can really expect as a dancer. As the couple converse the stalker approaches them and introduces himself as a talent scout for a dance company. Katz is overjoyed with the news and can believe that her breakthrough has finally arrived.
5a	**The Maid in the Garden**	Sheila a hard working woman, maid to the very wealthy Alexander and his son Peter, and her children Setu and Wendy. Sheila has promised Setu she would come home early today to celebrate his birthday however Alexander asks her to work late yet again. Although unhappy about the request Sheila agrees to working late since she needs to provide for her family. Peter aware of the fact that is Setu's birthday pleas his father to let Sheila go but Alexander refuses. While Sheila continues to work broken hearted Peter arrives with Setu and Wendy. The family is reunited and overjoyed. As Alexander watches their happiness he realises how important family is even for him.
5b	**Mother's Day**	Marvin a young gangster, who lives in a township with his drunken abusive father, and wishes to find his mother. Marvin father's refuses to give him any information about his mother and forbids him looking for her. Taking advantage of his father's drunkenness Marvin escapes to his aunt's house with the intention of asking her about his mother. On the way to his aunt house Marvin becomes hungry and stills a lady's bag to buy something to eat. When his aunt shows him a picture of his mother he is shock to realise that he has just stolen his mother's handbag. The DN comes to an end when

		Marvin is finally reunited with his mother.
6	**Sam & the Watch**	The DN is set in a prison where Sam, the main character, ended up falsely accused of murdering her husband and son. While carrying out her kitchen duties Sam realises that Joe, is wearing her husband jobs. Although she has always had difficulties standing up to men she knows she must do something. When Joe takes off the watch to wash his hands Sam snatches and runs away but she is captured by the prison officers. Luckily for Sam the inscription in the watch, to Frankie from Sam is enough evidence to earn her freedom.
7	**The Hit**	The Hit was a silent DN that features a girl who comes up to a boy. He points and laughs at her and as a reaction she smacks him in the face. He falls over and she plants her foot on him.
	The Postman	The Postman is the story of a lazy postman who comes into his boss' office looking for a raise. She refuses him the raise and he puts a rubbish bin over her head. The story finishes with the boss firing the lazy postman and handing him his p45 (document handed to employees when they cease working for an employer).
8	**Jimmy**	Jimmy a homeless, his friend Carl a terracotta gagger, and Mormor, a snobby successful businessman who likes putting people down. Mormor doesn't like Jimmy so he breaks Carl, this triggers Jimmy's anger who looks for revenge, attacks Mormor and seals his successful business plan. Without the plan Mormor falls into bankruptcy and becomes homeless while Jimmy becomes a successful businessman. One day Jimmy finds a homeless man begging and gives him money. As he hands over the money he realises the homeless person is Mormor they start talking and Mormor gives Jimmy the repaired Carl back.
9	**What We Do**	The initial images show one of the participants walking into the College proving a brief description of it and the famous people who studied in it. Then it shows the participant arriving to the venue of the workshops and meeting his peers. They DN describes and shows how they make DNs.
	Who We Are	This DN is divided in two parts. The first introduces each of the participants that created the DN and describes with narration and accompanying images what each of them likes and is good at. The second part shows a couple of pictures of landscapes while the narration tells the viewers that this is Ireland and describes it as a sunny place. The following narration tells Ireland is not really a sunny place but rather cold and miserable and the images show the participants around a bin pretending there was a fire and they are warming up their hands.
10	**Dislikes**	Is a 'documentary' in which foreigners visiting Trinity College and Dublin city centre are asked to say three things they don't like about Ireland.
	Likes	Is a 'documentary' in which foreigners visiting Trinity College and Dublin city centre are asked to say three things they like about Ireland.
11	**Club Documentary**	Described the Outreach Programme and presented the different workshops and participants in it. This was done by shooting the participants of the workshops as they worked in their projects and by asking them to describe what they did in their activity. The documentary also contains a part on the DN activity.
	Siblings	It opens with the murder of young man while he is having a coffee out in the street. The body is found by a brother and sister who are shocked to discover that the dead man is the girl's boyfriend. In desperation the girl calls her friend Mary and asks her to come to meet her. As Mary is making her way she also get attacked and murdered. The brother breaks the news to Mary's dead to the sister who doesn't understand why are all these things happening to her. As the siblings engaged in conversation the girl realises that the brother is the murderer. When she confronts him he attacks her and tries to kill her stubbing her with a knife. The girl manages to take the snatch the knife from her sibling and stubs him.
12	**Club Documentary Retake**	Same as above: Club Documentary

APPENIX K: DIGITAL NARRATIVE WORKSHOP WORK PLAN

OPENING GAMES AND INTRO (15 mins total)
Enemy/Defender pts 1 & 2, Gripe Orchestra
Name Game, Intro objects

15 mins elapsed

WHAT'S THE STORY (20 mins)
Work out story. Start by giving the title:
1) What is the setting?
2) A character -- who is this person, what are they like, if you could say just one characteristic about them what would it be?
3) His/her best friend or ally:
Who are they, what are they like?
4) What is it that the character wants? What's stopping them from getting it?
6) An Antagonist/bad guy or girl:
Who are they? What do they want?
Why do they hate our main character?
7) Additional characters, Who are they and what do they do?
BEAT 1, The Beginning.....
BEAT 2.....
BEAT 3.....
BEAT 4.....
BEAT 5.....
BEAT 6.....
BEAT 7.....
BEAT 8, A Reversal, or change of who's winning.....
BEAT 9.....
BEAT 10: THE ENDING.....

RAISE ENERGY HERE!!!!! (5 mins)
35 - 40mins: PLAY GAMES: Thuds + Enemy Defender pt3
40 mins
SHOOT & PASTE (45 mins)
SHOOT THE MEDIA FOR THE 10 STORY BEATS & PASTE INTO TIMELINE, trim and re-order as we go
85 mins
TIMELINE FIX (10 mins)
WORK ON TIMELINE (trimming re-ordering)
95 mins
MUSIC & V/O - if required (15 mins)
RECORD MUSIC/VOICE OVER and paste in time line.

110 mins

FINISH UP (10 mins)
View finished piece and discuss.
120 mins

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