Using Information and Communication Technology (ICT) to Facilitate Cognitive Engagement / Η χρήση των Τεχνολογιών Πληροφορικής και Επικοινωνίας (ΤΠΕ) για τη διευκόλυνση της γνωστικής συμμετοχής/δέσμευσης

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— ΑΚΟΛΟΥΘΕΙ ΤΟ ΠΛΗΡΕΣ ΚΕΙΜΕΝΟ —
— FOLLOWS THE FULL TEXT OF THE ARTICLE —

Using Information and Communication Technology (ICT) to Facilitate Cognitive Engagement

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Abstract

This article explores how teachers use ICT-enabled learning to engage students in classroom learning. These insights are drawn from a broader qualitative case study which sought to identify key factors that engaged year 5/6 students (aged 10-12 years) in religious education (RE) classes. The case consisted of six composite classes of Australian upper primary school students (combined classes of year 5/6) and their teachers. Semi-structured and focus group interviews as well as a series of direct classroom observations were employed to gain insights into how ICT-enabled learning fostered student engagement. The findings from this study suggest that ICT-enabled learning may facilitate cognitive engagement in situations where teachers adopt a student-centred pedagogy. This study suggests ways in which teachers might foster student engagement through ICT-enabled learning by participation in open tasks, peer learning interactions and global learning connections.

Key words: ICT-enabled learning, cognitive engagement.

1. Introduction

Educational research has reported a lack of student engagement in humanities-based discipline areas such as classroom religious education (RE) (de Souza, 1999; White, 2004). Over recent decades the engagement and disengagement of students in the humanities has been attributed to both pedagogical and curriculum factors (Lacey, 2011). This paper reports the findings of a qualitative study which investigated the use of ICT-enabled learning to engage upper Primary (aged 10-12 years) students in classroom RE. The impetus for this study stemmed from data collected from Catholic Education Melbourne (CEM), a centralised education authority that is the largest Catholic education system and the sixth largest education system in Australia. One in four students in Melbourne

attend a Catholic school. The survey data revealed that a cohort of upper Primary students valued and wanted to do academically well in RE, however, this discipline area did not engage these students in classroom learning. This paper reports a study which sought to discover how students might become more engaged in learning in the RE classroom. The investigation revealed that teachers could utilise Information and Communication Technology (ICT) to facilitate cognitive engagement and lead to successful learning experiences for students undertaking classroom RE.

1.1   The Impact of ICT on Student Engagement and Learning

During the last decade, the use of ICT has succeeded in engaging students in a range of curriculum areas (Chen, Cheng, Yeh, & Chan, 2012; Condie & Munro, 2007; Passey & Rogers, 2004; Underwood, 2009). Contemporary research on the influence of ICT on student engagement and learning suggests that virtual learning environments foster student interest and engagement. However, a major review of the use of ICT in education has noted, "evidence of digital technologies producing real transformation in learning and teaching remains elusive" (Luckin, Bligh, Manches, Ainsworth, Crook, & Noss, 2012, p. 8). This paper explores particular features of ICT-enabled learning which were able to facilitate cognitive engagement that transformed student learning in the RE classroom.

Primary students are interested in learning through ICT and find its use to be "highly motivational" (Burden & Keuchel, 2004, p. 9). The positive impact of ICT on students includes "greater engagement and persistence, [and] more on-task behaviour" (Condie & Munro, 2007, p. 4), as well as more active participation and enjoyment in undertaking learning tasks (Chen et al., 2012). Furthermore, ICT facilitates a stronger focus on the process of learning (Passey & Rogers, 2004). The multi-sensory nature of ICT also has the potential to increase understanding of concepts and make learning more interesting across a range of subject areas (Condie & Munro, 2007).

Chen et al., (2012) posit that student interest may be enhanced when learning is set within game-based contexts. These contexts include a game framework or a blending approach. A game framework places student learning within a narrative or adventure context; and this may include role-playing in order to achieve certain goals. A blending approach integrates learning activities within the context of a game (for example, students' progress on a board game when they successfully complete activities). Game-based contexts have been used successfully to facilitate student engagement and learning (Sandford, Ulicsak, Facer & Rudd, 2006).

Specific features of virtual learning environments are able to heighten student interest. Examples are the multi-sensory experience, the immersion in a three-dimensional environment, and being able to visualise a real-world experience from multiple perspectives (Ainley & Armatas, 2006).

A characteristic of virtual learning environments is their representation of real-world environments. Virtual learning environments range from computer learning programs that assist and mediate learning using two dimensional screens through to simulations of real-world environments which students may interact with and influence (Ainley & Armatas, 2006). There are few studies of the use of virtual learning environments in

teaching the humanities. A review of research on virtual learning environments from 1999-2009 revealed that many of these studies were based in the discipline areas of science, maths and technology (Mikropoulos & Natsis, 2011).

From the 1990s there has been a call for a pedagogical rather than a technological focus in the use of ICT (Becker, 1994; Hadley & Sheingold, 1993). The pedagogy underpinning the use of ICT has important implications for student outcomes (Ertmer & Ottenbreit-Leftwich, 2013). Primary students are more likely to be engaged when ICT is strategically used to support teaching and learning (Clarkson, Dunbar, & Toomey, 1999; Ofsted, 2004; Passey & Rogers, 2004).

Current theorists, as well as reviews of recent research, emphasise the use of ICT tools to enable learning (Ertmer & Ottenbreit-Leftwich, 2013; Fisher, Denning, Higgins, & Loveless, 2012; Mikropoulos & Natsis, 2011). Teachers are encouraged to "engage students in ... technology-enabled learning" (Ertmer & Ottenbreit-Leftwich, 2013, p. 176). Frameworks for teaching and learning using ICT have been developed in countries such as England, Australia, and Norway to support teachers in the purposeful use of ICT in the classroom (Fisher et al., 2012; Krumsvik, 2008; Starkey, 2010). Recent evidence suggests that a student-centred pedagogy is essential for authentic learning using ICT in contemporary primary classrooms (Ertmer & Ottenbreit-Leftwich, 2013; Ertmer, Ottenbreit-Leftwich, Sadich, Sendurur, & Sendurur, 2012; Hermans, Tondeur, van Braak, & Valcke, 2008). Authentic learning has been described as "real world learning" such as video conferencing to communicate in a foreign language to students in another country (Clarkson et al., 1999, p. 22; Condie & Munro, 2007).

The pedagogical beliefs and practices of teachers have been found to be decisive in determining how ICT is used in the classroom (Ertmer et al., 2012). In traditional classrooms, students' use of technology was limited and practices were centred on the teacher. (Ertmer & Ottenbreit-Leftwich, 2013; Keengwe, Onchwari, & Wachira, 2008; Palak & Walls, 2009). For teachers to move beyond this approach it is essential that they understand how to successfully embed ICT within a student-centred teaching and learning process. Despite the association between authentic technology use and student outcomes, ICT use in the RE classroom has been limited and infrequent (Ertmer et al., 2012; Ertmer & Ottenbreit-Leftwich, 2013).

There exists a range of views regarding the place of ICT in the RE classroom (Ang, 2012; Ofsted, 2011; Ryan, 2001). In Australia, it has been argued that ICT may increase the availability of resources and extend the zone of discourse (McGrady, 2002; Ryan, 2001). The importance of ICT use for the engagement of adolescent students in RE learning has been acknowledged; however, engagement is not listed as one of the four essential elements (knowledge, authenticity, relevance, and relationships) needed to facilitate RE learning (Ang, 2012).

Although ICT has been increasingly used in literacy and numeracy lessons in British classrooms since early this century, its use in RE classrooms was infrequent until recent times (Ofsted, 2004). More recently, ICT has been used in the teaching of humanities (including RE) in England to enhance learning outcomes (Ofsted, 2011). However, there has been little research into the role of ICT in RE learning, particularly

in the primary years.

ICT increases student motivation and engagement in learning (Chen et al., 2012). However, the sustaining of motivation and interest requires more than the disposition of students and the engaging nature of ICT (Burden & Keuchel, 2004; Passey & Rogers, 2004). A student-centred pedagogy and authentic technology use (related to real-life situations) are essential elements of effective ICT pedagogy in contemporary primary classrooms (Ertmer et al., 2012; Ertmer & Ottenbreit-Leftwich, 2013).

2.   Research Design

This case study was set in a large Catholic primary school in the Archdiocese of Melbourne, Australia. At the time the research was conducted, this school had a population of 700 students, 95% of whom were baptized Catholics. The school is located within a low socio-economic area in the outer suburbs of Melbourne. Many of the families are newly arrived immigrants from countries such as India, Sri Lanka and the Philippines and speak a language other than English in the home.

This research was underpinned by a case study methodology. A case may be defined as a "phenomenon of some sort occurring in a bounded context" (Punch, 2009, p. 119). In this research the case was six composite classes of year 5/6 students (150 students) and their teachers within a Catholic primary school.

This study involved *"deliberate or purposive sampling"* [italics by original author] (Punch, 2009, p. 252). That is, the participants, the setting (year 5/6 students aged between 10-12 years) and their classroom teachers in a Catholic primary school, were purposefully chosen by the researchers because they enabled maximum insight and understanding of the research question (Ary, Jacobs & Sorenson, 2010, p. 428). Where the research question was: what are the factors that enhanced the engagement of these year 5/6 students in an RE curriculum?

The study is founded on a constructivist epistemology in which it is posited that knowledge is constructed through social interaction between humans and their experience of the world, negotiated through language and developed in a social context (De Koster, Devise, Flament, & Loots, 2004). The perspectives of year 5/6 school students and their teachers were sought to help understand the meaning they had constructed (Ary et al., 2010). These perspectives were then observed in their classrooms "within the contexts of their natural occurrence" (Hatch, 2002, p. 7). The data collection instruments included semi-structured and focus group interviews, and direct observation in classrooms. Open-ended questions guided the semi-structured interviews (Kervin, Vialle, Herrington, & Okely, 2006). Prompts and probes were also used during the interviews to encourage participants to answer a question at a deeper level, to give detail, to provide elaboration or to give examples (Basit, 2010).

Gathering data through a focus group interview involved interviewing groups of approximately four people (Creswell, 2002). These interviews were chosen as they have advantages of group support and group dynamics which increase both participation and discussion (Morgan, Gibbs, Maxwell & Britten, 2002).

Cases respond differently according to complex situational factors within which they are bound; these contexts require the scrutiny of observation to facilitate depth of understanding of their complex nature (Kervin et al., 2006). To this end, observation assisted the researchers to gain an understanding of the case from the perspective of those being observed (Hatch, 2002).

Data collected through interviews was analysed using the Constant Comparison Method (CCM). The focus was on interpretive understanding of participants' experience (O'Connor, Netting & Thomas, 2008). CCM requires the systematic comparison of data whereby every line, sentence and paragraph of transcribed interviews is reviewed and compared (Bowen, 2008).

A three-step analysis procedure based on the work of Boeije (2002) was developed and implemented to analyse semi-structured and focus group interviews. Step one involved analysis and labelling of every passage within each semi-structured or focus group interview to determine what had been stated. Through comparison of every passage, commonalities, differences and repetitions were noted. This internal comparison facilitated categorizing; and it represented an attempt to understand the parts within the context of the entire interview.

The second step began once two or more interviews had been analysed. In this step interviews within the same group, that is, those who shared the experience of student or teacher, were compared. This meant that the interviews of year five / six students were compared with each other. Similarly, the interview scripts of the teachers were compared with each other. At this stage, patterns were discerned so that clusters and typologies were formed, for example, a typology of students who were engaged in a particular way.
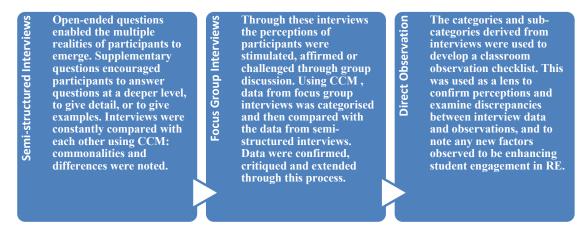
Step three involved a comparison between different groups. The perceptions of students were compared with those of teachers. Similar categories between groups were noted and further explored for differing/similar underlying factors, broadened and contextualised understandings, or differing/similar experiences.

The analysed data from semi-structured and focus group interviews provided a lens through which the researchers sought to understand and interpret the most salient "Me" of the participants, as student in the RE classroom or as teacher of RE, in the social setting of the RE classroom (Blumer, 1969; Bowers, 1988, p. 37; Gouldner, 1970; Mead, 1934). Field notes from classroom observations were compared with data from interviews to confirm perceptions, examine areas of dissonance, to note any new data, and to guide the researchers to a deeper understanding of participants' perceptions.

Using Constant Comparative Method (CCM) the initial categorisation of data from semi-structured interviews was compared with later focus groups interviews (Bowen, 2008). Through this process of comparison, categories and sub-categories emerged and were confirmed.

Categories and sub-categories from semi-structured and focus group interviews were used to develop a classroom observation checklist. The researchers wrote field notes as he observed individual items on the checklist, or any new data. These field notes were then compared with data from interviews to confirm perceptions, examine areas

of dissonance, and to note any new factors that facilitated student engagement in RE.

Figure 1 How Each Method Added to the Accumulation of Rich, Deep Data.

Semi-structured Interviews	Focus Group Interviews	Direct Observation
Open-ended questions enabled the multiple realities of participants to emerge. Supplementary questions encouraged participants to answer questions at a deeper level, to give detail, or to give examples. Interviews were constantly compared with each other using CCM: commonalities and differences were noted.	Through these interviews the perceptions of participants were stimulated, affirmed or challenged through group discussion. Using CCM, data from focus group interviews was categorised and then compared with the data from semi-structured interviews. Data were confirmed, critiqued and extended through this process.	The categories and sub-categories derived from interviews were used to develop a classroom observation checklist. This was used as a lens to confirm perceptions and examine discrepancies between interview data and observations, and to note any new factors observed to be enhancing student engagement in RE.

This research approach involved several levels of data collection including thirty semi-structured interviews (24 students and 6 teachers), seven focus group interviews (a teacher group and 6 student groups – involving 30 students), and thirty classroom observations involving 150 students. The intensity of each of these methods required a substantial amount of time in the field which produced a set of rich, deep data.

3. Findings and Discussion

A key finding from this case study is that ICT may support cognitive engagement. Teachers suggested that ICT kindled student interest in learning. They also suggested that other factors related to learning, such as the qualities of the task or process, were not important. Teachers held the view that students were engaged whenever they used ICT. Students indicated that they were engaged when ICT facilitated access to resources, provided multiple ways to present learning, broadened their perspectives and stimulated thinking about familiar topics.

These insights from student and teacher interviews were used as a lens for subsequent direct observations in the classroom. Classroom observations indicated that certain key attributes of an ICT tool enabled student engagement. There was a dissonance between the perceptions of teachers and students on the one hand, and the researcher's observations of how ICT engaged students in the classroom on the other. The scholarly literature indicates that, for an ICT tool to affect the cognitive engagement of students, it must be underpinned by effective pedagogical practice. Four key features of ICT-enabled learning were identified as facilitating cognitive engagement: exploring open tasks; reciprocal, supportive and constructivist peer interactions; a narrative context and relevant, meaningful content; and a student-centred pedagogy

3.1 Student Interviews

Students participated enthusiastically in learning situations where ICT was provided. They enjoyed the novelty of learning through computer usage. This was expressed in

a focus group discussion: "Using computers is a different way of learning: it's more fun and educational" (F/C). Computers assisted student learning in practical ways and enabled access to resources. This helped them to present their learning, broaden their perspectives, promoted thinking and facilitated understanding.

Students were often asked by their teachers to use computers for research purposes. They enjoyed the opportunity to research online and the way in which this facilitated the completion of work such as projects: "I like doing projects on the computer because it's easier to research and get information and pictures" (S/R). Students liked using computers because it enabled them to complete their research tasks.

Computers and software programs also helped students present their learning to others. The visual attributes of programs such as PowerPoint enabled students to show rather than having to explain their learning to others. As noted during a focus group discussion, such possibilities were appealing to introverted students. This appeal is evident in the following comment: "If you are a shy person you can express your learning using PowerPoint. Others can view this rather than you having to stand up in front of the class and talk about it" (F/B). Students also felt confident when using basic software programs such as Word to present their ideas. They were familiar with many of the features of these programs This self-assuredness is apparent in the following student's comment: "I like using computers because I'm pretty good at it and I know lots of special features" (S/T). Computers also provided students with the opportunity to access online resources that broadened their perspectives and deepened understandings.

Online resources gave students unprecedented access to information related to RE topics. This information increased understanding and stimulated interest. A focus group used the example of Easter to explain how research assisted them to think about this topic from a different perspective. "When we do Easter we think of Jesus dying and rising, but when we go deeper into it through research, we find out information we had never thought about before" (F/F). ICT enabled students to understand concepts, and to gather contextual and background information. This encouraged them to reflect on a topic such as Easter from new and different perspectives. Thinking about familiar topics in a different way made learning more interesting for students.

The data from student interviews indicated that ICT supported learning and facilitated the engagement of students in the RE classroom in multiple ways: computers and online research enabled the completion of set tasks; it broadened students' perspectives and facilitated deepened reflection on a topic; and common software programs assisted students to present their learning. In these various ways, ICT stimulated students' enthusiasm for and interest in learning.

3.1.1 Teacher Interviews

Teachers emphasised one fundamental quality of ICT: that it fostered student interest in learning. They reported that students enjoyed the novelty of learning in a different way, which ICT provided, such as use of computers and the Internet. This section reports on insights from teacher interview scripts related to their perception that students were excited about learning using ICT.

Teachers perceived that students were enthusiastic learners whenever they used ICT. According to the teacher focus group this was reflected in students' "excitement" (F/T) when using ICT. This view was evidenced in the following teacher comments: "They love the technology and they're right into it" (T/F); "ICT acts as a self-motivator" (T/E); "As far as getting them engaged, I think that ICT does it by itself" (T/B); and "They're already motivated just by getting online" (T/C). Teachers implied that student interest was enhanced through access to computers. Furthermore, students were engaged in learning, irrespective of the topic or activity, whenever ICT was used. This point of view is succinctly stated in the following reflection from the teacher focus group: "They love using computers, so almost any task you want them to do, or even if the RE topic is a little bit dry, they'll get right into it because they enjoy that medium" (F/T). Computers enhanced students' experience of learning.

Teachers suggested that they only needed to provide the opportunity for students to use ICT to maintain their interest in learning. They proposed that the qualities of the task or process were not necessary to facilitate student engagement. Students proposed that they were engaged when ICT enabled the completion of set tasks, facilitated the presentation of their learning, broadened perspectives and promoted thinking about the familiar in a different way.

Students and teachers constructed their understanding of the ways that ICT engaged students in RE learning (their perspective or voice) through semi-structured and focus group interviews. The researchers then endeavoured to make sense of (interpret) student and teacher perspective. The voices of students, teachers and the researchers are summarised in Table 1. An exploration of insights from the researcher's observations in RE classrooms follows this summary.

Table 1. The voice of students, teachers and the researchers derived from semi-structured and focus group interviews.

Voice of the students	Voice of the researchers
"I like doing projects on the computer because it's easier to research and get information and pictures" (S / R). "I like using computers because I'm pretty good at it and I know lots of special features" (S / T). "If you are a shy person you can express your learning using PowerPoint. Others can view this rather than you having to stand up in front of the class and talk about it" (F / B). "When we do Easter we think of Jesus dying and rising, but when we go deeper into it through research, we find out information we had never thought about before" (F / F).	Students were affectively engaged in RE classroom learning when: online research supported project work and extended their perspective on RE topics; and when basic software tools assisted them in the presentation of their learning.
Voice of the teachers	**Voice of the researchers**
"They love the technology and they're right into it" (T / F); "ICT acts as a self-motivator" (T / E); "As far as getting them engaged, I think that ICT does it by itself" (T / B). "They love using computers, so almost any task you want them to do, or even if the RE topic is a little bit dry, they'll get right into it because they enjoy that medium" (F / T).	Teachers emphasised that students were engaged whenever ICT was used. ICT was inherently engaging and did not require other factors such as the qualities of the task, learning process or curriculum to engage them.

3.1.2 Researchers' Observation: Engagement through the Attributes of an ICT Tool

Classroom observations indicated that students were affectively engaged, enthusiastic and interested in learning (Fredricks, Blumenfeld, & Paris, 2004), through the attributes of an ICT tool. Students were observed using an online game that supported learning in the RE unit "Life is Good", from the curriculum framework used in the Archdiocese of Melbourne, *Coming to Know, Worship and Love* (CEO, 2008). The focus of this unit was on preservation and respect for life. The game focused on ways to minimise loss of human life due to natural disasters. Two key attributes were apparent. These are referred to as the game-based context, and the game's interactivity with its immediate feedback. These attributes are reported in this section.

The first engaging attribute of ICT usage was that it involved a game-based context. It situated student learning within a narrative framework with a goal to achieve: to minimise loss of human life on an island in the event of a natural disaster. Students had to consider various options, and associated costs, and had to determine the most effective course of action. The narrative framework of this game centred on the Samoan people whose island had recently been decimated by a tsunami. Students empathised with this narrative. The interactivity of the game with its immediate feedback also supported student engagement.

An important attribute of this game was its interactivity. When students applied their solution(s), they received immediate written and visual feedback as to the effectiveness of their solution. Realistic, three-dimensional graphics enabled students to see the effect of their chosen solutions such as moving houses from the shoreline to hilltops. They pointed out and discussed these changes with peers as they appeared on the screen. The combination of written and visual feedback enabled students to make informed decisions and to modify solutions according to their effectiveness and/or cost.

Two attributes of an online game appeared to foster student interest: a game framework and the interactivity of the game (this included the opportunity to evaluate decisions through written and visual feedback). In following section presents further analysis of these findings. This further analysis revealed that year 5/6 students were cognitively engaged when use of the ICT tool was underpinned by ICT-enabled learning. The key features of ICT-enabled learning are explored in this section.

3.2   Cognitive Engagement and ICT-enabled Learning

Initial analysis of classroom observations indicated that the attributes of an ICT tool sustained student interest, or affective engagement (Fredricks et al., 2004), in learning. This finding aligns with research in virtual learning environments and various curriculum areas (Ainley & Armatas, 2006; Chen et al., 2012). Research in the UK has found that upper primary students had increased motivation and spent more time on-task when laptops were used in lessons (Burden & Keuchel, 2004). The active engagement of students is necessary if they are to be effective participants in a contemporary approach to learning (Keimer, Groschner, Pehmer, & Seidel, 2015). Whilst affective engagement

may be an important outcome of ICT usage, current theorists emphasise the use of ICT tools to enable learning (Ertmer & Ottenbreit-Leftwich, 2013; Fisher et al., 2012; Mikropoulos & Natsis, 2011). Further analysis of initial findings from this study led to the identification of four key features of ICT-enabled learning that facilitated cognitive engagement or "task-specific thinking" (Helme & Clarke, 2001, p. 136). These key features were: exploring open tasks; reciprocal, supportive and constructivist peer interactions; a narrative context and relevant, meaningful content; and a student-centred pedagogy.

Open tasks align with learning that is developmentally appropriate to students in year 5/6 (CEO, 2008). These tasks support abstract thinking and require the cognitive effort of students to explore concepts from multiple perspectives. The positive classroom climate created through reciprocal and supportive peer interactions promotes student learning. Furthermore, constructivist interactions enable deeper learning when peers collaborate, challenge and build upon ideas. Year 5/6 students were interested in authentic (real-world) learning. This occurred when they could see that the subject matter of school related to real life and the global community of which they are a part. These features of ICT-enabled learning are underpinned by a student-centred pedagogy. Such an approach to teaching and learning enables effective learning in contemporary primary classrooms. These key features are explored in the following sections.

3.2.1 Exploring Open Tasks

The interactive online game required students to explore an open task. Open tasks have multiple solutions and require students to think about and pursue several possibilities (Parsons & Ward, 2011). Students had to think about and decide upon what they believed to be the best solution/s in the context provided. These various solutions and possibilities were informally discussed with peers and then analysed in subsequent whole class discussions led by the class teacher. This feature of ICT-enabled learning aligned with one of the key aims of learning in year 5/6: "developing the ability to think and engage in the abstract and explore concepts that allow for several points of view" (CEO, 2008, p. 21). Critical inquiry and exploration are important components of learning (Buchanan, 2009; Buchanan, 2005). Open tasks provided all students with the opportunity to use cognitive effort to explore concepts from different perspectives; they were cognitively engaged in this type of learning. The teacher in this classroom had selected a task that gave students the opportunity to explore an aspect of the RE curriculum from multiple perspectives. Rather than telling students what they considered to be the best solution/s, the teacher guided students to investigate and consider a range of possibilities within the context of the game. The classroom teacher then used the perspectives students had gained through this ICT-enabled learning process to further deepen understanding through use of high-order thinking skills such as analysis and evaluation (Neal, 2005). They also promoted the peer interactions that facilitated cognitive engagement and learning.

3.2.2 Reciprocal, Supportive and Constructivist Peer Interactions

Cognitive engagement and learning were enhanced when peer interactions were

reciprocal, supportive, and constructivist. Reciprocal interactions were evident when students willingly shared their ideas and perspectives and responded to those of peers. Supportive interactions were observed when students explored ideas rather than when they diminished or dismissed the ideas of others. These characteristics of peer interactions facilitate a positive and trusting classroom-learning climate (Alexander, 2008; Buchanan & Hyde, 2006; Lacey, 2016). Constructivist interactions were also evident.

Derived from the work of Vygotsky (1978), constructivism may be defined as the process of constructing knowledge through interaction with others. Constructivist interactions were apparent when perspectives were discussed, challenged and built upon. Whilst these are student-centred interactions, teachers play a central role in establishing and maintaining a classroom climate that promotes such interactions (Reyes, Brackett, Rivers, White, & Salovey, 2012). The teacher in this classroom used a variety of methods to actively encourage these interactions. For instance, they interacted with individuals and small groups of students using open-ended questions and scaffolding conversations. Open-ended questions have more than one possible answer and often require high-order thinking (Sadker, Zittleman, & Sadker, 2011). Scaffolding conversations are those between the teacher and student/s that respond to their conceptual understanding and thinking (Ferguson, 2012). The teacher actively promoted the sharing and exploration of ideas through such processes with individuals, small groups and the whole class. A narrative context and relevant, meaningful content also engaged students in learning.

3.2.3 A Narrative Context and Relevant, Meaningful Content

The narrative context of the game framework fostered cognitive engagement and student learning. It placed the learning in a meaningful context. Students were able to connect their life story with the story of a different community. Their ability to empathise with the situation of these people was enhanced as they learnt about the problems they faced in protecting life and property. Their immersion in this story assisted them to develop a new level of awareness related to the application of practical social action. For instance, they learnt about the need for establishing an early warning system to lessen the potential impact of natural disasters. Relevant and meaningful content also fostered learning.

The online game sustained high levels of student interest in content related to their current RE unit, "Life is Good" (CEO, 2008). A finding from this case study was that students were interested in learning when knowledge was relevant and meaningful. As noted in the section *Researchers' Observation*, students could see the relevance of the narrative's content; how school related to real life (Faircloth & Miller, 2011). They reflected on a global issue that involved meaningful content (embedded in a real-world context); students are engaged in these contexts (Enright, 2012). Meaningful and relevant learning promotes the involvement of students in learning (Parsons & Ward, 2011). Meaningful and relevant content are essential when seeking to foster the cognitive engagement of students.

Although the National Catholic Education Commission (NCEC) has recognised that many Australian diocesan RE programs in recent years have emphasized the

cognitive domain and taken an educational orientation (NCEC, 2008), these programs may still promote the interplay between life and the Christian faith tradition (CEO, 2008; Buchanan, 2011). They acknowledge that an important aim of RE learning is to develop students who can interpret life from a Christian perspective. Therefore, the experiences of students and their interests still need to be recognized and included in the content of contemporary religious education (CEO, 2008). Year 5/6 students were interested in real-world learning. They were engaged in learning when ICT-enabled learning utilised relevant and meaningful content and involved them in "developing a Christian interpretation of life" (CEO, 2008, p. 3). Other subject areas also invoke personal sharing, and responding and connecting subject matter to life (Faircloth & Miller, 2011; Zhang & Dougherty Stahl, 2012). Relevant and meaningful content is an essential characteristic of engaging learning across subject areas; ICT may be utilised to enable relevant, meaningful, and therefore, engaging learning. Underpinning these various ways of involving students in learning through ICT use is a student-centred pedagogy.

3.2.4 Student-centred Pedagogy

A key finding from this study was that learning was facilitated through a student-centred pedagogy. Students interacted with the attributes of the online game and the key features of ICT-enabled learning. They explored open tasks, developed ideas with peers through reciprocal, supportive and constructivist interactions, and reflected on relevant, meaningful content. Student-centred pedagogy is an essential element of learning in contemporary primary classrooms (Ertmer & Ottenbreit-Leftwich, 2013; Hermans et al., 2008). This finding challenges teacher-centred pedagogical beliefs and practices in the classroom, which limit technology use and the central place of ICT-enabled learning (Ertmer et al., 2012; Keengwe et al., 2008; Palak & Walls, 2009). A major finding from this study was that cognitive engagement and effective learning using ICT was underpinned by a student-centred pedagogy. The cognitive engagement of students was further enhanced when teachers facilitated this pedagogy.

Affective engagement was enriched by the attributes of an online game: the game framework and the interactivity of the game. Students interacted directly with these attributes of the game. However, cognitive engagement and facilitated learning were promoted principally by ICT-enabled learning and the pedagogy underpinning ICT use. Students were given the opportunity to explore the various interpretations and solutions inherent in open tasks. Thinking was fostered through reciprocal, supportive and constructivist peer interactions. Students connected with learning when they were able to relate their life story with the broader narrative of life beyond school. Cognitive engagement was enhanced when ICT-enabled learning occurred in response to real-life situations (relevant learning) and real-world problems (meaningful learning). A major finding from this study was that a student-centred pedagogy underpinned learning: whether through the attributes of the online game, or the features of ICT-enabled learning. Teachers may promote and enhance cognitive engagement by supporting this student-centred teaching and learning process, or they may continue the teacher-centred practices and beliefs that have limited ICT-enabled learning and cognitive engagement.

4   Conclusions

This paper has explored a key finding from a case study. The case study sought to ascertain the key factors that facilitated the engagement of year 5/6 students in an RE curriculum. Several benefits were discerned when ICT was used in the primary classroom. The first of these was that the attributes of an ICT tool enhanced the affective engagement of students. This benefit aligns with findings in various curriculum areas (Ainley & Armatas, 2006; Chen et al., 2012). A further and significant finding from this study, which this paper discussed, was that key features associated with ICT-enabled learning were important pedagogical factors for the cognitive engagement and learning of year 5/6 students. Associated benefits of this type of learning include the promotion of cognitive effort, and high-order thinking and deep learning (Neal, 2005). Other discernible benefits are: learning through the multiple perspectives of others and collaborating to construct knowledge; the promotion of authentic real-world learning; and the development of independent learners through a student-centred pedagogy. Teachers may use the following features of ICT-enabled learning when appraising use of ICT to foster the cognitive engagement and learning of upper primary students:

•   Potential to explore open tasks

•   Opportunity for reciprocal, supportive and constructivist peer interactions

•   Use of a narrative context and connection to relevant, meaningful content

•   Learning that utilises a student-centred pedagogy

Each of these features has practical benefits for student learning. Exploration of open tasks provides students with the opportunity for critical and abstract thinking. These skills are appropriate for the development of students of this age., The learning climate is enhanced when peer interactions are reciprocal, supportive and constructivist; and the learning of individuals has the potential to exceed that which may be achieved if they work in isolation. When the subject matter of school involves relevant, meaningful content, students can discover that learning is not limited to the cognitive domain; they experience the affective domain of learning such as how to empathise with others (Buchanan & Hyde, 2008). Finally, a practical benefit of students being immersed in a student-centred pedagogy is that they learn how to be independent and interdependent learners in our twenty-first century world.

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Πρώτη φορά μοριοδοτούμενη επιμόρφωση για τη Θρησκευτική Εκπαίδευση στην Α/θμια και Β/θμια Εκπαίδευση από το μεγαλύτερο Πανεπιστήμιο της χώρας.

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