

## ***ACTION RESEARCH***

### **IRISH IN A 3D WORLD: ENGAGING PRIMARY SCHOOL CHILDREN**

**Gene Dalton, Trinity College Dublin**

**Ann Devitt, Trinity College Dublin**

While the majority of people in Ireland speak English as a first language, the minority Irish language is spoken daily by approximately 3% of the population even though is a compulsory subject in Irish schools. Recent research has shown the language to be in crisis, with consistently declining standards of attainment in schools. This paper presents the first cycle of an Action Research project aiming to assess the potential of using a three-dimensional virtual environment (3DVE) as a platform for task-based learning of Irish in the primary school. The action phase of the cycle consisted of an intensive pilot of a language learning intervention using a 3DVE (n=25 children aged 9-10 years). The reflection component was multiphase, involving analysis of pilot outputs, re-evaluation of the literature and an in-depth user consultation (n=15 children aged 10-11 years), inspired by Student Voice methodology. The user consultation findings indicated goal orientation as the primary driver for children learning in a 3DVE with social connectivity understood as a given in any such environment. This paper offers a novel classification of games and virtual worlds for language learning which serves to integrate the two research literatures in a meaningful way.

#### **Language(s) Learned in this study: Irish**

**Keywords:** Action Research, Computer-Assisted Language Learning, Virtual Environments, Game-Based Practice, Minority Languages.

**APA Citation:** Dalton, G., & Devitt, A. (2016). Irish in a 3D World: Engaging Primary School Children. *Language Learning & Technology*, 20(1), 21–33. Retrieved from <http://llt.msu.edu/issues/february2016/action.pdf>

**Received:** May 28, 2015; **Accepted:** November 19, 2015; **Published:** February 1, 2016

**Copyright:** © Gene Dalton & Ann Devitt

## **INTRODUCTION**

### **Re-energising Irish language learning and proficiency in Irish primary schools**

The Irish language is the first official language of the Irish state, but is spoken daily as a community language by only a fraction of the population. Since the foundation of the state, great efforts have been made to revive the language, primarily through the educational system. Most schools in Ireland are English-medium, with a growing minority of Irish-medium schooling, growth driven by demand. Irish is a compulsory subject in school in the Republic of Ireland between the ages of 4 and 18. Despite this substantial investment of time and resources, the Irish language is in crisis in English-medium schools, as demonstrated by the 2011 census figures which showed that almost one in three teenagers in the country claim to be unable to speak the language (CSO, 2011). There has been a dramatic decline in the standards of Irish in primary schools since the 1980s (Harris et al., 2006), a negative trend that a new communicative curriculum and teaching approach has failed to reverse. The challenges facing the Irish language are complex and diverse. Not least among them is the lack of context for using the language outside of school time. Most Irish children never use their Irish outside of school and do not participate in authentic language communities (Ó Laoire, 2005). Clearly, a new context is needed to give children an

experience of using the language in a meaningful way. This study aims to provide this context through applying task-based language learning and cooperative learning principles to a three-dimensional virtual environment (3DVE).

### **3DVEs for language learning**

This study takes a sociocultural perspective on language learning which emphasises the importance of learner interactions. In sociocultural theory, interaction is considered as “an essential force rather than as merely a helpful condition for learning” (Saville-Troike, 2006, p. 111). This approach aligns with the affordances of 3DVEs.

The term 3DVE encompasses a broad range of environments including virtual worlds and games. There is a wide range of definitions in 3DVE literature, some of which emphasise commonalities and others differences. Most of the literature does not use the umbrella term of 3DVE, but focuses on individual subcategories such as virtual worlds or games. For the purposes of this paper, we adopt the broader definition of 3DVE, which does not engage with the differences between games (such as World of Warcraft, The Sims, etc.) and virtual worlds (such as Second Life) and emphasises “[t]hree-dimensionality, smooth temporal changes and interactivity” as “the most important features that distinguish 3D learning environments from other types of virtual learning environments” (Dalgarno, Hedberg, & Harper, 2002, p. 149). The primary language learning affordances of 3DVEs described in the literature are set out below.

The opportunity to take part in an *authentic language community* is often listed as an important affordance of 3DVEs. This is connected to the communicative approach to language learning, which emphasises the importance of authentic, meaningful communication through the target language (Liou, 2012; Peterson, 2010). The affordance of a *sense of presence* provided by avatars is described by Cooke-Plagwitz (2008) as having the potential to enhance a users’ sense of belonging, helping them to interact. This facilitates immersion, which in turn can be an advantage for learning (Liou, 2012; O’Brien & Levy, 2008). As language learning theory has moved towards a greater emphasis on the role of interaction in language acquisition, the creation of meaningful contexts for interaction which facilitate language learning must be a key goal in the use of technology. There are several different affordances of 3DVEs that centre on *interaction* (Peterson, 2011). A *collaborative* multi-user approach to a 3DVE can maximise opportunities for interaction (Ibáñez et al., 2011). This collaboration in a virtual environment aligns well with the cooperative model of learning championed by the Johnson brothers (Johnson, Johnson, & Holubec, 2008), and is commensurate with a cooperative approach to language teaching as part of the communicative approach. A further advantage of using a 3DVE for language learning is the possibility of using *multiple modes of communication*—for example, real time chat, group chat, email, or audio messaging (Peterson, 2010).

As mentioned above, this paper reports part of a research project which aims to leverage these affordances and apply them to the context of children learning Irish as a second language. In the broader project, two cycles of research are planned according to Action Research (AR) principles. The first cycle explored the suitability of the environment and the language teaching approach for primary school children learning Irish. Building on this insight and experience, the second cycle will optimise the environment and teaching approach accordingly and apply it to a wider group of children.

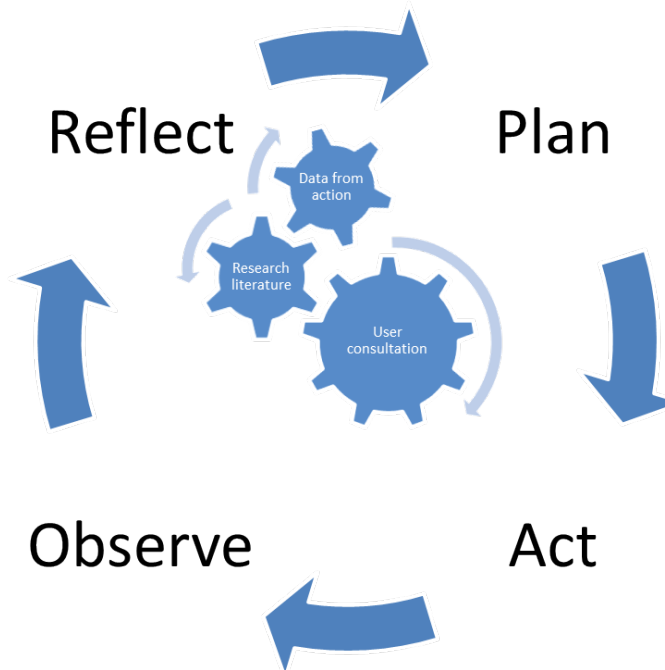
## **METHODOLOGY**

### **Action Research**

This study takes an AR approach that assumes four core principles to guide the conduct of the study (Liu, 2014). Firstly, the study is dual in nature, linking “action and research in a cycle that drives and reflects upon change” (Riggall, 2009, p. vi) to generate theory from practice. Secondly, it is an emergent, cyclic

process to ensure rigour and enhance participant understanding. Thirdly, AR is contextualized, responding to a specific enquiry in context but with the potential for transferability through transparent and considered accounts of AR studies. Finally, AR is values-oriented looking to improved practice in the everyday contexts of people's lives through participation and democracy. This aspect has different emphases in different AR models but underlies the ontological and epistemological standpoint of many AR researchers.

This paper reports one action-reflection cycle where the action involves engaging children with Irish language learning in a virtual world and the reflection component is multi-phase as represented in [Figure 1](#). The initial phase of reflection on the action undertaken led to adoption of a design-led user consultation phase and a deep engagement with the literature on game-based and virtual world learning in order to derive new theory from the participants' experiences and feedback. This in turn led to a reconceptualised model of action to move into future action-reflection cycles. This study is rooted very firmly in an Irish context where, as noted above, individuals have a somewhat problematic relationship with the teaching and learning of Irish and in the specific context of a primary school class. It does however seek to theorise from the action-reflection cycle through a close observation and listening to the voices of the participant children coupled with a deep engagement with the research literature.



*Figure 1.* Study Action Research Cycle (adapted from McNiff, 2002, p. 40)

#### Participants

The sample selection for this study was opportunistic: a group of 25 children (15 girls and 10 boys) aged 9-10 years. These children had been studying Irish in an English-medium school for 5 years, approximately 30 minutes every day. The observations and reflections deriving from this phase led to an in-depth user consultation as part of the reflection phase. A subset of 15 children volunteered to take part in the user consultation 5 months later when the children were 10-11 years old. An issue of gender imbalance arose during the sampling for the user consultation, with two boys and 13 girls volunteering, not inconsistent with gender imbalances in language learning classrooms (Carr & Pauwels, 2009). This will be addressed in the data analysis below. In addition to adhering to standard requirements for parental and personal consent, the study aligned with the principles of *student voice*—all materials and procedures

were carefully designed with age appropriate language to emphasise that the research was being carried out *with* the children, not *on* them (Hendrick, 2008) and that their voices would directly impact implementation choices for the 3DVE under development.

### Action Phase: Virtual World Environment, Approach and Instruments

As the participants are minors, Open Sim was chosen as the virtual world platform. The Sim on a Stick version enabled the development of a private, secure virtual world which could be configured for access by multiple users. [Figure 2](#) shows one of the virtual world spaces with an avatar.



[Figure 2](#). Irish language virtual world space.

Using a task-based language teaching approach (Ellis, 2003), a collaborative storytelling task was developed for the intensive, half-day pilot study. The task emphasised using language for meaning but did include a metalinguistic element of raising awareness of the form of the language. In order to maximise the potential for interaction and activity in the lesson, a cooperative learning model was adopted. The children were divided into cooperative teams of mixed ability to take part in language learning activities, such as vocabulary treasure hunts, with well-defined roles and responsibilities for each child (Johnson & Johnson, 1999).

Pre- and post-motivational questionnaires were used to investigate child attitudes towards learning Irish and towards their experience of the pilot. Pre- and post-language tests were also used to test for any language gains, although this was largely a test of the instruments, as language gains would not be expected after such a short intervention.

### Observation Phase

All 25 children reported that they found the experience fun and interesting. All but one of the 9-10 year old children said they would like to learn Irish this way more often. A selection of their comments on different elements of the day is given in [Figure 3](#). The results from the Attitude/Motivation Test Battery (AMTB) were broadly in line with previous research in this area, showing that children value the Irish language and believe it to be a significant part of Irish culture. There was no evidence of language gains

from the post-test. The very positive response from the children was encouraging, and indicated that this combination of virtual world platform and task-based language learning may indeed hold potential in the ongoing challenge of finding meaningful and effective ways to teach Irish. Interestingly, children reacted positively not only to the virtual world itself but also to the tasks they had to carry out in-world. A number of issues arose from this pilot. The suitability of the virtual world platform was in doubt, necessitating a search for a more child-friendly environment and interface. The need for a longer intervention was also evident, as language gains cannot be realistically measured after such a short intervention.



Figure 3. Feedback from the children on what they enjoyed about the pilot

## Reflection Phase

### Initial Reflections

An interesting question was derived from the children's engagement with the platform: is it a virtual world or a game? In the preparation for the intervention, the principal researcher had exclusively referred to the platform as a virtual world. However, during the pilot, the children spontaneously called it a game, talking about "playing the game" when referring to completing the tasks in the virtual world. Given the fact that virtual worlds and gaming are two distinct fields of language learning research, this response from the children highlighted the need to more clearly classify the type of platform being used, and its relationship to virtual world or gaming research, or both.

Furthermore, it became clear that the children were the best advocates for their own language learning needs. Their perspective on possible environments was essential in order to discover and optimise the best platform for their language learning. The theoretical exploration of the platform classification is outlined in the next section, followed by a description of a user consultation study carried out with the children regarding these platforms.

### Theorising the experience

Reflection on the data forced a reconsideration of the classification of the environment. Research into the use of virtual worlds and games for learning has developed in two parallel fields, which at times can

overlap or diverge. The term *virtual world*, in its strictest sense, refers to an open-ended, social, three-dimensional virtual environment, where there is no goal orientation, and the learning affordances centre around interaction and constructivist learning. A *game*, on the other hand, is understood to have a narrative and clearly defined goals. Goal orientation has emerged as a clear criterion which can distinguish between the two. Cornillie, Thorne, and Desmet (2012) separated Digital Game-based Language Learning (DGBLL) from Virtual World Language Learning (VWLL) in their categorisation of games and virtual environments according to goal orientation. In their classification, goal orientation is a binary variable, its presence given as an indicator of the DGBLL category. Virtual worlds are excluded from DGBLL because of their lack of goal orientation in line with Prensky's (2001) categorisation of a virtual world as a toy. This is a strict interpretation of the broader literature on learning in immersive environments where goals are a characteristic of the overall environment, combining the environment and the learning task (De Freitas, 2014).

The reflection phase of this cycle highlighted a number of anomalies within this classification. When a virtual world is used as a platform for task-based language teaching, does it remain a *virtual world*? There may not be intrinsic goal orientation in the platform, but now there is extrinsic goal-orientation in the language learning design. When a game is used without specific language learning goals, does playing it classify as DGBLL? In this case the intrinsic goal orientation is there, but there is no goal orientation in the language learning design. Berns, Gonzalez-Pardo, and Camacho demonstrated this anomaly in their 2013 study where they described game-like applications in a 3DVE. The platform they used was more like a virtual world, but they used goal orientation in the tasks, therefore making the experience game-like.

The fuzzy classification (Zadeh, 1965) presented here builds on the classification by Cornillie et al. (2012), taking the useful binary distinction of learning objectives and gaming goals. However, it makes two key adaptations:

1. Goal orientation is represented as a continuum that combines two classification features.
2. The two classification features represent two realisations of goal orientation, one intrinsic (in the platform) and one extrinsic (in the language learning design), but both impact learner motivation and interaction within the learning experience.

In the continuum (Figure 4), 3DVEs are situated according to their net goal orientation, a fuzzy relation between intrinsic and extrinsic goal orientation. The nature of the relation is unspecified here as this would require empirical investigation of user experiences of goal orientation in different environment types. This reconceptualization allows the extension of DGBLL theory to a broader range of 3DVEs, uniting the fields of research, and enabling the affordance of goal orientation to be exploited more broadly. In that case, individual researchers and language teachers could decide what degree and type of goal orientation on this continuum is most appropriate for their own language teaching needs.

	<div style="display: flex; justify-content: space-between; align-items: center;"> <span>Low</span> <span>Goal Orientation Continuum</span> <span>High</span> </div>				
	Virtual world without extrinsic LL goals	Virtual world with extrinsic LL goals	Game without extrinsic LL goals	Game with extrinsic LL goals	Custom-built LL game
Intrinsic goal orientation (game design)	—	—	√	√	√
Extrinsic goal orientation (LL design)	—	√	—	√	√
Example	—	Second Life (Wehner, Gump, & Downey, 2011)	World of Warcraft (Rama, Black, van Es, & Warschauer, 2012)	The Sims (Ranalli, 2008)	Croquelandia (Sykes, Oskoz, & Thorne, 2008)

Figure 4. 3DVE Fuzzy Taxonomy

### User Consultation

In line with student voice methodology and design-based research, having defined a fuzzy taxonomy for 3DVEs, we returned to the users, the children, to investigate the alignment of child interests and learning with the goal orientation continuum in Figure 4. The children were interviewed for 30 minutes in three groups of five, the groups assigned at random. Guidelines for focus groups for children were used to ensure best practice in the groups (Vaughn, Schumm, & Sinagub, 1996). The children directed the conversation with the facilitation of the researcher exploring paths opened by the children themselves. The open-ended questions focused on the children's personal experience of learning Irish in school and the games and virtual worlds they engage with outside of school.

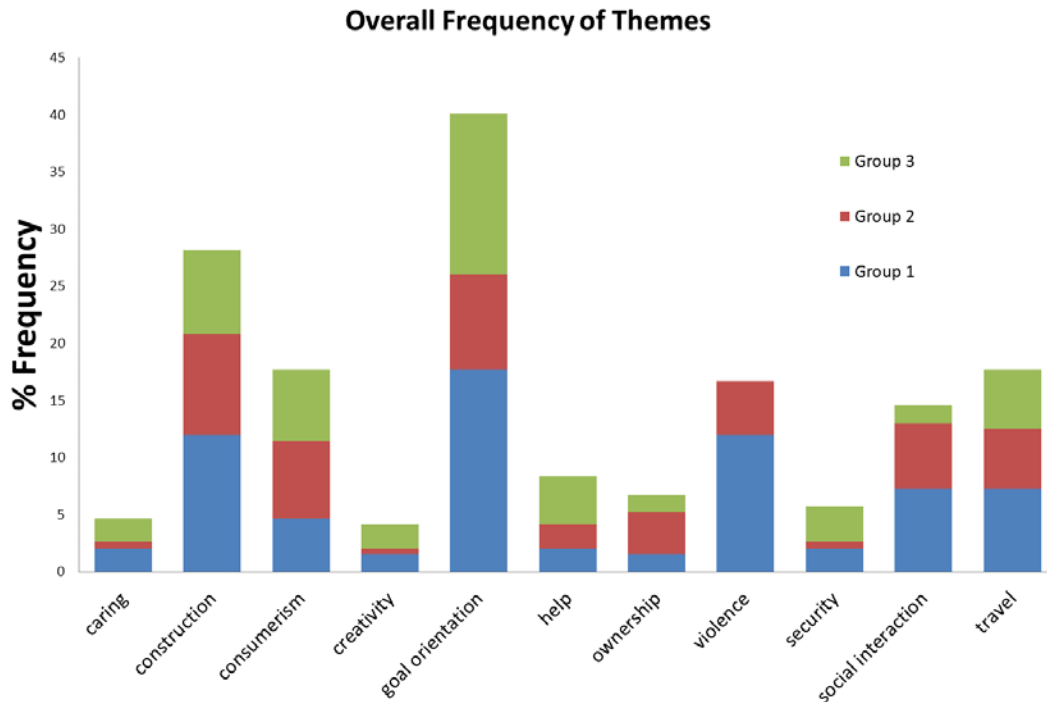
### Data Analysis

The focus groups were recorded and transcribed (for findings on classroom observations, see Dalton & Devitt, 2013). A thematic analysis was undertaken using a combination of qualitative and quantitative methods (Braun & Clarke, 2006; Ryan & Bernard, 2003). This was a somewhat novel approach where quantitative corpus analysis methods were applied to the qualitative data in order to support and enhance the qualitative data analysis process. Two a priori themes, goal orientation and social interaction, were derived from the 3DVE literature and the pilot intervention (Dalton & Devitt, 2013), while other themes were identified through careful reading and re-reading of the transcriptions to identify keywords related to themes (see Appendix for keywords and themes). KHCoder, corpus analyser, was then used to calculate keyword frequencies within themes (# sentences containing keyword / # sentences coded).

### FINDINGS

The themes identified in the data along with some examples of keywords associated with each theme are listed below. These themes are distinct, not embedded and have minimal overlap of keywords. Overall and group theme frequencies are set out in Figure 5.

- **Caring:** pet, feed, look after
- **Construction:** make, build, block
- **Consumerism:** buy, shop, money
- **Creativity:** customise, dress up
- **Goal orientation:** mission, mini game, earn, have to,
- **Help:** hint, clue, help
- **Ownership:** your own, your design, your person
- **Violence:** kill, shoot, steal, guns
- **Security:** private, block user, bully
- **Social interaction:** friend, talk, group
- **Travel:** explore, fly, portal



*Figure 5.* Graph demonstrating the percentage occurrence of 11 main themes across all three groups

The most frequently occurring theme is seen to be that of goal orientation, followed by construction, consumerism, travel, violence and social interaction. These trends are similar across individual groups, however, the variation between groups is statistically significant and will be described in more detail below.

### 3DVEs: The Children's Themes

The specific theme of goal orientation was the most commonly occurring theme overall, coming first in two of the three groups, and narrowly outstripped by construction in the other. This theme related to the



overall purpose of the 3DVE, as in the following extracts from the data:

- G1. Well, you could do ... really ... fun and missions. Like missions to ... get ... a trophy or something. ... find ... something Irish and then .. you have to go to ... climb up trees and ... go on a boat if there's a river.
- G2. I think [the main thing is] the missions because otherwise some people just go, 'It's Irish. I don't care.' Like they just have no respect for it or something.
- G3. Yes, and you get to unlock things and it ... nice and fun. You start off with the most of it, like half of it Irish, half of it English and then it starts to get harder and harder as you get to the better stuff and you get money and all that. And hopefully you'd learn.
- G4. If you earn points, you can unlock new jobs that you want. ...you might unlock a new job, but the highest jobs which get much money and they're more fun, they're like the hardest to get to. But everyone wants to get to them, so they keep going...

In the context of learner autonomy, it is interesting to note that these children have a strong awareness of the value of motivation for their learning.

Construction was the second most frequently occurring theme, its focus being on building and making, referencing Minecraft extensively. The consumerism theme related mainly to clothes shopping, possibly a very gendered theme among girl participants. The theme of violence in two out of three groups related to shooting, killing, guns and zombies, making reference to some violent games, such as Call of Duty and Grand Theft Auto, along with the survival mode of Minecraft. Three children, two boys and one girl, were responsible for *initiating* these discussions, suggesting that gender may influence the types of game enjoyed by children. The gender imbalance in the sample, with boys under-represented, may have skewed the relative importance of the violence theme in the data. The low incidence of the social interaction theme (15% of coded sentences) was unexpected. An analysis of the extracts related to social interaction however suggest that the children may not have commented on interaction as they assumed that multimodal communication would be available and was therefore intrinsic to platform, as in the extracts below:

- S1. You could have a click...like a kind of, you know that thing that people sign and you talk? You'd have that at the top of the screen, you could click it and then you could type what you want and then you could go write to everyone who was playing.
- S2. And you could get the headphones and talk to people, but you have to talk in Irish.
- S3. And like your friend can be in front of you. You could be talking to him across the thing.
- S4. And then you can text your friend as well saying...

A number of themes (e.g., ownership, creativity, and security) relate to learner autonomy and identity within the world. Upon closer examination, it is clear that several other themes may actually be seen as different forms of goal orientation—making, buying, shooting, feeding a pet, travelling, and so forth, in addition to the discrete theme of goal orientation, as illustrated in [Figure 6](#). This demonstrates the pervasiveness of goal orientation throughout the children's interviews. It also suggests that goal orientation has many realisations that move away from pure competition alone and aligns with the fuzzy taxonomy above with goal orientation as a continuous, rather than discrete, variable.



Figure 6. Goal-oriented themes

## CONCLUSION

The findings demonstrate the centrality of goal orientation in a child’s experience of and attitudes toward 3DVEs, especially when the goal orientation subthemes are taken into account. In the domain of virtual world research, one of the key affordances of this type of environment is its open-ended nature where the users are free to decide what they want to do themselves and are not subject to the type of narrative and goal-oriented constraints that are typical of a game (see De Freitas et al., 2010).

However, these findings suggest that children may prefer a more game-like environment with clearly defined tasks and goals. This could have important implications for researchers designing a 3DVE for children and aligns with the literature on task-based language learning where tasks with specific parameters structure and drive language learning (Nunan, 2004) The proposed new classification of 3DVEs according to a goal-orientation continuum offers greater flexibility for those looking to apply 3DVEs to their specific language learning contexts, and may also serve to unite the divergent fields of virtual world and gaming research.

While the research reported here was carried out with a small number of children in the specific context of learning Irish at primary school in Ireland, there may be broader implications beyond this context. The strong preference that these children showed for different types of goal orientation in 3DVEs may indicate a trend among children to gravitate towards clearly defined tasks and goals in the language classroom, rather than open-ended activities. Furthermore, it is important to note the wide variety of goals mentioned by the children—building, buying, making, and so forth—showing that goal orientation is not limited to a competitive model where children are trying to win. The student voice methodology used in the user consultation phase of this cycle proved an effective strategy to bring children into the design process. This was hugely valuable in this research project, and could be applied on a wider scale to enhance sense of ownership and learner autonomy of children in the language classroom. Finally, this research shows the potential of using 3DVEs for minority language learning, as in this research they provided a much needed environment for meaningful and authentic language use.

## APPENDIX

goal orientation	social	construction	consumerism	rough play	travel
mission	friend	make	buy	kill	travel
quest	talk	build	shop	die	explore
follow	text headphone	own	earn	shoot	run

solve mystery riddle secret figure out missing adventure mini game job levels earn harder catch trying to try and find trophy get* collect go* have to unlock win points stars complete	headset people* join group invite write social chat	house block brick	coin money	arrow bow guns zombies steal TNT creeper explode bam destroy	around go portal drive car boat enter jump fly go underground go underwater
	<b>security</b>	<b>caring</b>	<b>creativity</b>	<b>help</b>	<b>ownership</b>
	private chat private report mean* annoying* bully social bullying code lying block user random people	pet feed health look after energy gym	clothes dress up customise design make your character	need to learn help hint clue	your own your name your person your mind your design their own your shop make your character

\*refers to words which were initially included in the keywords, but had to be removed due to being used in other contexts and potentially falsely inflating results.

---

## ACKNOWLEDGEMENTS

In addition to the participants of the study for their very valuable contributions, we would like to acknowledge the Irish Research Council for funding this project.

---

## ABOUT THE AUTHORS

Gene Dalton has spent several years working as a primary teacher in Dublin and is currently undertaking her PhD research at the School of Education, Trinity College Dublin funded by the Irish Research Council.

**E-mail:** [daltonge@tcd.ie](mailto:daltonge@tcd.ie)

Dr Ann Devitt is Assistant Professor in Modern Languages at the School of Education, Trinity College Dublin. Her research interests include second language teaching and learning, technology aided learning, in particular Computer Aided Language Learning, and applying computational linguistic and corpus methodologies in educational research.

**E-mail:** [Ann.Devitt@tcd.ie](mailto:Ann.Devitt@tcd.ie)

**REFERENCES**

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- Carr, J., & Pauwels, A. (2009). *Boys and Foreign Language Learning*. Basingstoke: Palgrave Macmillan.
- Cooke-Plagwitz, J. (2008). New directions in CALL: An objective introduction to Second Life. *CALICO Journal*, 25(3), 547–557.
- Cornillie, F., Thorne, S. L., & Desmet, P. (2012). Digital games for language learning: from hype to insight? *ReCALL: Journal of Eurocall*, 24(3), 243–256.
- CSO. (2011). *Census 2011 Profile 9 What We Know - Education, skills and the Irish language*. (Central Statistics Office). Retrieved from <http://www.cso.ie/en/census/census2011reports/census2011profile9whatweknow-educationskillsandtheirlanguage/>
- Dalgarno, B., Hedberg, J., & Harper, B. (2002). The contribution of 3D environments to conceptual understanding. In O. J. McKerrow (Ed.), *Winds of Change in the Sea of Learning: Proceedings of the 19th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education* (Vol. 1, pp. 149–158). Auckland, New Zealand: UNITEC, Institute of Technology.
- Dalton, G., & Devitt, A. (2013). Focus on form in a virtual world: Unlocking communicative competence in children learning Irish as a second language. Presented at the Conference of the Computer Assisted Language Instruction Consortium (CALICO), 2013, Hawaii, USA.
- De Freitas, S. (2014). *Education in Computer Generated Environments*. London: Routledge.
- De Freitas, S., Rebolledo-Mendez, G., Liarokapis, F., Magoulas, G., & Poulouvasilis, A. (2010). Learning as immersive experiences: Using the four-dimensional framework for designing and evaluating immersive learning experiences in a virtual world. *British Journal of Educational Technology*, 41(1), 69–85.
- Ellis, R. (2003). *Task-based language learning and teaching*. Oxford, U.K.; New York: Oxford University Press.
- Harris, J., Forde, P., Archer, P., Nic Fhearaile, S., & O’Gorman, M. (2006). *Irish in primary schools: long-term national trends in achievement*. Dublin: Stationery Office.
- Hendrick, H. (2008). The Child as a Social Actor in Historical Sources. In P. M. Christensen & A. James (Eds.), *Research with children: perspectives and practices* (2nd ed). New York, NY: Routledge.
- Ibanez, M. B., Jesus Garcia, J., Galan, S., Maroto, D., Morillo, D., & Delgado Kloos, C. (2011). Design and Implementation of a 3D Multi-User Virtual World for Language Learning. *Educational Technology & Society*, 14(4), 2–10.
- Johnson, D. W., & Johnson R. T. (1999). *Learning together and alone: cooperative, competitive, and individualistic learning*. Boston: Allyn and Bacon.
- Johnson, D. W., Johnson, R. T., & Holubec, E. J. (2008). *Cooperation in the Classroom* (Eighth edition). Edina, Minn.: Interaction Book Co.
- Liou, H.-C. (2012). The roles of *Second Life* in a college computer-assisted language learning (CALL) course in Taiwan, ROC. *Computer Assisted Language Learning*, 25(4), 365–382. <http://doi.org/10.1080/09588221.2011.597766>
- Liu, W. (2014). *The Exploration of Reciprocal Peer Coteaching in a Chinese Course: an Action Research Project on Language Teacher Education* (PhD). Trinity College, Dublin, Ireland.

- McNiff, J. (2002). *Action Research: Principles and Practice* (2nd ed.). London: Routledge.
- Nunan, D. (2004). *Task-based language teaching*. Cambridge, UK; New York, NY, USA: Cambridge University Press.
- O'Brien, M. G., & Levy, R. M. (2008). Exploration through virtual reality: Encounters with the target culture. *Canadian Modern Language Review-Revue Canadienne Des Langues Vivantes*, 64(4), 663–691. <http://doi.org/10.3138/cmlr.64.4.663>
- Ó Laoire, M. (2005). Bilingualism in school settings in Ireland: Perspectives on the L2 curriculum. In J. Cohen, T. McAllister, K. Rolstad, & J. MacSwan (Eds.), *Proceedings of the 4th International Symposium on Bilingualism*. Somerville, MA: Cascadilla Press.
- Peterson, M. (2010). Massively multiplayer online role-playing games as arenas for second language learning. *Computer Assisted Language Learning*, 23(5), 429–439.
- Peterson, M. (2011). Towards a research agenda for the use of three-dimensional virtual worlds in language learning. *Calico Journal*, 29(1), 67–80.
- Prensky, M. (2001). *Digital Game-Based Learning*. St Paul: Paragon House.
- Rama, P. S., Black, R. W., van Es, E., & Warschauer, M. (2012). Affordances for second language learning in World of Warcraft. *Recall*, 24, 322–338. <http://doi.org/10.1017/S0958344012000171>
- Ranalli, J. (2008). Learning English with The Sims: exploiting authentic computer simulation games for L2 learning. *Computer Assisted Language Learning*, 21(5), 441–455. <http://doi.org/10.1080/09588220802447859>
- Riggall, A. (2009). Action Research: What is it, who does it and why? In *Action Research: Making a Difference in Education* (Vol. I). Slough: NFER.
- Ryan, G. W., & Bernard, H. R. (2003). Techniques to identify themes. *Field Methods*, 15(1), 85–109.
- Saville-Troike, M. (2006). *Introducing second language acquisition*. Cambridge, UK ; New York: Cambridge University Press.
- Sykes, J. M., Oskoz, A., & Thorne, S. L. (2008). Web 2.0, synthetic immersive environments, and mobile resources for language education. *Calico Journal*, 25(3), 528–546.
- Vaughn, S. R., Schumm, J. S., & Sinagub, J. M. (1996). *Focus group interviews in education and psychology*. Sage Publications.
- Wehner, A. K., Gump, A. W., & Downey, S. (2011). The effects of Second Life on the motivation of undergraduate students learning a foreign language. *Computer Assisted Language Learning*, 24(3), 277–289. <http://doi.org/10.1080/09588221.2010.551757>
- Zadeh, L. A. (1965). Fuzzy sets. *Information and Control*, 8(3), 338–353. [http://doi.org/10.1016/S0019-9958\(65\)90241-X](http://doi.org/10.1016/S0019-9958(65)90241-X)