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Andragogy and E.M.O.T.I.O.N.: 7 key factors of successful serious games

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Abstract: Digital games have the potential to create active and engaging learning environments, supporting problem-solving, and learning through practice. As educators struggle to motivate the learners in their classroom, games provide a great opportunity to enrich the education curriculum. Students nowadays are characterized as the "Nintendo Generation", because they spend significant amounts of their everyday lives from a very young age interacting with the computers by playing games. However, using games for learning requires a rethinking of the learning objectives, another model for ownership of tasks, complex structures for support of students, new ways of assessing students, and a host of technological integration issues that have to be undertaken. So, how might one create effective learning games?

Digital games are a deviation from the normal pedagogy. They are instead embedded within the field of Andragogy. The main principle follows that the educational digital games encourage self-directness and independency. Moreover, the Andragogy of educational digital games provides substance to the learning process through active experimentation.

Taking the above into consideration, this paper aims to introduce and elaborate on a holistic framework based on 7 key factors that should be considered in creating a successful serious game. This framework is named "E.M.O.T.I.O.N" and stands for "Engaging game", "Motivation", "Opportunity of mastery", "Theme and story", "Intriguing learning", "Objectives" and "Natural flow between learning and fun". "E.M.O.T.I.O.N" is a framework that underlines the necessity of not disassociating instructional content from emotional context. In other words, we should not create sterile bulleted lists of rules. We should not assume players make decisions about adhering to policy based on rational algorithms and not normal human emotions. We should not strip learning modules of humanity and replace it with policy, terminology, and models, but fill a player with emotions ranging from frustration to elation, from sadness to anger to enthusiastic happiness. Serious games should embrace and encourage human emotion. It would be a breath of fresh air if our learning modules borrowed from games and put the critical element of emotion back into learning. The main message of this paper is that humans are quite adept at recalling learning when the learning is tied to strong emotions.

Keywords: Andragogy, Framework, Game-based learning, Creativity, Model of learning, Game Design

1   Introduction

Gaming is both a teaching strategy and a high cognitive learning technique, which engages and motivates the participants, bringing fun and immediate feedback (Reece and Walker, 2007). Further, game-based learning is a multifaceted educational phenomenon, which, according to Plass, Homer and Kinzer (2015), involves multiple facets of cognitive, affective, social, cultural and motivational behaviour. Moreover, games are defined as a complex learning context, which, with the involvement of Andragogy, or in other words, the student-centred learning approach, could lead to student success and academic performance. The rationale for game-based learning being effective is because embeds, besides the andragogical principles of learning, the following key aspects: motivation, player engagement, customization of the learning content, and the opportunity to fail and learn from this (Plass, Homer and Kinzer, 2015). Some authors stated that andragogy is part of online learning (Chametzsky, 2014). On the contrary, the authors of this paper argue that andragogy incorporates a range of theories and principles of teaching adults, whilst games and online learning are strategies of learning and

elements of andragogy. Digital games create active learning environment, support problem solving and learning through practice and enhance the educational curriculum. However, learning through games requires particular types of objectives, technological embedment and specific ways of assessment. The aim of this research is to introduce and elaborate on a holistic framework based on seven key factors that can lead to creating successful serious games. The framework is called E.M.O.T.I.O.N. These letters stand for the following key words: Engaging Games, Motivation, Opportunity of Mastery, Themes and Story, Intriguing Learning, Objectives and Natural Flow between Learning and Fun. The message is that learners recall knowledge when is strong related to Emotions. In the next section the authors discuss the methods and key principles of Andragogy.

2   Methods and principles of Andragogy

The authors define pedagogy as the art of teaching children, whilst andragogy is depicted as the science of adult learning (Knowles, 1980; Reece and Walker, 2007). In other words, andragogy, by being a student centred approach to learning, is in fact a deviation from pedagogy, which is teacher-centred approach to learning (Knowles, 1980). Game based learning method requires independence in reading, reflecting, presenting and doing, from learners (Bonk and Khoo, 2014). It follows that the related approach to learning through game-based is in fact the andragogical approach, which is more suitable for adult learning. The adult learning is actually rooted within six main andragogical principles: 1)Adult learners requires a rationale for learning; 2) Adults have autonomy and wish to design their own direction for learning; 3) Adults have existing experience and they desire to embed such prior experience into their own learning and styles; 4) Adults have a readiness to learn as soon as they start having challenges in life; 5) They ask for learning which is adaptable to their needs in order to live and achieve fulfilment in their lives; 6) Rather than being external their motivation is more internal, towards satisfaction and self-concept (Reece and Walker, 2007; Holton III, Swanson and Naquin, 2001). It is assumed that these principles were designed as the foundation that ensures a more effective learning process for the adults (Holton III, Swanson and Naquin, 2001). Thus, Andragogy is the adult learning theory which leads to adults' accomplishment in learning (Plass, Homer and Kinzer, 2015). In order to be achieve success in learning, Knowles (1984a; 1990; 1995, in: Holton III, Swanson and Naquin, 2001, p.120) suggested eight steps described as learning practice required within the andragogical model of learning, as fundamental for adult learning experience: (1) adult learner preparation for the game-based learning; (2) the creation of an environment based of collaboration and interaction; (3) Self-planning actions for game-based learning; (4) Assessment of own game-based learning needs; (5) the design of own game-based learning objectives; (6) the design of game-based learning plans; (7) Guiding adult learners to achieve their learning plans; (8) Guiding adult learners to assess their own learning outcomes from game-based learning (Holton III, Swanson and Naquin, 2001). The next section introduces andragogy and game-based learning and discusses the seven key factors of the holistic framework for game-based learning, and their importance in learning and achieving successful serious games.

3   Andragody and Game-Based Learning

In view for the game-based learning strategy to achieve its success in learning and to reach the designed learning objectives, it is critical for learners to respect the key principles of andragogy: a) to understand the rationale of playing; b) to have autonomy and self-directed game-based learning; c) to have the knowledge and own styles and methods of game-based learning; d) to acknowledge the importance of serious game design for their life challenges; e) to recognise specific serious games that are relevant to their particular situations and goals in life; f) to direct the serious games towards self-actualization (Reece and Walker, 2007; Holton III, Swanson and Naquin, 2001). Further, in order to achieve success in this type of learning, by the adult learners, the authors of this research argue about the role of EMOTIONS in recalling learning and suggest that E.M.O.T.I.O.N. acronym should be a component of the Andragogical Model of Adult Learning. As a result of such statement, the authors undertook in the next lines, a short analysis of each component of the recommended Acronym: E.M.O.T.I.O.N.

Engagement (E) - according to Bonk and Khoo (2014) means reading online information, preparing presentations, participating in simulations and designing real life games. In this situation, engagement refers more to the technological involvement than to writing assignments; in other words, adult learner engagement involves the design of educational games or learning by means of serious games (Bonk and Khoo, 2014). The rationale of involvement is the increase of chances for the student to recall knowledge (Chametzky, 2014).

Motivation (M) – the second element component of the Adult Andragogical Game Based Learning Model is motivation. This is a significant component of the learning process of gamification and designing serious games. The motivation comprises interaction, socialization, support, encouragement and feedback, required as principles for the foundation of adult learning (Bonk and Khoo, 2014). It is also advisable the incorporation within the game design of certain interesting mechanics with effect on learning (Plass, Homer and Kinzer, 2015).

Opportunity of Mastery (O) – This component implies a complete autonomy from the learner in order to develop his/her knowledge, to be creative and to master his/her skills for achieving success in gamification (Bonk and Khoo, 2014). Gamification means the usage of certain game elements in order to stimulate the motivation of learners (Plass, Homer and Kizner, 2015).

Themes and Story (T) – The next element of the learning model is the element of relevance for the learner's situation in life and his/her challenges, and its meaning for the final goal. There must be an opportunity for the learner to have real topics and themes that are direct linked to life. Hence, themes from newpapers, magazines and online that can be identified as actual and relevant for the learner (Bonk and Khoo, 2014).

Intriguing learning (I) – The adult learning model requires an element of curiosity and surprise, beneficial for the involvement and development of the learner. Curiosity is key to learning and the technology can provide learners with such opportunity by incorporating news from the real events in press and on the TV (Bonk and Khoo, 2014).

Objectives (O) – Unless the learning is goal driven, there will no effect or positive learning outcome (Bonk and Khoo, 2014). There are several types of objectives to consider in educational setting and three of them are curricula objectives, teaching objectives and learning objectives (De Freitas & Oliver, 2006).

Natural Flow between Learning and Fun (N) – It is argued that learning must have an element of fun, in order for learning to progress. Technology can offer such element through the novelty of game design and their link to real life situations (Bonk and Khoo, 2014). The effect of enjoyment and fun from a serious game design is according to Giannakos (2013), happiness, which at its turn is linked to success and achievement. The meaning of flow between learning and fun means the 'immersion' of learner into the game-based learning process in such a manner that can create enjoyment or fun (Hamari et al., 2016).

The next section introduces the E.M.O.T.I.O.N. framework or in other words the Andragogical Adult Game-Based Learning Model.

4   The E.M.O.T.I.ON. framework

E.M.O.T.I.O.N" is a framework that underlines the necessity of not disassociating instructional content from emotional background. Emotions in games can be implemented through emotional context, emotional dialogues and even emotional interface.
Emotional game context can include different emotional worlds and expressions, exciting users, reinforcing reflections and even enhancing memory functions [Kim et al,]. But possibility of integration of emotions into the learning content depends on many factors (the game purpose, the purpose, target audience, terms of use) and as a whole is strongly limited.
Inclusion of emotions in game dialogues is one of the latest trends in modern game development (Collins et al., 2016). Emotional dialogue models can be integrated in educational games without any limitations as they do not usually depend on the learning context.
Emotions are being also increasingly considered in interface design (Lockner & N. Bonnardel, 2014). In a whole emotional background might essentially increase effectiveness of learning but it should be applied very carefully as different users might differently perceive these emotions and learning results might be unexpected.

4.1 Engaging Game

One of the basic elements of the E.M.O.T.I.O.N. framework is to design and to create an engaging game. This element belongs to the heart of this framework, because it is considered that successful serious games should

engage people, motivate action, promote learning, and solve problems.

Several research studies have been carried out and corresponding games have been developed that aim to include the aforementioned feature to support learning and teaching focusing on creating a successful engaging game (Malliarakis et al., 2013c; Malliarakis et al., 2014a). CMX is one of these games that was designed and developed to enhance learning and teaching of computer programming and to be used in the classroom as a supporting tool. It aims to increase students' participation so that they are able to practice more with the concepts they are taught, without however replacing the teacher's role as the tutor (Malliarakis et al., 2013a; Malliarakis et al., 2014b).

An engaging game should have an attractive and immersive scenario. For example in CMX, the main environment replicates a toxic factory which pollutes the ecosystem with toxic waste, putting in danger the last remaining land of the world. In this alternate reality, a team of individuals called crackers are activists that are trying to invade the factory and shut down its main server so that it stops polluting the environment. However, the factory is equipped with employees named hackers, who are paid to protect the server and the factory's on-going operation. A virus has infected the main server, and has made the server vulnerable to attacks. Thus, the crackers are seizing this opportunity to find the passwords hidden inside the factory and reach the server to enter them and shut it down, while hackers are trying to find the passwords in order to destroy the virus (Malliarakis et al., 2014c; Malliarakis et al., 2016).

4.2   Motivation

The motivational effects of games and playing have been described earlier in literature, but for the first time this was more systematically explored by Frank Lepper and Thomas Malone in the 1970s and 1980s (Lepper & Greene, 1975; Lepper, 1988; Malone, 1981; Malone & Lepper, 1987). With the common basic idea of exploring what makes learning fun, they both studied how digital multimodal games might be used to motivate students for solving mathematical problems (Malone & Lepper, 1987).

In the rapid digitalisation of classic game concepts in the 21st century many analogue game have been digitised at the same time as the quality of digital media has improved. There has also been a rich development of brand new game concept including more serious games for educational purposes. For several reasons it is realistic to assume that the motivational factor identified by Lepper and Malone are much stronger in today's games with high-end sound and graphics.

Two motivational factors that were suggested independently by both Lepper and Malone were curiosity and challenge. Based on common findings Lepper and Malone later combined their findings into to 'The taxonomy of intrinsic motivation'. A two levels taxonomy, with a level of internal motivation and a level of interpersonal motivation. Their factors in the level of internal motivation are challenge, curiosity, control and fantasy and in the level of interpersonal motivation their factors are competition, cooperation and recognition. (Malone & Lepper, 1987)

Another motivational concept that often has been involved in game-based learning research is the flow theory originating from the Hungarian-American Professor of Psychology Mihály Csikszentmihalyi (Wang & Chen, 2010; Admiraal et al., 2011; Hamari et al, 2016). The concept of flow that also has challenge as a main ingredient has been defined by Csikszentmihalyi (1990), as a state of deep absorption as when a person is focused playing a game or some other activities that are joyful and intrinsically motivating. Furthermore, the flow theory builds on the reciprocal relationship between challenge and proficiency. To be there in the so called 'flow channel' between boredom and anxiety, is what keeps a player in a motivated flow state. Relating to game design the player gets bored when the game is too easy without challenges, and anxious when the challenges are too high to master.

4.3 Opportunity of mastery

People want to achieve goals and get better. They want to experience meaningful growth. Games offer an opportunity for mastery (Malliarakis et al., 2015). They start with small, simple goals; as the player progresses, they also increase in difficulty. A compelling gameplay loop gives meaningful goals with clear actions, with results presenting relevant feedback that directs them to the next goal. This cycle repeats, keeping players interested and engaged. Games meet this motivational need with their outlet for achievement through goals and feedback.

4.4 Theme and story

Stories and plot serve as a form of escapism (in games that use them), and allow players to experience and create their own stories. This way, teaching and learning is enhanced, students remain immersed in the game's environment, without disorienting their interest or motivation to win.

One important factor of engaging theme and story is that the system should not present delays in its responses and should manage to produce the appropriate feedback to the teacher (learning analytics). System delay or failure issues are very important factors for the proper operation of these games in education and they could have a huge impact in the learning process and students' motivation that could potentially ruin game's theme and story (Malliarakis et al., 2014d).

4.5 Intriguing Learning

Intrigue per is defined as arousing the curiosity or interest of something, Being intrigued people are wanting to know more about corresponding subject and are making efforts to satisfy their curiosity. Using intrigue in games is one of the most effective ways to captivate the user and keep his interest during the gameplay. Using intrigue in learning can perform the same role and thus to improve the effectiveness of learning and game-based learning gives a good possibility to implement intrigue learning thought a game context.

(K. Kapp, 2014) identified eight game elements, that when applied to learning, make it more intriguing and thus more engaging and motivating: Mystery, Action, Challenge, Being at risk, Uncertainty of outcome, Opportunity for mastery, Visible signs of progress and Emotional content.

Different approaches can be used for implementing these elements, but in any case it depends on how successful learning and game scenarios are combined. The more connected the scenarios the more successful the game intrigue will be transferred to the learning process. In (Shabalina et al, 2009, Shabalina & Vorobkalov, 2013) an approach that allows to merge learning and game scenarios into one inseparable scenario is suggested. The approach is based on three I's (course material must be Introduced through a game world; learners must see Interpretation of solutions in a game context; learning results must Influence game results) and it allows to keep intriguing game elements in a game context.

4.5 Objectives

In earlier discussions on GBL it has frequently been highlighted that there is need to align games with curricula objectives (Amory et al., 1998; De Freitas & Oliver, 2006; Squire, 2011), and as pointed out by De Freitas and Oliver (2006) teaching aims and learning objectives in the actual course have to be considered. The rich variety of games might be divided into the subclasses of educational games and serious games. Educational games that have been developed with the aim of learning by gaming, and serious games that more fundamentally are based on specified learning outcomes. However, it is not always easy to make these clear definitions and distinctions between the classes, and instead of a strict division, the differences could be seen as a continuum as suggested by Marsh (2011).
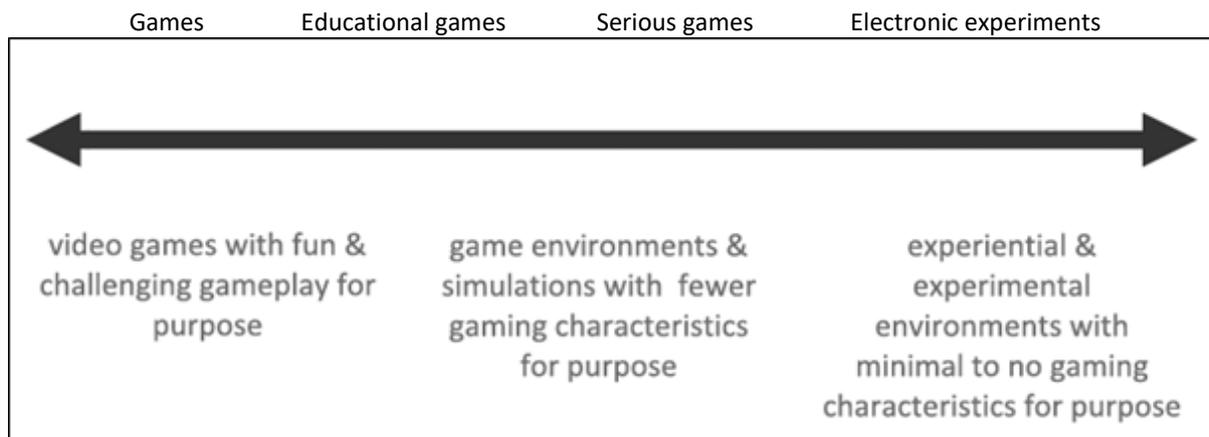
Games	Educational games	Serious games	Electronic experiments

Figure 1. The learning game continuum (Marsh, 2011)

The balance between enjoyable gameplay and explicit educational objectives will probably always be a remaining challenge to address. Gaming for gaming's sake can be a fun and stimulating experience, but without any learning outcomes at all, the gaming is not game based. On the other hand, if the educational objectives get to dominant the learning games might appear as e-books or electronic lab experiments.

4.6 Natural flow between learning and fun

Students, nowadays, learn and react to technologies very differently than a few years ago. This is mainly because they are familiarized from a very early age with environments such as computer games that include impressive graphics and multimedia (Guzdial & Soloway, 2002). This leads to students being un-impressed with the traditional educational tools used in the class, which leads to lack of motivation in participating. In parallel, the difficulties faced during learning of multiple and complex concepts as well as the inability to apply them in specific contexts, indicates the need for the creation and usage of educational games that have been designed to support entertainment and cover a variety of educational goals (Gunter et al, 2008). To this end, in this framework it is underlined the importance of game flow, as a defining element for the success of an educational game. Game flow regards the intrinsic motivation and playing for the sake of playing, and learning for the sake of learning (Balogh, Benedek & Vidékiné-Reményi, 2013). Thus, a significant challenge is how to design games in order to stimulate this motivation and maintain the flow throughout the game's duration while learning. We consider that the proper incorporation and application of game flow in an educational game will lead to the increase of students' interest and their positive attitude towards the transfer of knowledge. To this end, we emphasize that a proper combination of game characteristics and learning content should be set during the design and development of educational games.

5   Conclusions

This paper introduced and elaborated on a holistic framework based on 7 key factors that should be considered in creating a successful serious game. This framework is named "E.M.O.T.I.O.N" and stands for "Engaging game", "Motivation", "Opportunity of mastery", "Theme and story", "Intriguing learning", "Objectives" and "Natural flow between learning and fun". "E.M.O.T.I.O.N" is a framework that underlines the necessity of not disassociating instructional content from emotional context. In other words, we should not create sterile bulleted lists of rules. We should not assume players make decisions about adhering to policy based on rational algorithms and not normal human emotions. We should not strip learning modules of humanity and replace it with policy, terminology, and models, but fill a player with emotions ranging from frustration to elation, from sadness to anger to enthusiastic happiness. Serious games should embrace and encourage human emotion. It would be a breath of fresh air if our learning modules borrowed from games and put the critical element of emotion back into learning. The main message of this paper is that humans are quite adept at recalling learning when the learning is tied to strong emotions.

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