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Literature Review

MAKING EFFECTIVE YET FUN EDUCATIONAL DIGITAL GAMES THAT WILL HELP SECONDARY SCHOOL STUDENTS OR OTHER STUDENTS AGED FROM 11 TO 18 IN LEARNING KEY SKILLS THROUGH THE USE OF TECHNOLOGY.

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Research Question

The main purpose of this study is to make effective yet fun educational digital games that will help secondary school students or other students aged from 11 to 18 in learning key skills through the use of technology.

Introduction

In order to understand better, by key skills I am referring to Maltese, English, Math's, and Science subjects that are thought in Maltese education.

From research that I already done people in general are trying to gamify tasks that are tedious to do, but not everyone understands the true meaning of gamification.

Converting a textbook into digital version is not gamification (Radoff, 2012) nor putting traditional educational methods into a game is.

Therefore, I will conduct several studies to learn if is it possible to achieve this ambition and if yes, what is the best approach.

Digital Technology and Games

In this section I will address why we should use digital games instead of traditional games in order to improve learning and engaging students to these learning games.

Technology

After reading several articles and journals all start with a particular statement, Secure Networks (2016), Hatch, Kristina E. in *Determining the Effects of Technology on Children* (2011) and Kevin C. Costley in *The Positive Effects of Technology on Teaching and Student Learning* (2014) say that technology today has become part of our lives: at home, at work or even in any other place. The use itself will prepare children for future life and jobs and that nowadays children are very attracted to technology so it will help to keep students more focused to the lesson.

"Others argue that children using technology are becoming socially stunted, ungrateful, and ridden with health related issues" (Hatch, 2011).

A survey on media use, conducted by The Kaiser Family Foundation in 2010 cited in (Hatch, 2011, pp. 3-4), states that a group of eight to eighteen years old spends on average of ten hours and forty-five minutes per day exposed to media.

To be able to start working on the research question it would be wise to explore some pros and cons of technology impacting our lives and that of our children, since introducing an engaging game to school and accessible also at other places might increase the hours spent on technology. Although it might also remain the same since hours spent on the game might also result in less hours spent on another technological medium such as television.

Pros

Technology brings many benefits to users not only from game aspects but also as accessibility and training.

Compact and Easily updated

Smartphones and tablets are compact enough to carry them everywhere. This will make games available almost anywhere you are and if there is a need of an update, rather for patching the game for bugs and or adding fresher information, it will be quick and easily distributed automatically trough all students (Secure Networks, 2016).

Improved Vision

First of all, to be clear from the beginning, the study shows that action games, like shooter genre, had more impact on the benefits of vision improvement then those who had no action (Handwerk, 2009).

One of the first benefits is called contrast sensitivity function, where players could recognise even minor changes in shades of grey against a uniformly coloured background. Other benefits included that players could keep track of multiple objects at the same time and were able to pay attention to a serious of fast moving events (Handwerk, 2009).

Scientist also suggest that in the future games can be used as a therapy to vision correction after that a patient has undertaken a surgery (Handwerk, 2009).

Renovating the Class

In an interview, Cheryl Lemke, executive director of the Milken Exchange on Education technology as cited in (Hatch, 2011) discovered that:

- Technology improves basic skills and that electronic material can be more stimulating for children.
- Students found technology more motivational since it provides ease to certain tasks like typing instead of writing which in the end kept them more interested and produced more work.
- Exploration of objects and activities through simulation and 3D models.
- Technology prepares children for their future jobs since sixty percent of the jobs require the use of technology and is expected to increase rapidly.

Students today use technology alongside traditional education and with the proper balance of the two, they will be able to take the benefits of modern education. Apart from that technology is assisting students that have disabilities to perform certain tasks that would be harder to perform (Hatch, 2011).

Socialisation

In an article by Los Angeles Times as cited in (Hatch, 2011), technology may help children to keep their friends closer and also build their own identity, since social media has become a way of keeping in touch with your friends rather than searching for new, thus this is mirroring children's social lives.

Exercising with Games (ExerGaming)

Because of advancing technology games have now the ability to introduce physical movement or reaction of the player as a command. Because of games are fun and engaging they are encouraging gamers to perform more physical activity. This method has been successful to introduce physical activity in a gamers lifestyle although it should be never replacing exercising (Hatch, 2011).

Cons

Loss of privacy

This could be one of the most alarming things as or lives are becoming more connected through social networks and other technologies. Adults and children can attempt and hide information to make it private as much as possible and sharing only desired information among their friend but even this might not be enough as social medias are now introducing advertising agents (Hatch, 2011, pp. 16-20).

"Many children do not realize how public their information is becoming, and how many potentially threatening people can access it. As children publicly post their emails, schedules and locations, they are allowing strangers to know where they are at all times. It is more difficult to keep yourself private when our world suddenly became the entire World Wide Web" (Hatch, 2011, pp. 16-20).

Degrading Multitasking

continuous partial attention (CPA) is when someone is focusing on multiple tasks but would never fully focused on one task. By using constantly technology children are being able to split their priority on several tasks at once but in doing so also losing the ability to focus due to constant input of new information (Hatch, 2011, pp. 18-20).

Health Related Issues

By uncontrolled used of technology children are become more prone to obesity and developmental challenges (Hatch, 2011, pp. 20-24).

"The American Academy of Paediatrics recommends that young children spend a maximum of one to two hours of screen time per day, but this suggestion is not being adhered to" (Hatch, 2011, pp. 20-24).

Also, unnoticed from video games and televisions, transport methods like cars, elevators and others are contributing to a sedentary life style. Alongside obesity children's sensory skill development is also being put at risk by overuse of technology (Hatch, 2011, pp. 20-24).

Changing Social Norms

Although its true that today is very easy to reach other people and talk or chat with, it is becoming also a problem when children have to face someone in real life. It is much easier to hide behind your device screen to express certain feeling or emotions rather than a face to face conversation and this is leaving an impact on the children's capacity to interact with each other (Hatch, 2011, pp. 24-25).

Conclusion about Technology

At this point in time, as these studies suggest, we can have great benefits but also great risks from using technology at a young age for a prolonged time day after another. It is very hard to state whether it is good or bad, and this might all change soon again since technology will keep on changing and evolving. Another aspect is that today's generation of children which have been exposed to technology for a long time have still not developed into adults so these studies may not be conclusive yet (Hatch, 2011).

"We have completely changed the way children play. We are in the midst of a large, uncontrolled experiment on children, the effects of which we won't know for years" as Dimitri Christaski, the director of the Child Health Institute at the University of Washington, cited in (Hatch, 2011, p. 31).

Hatch (2011) suggests that to allow children gain the benefits of technology while keeping away the hazards that come along with, is to moderate and parental control as many of the physical risks arise from overuse and abuse their technology of choice.

Games and Education

One benefit of games in education is that they encourage active learning. Active learning is a way of making learning authentic and it encourage students to participate in the lesson trough discovery, processing and applying new information as defined by Van De Bogart (2009) cited in (Milczynski, 2010).

But what does make games so engaging? According to MacKenty (2006) as cited in (Milczynski, 2010) "it's the act of problem solving that makes games so engaging… devoid of challenge or risk of failure, games really aren't all that much fun".

In addition, MacKenty (2006) and Harris (2009) as cited in (Milczynski, 2010) both agree that if an educational game is well designed, students can build their problem-solving skills while having fun no matter the genre of the game.

In order to have a successful engaging educational game one must create a game suitable for students to be fun by challenging them. This subject will be further explored in the next chapter *Targeting Specific Audience with the Right Methods.*

An interesting question I came across while reading Milczynski (2010) literature review is of Rotter (2004) where he asks, "If a pupil didn't already study and learn the information, is there any way to get the answer during the game?".

This is e very intersting question and fluded my mind with different ideas. Where the game would be in such a way that the player can choose his own difficulty like in Dark Souls Two mad by Bandai Namco (2017). In Dark Souls II the player is able to chose the dificulty from the wepon chosen and in the education game, there might be portals which puts the player to the test to access a certain dificulty while if you did not reach that level yet you can go to a lower level to learn the needed skills.

Targeting Specific Audience with the Right Methods

Bartle's Taxonomy of Player Types

Bartle's Taxonomy of Player Types is the study of the way a player acts or interacts with the world or with other players in a MUD game which later was adapted to MMORPG's. It is important to keep in mind that this experiment was for players interacting in a virtual world for fun. There could be other players that do not play for fun and instead people can play the game as a job like: if you are a game designer, journalist, researcher and or gold farmer (CasualConnect, 2012).

Achievers

Achievers main goal is to gather as much points as possible and level up. They will set themselves in-game goals and work hard to achieve it. During their path, Achievers will also use other player's types but only in order to make way to their goal. For example, they will use exploration to find new secrets or treasures that will acquire them point. Use Socialising to gather more information about their goal and Killing to eliminate players who get in their way, eliminate rivals and if the game has score point for killing others in order to achieve more points (Bartle, 2016).

Explorers

Their main goal is to know the game mechanics and explore the whole maps finding all sorts of things. They will search in abandoned or less frequented areas, looking for bugs or how things work. Achievers role for scoring point may be necessary in order for an Explorer to advance to another level, but they find it tedious and think that everyone with a half brain can do that. Killing is much of an easier way to level up but may become of a hassle and interfering with their exploration if the deceased returns for vengeance. Occasionally they will also socialise with other players with the only intension of finding new places and things to explore. Usually what other players say will be old stories for them, but they will also ask a lot of interesting questions on game mechanics to discover further information. The fun of an explorer is to discover as much as possible about the game (Bartle, 2016).

Socialisers

Socialisers are only interested in other players. Their aim and goal is to create a strong long lusting friendship with other players. They usually use the game as a background for their meetings. They tend to enter in other player's types role from time to time to keep up with times. For example, they may explore so that they can enter in more arguments and or earn points to get a higher status among the other players. Killing is the last resort but they will not hesitate if someone else hurts their friends (Bartle, 2016).

Killers

The killers purpose is to cause distress and enjoy creating pain in other players. The more damage he deals the happier they are. The killer will also eventually take up all roles, but only to get better in killing. Points will make him stronger and more effective, they socialise with other killers to exchange weaknesses and strategies and explore new ways to kill players. Occasionally you can find players which act on players that are friendly and helpful, but this is very rare since killing is more rewarding (Bartle, 2016).

The following player types or player motivations of Lazzaro and Radoff are suggested by Bartle himself.

Lazzaro's 4 Keys to Fun

Lazzaro's refers to emotions in order to address and attract players and that interaction design has access to emotions. The studies are not based on a single game but on a huge variety of games of different genre. She observed a lot of players playing games and noticed that while playing people experienced a lot of emotions and it was driving them to be engaged with the game, because in reality, players where just pressing a button. Games offer: Novelty, challenge, friendship and meaning; These are what players do to create these immerging experiences (AIGAdesign, 2016).

Easy Fun

Easy fun is when the player is having fun in the game trough exploration, creativity, fantasy and controls. This type of fun is more related to the player exploring the game rather than the game itself offering challenges. Easy Fun usually creates joy, wonder and surprise and curiosity to them player (AIGAdesign, 2016).

Hard Fun

Games are fun because they are hard to beat, it frustrates the player to develop the skill needed to advance in the game but when the player manages to master this skill, they will feel joy and surprise.

Games are very good at challenging, letting you fail (you almost expect it that at a point or another you will fail, especially when you start a new game) but most important letting you try again as much as you like. Unlike school where failure is a big failure (AIGAdesign, 2016).

People Fun

People are more emotional when playing together in game or outside the game. They interact with each other and create bonds. People fun actions are: communication, competition and cooperation (AIGAdesign, 2016).

Serious Fun (Altered States)

This kind of fun is when a player evolves with the game. The player enjoys playing the game because of how it makes him feel inside while playing and after playing (Lazzaro, 2004).

Lazzaro says that games create a sense of accomplishment and meaning, but some people think that games are a waste of time. In reality what happens is that players change themselves while playing; gameplay changes their selves and changes their world. For example, a player can: lose weight, get smarter and or release frustration (AIGAdesign, 2016).

Jon Radoff

Jon Radoff (2012) talks about *Game Play Motivation* as what makes a player interested in a game.

Radoff (2012) says that You have to understand much more than conditioning to build a relationship of the player towards a game. He explains how Skinner made his early experiments based on pigeons and later on rats, but humans are much more different from that because we come from a different eco system.

Bartle's taxonomy is being and had been used even where it does not apply which Bartle himself agrees with, therefore Radoff (2012) has rethought the player types into motivations.

Achievement

Achievement is about learning a skill and then get to practice that skill giving the player the understanding if they are getting better or worse. Yet the game must be a balance in difficulty versus the player's skill (Radoff, 2012).

Radoff (2012) explains this by the theory of flow by Mihaly Csikszentmihalyi (2004) which in brief; you enter flow when your skill is high and the challenge is high as well. Here the person has a balance between his skill and his challenge, they will not get bored because the challenge is high enough while still not getting worried because also their skill is high.

Immersion

Radoff says that a person is immersed in a game by: storytelling, practicing theory of mind, adopting new viewpoints, imagining cause of effect, recognising patterns, appreciating beauty. It is all about experiences and letting the player relate with those experiences.

Story adds a lot to immersion. Let's imagen removing the story from *Farmville* (Zynga, 2009) and the gameplay would be just placing tiles on a plane, the game would be boring and people would not

engage that much, but since it has nursery, growing, animals and plants it is much more engaging and keeps the player wanting more (Radoff, 2012).

Cooperation

Cooperation is: altruism, coordination, coalition-building and grouping. Socialisation is important in immersion because people love to share stories with each other and in achievement people can demonstrate their skill to others (Radoff, 2012).

Competition

Competition is the player seeking for: attention, resources, recognition, physical domination, mates and other. As humans, it is important for us to have a role model, a leader who exemplifies certain roles in our society, so that we can try to emulate their skill from them and try to be more like them. Therefore, competition in a game can be used to create those role models for other players (Radoff, 2012).

From these studies, I learned a lot on how one should approach in game design in order to engage a specific set of audience. To full fill what I want to achieve, it is important that the game is interesting and engaging to every student. You cannot risk in leaving someone behind. Therefore, this study on different personalities and player types while playing will help me out in carrying such task based on studies and theories which are proven to work.

Currently Existing Educational Technologies

Teaching and Learning Technologies

There are several technologies that one can use in class as mentioned by Bevin Kateri (2017) a teacher and writer from Virginia, but in the list below I filtered those who fit best in teaching students from 11 – 18 years.

A brief list of today's educational Technologies that can be used in class are:

- **Interactive websites** where teachers can access and create games for their lessons such as quiz. An example of such sites would be Kahoot (2017) which as mentioned will let you create a quiz. Jumble, discussion and a survey which it might come in useful for my research later on.
- **Apps** which also include educational games such as the one's mentioned above are also a learning method using technology
- **Educational Video Sites** such as Discovery Education claims to offer several videos for a wide range of students which include exercises and interactivity in order not to leave students staring at the screen for a long time (Discovery Education, 2017).
- **Online Organisation** like Symbaloo (2017) which helps teachers organise their favourite websites on their desktop in a form of tile for easy access and organisation. Also, it is used on student's desktops to help those who struggle with reading to navigate with ease which in my case of study might be irrelevant since the youngest age is 11 years.
- **Interactive Whiteboards** helps the teacher and students to manipulate and interact with items projected on the board. Some of the companies which sell interactive whiteboards also offer resources for teachers. Teachers also have the ability to prepare their own lesson plans.

- **Online behaviour System** like Class Dojo (2017) are apps which teachers can use to award points to students that they think are worthy of having. The points can be awarded on several bases including behaviour not only academic. Again, Class Dojo can be too childish for the age I am aiming but it's always good to know about such things since one can always tweak or improve aspects which already work and have a huge success into one owns work.

As it is true that these technologies and methods exist and work, from my own experience as a student I never encountered such thing during a lesson apart from interactive whiteboard and projectors which is not mentioned in the list. So, one of the main problems that we might have here in Malta, could be: that such tools are not being provided to teachers, teachers could not be trained on how to use such technology, technology is too expensive for the budget of the school.

Teaching Methods Employed in Key Skills

According to research and discussing with teachers and lecturers, methods of teaching today are Student centred. This is a broad subject and can be explored in depth but here I am going to just scratch the surface so that I am able to understand what is this type of method used and why it is used. Keeping this information in mind will probably help me designed a better educational game, but without falling into the trap of false gamification mentioned in the introduction.

"Student-centred instruction [SCI] is an instructional approach in which students influence the content, activities, materials, and pace of learning. This learning model places the student (learner) in the centre of the learning process. The instructor provides students with opportunities to learn independently and from one another and coaches them in the skills they need to do so effectively. The SCI approach includes such techniques as substituting active learning experiences for lectures, assigning open-ended problems and problems requiring critical or creative thinking that cannot be solved by following text examples, involving students in simulations and role plays, and using self-paced and/or cooperative (team-based) learning. Properly implemented SCI can lead to increased motivation to learn, greater retention of knowledge, deeper understanding, and more positive attitudes towards the subject being taught" as Collins & O'Brien cited in (Froyd & Simpson, 2008, p. 1).

A brief summarisation by Lea et al as cited in (O'Neill & McMahon, 2005, p. 28):

- "the reliance on active rather than passive learning,
- an emphasis on deep learning and understanding,
- increased responsibility and accountability on the part of the student,
- an increased sense of autonomy in the learner
- an interdependence between teacher and learner,
- mutual respect within the learner teacher relationship,
- and a reflexive approach to the teaching and learning process on the part of both teacher and learner."

Further exploration of each individual subject will be needed in order to understand how teachers handle and manage to teach step by step, starting from the very basic, their subject since it is what the game will be doing alongside with the teachers lectures.

Conclusion

After exploring different subjects I now have a better understanding of how I can conduct further experimentation and studies on games in education while keeping students privacy but connected to their friends, play in cooperation to help and encourage one another, experiment and consider existing technology that are used in Maltese classroom (although highly unlikely since the game will not be portable and that will lose all the scope of this research) and explore more in depth traditional teaching methods as to make the game easier in learning the subject at hand. The game could also be customisable for the teacher in order to make it more suitable for their lesson or a dedicated game will be created for specific subjects.

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