Creating a Whole-Class Digital Learning Environment Using a Simple Variable-Based Flash Game

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ABSTRACT

Flash games were developed to assist in the teaching and learning of science at upper primary and lower secondary levels. One game reported here dealt with the concept of friction and it was designed to be easy to use for teachers. We report that whereas many digital learning environments rightly attend to children's learning, in order to engage teachers more fully in digital learning, change of practice must be managed in a carefully considered and considerate way. Therefore evaluation of this software is through teacher reflection following use of the instrument within the context of a teaching sequence employing standard hands-on experimental work. It is anticipated that teachers will attempt to adapt their practice to take account of this technology and that it will form the basis of further change and a greater engagement with digital learning.

KEYWORDS: *Whole-class, Digital learning, Flash game*

INTRODUCTION

The use of digital learning environments and Flash games or simulations has received much attention in the research literature (see for example, Niedder *et al.*, 2003 for a review of research and Angeli (2006) for a specific example). Many are quite sophisticated environments (Stylianidou *et al.*, 2003) where the user is enveloped in an alternative world and often engages with a virtual or alternative reality. These digital learning environments may be best suited to single-user per computer situations, however changing the standpoint of practicing teachers can be difficult to bring about. Thus, we note a conflict between catering for the needs of the child (*i.e.*, learning, and we emphasise 'meaningful learning' (Marcou and Valanides, 2006)) and catering for the needs of the teacher (*i.e.*, change of practice) – very often the teacher is as unwilling to change their practice as the child is to learn (the difficulty of changing teaching practices is noted by Meletiou-Mavrotheris and Mavrotheris (2006))

This work reports an attempt to incorporate digital learning into the whole-class setting. Dendrinos (2005) notes that teachers seldom use computers available in schools. Often, such attempts are anecdotally reported to consist of single outdated computers in a poor state of repair with multiple user groups struggling to access information or at the other extreme, dedicated computer rooms are provided but these require a level of support that is often lacking (INTO & CESI, 2007).

Teachers are more likely to incorporate digital learning into their classroom practice if they feel 'comfortable' with it. Minimal changes facilitate such comfort, thus it would be anticipated that further change could then be encouraged and be allowed to 'creep in'. To help with this scenario, the forms of digital learning must be simple and not require a high level of technical capability.

METHODOLOGY

The Design A Science Teacher (DAST) and the Constructivist Learning Environment in Science (CLES) questionnaires were administered to the following convenience sample (Table 1). The results of these showed that in five countries sampled (Cyprus, Czech Republic, France, Ireland and Slovenia) teachers of 10 year olds desired science lessons to be more about the world than what actually happened in science classes. In response to these findings, we embarked on an initiative to facilitate change in the practice of teachers by encouraging them to think and act in more "constructivist" ways. We approached this by helping teachers engage in more meaningful discussion with their students and empowering the students to have a greater role in their own learning.

Table 1. *Administration of CLES questionnaires*

Country	Primary	Post-primary
Ireland	77	0
France	0	48
Slovenia	24	26
Czech Republic	31	31

Three Flash games were developed for the purpose of teaching and learning concepts from the Irish science curriculum with a view to bringing about conceptual change (Andaloo et al., 1997). The first, on friction, was developed as part of the Sci-Spy project, which was a joint initiative of the national television and radio broadcaster in Ireland (RTE) and the *National Centre for Technology Education* in Ireland (NCTE). The remaining two games, on ecology, were developed for the Comenius Project: SOPHIA as part of Ireland's contribution to this project.

The briefs for the games were kept simple both from the point of view of cost and of use. Whereas children are particularly proficient at using computer games, many teachers are not. An interesting aspect of this game is that it does not aim to compete nor co-exist with commercially available computer games – and this was understood by the students who trialled it. Thus the games avoided negative impact and retained their novelty value as 'something different'.

The games were designed to offer a number of values on a small number of variables and then for the user to determine if their prediction of 'what happens next?' is correct or not. A simple questionnaire (Table 2) was applied for the students to complete. Once various predictions were made, students run the game and find out if their predictions were correct. It was noted that motivation levels remained high, and because many of the students made similar predictions, the solutions offered satisfied a number of predictions made by different students.

Table 2. *Student worksheet for the Flash game component of the module*

Combination		Prediction	Result	Mark
Road Speed	Surface Condition			✓ / ✗

Once the games were developed, they were used in conjunction with experimental hands-on activities, which helped to contextualise the digital learning component (Sharma *et al.*, 1999). It is important to note that the games do not replace school science hands-on activities but complement them (Clark, 1993; Tolstik, 2001). Furthermore it is the instructional method that is critical to effective learning rather than merely the provision of a digital learning component, hence the importance of making teachers comfortable with digital learning Saloman et al., 1977; Hagler *et al.*, 1987; Clark, 1983, 1994; Niemeic *et al.*, 1987; Belmore, 1983; Welsh and Null, 1991). The game was employed within the context of the whole class – the children sat in their normal seats and the game was displayed using a digital projector. The teaching sequence ran as follows:

1. Use of story
2. Simple experimental work
3. Introduction of Flash game and discussion of games in general
4. Predictions made concerning outcomes of each set of variables
5. Students selected to run the programme
6. Discussion to consolidate, recap and bridge

Because the aim of the software is to change teachers' practice, the evaluation tool used was a teacher reflection protocol (Appendix 1.) based on the work of Brockbank and McGill (2007).

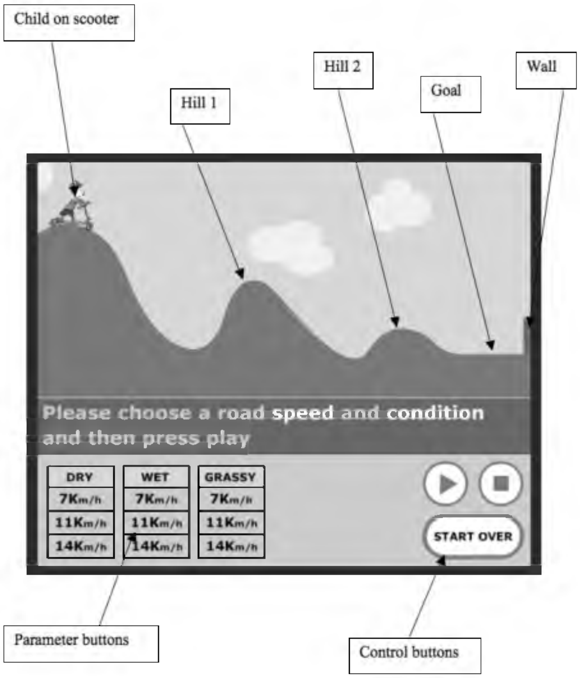

Figure 1. *The interface of the first game on friction*

RESULTS (ANTICIPATED)

In the trialling of the first game, all the students in the mixed ability setting were able to make coherent predictions of possible outcomes. There was as expected a range of levels in making 'correct' predictions.

It is anticipated that these games will prove effective in encouraging teachers to incorporate digital learning into their classroom practice. Such encouragement will be evident from their evaluations of the games in practice. It is anticipated that students will be able to make the switch from using traditional methods to using these games easily.

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Appendix 1. *Template for teacher evaluation*

Template for Teacher Evaluation

Lesson: ________________________ Date: ________________

Comment on the dialogue itself.

Comment on recommendations regarding methodologies

What seemed to go well and what seemed to go badly?

Comment on how your own teaching experience fitted-in to the lesson-plans:

What questions or new knowledge do you have now?

How did you feel the students responded?

Was the experience positive or negative, useful or helpful?

Does the experience tell you anything about yourself? Your practice? Your values?