Children's perspectives on the use of robotics for second language learning in the early years of primary education: a pilot study

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Abstract. This paper explores how floor programmable robotics can be used during play to promote language development. This paper describes a two-day pilot in two early years classrooms and presents data collected on children's perception of the Irish language and using robotics. A sample of 48 children (age range six to seven years) took part in a robotics activity using a bee-shaped robot, called Beebot. The activity was orientated around the children's second language, Irish. The children took part in a questionnaire before and after the activity about the language and the use of the robot in promoting their use of the language. Data was also collected through video, photos, a focus group, and the teacher's observations. The main finding of the pilot study was an increase in children's positive responses towards using the language when integrated into a robotics play activity.

Keywords: language, learning, robotics, early years, play.

1. Introduction

This research is situated in the Irish curriculum framework of play, known as Aistear (NCCA, 2009). The activity integrates the language curriculum, specifically the children's second language, Irish, and a technology resource: programmable floor robots. Language lessons are taught every day and the Irish language is used informally throughout the day. Play in the context of the Aistear curriculum framework is the perfect opportunity to develop that living language for young children. This study looks at the development of the second language during play.

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Robotics provides a playful way for teachers to integrate curriculum content with the development of meaningful projects (Bers, Seddighin, & Sullivan, 2013). While using robotics, children are given the opportunity to experiment with engineering concepts as well as telling stories by narrating contexts for their projects (Bers, 2008). By engaging in these types of robotics projects, young children play to learn while learning to play in a creative context (Bers et al., 2013; Resnick, 2003). In this study, children are developing their language skills by making meaningful connections through play and robotics. This study explores the use of robotics in a play environment for language learning, and how the intervention can both motivate children to learn and use Irish. This area is an identified gap in the research literature on robotics in early years education.

2. Method

The pilot study explores the following research questions.

- What are children's perspectives of using robots during play-based learning as an opportunity to use their new language?
- Can robots facilitate language learning in the early years of primary education?
- Do programmable floor robots motivate children to learn and use a new language?

To answer these questions, 48 children from two schools participated in this study. Day 1 took place in a boy's school (27 participants; age range six to seven years), and Day 2 took place in a girl's school (21 participants; age range six to seven years). Written consent was obtained from participants' parents/guardians and written assent from the children. An interview took place with the teacher on Day 1 and a focus group with two groups of children on Day 2.

On both days, the children completed a questionnaire about learning Irish before and after the activity. A focus group was conducted with two groups on Day 2. Their language lesson lasted for 30 minutes and then they were asked to participate in a play activity in a small group using a programmable robot, Beebot (see Figure 1), for a twenty-minute period. Beebot is a programmable floor robot that looks like a bee. The robot can move forward and backwards 15 cm, turn at 90-degree angles, and can pause. The code to move the robot can be inputted by pushing the

directional buttons on his back and the robot can take up to 40 commands. Once Beebot has completed its route, it will make a sound alerting the children to the end of the program they have inputted. Beebot was designed to move around on a floor map and, during the activity for this study, the floor map was designed for this specific context by the researcher and the classroom teacher. This map displays pictures and words that children have been learning in the Irish language lesson.

Figure 1. Beebot

3. Results

3.1. Questionnaire

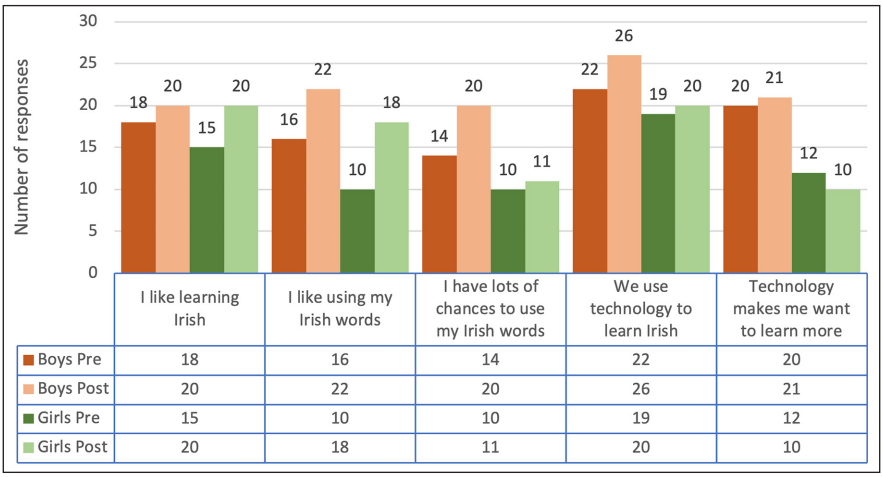
The children answered two questionnaires. One prior to the activity and one after. The questionnaire after the activity had an additional four questions about the robot. Children responded by colouring a cartoon face associated with yes, no, or maybe (see Table 1).

Table 1. Pre and post-intervention questionnaire

Pre-intervention questions	Post-intervention questions
I like learning Irish.	I like learning Irish.
I like using my Irish words.	I like using my Irish words.
I have lots of chances to use my Irish words.	I have lots of chances to use my Irish words.
We use technology to learn Irish.	We use technology to learn Irish.
Technology makes me want to learn more.	Technology makes me want to learn more.
	I talk to the robot in Irish.
	Is using robots to learn Irish fun?
	Robots help me to learn more Irish.
	Robots make me want to use more Irish.

As shown in Figure 2, the results of the questionnaire showed an increase of yes answers in the post-questionnaires on both days across the first four questions while there was a decrease in yes answers on Day 2 for Question 5.

Figure 2. Comparison of yes responses from boys and girls



	I like learning Irish	I like using my Irish words	I have lots of chances to use my Irish words	We use technology to learn Irish	Technology makes me want to learn more
Boys Pre	18	16	14	22	20
Boys Post	20	22	20	26	21
Girls Pre	15	10	10	19	12
Girls Post	20	18	11	20	10

The additional four questions after the activity which focused on the robot produced positive responses across both days of the pilot.

The boys on Day 1 gave more yes responses to the question 'robots make me want to use more Irish' (22 yes responses, five no responses and zero maybe responses), while the girls' responses on Day 2 were the same between yes and maybe (nine yes responses, three no responses, and nine maybe responses).

3.2. Focus group

A focus group took place on Day 2 of the pilot study with two groups of six children. The children were asked about using Beebot for learning Irish. The resounding comments from both groups were positive about using the robot and the impact it had on their learning. One child commented, "well they move lots of ways and make some noise. Yeah we really enjoy them because it helps us with our Irish".

At the end of the focus group, the children were asked for any additional comments on using the Beebot. The children compared the activity to other

activities that were available to them during the play-based activities session. One child commented on how the Beebot activity also included maths, it was more stimulating, and gave them an opportunity to use their imagination more: "there's lots of maths and cause of maths it helps get our imagination better instead of just going to blocks. When we're at blocks everything was really boring".

3.3. Teacher

The classroom teacher on Day 1 was interviewed after the activity. The teacher observed one child in the class who she would describe as having very little interest in Irish generally and who was more enthusiastic and engaged in the language because of the activity: "his behaviour and everything would have been a lot calmer than he normally would be – a lot more focused". She was surprised at the child's language production and their positive behaviour during the activity. When asked would this be an activity she would incorporate into the classroom the teacher commented:

> "I could see myself being able to cover loads of topics and loads of language. I just thought that they were really motivated. I don't see their motivation dwindling that quickly I would imagine, you could get a long time out of them [Beebots], and they would still be highly motivated and then obviously because you can change the language on the maps that you're using".

4. Discussion and conclusions

This study addresses an important gap in the research literature on the use of robots for language learning with young children. It echoes the findings of previous studies in other domains that children find the use of robots in learning motivating (Kazakoff, Sullivan, & Bers, 2013).

This pilot study would suggest that the functional context of robotics provides a functional context for the use of the language – another critical factor in Irish language learning as the language is not widely spoken as a community language (Devitt et al., 2018). The children themselves comment on the benefits of integrating other curriculum areas (in this case maths) to build interest. Future research, however, would need to include a larger population and statistical analysis to confirm or refute our preliminary results.

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