The Use of Mobile Learning Technologies in Primary Education

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Abstract

This research explains the rationale behind the utilization of mobile learning technologies. It involves a qualitative study among children to better understand their opinions and perceptions toward the use of educational applications (apps) that are available on their mobile devices, including smartphones and tablets. The researchers organized semi-structured, face-to-face interview sessions with primary school students who were using mobile technologies at their primary school. The students reported that their engagement with the educational apps has improved their competencies. They acquired relational and communicative skills as they collaborated in teams. On the other hand, there were a few students who were not perceiving the usefulness and the ease of use of the educational apps on their mobile device. This study indicates that the research participants had different skillsets as they exhibited different learning abilities. In conclusion, this contribution opens-up avenues for future research in this promising field of study.

Keywords: Mobile Learning, Technology in Education, Mobile Learning Technologies, Educational Apps, Simulation Games, Storytelling.

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INTRODUCTION

Today's children are spending a considerable amount of their leisure time online (Kapp, 2012). Very often, they play games on mobile devices, including; tablets or smartphones. These developments have inevitably led to a new paradigm shift; as learning-via-play, or the use of mobile technologies in education have changed the way how students think and process information (Ge & Ifenthaler, 2018; Johnson & Mayer, 2010). Very often, technologies, including games provide an immersive, voluntary and enjoyable activity as challenging goals are pursued according to agreed-upon rules (Camilleri & Camilleri, 2019a; Hwang & Wu, 2012; Kinzie & Joseph, 2008). The students' learning through gameplay is not only fun, but it also allows children to construct their own meanings as they can make sense of the world, in their own ways. This is in stark contrast to the traditional educational approaches, where the students stay passive and their instructor is the conductor of content and actions (Yelland, 1999). The games can be used to improve the students' computational thinking skills in an innovative manner (Kazimoglu, Kiernan, Bacon & MacKinnon, 2012; Sung, Hillyard, Angotti, Panitz, Goldstein & Nordlinger, 2010). At the same time, these innovations are increasingly satisfying the basic requirements of the schools' educational programs as they strive to provide an engaging learning environment for their students (Carvalho, Bellotti, Berta, De Gloria, Sedano, Hauge, Hu & Rauterberg, 2015; Connolly, Boyle, MacArthur, Hainey & Boyle, 2012; Crookall, 2010; Sandholtz, 1997). For instance, many games incorporate clear goals, achievement-based systems and rewarding mechanisms that motivate students to discover more (Kazimoglu et al., 2012). Course instructors can utlize high score charts to entice the players to improve their performance and to share their scores with others when they do well. Of course, such technologies may be utilized outside the context of entertainment; and are considered as part of a thoughtful progress toward discovery-based learning (Lugmayr, Sutinen, Suhonen, Sedano, Hlavacs & Montero, 2017; Wouters, Van Nimwegen, Van Oostendorp & Van Der Spek, 2013). The serious games are not created with the primary purpose of pure entertainment, but with the intention for use in education and training (Loh, Sheng & Ifenthaler, 2015). These games have defined learning outcomes that are designed to balance subject matter with gameplay (Kiili, 2005). The gameplay allows students to apply their conceptual knowledge. Previous studies have reported that such technologies in education can enhance the learning interests of students (Ebner & Holzinger, 2007) and could further increase their motivation (Burguillo, 2010; Dickey, 2011). Researchers have also indicated that the digital game based learning and educational apps on mobile devices are becoming an integral part of the children's cognitive development as they support them at home and at school (Camilleri & Camilleri, 2019b; Nolan & McBride, 2014; Huang, Huang & Tschopp, 2010; Zheng, McAlack, Wilmes, Kohler-Evans & Williamson, 2009; Harris, Mishra & Koehler, 2009). Consequently, the mobile learning technologies hold great potential as students can improve their knowledge, skills and learning performance in an informal manner (through communication technologies (Hwang & Wu, 2012; Camilleri & Camilleri, 2017a; Ciampa, 2014).

However, the use of mobile learning is still far from mainstream (Camilleri & Camilleri, 2017b). Therefore, this research investigates the costs and benefits of using educational apps (Hwang & Wu, 2012; Connolly et al., 2012; Graesser, Chipman, Leeming & Biedenbach, 2009). Recent academic literature suggests that there is potential for further development of game-based learning, across a broad range of educational programs (Erhel & Jamet, 2013). The schools' interactive environments that incorporate serious games with highly engaging experiences are already having a positive effect on students, as they enhance their visual, selective attention among other cognitive, motivational and emotional benefits (Ge & Ifenthaler, 2018; Carvalho et al., 2015; Crookall, 2010; Wouters & Van Oostendorp, 2017; Zheng et al., 2009). In this light, this contribution provides a critical review of relevant theoretical underpinnings on mobile learning via serious games. It also explores the students' opinions, beliefs and perceptions on the use and ease of use of serious games in the primary educational level. Hence, this study adds value to the extant academic literature as it evaluates the effectiveness and motivational appeal of two serious games, from the students' perspectives. It explains how, where and when these games can be considered as relevant teaching and learning resources. In addition, it provides a good insight on how serious games could (not) improve the students' achievement and learning performance.

LITERATURE REVIEW

The Primary Educational Context

Many teachers can avail themselves of high-quality digital learning resources to support them in the delivery of primary education (Tondeur, van Braak & Valcke, 2007; Goodinson, 2002). Relevant theoretical underpinnings suggest that ICT can be an effective way to promote independent learning and problem solving as it empowers children to seek answers for themselves, think critically, and take initiatives (Hermans, Tondeur, van Braak & Valcke, 2008). Therefore, educators are encouraged to make use of certain technologies, including computer games to develop their students' strategic reasoning capacities, as well as critical and reflective thinking abilities in primary education (Bottino, Ferlino, Ott & Tavella, 2007). They can also use the Internet as it has become an important learning tool. It is considered as a medium to improve the pupils' independent learning and metacognitive awareness (Goodinson, 2002). Notwithstanding, today's children are also engaging with ICT in their homes. Therefore, there is scope for teachers to integrate ICT in-class. For example, educators are utilizing technologies like the interactive whiteboard to enhance the students' perceptions toward ICT and learning. The electronic whiteboard facilitates social interaction as the children can gain access to multiple resources through a network. Very often, the children are engaging together as a large group. They ncollaborate with their peers as they share their insightful ideas. The primary school pupils may be capable of articulating their own learning processes (Goodison, 2002). Therefore, educators can use ICT to create rich contexts for students to stimulate their active learning (Hermans et al., 2008). This improves the learning environments as it fosters autonomous or cooperative learning. As a result, our children will be capable of using technology to solve problems, by establishing strategies and applying them; even though such activities may appear to be demanding in terms of attention and effort (Bottino et al., 2007).

However, there may be teachers who may require more time to acquaint themselves with a wide range of ICT tools and applications before using them in-class with their pupils. Mama & Hennessy (2010) contended that the teachers' perceptions on ICT can either constrain or enhance the utilization of technology in primary education. They went on to suggest that the level of integration of technology in-class appears to be directly related to the teacher's willingness to use the technology in their lessons (Camilleri & Camilleri, 2017a), which in turn can have an effect on the students' motivation, engagement, and learning outcomes (Mama & Hennessy, 2010). The use of technology demands a broader and deeper understanding of software on the part of the teaching staff (Hermans, Tondeur, van Braak & Valcke, 2008; Goodinson, 2002). The teachers are expected to be creative in designing appropriate learning situations for their students. Mama and Hennessy (2010) posited that the primary school teachers should be knowledgeable about the educational purposes of the ICT tools, by situating the use of particular technologies in specific lessons in order to encourage meaningful integration. Tondeur et al. (2007) maintained that the teaching staff should be aware of the variety of possible computer uses in primary education to continuously improve the content and structure of the schools' curricula. This way they will be in a position to improve the quality of their teaching through blended learning approaches.

A Cost-Benefit Analysis on the Use of Mobile Learning Technologies

Benefits

Both teachers and students are increasingly using their own computers to access course content online. Whether learning happens though formal or informal routes, it is very likely that tomorrow's students will have to continue using technology in their future employment. Therefore, it would make a lot of sense if educators use virtual learning environments including serious games, stories and simulations as a vehicle to instill knowledge, skills and competencies among their students (Winterton, Delamare-Le Deist & Stringfellow, 2006; Plowman, McPake & Stephen, 2010; Granic, Lobel & Engels, 2014). This reasoning suggests that there is an opportunity for those students who would like to learn theory and concepts through digital media. They can acquire tacit knowledge through relevant experience of performing certain tasks (Loh et al., 2015). Students can enhance their skills over

time, particularly if goal-directed, in response to some demand in the external environment (Granic et al., 2014). As a result, they become competent in their tasks as they capture skills and dispositions beyond cognitive ability.

The competencies that are acquired through digital technologies are fundamentally behavioral in nature, as they are susceptible to self-awareness, self-regulation and social skills. Digital games promote collaboration, problem-solving and communication, experimentation and the exploration of identities (Loh et al., 2015; Zheng & Zhou, 2006; Fleming & Wood, 2001). The use of digital games in education necessitates standardized curricula that promotes competition, achievement and reward structures (Kapp, 2012). The students' desire to win or complete games could motivate them to study course-related materials. Their efforts are rewarded when they win rounds of the game. At the same time, they achieve learning outcomes as the digital environment comprises (i) a set of rules and constraints, (ii) a set of dynamic responses to the learners' actions, (iii) appropriate challenges enabling learners to experience a feeling of self-efficacy, and (iv) gradual, learning outcome-oriented increases in difficulty (Ventura, Shute & Kim, 2012; Johnson & Mayer, 2010).

Arguably, it is in the interest of all stakeholders and educators to develop meaningful pedagogies that integrate digital teaching resources, including serous games with traditional teaching methods (Camilleri & Camilleri, 2017b; Shulman, 1987; Girard, Ecalle & Magnan, 2013). Without play, education becomes a force of compliance, not intelligence (Vogel, Vogel, Cannon-Bowers, Bowers, Muse & Wright, 2006). Video games may help kids develop adaptive emotion regulation (Oblinger, 2014). Moreover, they can increase the children's positive mood after playing the violent game as relevant studies indicated that there was no significant increase in aggressive mood scores for either boys or girls after playing violent games (Adams, Mayer, MacNamara, Koenig & Wainess, 2012). Other research has indicated that gamers are able to translate the prosocial skills that they learn from co-playing (or from multi-player gameplay) with their peers and family members beyond the gaming environment (Ferguson, 2011). Very often, students are usually motivated to review their knowledge and understanding of something that they have just learned (Griffiths, 1991). They may do so by exchanging their knowledge with one another. Hence, the gaming environment may usually provide the right setting for student-centered learning; that allows two-way communication through instant feedback between instructors and students (Sandholtz, 1997; Harris et al., 2009). Moreover, game-based learning (and the use of serious games) may be accompanied by insightful discussions and social activities (Erhel & Jamet, 2013). The provision of quality learning and instruction within preschool environments has considerable potential to add digital capital through gamification (Kapp, 2012).

Costs

Only nine studies have reported an improvement in learning quality when compared to the delivery of conventional lessons (Adams et al., 2012). Just four out of 16 studies concluded that this medium increases motivational investment (Adams et al., 2012). Other studies suggested that they were not in a position to conclude that educational games can have a positive effect on the students' learning and motivation (Yee, 2006) .Therefore, the legitimacy of digital game-based learning, including the use of serious games in education ought to be critically analyzed and re-examined in different settings (Ge & Ifenthaler, 2018). A few researchers suggested that a range of different factors, including; individual learner characteristics (Loh et al., 2015; Juul, 2009); the learning situation and the specificity of certain subject areas (Girard et al., 2013) could have an impact on the effective implementation of digital games in education. Generally, they argued that there may be students who will not engage or respond to extrinsic, technical games as they may not regard them as play. Moreover, it may be irresponsible to postulate that children with different abilities will readily embrace the digital culture that is being transcended to them through during their learning journey.

Apparently, some academics have reported contradictory results that were essentially ascribed by different methodologies (Ventura et al., 2012). In fact, many researchers have often adopted media comparison approaches by measuring the learning outcomes of those students who played educational games against the learning outcomes of other students who learned through conventional media (Creswell, 2009). Evidently, such methodologies were vulnerable to many confounding factors including; the format of educational content and the teachers' social presence, among other variables. To avoid these methodological limitations, other researchers have adopted the value-added approach which essentially involved a critical analysis of the learning outcomes of educational (narrative) games (Rollings & Adams, 2003).

Some researchers argue that digital games can make hyperactive, violent, stupid and anti-social children (Sweller, Van Merrienboer & Paas, 1998; Camilleri & Camilleri, 2017c). Moreover, there may be educators who may still prefer "old teaching" methodologies rather than using the latest, interactive learning resources (Camilleri & Camilleri, 2017b; Papastergiou, 2009). The digital game-based learning environment can impose considerable constraints that make it extremely difficult to integrate deep content, strategies, and skills (Graesser et al., 2009). The players' failure adds content by making them see new nuances in a game, as there may be negative connotations of failing in games (Lomas, Koedinger, Patel, Shodhan, Poonwala, & Forlizzi, 2017).

Many individuals (including teachers) are still wary of electronic innovations in a context where serious games are continuously evolving at the speed of technology. In the past, there were instances were early childhood instructors were averse toward the digital culture as they resorted to outdated pedagogical and developmental standpoints (Vogel et al., 2006). In the event that the classroom practitioners would exhibit an intrinsic personal interest in digital gaming, they may still face limited opportunities to develop their digital literacy. Alternatively, their school may not possess sufficient scarce resources to incorporate interactive games into their lessons (Camilleri & Camilleri, 2017d). Notwithstanding, Educational leaders may not realize that their teachers will require adequate investments in infrastructure as well as appropriate training and development for the successful implementation of digital learning resources, including serious games in education (Camilleri & Camilleri, 2019c). The policy and funding constraints were also cited as barriers to the integration of technology in early childhood learning centers (Vogel et al., 2006). However, they went on to suggest that these problems are often considered as a peripheral priority for many educators and policy makers.

THE RESEARCH METHOD

The Qualitative Methodology

This research involved the systematic generation of theory from qualitative data that relied on the researchers' inductive, expansionist thinking. This study explored the participants' reactions and intrinsic behaviors. Therefore, the gathering of the interpretative data was obtained through organized, face-to-face interview meetings with fifty-four students who were between 6-8 years of age. They attended a primary school in a small European country. During the fieldwork, the researchers noticed the school's organizational culture and background, its management styles, as well as the teachers' attitudes toward educational technologies, among other issues. These attributes were clearly evidenced before and after gathering the data.

The Interview Administration

Generally, the interviews were executed in less than 30 minutes. The researchers conducted face-to-face, semi-structured interview sessions in a classroom during the school's breaks. The personal interviews' non-verbal cues have helped the interviewers to better understand the participants' verbal responses. An effort has been made to induce the informants to talk freely and openly to gain a good understanding of their perspectives of educational apps on their school tablets (Carvalho et al., 2015).

Capturing the Data

The semi-structured interviews were characterized by their pre-determined list of themes and questions. Following a brief introduction, the students were invited to give details of how they were using the mobile learning technologies in their classroom. The aim of the interview was to discover whether the use of serious games in education were considered as a strategic tool that could entice the students' motivation and curiosity in academic subjects (Wouters & Van Oostendorp, 2017). At the same time the interviews have revealed the students' perceptions about the use of educational technologies. The researchers relied on Lincoln and Guba's (1985) trustworthiness principles to establish the credibility, transferability, dependability and confirmability of this qualitative study, and to ensure that this study can be replicated in other contexts. Therefore, we are presenting the interview guiding questions in Appendix A. During the interview sessions, the participants' views and opinions were annotated and / or recorded on tape; with the interviewees' and their parents' prior consent. At times, the students were encouraged to expand on issues and to clarify their argumentation. The gathered data had lent itself

to a systematic content analysis that involved open and axial coding. The NVivo (v8) qualitative software was chosen for its functionality. This software has enabled the coding and analysis of text, image and audio data. The program enabled the researchers to sort the texts into tree structures and that comprised their annotations on the participants' intrinsic and extrinsic motivations, that shed light on the rationale to play games at school, as well as their perceived usefulness of games, perceived enjoyment from the gameplay, attitudes toward competition and intellectual stimulation, and attitudes on their social interactions, among other issues..

RESULTS

The students' perceptions and motivations to engage with mobile learning

The interviewees reported that they were using the mobile apps as they played different types of entertaining games at home, and when they were out and about. They suggested that they liked action, adventure, building, concentration, detective, retro, role-play, simulation, sports, and strategy games, among others. Many students claimed that very often they played such games without engaging with other individuals. However, a few of them stated that they communicated to other individuals during the gameplay. In this case, the games incorporated networking options and involved interactions with other gamers. These interviewees hinted that they were addicted to such games. They also admitted that they often shared similar interests as other gamers. They went on to suggest that multiplayer games triggered the competition amongst players as this was one of the requirements to progress in the gameplay. The interviewees explained that these entertainment apps fostered an increased interaction among online gamers.

Afterwards, the students were requested to describe the school's apps that they used during their Math and English Language lessons. The majority of the interviewees suggested that they "enjoyed" playing the school's (serious) games. Therefore, they were requested to describe the school's games.

The students held that they practiced their Math skills when they played the educational app on their tablet. They were also incentivized to 'compete' against their peers (like the entertainment games), as they were given rewards (and results) during their gameplay. Generally, the students agreed that the Math game helped them improve their social skills as they shared their scores with their classmates. The players themselves suggested that they were motivated and engaged (Kiili, 2005) as the gameplay offered relevant incentives and challenges. The students were divided into small groups of two or three, where they had to collaborate together and work in tandem to solve problems (Zheng & Zhou, 2006). The students felt a sense of accomplishment and intellectual stimulation as they completed the game's levels.

Generally, they reported that the subject and its extraneous cognitive load, was well-presented to them. They held that the design of the instructional materials was appropriate for their level of education. A few of them declared that this game has also developed their analytical skills. Evidently, some of the students have recognized that the rationale of the math game was to enhance their knowledge and social skills. The students admitted that their engagement in this educational app's formative activities has effectively resulted in a cohesive class where they worked in teams to compete against their peers. The students held that they achieved their math game's goals and objectives by using their analytical skills or by experimenting at making choices; at times they asked questions to each other. Alternatively, they worked individually, to find the answer for themselves.

There were different reactions from various students when they were asked to communicate their opinions and perceptions on how the game has improved their understanding of the subject. However, the students felt a sense of accomplishment as well as an intellectual stimulation - as they completed the game's levels. Conversely, some

participants commented that they felt that the math game was difficult for them. Others reported that it was not exciting for them.

In the main, the students maintained that the design of the math game was appropriate for their level of education. Some of the students have realized that they were applying their theoretical knowledge during the math game. In sum, there were students who hinted that the teamwork has helped them to complete the game (as there were students with mixed abilities in class).

The same students who played the math game, were also using a digital story app during their English language lesson. The interviewees reported that they were seeing the benefits as well as challenges in developing and sharing their personal narrative through visual stories. The students suggested that their teacher has also created a short-story for them (as a demo) by combining recorded narratives with moving images, that included easy-to-read fonts, colors, magazine-style designs, music and / or sounds. These stories were usually narrated in less than 10 minutes, and typically involved individuals, places, events or other topics.

The students were instructed to work in small groups as they shared feedback on how to develop and improve their story. They were expected to write the script of their story in a logical manner, and to use the digital media to create animations and sounds (like their teacher). The students explained that their narrative story comprised an introduction, body and conclusion. They utilized metaphors, characters, adverbs and adjectives to describe the settings of their stories. Eventually, all members of the group were expected to communicate their digital story to other students. Following the group's presentation of the story they engaged in a critical discussion with the audience (of students).

The purpose of the digital story was to encourage students to communicate with their peers who were chosen at random by the teacher. This activity demanded the students to use cues from the digital story and to share their own insights and experiences about life. A few students indicated that they felt uncomfortable working with individuals who were not familiar with them. These students claimed that the digital storytelling was challenging for them as they were expected to step outside of their comfort zone and to communicate their story in front of an audience. Three students declared that they did not want to work with other children that they did not know well. The students suggested that they were expected to share their individual and emotional experiences with others. They reported that after this activity they appreciated how their peers see, hear, and perceive the world in different ways. Evidently, these were some of issues that may have stretched the interviewees' personal boundaries. Many students reported that the sessions that followed the digital story were valuable for the storytellers and for their audience.

In the main, the students suggested that this activity has taught them about the importance of listening patiently to one another. They argued that the storytelling exercise enabled them to improve the relationships with their classmates. Some interviewees contended that this activity has allowed them to engage in public speaking. An interviewee suggested that the digital story game has helped her improve her critical and reflective skills as she learned how to evaluate high quality content.

On the other hand, there were a few interviewees who reported some technical issues. They held that they encountered some difficulty in getting acquainted with these two games' technologies. Other informants declared that they did not perceive the usefulness and the ease of use of playing the digital games at school. The researchers noticed that these particular students exhibited dissimilar learning abilities, when compared to the other interviewees. These students admitted that they were not keeping up with the pace of their peers.

CONCLUSIONS AND IMPLICATIONS

This research has provided a critical review of the extant academic literature on the use of mobile apps that are increasingly being used in primary education. This contribution suggests that children learn through mobile technologies and by engaging with serious games (Kapp, 2012; Loh et al., 2015; Fleming & Wood, 2001). The use of the math game and the digital story app have educated students and immersed them in the gameplay. The findings from this qualitative research indicated that the students were learning how to work out the solutions for themselves rather than by being "spoon-fed" by their teacher. This finding is also consonant with the discovery-based learning and other constructivist approaches (Lugmayr et al., 2017; Wouters et al., 2013; Rollings & Adams, 2003).

The results suggest that both the math and the story-telling apps have improved the students' cognitive skills. At the same time, these games motivated them and provided emotional benefits as they engaged with other individuals. This research reported that the students had to use their relational skills as they were expected to work in tandem with their peers. The serious games that were used here, have helped the students to improve their communication and transferable skills. The students themselves indicated that they considered these resources as necessary to improve their learning journey. Hence, there is scope for the primary school leaders and policy makers to create and adopt mobile learning technologies in addition to traditional teaching methodologies, to deliver an inclusive, student-centered, quality education for all children (Camilleri & Camilleri, 2019d).

If the teachers do not embrace these disruptive technologies, including the digital games and stories, that are widely available through mobile apps, they may be in danger of losing touch with today's cultural realities. Hence, today's primary level educators should be aware about the use of these mobile technologies as they can truly support our children during their learning journey. They need to encourage their students to avail themselves of the educational apps on their mobile devices. This study has indicated that the mobile learning apps should be appealing and child-friendly. Moreover, these educational apps could be developed in such a way to increase the students' engagement amongst themselves and with their teacher, in real time. The teachers' willingness to use these educational technologies would probably have an effect on the students' readiness to engage with them. This will ultimately improve the pupils' learning experience. Hence, the teachers are expected to develop relevant educational material in formats that are suitable for the screens of mobile devices. They should design attractive course content that may include a good selection of images and videos to entice their students to use their mobile for educational purposes (Camilleri & Camilleri, 2019e).

This chapter implied that the ubiquity of mobile technologies and their multiple applications have improved the educators' potential to entice the students' motivation and willingness to learn in innovative and exciting ways (Camilleri & Camilleri, 2019f). In conclusion, the primary schools are encouraged to regularly explore their students' attitudes and perceptions toward the use of mobile learning resources, via quantitative and qualitative research in order to identify any areas of improvement. There can be instances where the teachers may require technical training and professional development to learn how to prepare and share customised mobile learning resources for their students.

Research Limitations and Future Research

This research was conducted among primary school students who were the children of the middle-class and high-income parents, in small European country. Therefore, the findings of this study ought to be supported by further research in other contexts. Other research may consider different sampling frames, research designs, methodologies and analyses which could produce different outcomes. Future research can analyze the designs of serious games. Further studies may reveal that there may be other motivations among different demographics, on the use of digital game-based learning.

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KEY TERMS

Constructivist-Based Learning: The 'Constructivist-Based learning' is a learning theory claiming that individuals construct their knowledge and understandings through experiencing things.

Digital Learning Resources: The 'Digital Learning Resources' include digitally formatted, educational materials like; graphics, images or photos, audio and video, simulations and animation technologies, that are used to support students to achieve their learning outcomes.

Digital Game-Based Learning: The 'Digital Games-Based Learning' (DGBL) involves the use of educational video games that can be accessed through computer-based applications. DGBL are usually aimed to improve the students' learning outcomes by balancing educational content and gameplay.

Discovery-Based Learning: The 'Discovery-Based Learning' is a constructivist-based approach to education as students seek to learn through continuous inquiry and experience.

Learning Outcomes: The 'Learning Outcomes' are assessment tools that measure the students' achievement at the end of a course or program.

Mobile Learning: 'Mobile Learning' (M-Learning) is a term that describes how individuals learn through mobile, portable devices, including smart phones, laptops and/or tablets.

Serious Games: The 'Serious Games' refer to games that are used in industries like; education, health care, engineering, urban planning, politics and defense, among other areas. Such games are usually designed for training purpose other than pure entertainment.

Ubiquitous Technology: The 'Ubiquitous Technology' involves the use of wireless sensor networks that disseminate information in real time, from virtually everywhere.

APPENDIX A.

Interview guiding Questions

- Do you like digital games?
- What kind of games do you like to play?
- Can you please describe them?
- Are there any games that you dislike?
- Can you please describe them?
- Do you play digital games at home?
- How often do you play digital games at home?
- How often to you play digital games at school?
- Describe the games that you use at home.
- Describe the games that you use at school.
- Which games do you like the most? Why?
- Are the school games supporting you in learning the school's subjects? How?
- Are there any things that you like in the school games?
- Are there any things that you do not like in the school games?
- Should your teacher use digital games at school? Why?
- Do you think that your school is using good or bad games? Why?