

Gaming literacy: The Role of Feedback in Enhancing Media Literacy Through Serious Games

Evaluating the impact of formative feedback in the learning process

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ABSTRACT

Through the use of formative feedback mechanisms, the study investigates how playing serious games might enhance media literacy abilities and promote favorable attitudes towards media literacy. Furthermore, it examines logical theories that underpin game-based learning. The purpose of the study is to determine how much the efficacy of formative feedback contribute to improved media literacy. For the purpose of this study, there were a large number of variables that were taken into consideration. Measurements included perceived media literacy, attitudes towards media literacy, a test of actual media literacy, player satisfaction, autonomy, and competence. More specifically, participants were divided into four groups: (1) viewed stories in the game and received feedback, (2) viewed story screenshots with feedback, (3) viewed story screenshots without feedback, and (4) control group with no story exposure. According to the results feedback did not significantly affect media literacy levels; nonetheless, those who played the game felt more competent, autonomous, and satisfied with their experiences. These results imply that, despite their engaging nature, serious games may not be highly impacted by feedback alone in terms of their ability to increase media literacy.

KEYWORDS: Serious Games, Media Literacy, Formative Feedback, Attitudes towards media literacy, player satisfaction

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2. Introduction

Today's landscape is characterized by great technological developments in several industries, including the gaming industry. The first ever computer game dates back to 1962, developed by Steve Russell, a Massachusetts Institute of Technology (MIT) student (Kent, 2001, p.17-18). The game was developed within the framework of expertise and not for profit (Zackariasson & Wilson, 2010, p.140). Over the next decade, the gaming industry began to flourish (Zackariasson & Wilson, 2010, p.140) and still remains a very profitable industry (Ullah et al., 2022, p.189; Belyaeva et al., 2022, p.333). According to Statista (2024), it is predicted that by the end of 2024, the game industry will reach US\$ 455.30 billion. Moreover, it is anticipated to have an annual growth rate of 7.93% between the years 2024-2029 and the number of users is expected to reach 3.0 billion by 2029.

The number of studies examining the effects of games for educational purposes has increased throughout time. The conclusion is that game-based learning has the ability to affect people (Ullah et al., 2022, p. 189). Specific games are designed to expand the imagination, sharpen curiosity and encourage discussion. The use of these games is beyond entertainment, and they are known as "serious games" (Ullah et al., 2022, p.190). Their main objective is to help users simulate reality and understand the impact of their decision on the real world (Annetta, 2008). Serious games date back to the 70', with the first serious game being used as a tool for teaching History (Baxter et al., 2021, p.100).

Educational games which are a subset of serious games, are games specifically developed for educational purposes (Backlund & Hendrix, 2013). Nowadays, more and more educational games are invented with the main focus of creating new educational tools that have motivating and engaging characteristics (de Freitas, 2018).

After the technological integration such as the mobile phones, tables and other similar inventions, which increased the use of the Internet, more and more technological advancements have begun to emerge (Keengwe et al., 2008, p. 560). In this context, serious games have developed to amplify learning purposes and evolve ever-changing mechanisms. These advancements have facilitated the creation of more sophisticated and impactful educational tools (Backlund & Hendrix, 2013, p.1; Baxter et al., 2021, p.102).

The technological progress and the immersed need to engage students in meaningful and experiential learning, has led to the transformation of traditional educational methods (Brandl & Schrader, 2024, p. 1-2). Serious games give students access

to pedagogical content, scenarios and circumstances that they couldn't otherwise, offering a practical method that can greatly improve learning and retention of challenging concepts (Baxter et al., 2021, p.101; Papanastasiou et al., 2017, p.46). A well-structured serious game enhances learner motivation and avoids frustration and boredom, which brings the desired result of learning (Westera et., 2019, p.360).

Taking into consideration that there is significant interest, especially among younger generations, in improving their digital skills and competencies, another term that needs to be introduced is *media literacy* (Glas et al., 2023). Media literacy is a skill that offers the ability to evaluate the different kind of media through which the information is filtered (Schwarz, 2005, p.11). Potter advocates for the crucial role of media literacy in education, highlighting its beneficial role. More specifically, he emphasizes that media literacy equips younger generations with cultural competence and social skills that are needed in the media landscape (Potter, 2010, p. 683). The role of media literacy is to provide knowledge through social concerns and educate on possible misuse of the media, by enabling the analysis and the critical evaluation of media messages (Ivanović, 2014, p.440).

However, complex technological challenges are presented when creating a serious game with a focus on media literacy skills. It is crucial to consider the gap between the game designer and the game narrator. There is a difficulty in turning educators into technology experts and the opposite (Livingstone, 2011, p33). With serious gaming being recognized as a tool to educate and train users, there is a variety of games which focus on media literacy and topics such as digital privacy, fake-news and practical media skills. (Glas et al., 2023).

Therefore, media literacy enables individuals to avoid the negative effects associated with media consumption by enhancing critical thinking skills and guiding them in making informed decisions (Glas et al., 2023). Additionally, gaming is recognized as a powerful tool which has a large potential to support training and education. This lies in its ability to engage users in an interactive digital experience. Well-designed games are capable of giving immediate feedback to players. This idea allows them to improve their work and performance and achieve their goals in a more constructive and efficient way (Ullah et al., 2022).

Most people agree that feedback is a crucial and required part of any educational process (Jensen et al., 2012, p.246). Feedback has a dual role in the educational field. On

the one hand, it supports the students in the learning process and, on the other hand, it helps the teachers to reach their educational goal. Last but not least, it is a powerful pedagogical strategy for encouraging communication between instructors and students in the educational process. (Carvalho et al., 2014, p. 220).

Hence, the research question is ***to what extent does playing a serious game impact media literacy, and in what way does formative feedback contribute to learning objectives and the development of more favorable attitudes towards media literacy.***

2.1. Societal and academic relevance

With fake news, misinformation and exaggerated information rapidly flourishing in the digital landscape, the need to focus on media literacy has never been more important. The societal relevance of this research lies in equipping media consumers with the necessary tools to critically evaluate the information they receive. In an era where most of us rely on digital platforms, the ability to distinguish between fake-news and misinformation while protecting ourselves has become paramount. This study investigated the impact of serious games on media literacy skills, particularly focusing on the potential of formative feedback. By emphasizing the role of feedback in serious games, the aim is to explore the extent to which feedback is useful to educate about ethical media use. Additionally, the academic relevance extends to investigating how these games are capable of adding value in the educational field and how formative feedback can work as an influencing motivation. Moreover, this study acknowledges the continually evolving importance of media literacy within the field of science and the ongoing attempts to define and expand its conceptual boundaries.

Several studies have concluded that winning a game significantly contributes to player satisfaction, enhancing their overall experience while increasing engagement and motivation to continue playing (Rieger et al., 2014, p.282). Most of the games use mechanisms to increase players' involvement, such as competition elements, rewards and satisfaction of psychological needs (Xiaohan et al., 2020, p.75). According to one who analyzed, among other researchers', self-determination theory, autonomy competence and relatedness plays have a physiological impact on player satisfaction. Autonomy is a term that refers to the feeling that each of us is in control of our behaviours and goals (Rieger et al., 2014, p.282) while competence is a widely used term that describes the sense of performing effectively and demonstrating the necessary skills to achieve a goal (Wang et al., 2019, p.1; Kazakova et al., 2014, p. 26). Finally, relatedness is a concept that refers to players' feeling of connection and interaction with others. Multi-playing and cooperation in games have proven to increase player satisfaction (Ryan & Deci, 2017, p.14).

3. Literature review

3.1. *Media literacy as an evolving concept*

Literacy is an evolving term that was first used in the 19th century and was initially associated with the ability to read and write (Pereira & Moura, 2019). The technological changes, including media advancements, evoked the evolution of the term (Kutlu-Abu & Arslan, 2023, p.86). As Livingstone et al. (2013, p.346-347) highlight, the concept of the media has also evolved from transmitting information into actively spreading knowledge among people. Understanding the media environment is crucial because each media channel has a unique influence on human behavior, and it requires different competences and skills (Livingstone et al., 2013, p.355).

Media literacy is a multidimensional concept constructed of many different elements and with many different interpretations (Potter, 2010, p.676). Its societal and educational importance is supported by the variety of implementation not only in the educational field but also in communication, sociology, psychology, politics and history (Hobbs, 2019, p.5). Globally, approaches to media literacy vary according to a country's level of development, ideology, and technological progress (Kutlu-Abu & Arslan, 2023, p.86; Park, 2017). For instance, German-speaking media education takes into consideration all media-related activities in relation to communication skills, while English-speaking media education places it under the broad title of literacy, which is the study of the capacity to read and write in a culture's common tongue (Tulodziecki & Grafe, 2012, p.45; Kutlu-Abu & Arslan, 2023, p.86).

A bibliometric analysis conducted on media literacy articles showed that a total of 3,216 publications were related to media literacy, while this concept has 768 articles, from 2000 to 2021 (Kutlu-Abu & Arslan, 2023, p.88). Furthermore, although over the same time period the number of citations on media literacy fluctuates, the overall picture is that in recent years the numbers have increased (Kutlu-Abu & Arslan, 2023, p.89).

Children and young people that are media literate are more resilient, which is important for human development and well-being (Hobbs, 2019, p.9). Media literacy has shown to be successful in a variety of educational scenarios. For instance, Primack et al.

(2006, p.469) did a survey regarding smoking that showed that students with higher levels of media literacy were less likely to smoke.

The emergence of digital technology in education has stimulated interest in media literacy pedagogy among academics and educational practitioners. The technological, cognitive, and social competences, knowledge, and skills required to participate in the modern knowledge economy and communicate successfully are starting to be referred to as digital literacy (Hobbs, 2019, p.10). Riel et al. (2012, p.3) defines digital literacy as “the ability to efficiently and accurately use digital information technologies and the information retrieved from them in a variety of contexts, such as academic, career, or daily life; is both knowing how to use technologies in today’s world as well as how to retrieve, use, and analyze information that digital media provides.”

A study conducted by Audrin & Audrin (2022, p.399-400) revealed that in 2001 there were few studies on digital literacy. However, after almost 20 years, there are more than 300 articles studying and analyzing it. These findings seem reasonable, as digitization has flourished as a concept in recent years, emphasizing the increasing significance of digital literacy and its significance to academic endeavors (Audrin & Audrin, 2022, p.400).

As the political and media landscape is constantly changing, there is a need for new media literacy initiatives. Today more than ever, with fake news and misinformation being at the core of the media environment, media literacy can prove essential and gradually support the education of responsible media management (Bulgar & Davison, 2018, p.12). Nevertheless, because of its longitudinal nature, the evaluation of media literacy is challenging. The diversity of media literacy objectives creates inconsistent expectations and makes it difficult to decide which outcomes to assess and how to measure them (Hobbs & Jensen, 2009, p.8).

The essence of media literacy is in the development of critical thinking skills in order to interpret the complex messages produced by today’s media. Moreover, it is important for individuals because it enables them to recognize the potential advantages and disadvantages of the media and hence determine its impact (Torabi & Ferdosipour, 2020, p.97-98).

3.2. Media literacy through game-based learning

The integration of computer games with education has a history, dating back to the late 1970s and early 1980s (Arke 2012; Ullah et al., 2022). In the following years, the academic landscape demonstrated the value that games brought to science education. As Ullah et al. (2022) has emphasized, students' motivation is notably increased with the integration of games into the educational process. The significance of motivation has always been acknowledged by scholars as an important factor in the learning process (Gee, 2009; Paras & Bizzocchi, 2005) and it is driven by the personal need to achieve a goal (Gee, 2009).

For both adults and children, media literacy has become essential in the modern world of digital media. Even though most people are familiar with technology and the internet, students frequently lack the abilities needed to properly access and analyze online content. Furthermore, media literacy is not considered as an individual social skill but a more social cultural one, deeply connected with community and societal contexts (Sousa & Costa, 2019, p.143). Game-based learning allows students to actively construct knowledge and control their learnings within a safe environment (Sousa & Costa, 2019, p.143). A variety of games have been integrated into the educational field in various ways. The use of games as a means to deliver educational content directly into students' consciousness has been proven effective by several studies. Moreover, the benefit of these games is equal for both students and adults. The psychological mechanisms that engage players are profound, including the engaging attention to sound and movement which engage them in the learning process (Liu et al., 2020, p.55).

Today's educational landscape highlights the essential role of feedback. As many researchers support, it is considered as an important tool in the learning process as it helps in understanding the overall performance (Akkuzu, 2014, p.38). Feedback is defined as information that is provided to an individual by an external source, such as a teacher, book or game. It is aimed at informing the individual about his performance or understanding (Hattie and Timperley, 2007). Feedback can be provided from different sources like teachers, parents or technological mechanisms and with various methods like orally or paper-based. The source and the method have an impact on the recipient.

With a focus on technology that provides immediate feedback in a constructive way, the advantages are many (Arunwarakorn et al., 2017, p.269). The purpose of formative feedback is to identify particular mistakes and misconceptions while also offering information on how accurate a learner's response was at the time. As Morris et al. (2021, p.2) highlights, effective formative feedback allows the evaluation of actual performance based on predetermined performance criteria. The inclusion of technology within the art of feedback can be proven to engage learners. Undoubtedly, most students enjoy playing games, thus learning platforms with immediate feedback are appreciated and often lead to increased engagement and motivation (Grier et al., 2021, p.200).

Several online games are designed to give immediate feedback to players, thus they motivate them to develop their critical thinking and guide. Several studies have delved into the effectiveness of formative feedback rather than the standard model of feedback (McCallum & Milner, 2020, p.2; Gedye, 2010, p.41-43). As stated by McCallum & Milner (2020, p. 9), formative feedback encourages participants to interact with the content and evaluate themselves using the feedback provided to them.

Formative feedback mainly focuses on providing information to the learner, in our case, to the participants, with the aim of affecting the way they think or behave in order to enhance their knowledge (Shute, 2008). There are many factors that can have an impact on the effectiveness of formative feedback. To name a few, the ability to self-assess can provide learners with a sense of dependence and the ability to improve self-correction and keep them away from practices that encourage teacher evaluation (Gedye, 2010, p.41). Additionally, effectiveness can be achieved by setting clear goals. Formative feedback often involves students in the feedback process and is not a one-way process that leads to misunderstandings and complex academic instruction (Gedye, 2010, p.42).

Media literacy is considered by many scientists as a constantly evolving concept, thus many of them have focused on its delineation and definition (Potter, 2010). Potter (2022), defines media literacy as “the ability of a citizen to access, analyze, and produce information for specific outcomes.”

At its core, media literacy seeks to cultivate awareness of information and digital media skills. In a world where information is endless but, in many cases, unreliable, individuals need to develop a critical mindset (Rasi et al., 2019). Fake news, misinformation and exaggerated information flourish in the digital landscape. In recent years, there is a

broad list of games which are becoming more and more popular among adolescents. They are developed with a view to focusing on fake news, digital privacy and personal safety, aiming to enhance media education. However, the concerns that arise are on which skills and abilities the games focus and how these games are designed to cultivate media literacy (Glas et al., 2023). Additionally, the learning purpose must be clear and close to participants' interests because, in this way, they are more willing to achieve their goal (Paras & Bizzocchi, 2005). To successfully encourage media literacy, these educational games must be fascinating to youngsters as well as relevant to their daily interests.

3.3. *The evolution of serious games*

Multimedia technologies have been increasingly used in recent years to teach vocational and academic skills through educational video games, software and computer games. Although there has long been evidence that games are useful learning tools, experimental research is still in its infancy. Scholars argue that games promote immersive, contextual, and constructive learning that is enhanced by active exploration and immersion (Girard et al., 2012, p.207-208).

The rise of technology has brought "serious games", which at their core are games that combine gaming and learning (Girard et al., 2012, p.208). They are characterized as interactive and controlled by a set of established rules and constraints and are usually focused on a specific goal often defined by a challenge (Wouters et al., 2013, p. 250).

The term "serious game" has many definitions and, in many cases, it is related to game-based learning (GBL). According to Plass et al., (2015, p.260-261), game-based learning (GBL) offers the potential to improve training activities and initiatives, because of its ability to engage students, incorporate role-playing elements, be consistent, and allow users to adapt and test ineffective strategies that can be replicated. Even though game-based learning is described by many scholars as a branch of serious games, others consider them as two related terms. The concept of serious games is based on games that are used for training, educative and simulative purposes, while they are designed to run on personal devices or video game consoles (Susi et al., 2007, p. 2-3). Games are a very interesting way of learning. They use story-telling and create engagement with characters in a compelling way that keeps the player entertained and engaged. These kinds of educative games create

skills and abilities while creating a vivid environment in which the user is able to learn and solve problems while exploring and playing a game (Corti, 2006, p.2).

Although serious games are believed to enhance learning and reinforce cognitive abilities, studies on the benefits of serious games are rare. Games and simulated environments allow participants to experience situations that would otherwise be impossible (Susi et al., 2007, p.8). The development of analytical, dimensional, and strategic skills as well as enhanced learning and memory retention are just a few of the many advantages that come with playing serious games. They improve practical skills in areas such as urban planning, architecture and medicine, giving students the opportunity to tackle complex scenarios that are not feasible in real life due to financial, time or safety issues (Mitchell & Savill-Smith, 2004, p.19-20; Susi et al., 2007, p.8). On the other hand, research acknowledges the potential negative effects of gaming such as health issues like headache, mood swings and psycho-social issues like depression, loneliness and isolation, not to mention the violence on which many games are based (Mitchell & Savill-Smith, 2004, p. 8-10).

3.4. Immediate feedback in games

The evolution of the Internet enabled people to communicate in a bidirectional way and made possible the expression of ideas and opinions to a worldwide audience. The old idea of word-of-mouth has now been transformed, as multiple online platforms and feedback methods have taken its place (Dellarocas, 2003, p.7-8). Many scholars examine the value of personalized learning in computer-assisted education, emphasizing the advantages of digital learning platforms that are personalized to meet the needs of specific learners. Adaptive feedback is an element that has been thoroughly researched in digital learning and is highlighted as vital in personalized learning scenarios (Celik et al., 2021, p.1-2).

Since formative feedback is designed to provide immediate feedback, learners are able to evaluate and improve themselves promptly. Researchers confirm that having feedback can improve and even motivate the learning performance (Tsai et al., 2015, p. 260). Similarly, immediate feedback systems in games are essential for raising player performance and engagement, since they let users evaluate their own gameplay and modify their tactics instantly. Adaptive feedback in instructional games promotes a more enjoyable and effective learning environment, just as direct feedback increases interest in learning (Tsai et al., 2015, p.264-265).

Providing players with real-time feedback on their performance is essential for enabling them to make necessary improvements and decide whether to modify or continue with their actions. Numerous feedback formats have been found to affect motivation and performance; immediate feedback is especially useful, according to studies (Schaffer & Feng, 2015, p.3). Competence and autonomy are two critical psychological requirements that influence intrinsic motivation, particularly in terms of game production and player engagement. It can be difficult for game designers to modify elements during the game design process, which can affect the development of autonomy and competence. However, of all these elements, feedback is the most flexible and powerful in shaping motivation (Burgers et al., 2015, p.95).

3.5. *Enhancing media literacy through serious games*

The majority of us are familiar with decrypting or creating messages using the media. Media literate can be considered the ones with access to different kinds of media and information, games and technology (Potter, 2022). But a person who is truly literate is the one who possesses the skills and the knowledge to navigate effectively in different forms of media, and at the same time analyze and evaluate them (Potter, 2010). Media literacy skills suggest that an individual is able to understand and recognize different formats of traditional and digital media from a critical and responsible point of view (Hobbs et al., 2003). Individuals who grew up with digital media tend to have the perception that they are knowledgeable about the technologies, precisely because they are exposed to them so often (Hargittai, 2010). However, a study made by Akçayoğlu et al. (2019) showed that most of the participants were not familiar with media literacy.

The level of media literacy refers to an individual's capability at understanding, analyzing and critically evaluating different forms of media (Eristi et al., 2017). Gaining more control over the media allows us to be more aware of harmful effects and avoid being part of mass media production (Potter, 2022). In addition, formative feedback, as defined above, focuses mainly on improving the recipient's knowledge. Attitudes towards media literacy are referred to as individuals' abilities to evaluate messages, identify biases and make responsible media choices. It is not only the knowledge that individuals must gain, but also the need to learn how to apply it in order to develop new learning perspectives (Ku et al., 2019).

Digital games, with internet learning objectives, can strategically improve media literacy. Among other competencies, they assist players to learn media functions, cultivate their critical thinking and teach them how to work in digital environments (Škripcová, 2022). For many decades now, it has been proved that the value of games in science education is high and that students' educational motivations have been increased (Ullah et al., 2022). In addition, there is this mechanism that the player tends to connect satisfaction with his performance. Thus, a satisfied player has positive emotions and increases his self-esteem when he has a positive game experience (Klimmt et al., 2009).

The theoretical approach used in this research is based on educational psychology and the educational media, coming from previous studies. The insights given about games in the educational sector and the development of literacy skills through them, provide a

comprehensive approach to exploring the relationship between the impact of serious games on media literacy. This research problem is significant as formative feedback is essential, because it motivates individuals to play more and put much more effort (Ullah et al., 2022).

3.6. *Pedagogical strategies in serious games*

Conveying knowledge and encouraging behavior change is often more successful in serious games with a narrative setting. As a result, designers of serious games often choose to use interactive storytelling to present interventions and educational information (Troyer et al., 2017, p.550; Arnab et al., 2014). A number of prerequisites must be met for such serious games to produce meaningful learning effects. In addition to concentrating on producing aesthetically pleasing graphics and captivating stories, designers also have to deal with the difficulty of incorporating suitable instructional techniques into these narratives (Troyer et al., 2017, p.550).

Due to their compelling nature and realistic simulations, serious games present an exceptional opportunity for improving the educational sector. But, besides the theoretical approach, there is a need to develop games that can effectively help and support the learning process (Fernández-Sánchez et al., 2023, p.3) Achieving this requires the involvement and the cooperation of various stakeholders within the serious game lifecycle, including teaching, students, educators' developers and companies (Bellotti, 2011, p.7).

3.7. *Player satisfaction, media literacy and gamification: An SDT perspective*

As media literacy becomes more and more crucial in education, there is a need to understand the kind of games that contribute to player enjoyment and satisfaction. Digital skills are distinguished by different types of skills, including the verification of a credible source, responsible choices regarding the sources of information and the effective use of technological tools (Alt & Raichel, 2020, p.2). Among the variety of tools offered to enhance digital skills, researchers suggest that games can prove valuable (Alt & Raichel, 2020, p.3; Škripcová, 2022, p.132). The term “gamification” refers to the application of game-designed elements in non-game contexts with a view to engaging and motivating individuals to achieve their goals (Caponetto et al., 2014, p.50). This widely used term applies in various fields, including education, to enhance learning outcomes. Digital educational games and gamification elements can be utilized to foster higher levels of knowledge creation among learners (Alt & Raichel, 2020, p.4).

Nonetheless, researchers believe that competencies like media literacy skills, as well as creativity and problem-solving are unlikely to be attained through digital platforms unless they are guided by clear objectives and outcomes (De-Marcos et al., 2014, p.83). Therefore, they suggest that traditional ways of education need to be replaced by innovative and pedagogical-driven ideas that would engage students individually and collectively in social constructivist education (Henriksen et al., 2016, p.31; Alt & Raichel, 2020, p.4). Educational approaches that exemplify creativity can effectively nurture individuals' development as well as influence their learning objectives. It is more than important to cultivate teaching methods that leverage new technologies to foster freedom of cognition, which is otherwise challenging to achieve (Henriksen et al., 2016, p.32).

In this context, feedback can function as goal setting. Within the context of gaming, feedback can work as a guide towards the desired outcome, enhance the status of a player and increase users' participation (Mazarakis, 2015, p.6).

According to a psychological theory, called self-determination theory (SDT), human motivation is driven by three needs; autonomy, competence and relatedness (Ryan & Deci, 2000, p.68). This theory supports the fact that individuals throughout their lives are engaging in activities to enhance their personal satisfaction and not in activities for external rewards (Tamborini et al., 2011, p. 26). The fulfilment of these needs intensifies self-

motivation and reinforces mental health. (Tyack et al., 2021, p.3; Ng et., 2012, p.326; Ryan & Deci, 2000, p.68; Parchomovsky & Stein, 2020, p. 62).

This theory is widely used in gaming; thus, it is important to explore how autonomy and competence have an impact on player satisfaction. Individuals feel more in control of themselves when they get the impression that their actions have a great sense of autonomy. Studies have identified that playing a game has the power to satisfy the needs for autonomy and competence. The entertainment that players derive from gaming has been shown to satisfy their hedonic needs (Tamborini et al., 2011, p. 26). In the gaming landscape, studies have shown that competence is linked to player satisfaction and game enjoyment. Advanced players with higher expertise are likely to experience greater satisfaction compared to those with less experience (Kazakova et al., 2014, p. 27).

3.8. *Credibility and critical thinking competences*

In today's landscape, the credibility of sources has started to create doubts. People have become aware that traditional communication channels like corporate advertising are no longer trustworthy. However, there has been a tendency observed towards alternative online sources like social media or specific online platforms (Hajli et al., 2014, p.239).

The difference between media literacy and credibility is their focus. On the one hand, media literacy mainly focused on how messages are interpreted, whereas credibility focuses on how messages are evaluated. Nevertheless, both terms share a common goal and can offer essential advancements in the societal environment (Shabani,2021, p.416).

Monitoring how well players have met specific learning objectives within the game environment is part of the process for developing an educational objective in games. Depending on the expected learning outcomes and educational goals, these objectives can vary significantly (Smale et al., 2016, p.507). Basically, learning objectives are the expected outcome regarding the knowledge and skills a person has acquired. There are several mechanisms for evaluating learning objectives, one of which will be analyzed in this paper is feedback.

In educational games, feedback is an essential element that helps facilitate successful learning outcomes. It is important as it provides students with important details about whether their answers are correct within the game. Feedback confirms the accuracy of student

responses and provides information about how well they are achieving the desired learning objectives. By taking advantage of this verification feature, students can evaluate their performance and modify their strategy as needed. Educational games can successfully assist students in the learning process by fostering greater engagement and facilitating more meaningful achievement of educational goals by providing timely and relevant feedback (Cameron & Dwyer, 2005; Van Der Kleij et al., 2015).

Similarly, critical thinking is essential in education, though it varies in definition. This ambiguity has led to separating the term into two roots; philosophy and psychology. Based on the philosophical approach, critical thinking mainly focuses on personal characteristics of a person rather than his actual behavior or actions. Facione (1990, p.3) defines it as “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgment is based”.

Nevertheless, the psychological approach defers in two ways. On the one hand, the main focus is on how people actually think in comparison to how they should think under ideal circumstances. On the other hand, rather than giving the focus on the characteristics of the critical thinker, types of action or behaviors are in the foreground. (Lai, 2011, p.7) Willingham (2008, p.8) defines critical thinking from a psychological approach as “seeing both sides of an issue, being open to new evidence that disconfirms your ideas, reasoning dispassionately, demanding that claims be backed by evidence, deducing and inferring conclusions from available facts, solving problems, and so forth”.

Considering learning objectives in critical thinking, it is crucial to find a balance between course content and the process through which this content is properly learned and understood. While critical thinking principals give instructional guidelines for connecting and mastering educational content, learning outcomes establish the primary goals for the subject (Mandernach, 2006, p.42).

Among many educational practices, studies have concluded that digital-based learning has essential outcomes. In a knowledge-oriented world, critical thinking is a necessary competence. The vital role of sharpening critical thinking knowledge is growing due to the continuous increased learning content and the need to apply high-level cognitive skills in the educational process (Dam & Volman, 2004, p.360). In this context,

digital games provide unique advantages, including engaging content, interactive environments that enhance problem-solving abilities (Chen & Wu, 2021b, p.19). Furthermore, group games reinforce critical thinking skills by involving students in group problem-solving and strategic planning (Lee et al., 2016, p.100). Based on what Chen & Wu (2021b, p.20) highlights, role-playing games (RPGs) are useful educational tools that encourage learners to adopt diverse perspectives and critically evaluate social issues. These games allow learners to observe problems from various angles, fostering tolerance and unbiased reflection, two fundamental components of critical thinking.

Game-based learning and problem-solving disciplines have similarities in developing an individual's ability to tackle complex challenges. This shows that well-designed games are capable of providing a learning environment where critical thinking skills are enhanced (Cicchino, 2015, p.3). At the same time, player satisfaction comes from the experience and expectation that players have from the game, as such games that foster a willingness to continue playing not only contribute to the development of critical thinking, but also to players' engagement.

Furthermore, the concept of media literacy, as previously explained, incorporates the ability to analyze, criticize and evaluate information critically. At its core, the main goal is to cultivate awareness through the digital world, thus critical thinking is required for developing high-level cognitive skills in processing information and empowering individuals' abilities towards media literacy. The cultivation of a critical mindset is required for successfully interpreting and comprehending media messages by integrating media literacy with critical thinking (Zhang et al., 2022, p.372).

3.9. Self-efficacy and game engagement

Scholars acknowledge the importance of self-efficacy, a concept first introduced by Bandura, known as the father of cognitive theory, over three decades ago. This concept refers to one's belief that one's personal skills and abilities are more than sufficient to complete a task (McCormick, 2002, p.34-35; Paglis, 2010, p.771). Psychological researchers showed that individuals with higher self-efficacy are more likely to be part of an activity and the reason is that they feel confidence that they will execute this activity better (Maurer, 2001, p.124). Meanwhile, leaders with higher self-efficacy have more chances not only to achieve their individual goals but also to influence their followers into higher levels of teamwork (Paglis, 2010, p.779).

Self-efficacy is crucial to player motivation. When the game provides enough opportunities for players to achieve their goal, the level of self-efficacy is enhanced. In contrast, a game that is too difficult causes self-efficacy to decrease (Klimmt & Hartmann, 2006, p.141). Therefore, well-designed games enhance self-efficacy levels and motivate players to face in-game challenges and encourage engagement.

3.10. Hypotheses

The aforementioned highlights that game-based learning enhances player satisfaction and increases motivation, while allowing players to build knowledge and enhance self-efficacy. Furthermore, media literacy, which is vital in the digital age, emphasizes the need for individuals to develop a critical mindset towards the various media they consume. Most importantly, serious games are designed to learn and educate each of us in an engaging and constructive way. The important role of feedback enhances serious games by spotting mistakes and providing useful information about one's knowledge and uncertainties. Additionally, players' credibility and critical thinking are enhanced when they are satisfied with their experience, feel a sense of autonomy, and achieve competence throughout the game process. Having said that, we assume the following:

H1: Self-efficacy in media literacy is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.

H2: Perceived responsibility in news media is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.

H3: Competence towards media literacy is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.

H4: Uncertainty in media literacy is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.

H5: Self-efficacy in media literacy is increased with a) player satisfaction followed by b) autonomy followed by c) competence

H6: Perceived responsibility in news media is increased with a) player satisfaction followed by b) autonomy followed by c) competence

H7: Competence towards media literacy is increased with a) player satisfaction followed by b) autonomy followed by c) competence

H8: Uncertainty in media literacy is increased with a) player satisfaction followed by b) autonomy followed by c) competence

H9: Credibility is increased with a) player satisfaction followed by b) autonomy and c) competence.

H10: Critical thinking is increased with a) player satisfaction followed by b) autonomy and c) competence.

H11: Credibility is increased with a) Self-efficacy in media literacy followed by b) perceived responsibility in news media followed by c) Competence towards media literacy and d) Uncertainty in media literacy.

H12: Critical thinking is increased with a) Self-efficacy in media literacy followed by b) perceived responsibility in news media followed by c) Competence towards media literacy and d) Uncertainty in media literacy.

4. Method

4.1. Justification

The purpose of this study is to investigate the impact of a serious game on media literacy and how formative feedback contributes to the achievement of learning goals and promotes more positive attitudes towards media literacy. Given the complexity and multidimensional nature of these concepts, quantitative analysis is ideal for capturing the diverse perspectives of participants. The four different groups randomly participating in four different scenarios supported the understanding of the research purpose.

The main reason for the qualitative analysis was to gain an in-depth understanding of the participants' experiences and perceptions. As Holton & Burnett (2005, p.32) states, quantitative experimental research allows the investigation of a phenomenon in a controlled environment, using closed-ended questions. Furthermore, through quantitative methods, researchers use smaller representative groups to make assumptions about a larger group of people that would be impossible to do otherwise (Holton & Burnett, 2005, p.33). Using the four different groups as independent variables, this study aimed to observe the effect on dependent variables like media literacy, attitudes towards media literacy, test of individual learning objectives, player satisfaction, autonomy and competence. By altering the independent variable and applying the randomization principle, researchers can be sure that any observed difference is caused from the variable changed rather than any other extrovert factor (Sprinkle, 2003, p.289).

Moreover, quantitative methods allow the use of validated and reliable questionnaires, which ensure consistency in data collection. The statistical tool, called SPSS, that was used for this study offers tests of reliability throughout the questions and enhances the overall validity of the study. More specifically, reliability analysis, that was done on every question, ensured that questions gave consistent results that were valid for this specific research. Last but not least, the reliability analysis showed that most of the scales were reliable, except for self-efficacy in media literacy, perceived responsibility in news media and uncertainty in media literacy.

Finally, ethical factors were considered during this study. First of all, the introduction of the questionnaire reassured the participants that their response would only be used for this study and their responses would remain anonymous. In addition,

participants were informed about the purpose of the study, their right to withdraw at any time without consequence, and how the data would be used. In addition, to avoid any discomfort and stress, the participants were given the researcher's contact information.

4.2. *Choice of the game*

The online game that was chosen for the analysis is called Reality Check: The Game and it is available in English and in French. The game provider is MediaSmarts, a digital media literacy organization. This game is suitable for minors and adults and its main objective is to identify whether a story is true or false. The game has different missions which are related to five different topics. Each topic has its own learning objective, namely: News You Can Use - Authentication and Citizenship - The Goods in Science and Health - Authentication 101 - We Are All Broadcasters.

Each player is free to make his own choice. After choosing a topic, the game provides a story and gives some clues about the reliability of the source, the original source of the story, the credibility of the profile etc. Together with the clues mentioned, the game provides several tools like other websites, where the same story is available. After checking in detail all the mentioned points, the player is ready to decide whether the story is true or false. At the end, regardless of whether the player answered right or wrong, the game gives him some insights, with the purpose of enhancing his knowledge and critical aspects of media consumption. Each game lasts no more than 10 minutes, and it can be easily played on computers, tablets, or mobiles. This accessibility ensures that a wide audience can engage with the content, promoting media literacy in a diverse range of settings. Additionally, the bilingual nature of the game allows it to reach a broader demographic audience. The game's design, emphasizing interactive learning and immediate feedback, supports users in developing critical thinking skills necessary for navigating today's complex media landscape.

4.3. Procedure

In this study, an online experimental survey was conducted using four different groups. Each group answered the questionnaire based on a scenario they were exposed to. Additionally, each group differed concerning feedback. The first group got feedback after playing the serious game, the second had feedback in the form of screenshots extracted from the game, the third one did not get feedback at all and the fourth one was used as a control group without being exposed to a story at all.

The first group that played the game was mentioned above and were asked to complete a questionnaire which included the same questions as the other groups, but questions about the game, autonomy and competence were included as well.

The second group responded to the questionnaire based on the same stories, extracted as screenshots from the game. Nevertheless, this group did not have the option to see the clues; only the story as it is posted. But after answering whether they believe that the story is true or false, they received feedback, once again in the form of screenshots extracted from the game. Finally, they were asked to complete the questionnaire.

The third group was also exposed to the same stories, presented as screenshots from the game. Unlike the other groups, they did not receive any feedback. Upon indicating whether they perceive the story as true or false, they were asked to complete the questionnaire.

Lastly, the fourth group was not exposed to a story at all and only answered questions about media literacy, attitudes towards media literacy and current media literacy. Through the implementation of these four scenarios, the objective was to understand whether serious games help individuals identify and learn more about media literacy and, if so, having feedback or not had indeed an impact on individuals' level of literacy. This design aimed to determine the effectiveness of interactive learning and feedback in enhancing media literacy skills. By comparing the different groups, the study sought to identify the specific elements that contribute most significantly to media literacy improvement.

In order to get a representative sample for each group, an experimental survey was conducted, with 40 participants per group. Therefore, in total, the responses were 160. The sample included participants from different age groups, educational backgrounds and

previous experience in gaming, to ensure that useful insight was used to conduct our analysis. Participants were randomly assigned to one of the four groups. The survey was conducted online, and participants were informed about the topic and the purpose of the study before moving on to the questionnaire. Also, they had the option to participate through their phones, tablets or laptops. In addition, before the questionnaire started, there was a consent form which included all the necessary information and instructions and that data was only used for academic purposes. The questionnaires were anonymous, so there were no ethical issues and the questions were only related to the topic. If anyone felt pressure in the procedure, they were able to just leave the process immediately and not fulfill the questionnaires.

The data collection took place in April 2024. First, I started by reaching out possible participants through WhatsApp groups or social media like Facebook and Instagram. On top of that, I reached possible participants from my academic background and my own work environment. Moreover, I reached out to individuals from several professional networks such as LinkedIn.

To collect the questionnaire the platform used is called Qualtrics. This platform offers a user-friendly interface, which facilitates questionnaire distribution and response collection. Participants used a link and automatically accessed the online questionnaire where they were asked if they wanted to participate and if so began to complete the questionnaire. Qualtrics automatically saved their responses for later analysis.

Before starting the survey, participants were informed about the aim of the study, which was the impact of serious games on media literacy and the significance of formative feedback in this context. Besides, the introduction of the survey included information such as the duration of the study, which was about 10 minutes, and the minimum participation age, which was 18 years old.

Moreover, they were informed that the participation was voluntary, and they can withdraw the survey at any given point. Regarding their personal information, when reading the introduction, participants were assured that it would be strictly confidential and would only be used for academic purposes. Participants were aware of the anonymity of their answers, and they also had the choice to communicate with me for any extra questions. Finally, the questionnaire was in English. If they agree with these terms, they would continue with the questionnaire, otherwise if they disagree, the survey would end.

This comprehensive approach ensured that participants were well-informed and comfortable, contributing to the integrity and reliability of the study. After collecting the data, they were loaded into the SPSS program for further analysis.

4.4. Sample

The total number of participants was $N= 160$. In terms of their sexual orientation, 46.9% were male, 52.5% were female and 0.6% preferred not to say. Participants' average age was 26.5 ($SD= 5.06$) and ranged from 20 years old to 57 years old. Most of the participants were 27 years old, representing 20% of the total sample, followed by 26 years old, which represented 17.5% of the total sample.

Furthermore, participants had diverse cultural backgrounds due to the international nature of the survey. The sample obtained a total of 10 different countries, including Argentina, Austria, Belgium, Cyprus, France, Germany, Greece, Netherlands, Spain and the UK. Most of the participants were from Greece (56.3%), followed by the Netherlands (31.3%) and Spain (2.5%). Finally, the education level in total was stated as the following: 1.9% had a secondary school/high school degree, 21.9% a bachelor's degree, 48.1% a masters. degree, 22.5% had a PhD, MBA, or other equivalent degree, 2.5% had other and 0.6% preferred not to say.

4.5. Measurements

Through scenarios such as evaluating a social media post, the intention was to find if games had an impact on participants' perception of media literacy, attitudes towards media literacy and actual media literacy. Player satisfaction, autonomy and competence were also measured. By analyzing these scenarios, the purpose was to understand if there was a statistical significance when respondents got formative feedback or not, in order to understand if this variable finally affects, and if so, how media literacy.

Media Literacy. Media literacy was measured using a five-item Likert scale which was taken from Maksl et al. (2015) and based on a five-point scale (1=strongly disagree, 5=strongly agree). This scale included items like "I am in control of the information I get from the news media" and "If I take the right actions, I can stay informed".

Attitudes towards media literacy. A five-point Likert scale (1=strongly disagree, 5=strongly agree) was used to measure attitudes and items like "I am confident in my ability to judge the quality of news" and "I am often confused about the quality of the news" taken from Vraga et al. (2015) were included.

Test of ILC. Test of ILC consisted of two multiple choice questions which had four answer options and only one option was correct. Both questions were built on the game content and the goal of the game was around media literacy. The first question was about how one could indicate the credibility of a social media post and the second question was about how one could apply critical thinking when encountering a social media post.

Player Satisfaction. Satisfaction was measured with 5 items like "I enjoy playing the game" (Phan et al., 2016) and based on a seven-point Likert scale (1=strongly disagree, 7=strongly agree). This measurement was used only for the group who played the game.

Autonomy. Autonomy was measured using a five-point Likert scale (1=strongly disagree, 5=strongly agree) including items like "The game provides me with interesting with interesting options and choices" taken from Ryan et al., (2006). This measurement was used only for the group who played the game.

Competence. Competence was measured using a five-point Likert scale (1=strongly disagree, 5=strongly agree) including items like "My ability to play the game is well-matched with the game's challenges" (Sheldon & Filak, 2008). This measurement was used only for the group who played the game

4.6. Media literacy and attitudes towards media literacy

Based on the measurement, this analysis examined media literacy, as perceived by each participant, and attitudes towards media literacy, which refers mostly to participants' abilities to evaluate messages. The analysis started by recording three variables because the items included in these questions were in the same concept but were going in the opposite direction. Two of them were questions about attitudes towards media literacy and one of them was about player satisfaction. After reversing the questions, two factor analyses were conducted.

Media literacy. To measure media literacy, the scale taken from Maksl et al. (2015) was used. The 6 items which were 5-point Likert-scale based (1 = strongly disagree, 5 = strongly agree) were entered into a conformatory factor analysis using Principal Components extraction with Direct Oblimin rotation based on Eigenvalues (>1.00), $KMO = .59$, $\chi^2 (N = 160,15) = 69.2$, $p < .001$. The resultant model explained 50% of media literacy level. Factor loadings of individual items onto the two factors found are presented in Table 1. The two factors found are presented in Table 1. The factors found were:

Self-efficacy in media literacy. The first factor included four items relating to participants' perceptions of their media literacy, which are based on their individual actions. This encompassed items like it's my own behavior that determines the credible information, I can avoid being misinformed, what affects my knowledge is what I do myself and the action that I take can keep me informed. ($M = 14.28$, $SD = 2.65$)

Perceived responsibility in news media. The second factor included two items about what participants believed of their media literacy level when perceiving news from the media. This encompassed items like I can control the information I get from the news media and the misinformation by the news media is my own mistake. ($M = 6.21$, $SD = 1.80$)

Table 1. Factor loadings explained variance and reliability of the six factors found for the scale 'own perception of media literacy'.

	<i>Self-efficacy in media literacy</i>	<i>Perceived responsibility in news media</i>
If I take the right actions I can stay informed	.66	
If I pay attention to different sources of news, I can avoid being misinformed	.65	
If I am misinformed by the news media, it is my own behavior that determines how soon I will learn credible information	.63	
The main thing that affects my knowledge about the worlds is what I do myself	.53	
I am in control of the information I get from the news media		.74
When I am misinformed by the news media, I am to blame		.66
<i>R</i> ²	.29	.20
Cronbach's <i>a</i>	.53	.43

Attitudes towards media literacy. To measure attitudes towards media literacy, the scale taken from Vraga et al. (2015) was used. The 6 items which were 5-point Likert-scale based (1 = strongly disagree, 5 = strongly agree) were entered into a conformatory factor analysis using Principal Components extraction with Direct Oblimin rotation based on Eigenvalues (>1.00), $KMO = .71$, $\chi^2 (N = 160,15) = 146.9$, $p < .001$. The resultant model explained 50% of media literacy level. Factor loadings of individual items onto the two factors found are presented in Table 1. The two factors found are presented in Table 2. The factors found were:

Competence towards media literacy. The first factor included four items about individuals' self-perceived capability in evaluating news media within the context of media literacy. This included items like I understand how media works in my country, I am capable of interpreting news messages, I am able to judge the quality of news and I have a good understanding of media literacy. ($M = 13.91$, $SD = 3.03$)

Uncertainty in media literacy. The second factor included two items that reflect individuals' uncertainties regarding aspects of media literacy and news quality. These items were reverse coded so that a higher score would reflect more favorable attitudes. This suggested items that had a sense of confusion regarding the source of news media and media literacy skills. ($M = 1.5$, $SD = 1.90$)

Table 2. Factor loadings explained variance and reliability of the six factors found for the scale 'attitudes towards media literacy'.

	<i>Competence towards media literacy</i>	<i>Uncertainty in media literacy</i>
I have the skills to interpret news messages	.77	
I have a good understanding of the concept of media literacy	.70	
I am confident in my ability to judge the quality of news	.68	
I understand how news is made in my country	.67	
I'm often confused about the quality of news and information		.75
I'm not sure what people mean by media literacy		.62
<i>R</i> ²	.38	.19
Cronbach's <i>a</i>	.70	.44

The next step was to conduct reliability analyses to evaluate the consistency of each subscale that was found from the factor analysis. The results indicated that all four reliability analyses were based on a sample size of 160 valid cases, signifying complete item responses from all participants. Nevertheless, as presented in Table 1 and Table 2 the subscale with an acceptable Cronbach's α was *competence towards media literacy*.

Additionally, it was essential to evaluate the reliability and the consistency for the rest of the measurements. Player satisfaction ($M = 19.7$, $SD = 4.9$) with Cronbach's $\alpha = .741$, autonomy ($M = 13.7$, $SD = 3.65$) with Cronbach's $\alpha = .763$ and competence ($M = 15.08$, $SD = 3.32$) with Cronbach's $\alpha = .840$, as to acknowledge if the scales were consistently reflecting the legitimate concept. The results showed that all three scales were reliable.

5. Results

5.1. *Group differences regarding media literacy based on their own behavior*

Four one-way ANOVAs were conducted using the four subscales that were found in factor analyses and the experimental groups, which were participants that played the game, participants that had feedback, the ones that didn't have feedback and the control group. This analysis aimed to compare the four groups and analyze if there was a significant difference between them.

The first one-way ANOVA was conducted using experimental groups as IV and self-efficacy in media literacy as a DV. The analysis aimed to analyze the influence of experimental groups on self-efficacy. The ANOVA indicated that there were no significant differences between groups $F(3,156) = .22, p = .882, \text{partial } \eta^2 = .004$. Turkey post-hoc comparisons revealed that there were no further significant comparisons between groups. Therefore, H1a, b are rejected.

The second one-way ANOVA was conducted using experimental groups as IV and perceived responsibility in news media as a DV. The analysis aimed to analyze the influence of experimental groups on the perceived accountability towards news media. The ANOVA indicated that there were no significant differences between groups $F(3,156) = 1.60, p = .191, \text{partial } \eta^2 = .030$. Turkey post-hoc comparisons revealed that there were no further significant comparisons between groups. Therefore, H2a, b are rejected.

The third one-way ANOVA was conducted using experimental groups as IV and competence towards media literacy as a DV. The analysis aimed to analyze the influence of experimental groups on the individuals' capability towards news media. The ANOVA indicated that there was a significant difference for experiment groups when it comes to competence towards media literacy $F(3,156) = 2.74, p = .045, \text{partial } \eta^2 = .050$. Turkey post-hoc comparisons revealed that for participants who had screenshots with formative feedback their own perception of identifying media literacy was significantly higher ($M = 3.74, SD = .77$) than the ones that played the game ($M = 3.27, SD = .70$), $p = .028$. No other

comparisons reached significance. Therefore, based on the direction of H3a, b are rejected even though it is significant.

Lastly, the fourth one-way ANOVA was conducted using experimental groups as IV and uncertainty in media literacy as a DV. The analysis aimed to analyze the influence of experimental groups on the individuals' doubtfulness towards news media and media literacy. The ANOVA indicated that there was a significant difference for experiment groups when it comes to competence towards media literacy $F(3,156) = 2.24, p = .086$, partial $\eta^2 = .041$. Turkey post-hoc comparisons revealed that there were no further significant comparisons between groups. Therefore, H4a, b are rejected.

5.2. Relationship between groups concerning credibility and critical thinking

At this point dummy variables were constructed for credibility and critical thinking, as to change the categorical into data binary format. Responses were converted into dummy variables, where each response option was represented by a binary variable indicating the selection of that option (1) which was the correct answer or (0) which were the wrong ones.

A chi-square of independence was performed to examine the relationship between the experimental groups and credibility. The relation between these variables was not significant, $\chi^2(3, N = 160) = 5.8, p = .120$. This indicated that there is no significant support for a relationship between the different groups and the participants' perceptions of credibility.

A chi-square of independence was performed to examine the relationship between the experimental groups and critical thinking. The relation between these variables was not significant, $\chi^2(3, N = 160) = 7.5, p = .057$. This indicated that there is no significant support for a relationship between the different groups and the participants' perceptions of critical thinking. Both analyses rejected H3a, b.

5.3. *Player satisfaction, competency and autonomy as predictors for media literacy in game group with feedback.*

Four linear regression analyses were conducted, with a view to examine whether we can use the independent variables to predict the possible score on the dependent variable.

The first one had as a dependent variable self-efficacy in media literacy. The predictors were player satisfaction, competence and autonomy. This model was not significant $F(3, 36) = 1.63, p = .199, R^2 = .05$. Player satisfaction was not found as a significant positive predictor for media literacy ($\beta = -.19, p = .367$), as well as autonomy ($\beta = -.06, p = .815$) and competence ($\beta = .40, p = .058$). Therefore, H5a, b, c are rejected.

The second linear model used as dependent variable perceived responsibility in news media and the predictors were player satisfaction, competence and autonomy. The model was not found as significant $F(3, 36) = 2.60, p = .067, R^2 = .110$. Player satisfaction was not found as a significant positive predictor for media literacy ($\beta = .12, p = .565$), as well as autonomy ($\beta = -.39, p = .102$) and competence ($\beta = -.13, p = .496$). Therefore, H6a, b, c are rejected.

The third one had as dependent variable competence towards media literacy. The predictors were player satisfaction, competence and autonomy. This model was not significant $F(3, 36) = 1.07, p = .375, R^2 = .082$. Player satisfaction was not found as a significant positive predictor for media literacy ($\beta = -.11, p = .590$), as well as autonomy ($\beta = -.13, p = .602$) and competence ($\beta = .35, p = .098$). Therefore, H7a, b, c are rejected.

The last linear model had as a dependent variable uncertainty in media literacy and the predictors were player satisfaction, competence and autonomy. The model was not found as significant $F(3, 36) = 0.67, p = .577, R^2 = .053$. Player satisfaction was not found as a significant positive predictor for media literacy ($\beta = .19, p = .384$), as well as autonomy ($\beta = -.05, p = .854$) and competence ($\beta = .02, p = .923$). Therefore, H8a, b, c are rejected.

5.4. Credibility and critical thinking in media literacy

Dummy variables for credibility and critical thinking were used for the logistic regressions. Several logistic regression analyses were performed for each dependent variable. To begin with, the dependent variables used were regarding the effect of player satisfaction, autonomy and competence on credibility and critical thinking. In continuation depended variables such as self-efficacy in media literacy, perceived responsibility in news media, competence towards media literacy and uncertainty in media literacy on credibility and critical thinking were used.

The logistic regression model that used credibility as a dependent variable was significant, $\chi^2(1, N = 160) = 30, p = .003$. The model explained 36% (Nagelkerke R^2) of the variance and correctly classified 75% of cases. There was no significant predictor player satisfaction (Wald = .59, $p = .445$), autonomy (Wald = 1.69, $p = .194$) and competence (Wald = 3.03, $p = .082$). Therefore, H9a, b, c are rejected.

The logistic regression model that used critical thinking as a dependent variable was significant, $\chi^2(1, N = 160) = 33, p < .001$. The model explained 37% (Nagelkerke R^2) of the variance and correctly classified 82.5% of cases. There was no significant predictor player satisfaction (Wald = .01, $p = .921$), autonomy (Wald = .73, $p = .394$) and competence (Wald = 2.79, $p = .095$). Therefore, H10a, b, c are rejected.

The logistic regression model that used credibility as a dependent variable was significant, $\chi^2(1, N = 160) = 137, p < .001$. The model explained 85% (Nagelkerke R^2) of the variance and correctly classified 85.6% of cases. There was no significant predictor self-efficacy in media literacy (Wald = 1.20, $p = .272$), perceived responsibility in news media (Wald = .07, $p = .797$), competence towards media literacy (Wald = 2.76, $p = .097$) and uncertainty in media literacy (Wald = .90, $p = .345$). Therefore, H11a, b, c,d are rejected.

The logistic regression model that used critical thinking as a dependent variable was significant, $\chi^2(1, N = 160) = 134, p < .001$. The model explained 16.4% (Nagelkerke R^2) of the variance and correctly classified 83.8% of cases. Self-efficacy in media literacy was a significant predictor (Wald = 4.89, $p = .027$) as well as perceived responsibility in news media (Wald = 5.24, $p = .022$). However, competence towards media literacy (Wald = 1.54, $p = .214$) and uncertainty in media literacy (Wald = 1.45, $p = .228$) were not significant. Therefore, H12a, b are accepted, while H12c,d are rejected.

Hypotheses	
<i>H1: Self-efficacy in media literacy is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.</i>	Rejected
<i>H2: Perceived responsibility in news media is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.</i>	Rejected
<i>H3: Competence towards media literacy is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.</i>	Rejected
<i>H4: Uncertainty in media literacy is highest for people who a) played a serious game followed by b) people who have seen screenshots with formative feedback compared to people who have seen screenshots without formative feedback.</i>	Rejected
<i>H5: Self-efficacy in media literacy is increased with a) player satisfaction followed by b) autonomy followed by c) competence</i>	Rejected
<i>H6: Perceived responsibility in news media is increased with a) player satisfaction followed by b) autonomy followed by c) competence</i>	Rejected
<i>H7: Competence towards media literacy is increased with a) player satisfaction followed by b) autonomy followed by c) competence</i>	Rejected

<i>H8: Uncertainty in media literacy is increased with a) player satisfaction followed by b) autonomy followed by c) competence</i>	Rejected
<i>H9: Credibility is increased with a) player satisfaction followed by b) autonomy and c) competence.</i>	Rejected
<i>H10: Critical thinking is increased with a) player satisfaction followed by b) autonomy and c) competence.</i>	Rejected
<i>H11: Credibility is increased with a) Self-efficacy in media literacy followed by b) perceived responsibility in news media followed by c) Competence towards media literacy and d) Uncertainty in media literacy.</i>	Rejected
<i>H12: Critical thinking is increased with a) Self-efficacy in media literacy followed by b) perceived responsibility in news media followed by c) Competence towards media literacy and d) Uncertainty in media literacy.</i>	H12a,b – Accepted H12c,d - Rejected

6. Discussion

Games can greatly improve media literacy, by offering dynamic and captivating learning environments where players can sharpen their analytical and critical thinking abilities. Through gaming, individuals can discover biases, navigate and analyze a variety of media messages, and comprehend the processes associated with media production. Playing games that imitate real-world situations gives players a safe environment in which they can enhance their media literacy abilities. Feedback is essential to this process because it provides players with quick answers to their actions, enabling them to better comprehend the effects of their decisions and improve their tactics.

This study examined the effect of serious games on media literacy and the contribution of feedback to individuals' learning goals and the development of attitudes toward media literacy. Moreover, it was examined whether the perception of media literacy was higher for people who played the game, followed by those who had feedback and those who did not. Additionally, I made the same assumption about media literacy attitudes and individual learning goals. Finally, I examined whether media literacy and individual learning goals increase with player satisfaction, autonomy, and competence during gameplay.

In general, I did not find that media literacy and attitudes towards media literacy are increased when it comes to playing a game with feedback or having feedback or not and thus hypotheses H1a, b, c, H2a, b, c, H3a, b, c, H4a, b, c were not supported. Nevertheless, the results revealed that participants who had feedback on the perception of identifying media literacy were higher than the ones who did not have feedback. Therefore, even though the hypotheses were rejected, it is assumed that implementing any teaching method, regardless of its specifics, is more beneficial than not employing any instructional approach at all. As highlighted by Bonney (2015, p.24), teaching is more effective and helpful for students, and the results of learning usually depend on the choice of teaching method. Feedback as a teaching method reduces uncertainty when provided effectively for the recipient. Furthermore, it is important to be understandable and relevant to the recipients' learning objective (Brinko, 1993, p.584).

Nevertheless, it is undoubtable that digital games are important and useful in the development of media competences. Among other abilities they develop critical thinking,

they teach players how to handle the media and newly gained knowledge (Škripcová, 2022, p.138).

Another conclusion that I can find out is that participants believe their own media literacy skills are higher than those who played the game and actually measured their media literacy level. What can easily influence this belief is cognitive biases and perception of the game. This assumption is supported by Ptaszek (2019, p.10), who concluded that the multidimensional nature of media literacy can easily lead to a discrepancy between self-assessed and actual media literacy skills. More than that, it requires a holistic approach, which means that individuals must be confident and fully aware of their media literacy skills. More often than not, partial awareness can lead to an overestimation of their skills and abilities.

The lack of expertise is somehow misleading for people with deficits. Despite their errors or lack of knowledge, they tend to support the fact that their own actions are better than those with a higher level of expertise. They base their knowledge on general information claiming their perspective is the correct one and thus underestimate their capacities (Dunning, 2011, p.259-260).

Therefore, to answer the research question of this study which was, to what extent does playing a serious game impact media literacy, and in what way does formative feedback contribute to learning objectives and the development of more favorable attitudes towards media literacy. Even though there was no significant increase in media literacy or attitudes towards media literacy when playing a game with or without feedback, there were notable findings regarding media literacy. Participants that had feedback showed a higher perception of identifying media literacy than those who did not receive feedback. This suggests that incorporating feedback into the teaching process can still be proven beneficial.

To sum up, although this study identified that serious games did not significantly enhance media literacy, they still remain crucial for developing critical thinking and handling media literacy through the educational process. From a societal point of view, encouraging media literacy through games can provide people with needed tools to better understand the diverse media that are available in today's society. Equally important is formative feedback within the games, as it helps players identify their actions and eliminate ambiguity. In theory, feedback mechanisms have the potential to contribute to the

advancement of educational theories concerning motivation and cognition development. Exploring the different feedback mechanisms within the educational process can further enhance educational theories related to media literacy.

6.1. Limitations

The study had several limitations which were determinative. First and foremost, time was an important limitation. Due to external circumstances, the period of time was limited. Because of time management, the sample consisted of 160 participants, which was not small, but certainly not big enough to come to a more valid conclusion. Particularly, if taken into consideration the complexity of the terms examined and the different variables measured.

Another important limitation was the different platforms that were used, which I was unable to monitor and be sure that participants, especially in the game group, showed the appropriate dedication.

Furthermore, the serious game that was used might not be the appropriate one to measure media literacy because it provided a lot of information which the player needs to read before answering the question, and in some cases, they might not have the time or even feel uninterested. Furthermore, the game was not so interactive, which can also lead to unsuccessful results because it did not keep the interest and the attention needed. Last but not least, even though the feedback was immediate, it should have been shorter so that players would have the time they needed to read it carefully and understand it decisively.

Self-efficacy theory and research have contributed greatly to the comprehension of self-assessment and media literacy. Media education aims to teach students how to efficiently search for information online and make educated, critical decisions (Buckingham, 2003, p.95). According to research, self-efficacy is an important internal element shaped by personal and environmental circumstances that affects the reliability of self-assessments, methods of study, and overall academic achievement (Schunk & DiBenedetto, 2021, p.24-25). This emphasizes the significance of developing effective measurement methods for media literacy and encourages students to take an active role in their learning through self-assessment.

Specifically, due to its complexity, the examination of media literacy has many different approaches. First and foremost, measuring self-perceived media literacy is subjective, which leads individuals with high perceived media-literacy to feel they no longer need to improve their skills. Additionally, there are individuals who seek to enhance their media literacy levels in varied ways by improving their personal skills (Vraga et al., 2015, p.51).

As such, for future studies I would suggest delving into the measuring of media literacy and the development of tools that could capture the multidimensional nature of this concept but also investigate different types of feedback and their effect on media literacy. For instance, a future researcher can take the study one step further and examine, whereas games with personalized feedback are more effective or not than games with generic feedback in improving media literacy skills. This can contribute to a further examination of how serious games and feedback can effectively enhance media literacy and educate individuals into tackling the various news received from different media sources.

6.2. Conclusion

In summary, this study looked at how media literacy is affected by serious games and how feedback influences learning objectives. This study sought to contribute to the ongoing discourse on media literacy by examining how serious games and feedback can enhance individuals in their learning outcomes. Given that those who received feedback demonstrated greater levels of media literacy, it was clear that feedback was vital. Therefore, feedback methods have proven to be beneficial when incorporated into an educational process. Through this contribution, the study aimed to promote the vital role of media literacy and the necessity of using serious games to interact with students in the modern educational landscape.

Reference list

- Buckingham, D. (2003). *Media Education: Literacy, learning and contemporary culture*. <http://ci.nii.ac.jp/ncid/BA62761178>
- Schunk, D. H., & DiBenedetto, M. K. (2021). Self-efficacy and human motivation. In *Advances in motivation science* (pp. 153–179). <https://doi.org/10.1016/bs.adms.2020.10.001>
- Akçayoğlu, D. İ., & Dağgöl, G. D. (2019). A study on the perceived media literacy level of preparatory year students in a university setting. *Contemporary Educational Technology, 10*(4), 416–429. <https://doi.org/10.30935/cet.634195>
- Akkuzu, N. (2014). The role of different types of feedback in the reciprocal interaction of teaching performance and self-efficacy belief. *the Australian Journal of Teacher Education, 39*(3). <https://doi.org/10.14221/ajte.2014v39n3.3>
- Alt, D., & Raichel, N. (2020). Enhancing perceived digital literacy skills and creative self-concept through gamified learning environments: Insights from a longitudinal study. *International Journal of Educational Research, 101*, 101561. <https://doi.org/10.1016/j.ijer.2020.101561>
- Anderson, E. F., McLoughlin, L., Liarokapis, F., Peters, C., Petridis, P., & De Freitas, S. (2010). Developing serious games for cultural heritage: a state-of-the-art review. *Virtual Reality, 14*(4), 255–275. <https://doi.org/10.1007/s10055-010-0177-3>
- Annetta, L. A., & Heneghan, J. (2008). *Serious educational games: From theory to practice*. Sense Publishers.
- Arke, E. T. (2012). Media Literacy: History, Progress, and future hopes. *The Oxford Handbook of Media Psychology*, 96–108. <https://doi.org/10.1093/oxfordhb/9780195398809.013.0006>
- Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., De Freitas, S., Louchart, S., Suttie, N., Berta, R., & De Gloria, A. (2014). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology, 46*(2), 391–411. <https://doi.org/10.1111/bjet.12113>
- Arunwarakorn, S., Suthiwartnarueput, K., & Pornchaiwiseskul, P. (2017). Forecasting equilibrium quantity and price on the world natural rubber market. *Kasetsart Journal of Social Sciences*. <https://doi.org/10.1016/j.kjss.2017.07.013>

- Baxter, G., Hailey, T., Savorelli, A., Akhtar, U., & Ivanova, R. R. (2021, September). Teaching history and bringing the past back to life with serious games. *In Proceedings of the 15th European Conference on Game Based Learning (ECGBL)*(pp. 99-107).
- Bonney, K. M. (2015). Case study teaching method improves student performance and perceptions of learning gains. *Journal of Microbiology & Biology Education*, *16*(1), 21–28. <https://doi.org/10.1128/jmbe.v16i1.846>
- Gedye, S. (2010). Formative assessment and feedback: a review. *Planet*, *23*(1), 40–45. <https://doi.org/10.11120/plan.2010.00230040>
- Brinko, K. T. (1993). The practice of giving feedback to improve teaching. *Journal of Higher Education/~the æJournal of Higher Education*, *64*(5), 574–593. <https://doi.org/10.1080/00221546.1993.11778449>
- Cameron, B., & Dwyer, F. (2005). The effect of online gaming, cognition and feedback type in facilitating delayed achievement of different learning objectives. *The Journal of Interactive Learning Research*, *16*(3), 243–258. <https://eric.ed.gov/?id=EJ726315>
- Caponetto, I., Earp, J., & Ott, M. (2014). Gamification and Education: a Literature Review. *ResearchGate*.https://www.researchgate.net/publication/266515512_Gamification_and_Education_a_Literature_Review
- Celik, I., Muukkonen, H., & Dogan, S. (2021). A model for understanding new media literacy: Epistemological beliefs and social media use. *Library & Information Science Research*, *43*(4), 101125. <https://doi.org/10.1016/j.lisr.2021.101125>
- Chen, H., & Wu, C. (2021b). A digital role-playing game for learning: effects on critical thinking and motivation. *Interactive Learning Environments*, *31*(5), 3018–3030. <https://doi.org/10.1080/10494820.2021.1916765>
- Cicchino, M. I. (2015). Using Game-Based learning to foster critical thinking in student discourse. *~the æInterdisciplinary Journal of Problem-based Learning*, *9*(2). <https://doi.org/10.7771/1541-5015.1481>
- Corti, K. (2006). Games-based Learning; a serious business application. *Informe de PixelLearning*, *34*(6), 1-20.
- Dam, G. T., & Volman, M. (2004). Critical thinking as a citizenship competence: teaching strategies. *Learning and Instruction*, *14*(4), 359–379. <https://doi.org/10.1016/j.learninstruc.2004.01.005>

- De Smale, S., Overmans, T., Jeurig, J., & Van De Grint, L. (2016). The Effect of simulations and games on learning Objectives in Tertiary Education: a systematic review. In *Lecture notes in computer science* (pp. 506–516). https://doi.org/10.1007/978-3-319-40216-1_55
- De Troyer, O., Van Broeckhoven, F., & Vlieghe, J. (2017). Linking serious game narratives with pedagogical theories and pedagogical design strategies. *Journal of Computing in Higher Education*, 29(3), 549–573. <https://doi.org/10.1007/s12528-017-9142-4>
- De-Marcos, L., Domínguez, A., Saenz-De-Navarrete, J., & Pagés, C. (2014). An empirical study comparing gamification and social networking on e-learning. *Computers and Education/Computers & Education*, 75, 82–91. <https://doi.org/10.1016/j.compedu.2014.01.012>
- Dellarocas, C. (2003). The Digitization of Word of Mouth: Promise and challenges of online feedback mechanisms. *Management Science*, 49(10), 1407–1424. <https://doi.org/10.1287/mnsc.49.10.1407.17308>
- Dunning, D. (2011). The Dunning–Kruger effect. In *Advances in experimental social psychology* (pp. 247–296). <https://doi.org/10.1016/b978-0-12-385522-0.00005-6>
- Erişti, B., & Erdem, C. (2017). Development of a media Literacy skills scale. *Contemporary Educational Technology*, 8(3). <https://doi.org/10.30935/cedtech/6199>
- Facione, P. A. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction*. Millbrae, CA: The California Academic Press.
- Gee, J. P. (2009). Deep learning properties of good digital games: How far can they go? In *Routledge eBooks* (pp. 89–104). <https://doi.org/10.4324/9780203891650-15>
- Girard, C., Escalle, J., & Magnan, A. (2012). Serious games as new educational tools: how effective are they? A meta-analysis of recent studies. *Journal of Computer Assisted Learning*, 29(3), 207–219. <https://doi.org/10.1111/j.1365-2729.2012.00489.x>
- Glas, R., van Vught, J., Fluitsma, T., De La Hera, T., & Gómez-García, S. (2023). Literacy at play: An analysis of media literacy games used to foster media literacy competencies. *Frontiers in Communication*, 8. <https://doi.org/10.3389/fcomm.2023.1155840>

- Grier, D., Lindt, S. F., & Miller, S. C. (2021). Formative Assessment with Game-based Technology. *International Journal of Technology in Education and Science*, 5(2), 193–202. <https://doi.org/10.46328/ijtes.97>
- McCallum, S., & Milner, M. M. (2020). The effectiveness of formative assessment: student views and staff reflections. *Assessment and Evaluation in Higher Education/Assessment & Evaluation in Higher Education*, 46(1), 1–16. <https://doi.org/10.1080/02602938.2020.1754761>
- Schaffer, O., & Feng, X. (2015). Finding Flow with Games: Does Immediate Progress Feedback Cause Flow? *In AMCIS*.
<https://aisel.aisnet.org/amcis2015/HCI/GeneralPresentations/12/>
- Hajli, M. N., Sims, J., Featherman, M., & Love, P. E. (2014). Credibility of information in online communities. *Journal of Strategic Marketing*, 23(3), 238–253. <https://doi.org/10.1080/0965254x.2014.920904>
- Hargittai, E. (2010). Digital Na(t)ives? Variation in Internet Skills and Uses among Members of the “Net Generation.” *Sociological Inquiry*, 80(1), 92–113. <https://doi.org/10.1111/j.1475-682x.2009.00317.x>
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112. <https://doi.org/10.3102/003465430298487>
- Henriksen, D., Mishra, P., & Fisser, P. (2016). Infusing creativity and technology in 21st century education: A systemic view for change. *Educational Technology & Society*, 19(3), 27–37. http://www.ifets.info/journals/19_3/4.pdf
- Hobbs, R., & Frost, R. (2003). Measuring the acquisition of media-literacy skills. *Reading Research Quarterly*, 38(3), 330–355. <https://doi.org/10.1598/rrq.38.3.2>
- Kazakova, S., Cauberghe, V., Pandelaere, M., & De Pelsmacker, P. (2014). Players’ Expertise and Competition with Others Shape the Satisfaction of Competence Needs, Gaming Gratifications, and Contingent Self-Esteem in a Gaming Context. *Cyberpsychology, Behavior and Social Networking*, 17(1), 26–32.
<https://doi.org/10.1089/cyber.2012.0413>
- Klimmt, C., Blake, C., Hefner, D., Vorderer, P., & Roth, C. (2009). Player performance, satisfaction, and video game enjoyment. In *Lecture Notes in Computer Science* (pp. 1–12). https://doi.org/10.1007/978-3-642-04052-8_1

- Ku, K. Y. L., Kong, Q., Song, Y., Deng, L., Kang, Y., & Hu, A. (2019). What predicts adolescents' critical thinking about real-life news? The roles of social media news consumption and news media literacy. *Thinking Skills and Creativity*, 33, 100570. <https://doi.org/10.1016/j.tsc.2019.05.004>
- Kutlu-Abu, N., & Arslan, R. (2023). Evolving trend of media literacy research: A bibliometric analysis. *the Journal of Media Literacy Education*, 15(1), 85–98. <https://doi.org/10.23860/jmle-2023-15-1-7>
- Lai, E. R. (2011). Critical thinking: A literature review. *Pearson's Research Reports*, 6(1), 40–41
- Lee, H., Parsons, D., Kwon, G., Kim, J., Petrova, K., Jeong, E., & Ryu, H. (2016). Cooperation begins: Encouraging critical thinking skills through cooperative reciprocity using a mobile learning game. *Computers and Education/Computers & Education*, 97, 97–115. <https://doi.org/10.1016/j.compedu.2016.03.006>
- Liu, Z. Y., Shaikh, Z. A., & Gazizova, F. (2020). Using the concept of Game-Based Learning in education. *International Journal of Emerging Technologies in Learning/International Journal: Emerging Technologies in Learning*, 15(14), 53. <https://doi.org/10.3991/ijet.v15i14.14675>
- Livingstone, S. (2011). Media literacy for all? On the intellectual and political challenges of implementing media literacy policy. *Media literacy: Ambitions, policies and measures*, 7, 31.
- Maksl, A., Ashley, S., & Craft, S. (2015). Measuring News media literacy. *The Journal of Media Literacy Education*. <https://doi.org/10.23860/jmle-6-3-3>
- Mandernach, B. J. (2006). Thinking Critically about Critical Thinking: Integrating Online Tools to Promote Critical Thinking. *Insight*, 1, 41–50. <https://doi.org/10.46504/01200603ma>
- Mazarakis, A. (2015). Using gamification for technology enhanced learning: The case of feedback mechanisms. *Bulletin of the IEEE Technical Committee on Learning Technology*, 4(17), 6-9.
- Mitchell, A., & Savill-Smith, C. (2004). *The use of computer and video games for learning: A Review of the Literature*. Bright Sparks.
- Morris, R., Perry, T., & Wardle, L. (2021). Formative assessment and feedback for learning in higher education: A systematic review. *Review of*

- Education*, 9(3). <https://doi.org/10.1002/rev3.3292> Zhang, X., Kubota, K., & Kubota, M. (2022). Creating a critical culture to cultivate students' critical thinking: a case study of a media literacy course in Japan. *International Journal of Innovation and Learning*, 31(3), 369. <https://doi.org/10.1504/ijil.2022.122070>
- Neys, J. L., Jansz, J., & Tan, E. S. (2014). Exploring persistence in gaming: The role of self-determination and social identity. *Computers in Human Behavior*, 37, 196–209. <https://doi.org/10.1016/j.chb.2014.04.047>
- Ng, J. Y. Y., Ntoumanis, N., Thøgersen-Ntoumani, C., Deci, E. L., Ryan, R. M., Duda, J. L., & Williams, G. C. (2012). Self-Determination Theory applied to health contexts. *Perspectives on Psychological Science*, 7(4), 325–340. <https://doi.org/10.1177/1745691612447309>
- Paras, B. S., & Bizzocchi, J. (2005). Game, Motivation, and Effective Learning: An Integrated Model for Educational Game Design. *In DiGRA Conference*.
- Parchomovsky, G., & Stein, A. (2020). Autonomy. *University of Toronto Law Journal*, 71(1), 61–90. <https://doi.org/10.3138/utlj.2019-0113>
- Park, J. (2017, February). Media literacy, media competence and media policy in the digital age. *In Proceedings of the 2017 arts, humanities, social sciences and education conference* (Vol. 7, pp. 3-6).
- Phan, M. H., Keebler, J. R., & Chaparro, B. S. (2016). The development and validation of the Game User Experience Satisfaction Scale (GUESS). *Human Factors*, 58(8), 1217–1247. <https://doi.org/10.1177/0018720816669646>
- Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of Game-Based Learning. *Educational :/Educational Psychologist*, 50(4), 258–283. <https://doi.org/10.1080/00461520.2015.1122533>
- Potter, W. J. (2010). The State of Media Literacy. *Journal of Broadcasting & Electronic Media*, 54(4), 675–696. <https://doi.org/10.1080/08838151.2011.521462>
- Potter, W. J. (2022). Analysis of definitions of Media Literacy. *Journal of Media Literacy Education*, 14(2), 27–43. <https://doi.org/10.23860/jmle-2022-14-2-3>
- Potter, W. J. (2022). *Media literacy*. SAGE Publications.

- Ptaszek, G. (2019). Media literacy outcomes, measurement. *The International Encyclopedia of Media Literacy*, 1–12. <https://doi.org/10.1002/9781118978238.ieml0103>
- Rasi, P., Vuojärvi, H., & Ruokamo, H. (2019). Media literacy for all ages. *Journal of Media Literacy Education*, 11(2), 1–19. <https://doi.org/10.23860/jmle-2019-11-2-1>
- Rieger, D., Wulf, T., Kneer, J., Frischlich, L., & Bente, G. (2014). The winner takes it all: The effect of in-game success and need satisfaction on mood repair and enjoyment. *Computers in Human Behavior*, 39, 281–286. <https://doi.org/10.1016/j.chb.2014.07.037>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist* / *the American Psychologist*, 55(1), 68–78. <https://doi.org/10.1037/0003-066x.55.1.68>
- Ryan, R. M., & Deci, E. L. (2018). *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*. Guilford Publications.
- Shabani, A., & Keshavarz, H. (2021). Media literacy and the credibility evaluation of social media information: students' use of Instagram, WhatsApp and Telegram. *Global Knowledge, Memory and Communication*, 71(6/7), 413–431. <https://doi.org/10.1108/gkmc-02-2021-0029>
- Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, 78(1), 153–189. <https://doi.org/10.3102/0034654307313795>
- Škripcová, L. (2022). Media literacy in digital games. *Media Literacy and Academic Research*, 5(1), 131-140.
- Sousa, C., & Costa, C. (2019). Game creation to promote media and information literacy (MIL) skills in basic education teachers. *Revista Lusófona De Educação*, 46, 139–152. <https://doi.org/10.24140/issn.1645-7250.rle46.09>
- Tamborini, R., Grizzard, M., Bowman, N. D., Reinecke, L., Lewis, R. J., & Eden, A. (2011). Media enjoyment as need satisfaction: the contribution of hedonic and nonhedonic needs. *Journal of Communication*, 61(6), 1025–1042. <https://doi.org/10.1111/j.1460-2466.2011.01593.x>
- Tsai, F., Tsai, C., & Lin, K. (2015). The evaluation of different gaming modes and feedback types on game-based formative assessment in an online learning

- environment. *Computers and Education/Computers & Education*, 81, 259–269. <https://doi.org/10.1016/j.compedu.2014.10.013>
- Tulodziecki, G., & Grafe, S. (2012). Approaches to Learning with Media and Media Literacy Education – Trends and Current Situation in Germany. *the Journal of Media Literacy Education*. <https://doi.org/10.23860/jmle-4-1-5>
- Tyack, A., & Wyeth, P. (2021). “The Small Decisions Are What Makes it Interesting.” *Proceedings of the ACM on Human-computer Interaction*, 5(CHI PLAY), 1–26. <https://doi.org/10.1145/3474709>
- Ullah, M., Amin, S. U., Munsif, M., Yamin, M. M., Safaev, U., Khan, H., Khan, S., & Ullah, H. (2022). Serious games in science education: A systematic literature. *Virtual Reality & Intelligent Hardware*, 4(3), 189–209. <https://doi.org/10.1016/j.vrih.2022.02.001>
- Van Der Kleij, F. M., Feskens, R. C. W., & Eggen, T. J. H. M. (2015). Effects of feedback in a Computer-Based Learning environment on students’ learning outcomes. *Review of Educational Research*, 85(4), 475–511. <https://doi.org/10.3102/0034654314564881>
- Vraga, E. K., Tully, M., Kotcher, J., Smithson, A., & Broeckelman-Post, M. A. (2015). A Multi-Dimensional Approach to Measuring News media literacy. *The Journal of Media Literacy Education*. <https://doi.org/10.23860/jmle-7-3-4>
- Wang, C., Liu, W. C., Kee, Y. H., & Chian, L. K. (2019). Competence, autonomy, and relatedness in the classroom: understanding students’ motivational processes using the self-determination theory. *Heliyon*, 5(7), e01983. <https://doi.org/10.1016/j.heliyon.2019.e01983>
- Westera, W., Prada, R., Mascarenhas, S., Santos, P. A., Dias, J., Guimarães, M., Georgiadis, K., Nyamsuren, E., Bahreini, K., Yumak, Z., Christyowidiasmoro, C., Dascalu, M., Gutu-Robu, G., & Ruseti, S. (2019). Artificial intelligence moving serious gaming: Presenting reusable game AI components. *Education and Information Technologies*, 25(1), 351–380. <https://doi.org/10.1007/s10639-019-09968-2>
- Willingham, D. T. (2008). Critical thinking: Why is it so hard to teach? *Arts Education Policy Review*, 109(4), 21–32. <https://doi.org/10.3200/aepr.109.4.21-32>
- Wouters, P., Van Nimwegen, C., Van Oostendorp, H., & Van Der Spek, E. D. (2013). A meta-analysis of the cognitive and motivational effects of serious games. *Journal of Educational Psychology*, 105(2), 249–265. <https://doi.org/10.1037/a0031311>

- Xiaohan, K., Khalid, M. N. A., & Iida, H. (2020). *Player Satisfaction Model and its Implication to Cultural Change*. *IEEE Access*, *8*, 184375–184382.
<https://doi.org/10.1109/access.2020.3029817>
- Susi, T., Johannesson, M., & Backlund, P. (2007). *Serious Games : An Overview*. *Technical Report*. <http://archive.his.se/PageFiles/10481/HS-IKI-TR-07-001.pdf>
- Kent, S. L. (2001). *The ultimate history of video games*. <https://www.amazon.com/Ultimate-History-Video-Games-Pokemon/dp/0761536434>
- Zackariasson, P., & Wilson, T. L. (2010). Paradigm shifts in the video game industry. *Competitiveness Review*, *20*(2), 139–151. <https://doi.org/10.1108/10595421011029857>
- Statista. (2024). *Games - Worldwide | Statista Market forecast*. <https://www.statista.com/outlook/amo/media/games/worldwide>
- Belyaeva, Z., Petrosyan, A., & Shams, S. R. (2022). Stakeholder data analysis in the video gaming industry: implications for regional development. *EuroMed Journal of Business*, *17*(3), 333–349. <https://doi.org/10.1108/emjb-10-2021-0150>
- Backlund, P., & Hendrix, M. (2013). Educational games - Are they worth the effort? A literature survey of the effectiveness of serious games. *IEEE*. <https://doi.org/10.1109/vs-games.2013.6624226>
- de Freitas, S. (2018). Are Games Effective Learning Tools? A Review of Educational Games. *Educational Technology & Society*, *21* (2), 74–84.
- Keengwe, J., Onchwari, G., & Wachira, P. (2008). Computer Technology integration and student learning: Barriers and promise. *Journal of Science Education and Technology*, *17*(6), 560–565. <https://doi.org/10.1007/s10956-008-9123-5>
- Brandl, L. C., & Schrader, A. (2024). Serious Games in Higher Education in the Transforming Process to Education 4.0—Systematized Review. *Education Sciences*, *14*(3), 281. <https://doi.org/10.3390/educsci14030281>
- Papanastasiou, G., Drigas, A., & Skianis, C. (2017). Serious Games in Preschool and Primary Education: Benefits and Impacts on Curriculum Course Syllabus. *International Journal of Emerging Technologies in Learning/International Journal: Emerging Technologies in Learning*, *12*(01), 44. <https://doi.org/10.3991/ijet.v12i01.6065>

- Schwarz, G. (2005). 1. Overview: What is media literacy, who cares, and why? *~the Yearbook of the National Society for the Study of Education*, 104(1), 5–17. <https://doi.org/10.1111/j.1744-7984.2005.00002.x>
- Jensen, A. R., Wright, A. S., Kim, S., Horvath, K. D., & Calhoun, K. E. (2012). Educational feedback in the operating room: a gap between resident and faculty perceptions. *~the American Journal of Surgery*, 204(2), 248–255. <https://doi.org/10.1016/j.amjsurg.2011.08.019>
- Carvalho, C., Martins, D., Santana, L. E., & Feliciano, L. (2014). Teacher Feedback: educational guidance in different school contexts. *Procedia: Social & Behavioral Sciences*, 159, 219–223. <https://doi.org/10.1016/j.sbspro.2014.12.360>
- Potter, W. J. (2010). The state of media literacy. *Journal of Broadcasting & Electronic Media*, 54(4), 675–696. <https://doi.org/10.1080/08838151.2011.521462>
- Ivanović, M. (2014). Development of media literacy – an important aspect of modern education. *Procedia: Social & Behavioral Sciences*, 149, 438–442. <https://doi.org/10.1016/j.sbspro.2014.08.284>
- Hobbs, R. (2019). Media Literacy foundations. *The International Encyclopedia of Media Literacy*, 1–19. <https://doi.org/10.1002/9781118978238.ieml0063>
- Livingstone, S., Wijnen, C. W., Papaioannou, T., Costa, C., & Del Mar Grandío, M. (2013). *Situating media literacy in the changing media environment: Critical insights from European research on audiences* (pp. 210–227). <https://doi.org/10.4324/9780203523162-21>
- Pereira, S., & Moura, P. (2018). Assessing media literacy competences: A study with Portuguese young people. *European Journal of Communication*, 34(1), 20–37. <https://doi.org/10.1177/0267323118784821>
- Kutlu-Abu, N., & Arslan, R. (2023). Evolving trend of media literacy research: A bibliometric analysis. *the Journal of Media Literacy Education*, 15(1), 85–98. <https://doi.org/10.23860/jmle-2023-15-1-7>
- Primack, B. A., Gold, M. A., Land, S. R., & Fine, M. J. (2006). Association of Cigarette Smoking and Media Literacy about Smoking among Adolescents. *Journal of Adolescent Health*, 39(4), 465–472. <https://doi.org/10.1016/j.jadohealth.2006.05.011>

- Hobbs, R., & Jensen, A. (2009). The past, present, and future of Media Literacy Education. *the Journal of Media Literacy Education*. <https://doi.org/10.23860/imle-1-1-1>
- Burgers, C., Eden, A., Van Engelenburg, M. D., & Buningh, S. (2015). How feedback boosts motivation and play in a brain-training game. *Computers in Human Behavior*, 48, 94–103. <https://doi.org/10.1016/j.chb.2015.01.038>
- Bellotti, F., Berta, R., & De Gloria, A. (2010). Designing effective Serious Games: Opportunities and Challenges for research. *International Journal of Emerging Technologies in Learning/International Journal: Emerging Technologies in Learning*, 5(S13), 22. <https://doi.org/10.3991/ijet.v5s3.1500>
- Torabi, N., & Ferdosipour, A. (2020). The study of the effectiveness of media literacy education on the development of creative thinking of students. *New Trends and Issues Proceedings on Humanities and Social Sciences*, 7(2), 90–99. <https://doi.org/10.18844/prosoc.v7i2.5019>
- Fernández-Sánchez, M. R., González-Fernández, A., & Acevedo-Borrega, J. (2023). Conceptual approach to the pedagogy of serious games. *Information*, 14(2), 132. <https://doi.org/10.3390/info14020132>
- Riel, J., Christian, S., & Hinson, B. (2012). Charting Digital Literacy: A framework for information technology and digital skills education in the community college. *Social Science Research Network*. <https://doi.org/10.2139/ssrn.278116>
- Holton, E. F., & Burnett, M. F. (2005). The basics of quantitative research. *Research in organizations: Foundations and methods of inquiry*, 29-44.
- Maurer, T. J. (2001). Career-relevant learning and development, worker age, and beliefs about self-efficacy for development. *Journal of Management*, 27(2), 123–140. <https://doi.org/10.1177/014920630102700201>
- Paglis, L. L. (2010). Leadership self-efficacy: research findings and practical applications. *Journal of Management Development*, 29(9), 771–782. <https://doi.org/10.1108/02621711011072487>
- McCormick, M. J., Tanguma, J., & Sohn López-Forment, A. (2002). Extending Self-Efficacy Theory to Leadership: A Review and Empirical Test. In *Journal of Leadership*

Education (Vol. 1, Issue 2, pp. 34–36). https://journalofleadershiped.org/wp-content/uploads/2019/02/1_2_McCormick_Tanguma_Lopez-Forment.pdf

Klimmt, C., & Hartmann, T. (2006). *Effectance, self-efficacy, and the motivation to play video games* (pp. 153–168). <https://psycnet.apa.org/record/2006-05034-010>

Sprinkle, G. B. (2003). Perspectives on experimental research in managerial accounting. *Accounting, Organizations and Society*, 28(2–3), 287–318. [https://doi.org/10.1016/s0361-3682\(01\)00058-7](https://doi.org/10.1016/s0361-3682(01)00058-7)

Appendix A

1. Questionnaire

Condition 1: Game

Dear participant,

Thank you very much for participating in this survey. I am a master student of the Media & Business master's programme of Erasmus University Rotterdam. This survey has been created to gather data for my thesis research regarding the impact of serious games on media literacy levels and the significance of formative feedback in this context.

Please be aware that your personal information will be kept strictly confidential, and the findings of this survey will be used solely for thesis research purposes. Your participation is completely voluntarily, meaning that you can quit at any time during your participation. Hence, your anonymity is guaranteed. Completing the survey takes approximately 10 minutes.

Please ensure to carefully read the provided instructions and kindly complete the entire survey without skipping any sections. Your thorough input is greatly appreciated. If you have any further questions do not hesitate to email me via:
695123dv@eur.nl

Thank you very much for your time!

Are you at least 18 years old or older? By selecting 'Yes,' you confirm that you meet the age requirement to participate in this survey

Yes

No

I understand and acknowledge the information above and freely consent to participate in this survey. Please indicate your choice below.

Agree <input type="radio"/>	Disagree <input type="radio"/>
--------------------------------	-----------------------------------

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
If I am misinformed by the news media, it is my own behavior that determines how soon I will learn credible information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am in control of the information I get from the news media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am misinformed by the news media, I am to blame	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The main thing that affects my knowledge about the world is what I do myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I pay attention to different sources of news, I can avoid being misinformed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I take the right actions, I can stay informed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I have a good understanding of the concept of media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the skills to interpret news messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I understand how news is made in my country	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident in my ability to judge the quality of news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not sure what people mean by media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm often confused about the quality of news and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How one could indicate the credibility of a social media post?

- Number of likes/shares
- The use of emojis
- The inclusion of verified sources
- The length of the post

How one could apply critical thinking when encountering a social media post?

Check the number of followers

Analyzing the sources

Focus only on the aesthetics

The post aligns with personal beliefs

Based on the game you played please tell me how much you agree or disagree with this statement, where 1 is strongly disagree and 7 is strongly agree

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I think the game is fun	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoy playing the game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel bored while playing the game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am likely to recommend this game to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If given the chance, I want to play this game again	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Based on the game you played please tell me how much you agree or disagree with this statement, where 1 is strongly disagree and 5 is strongly agree

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
The game provides me with interesting with interesting options and choices	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I could always find something interesting in the game to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I did things in the game just for the fun of it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced a lot of freedom on the game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Based on the game you played please tell me how much you agree or disagree with this statement, where 1 is strongly disagree and 5 is strongly agree

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I feel competent at the game	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel very capable while playing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel effective when playing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My ability to play the game is well-matched with the game's challenges	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What is your age? Please indicate your age in whole numbers

What is your gender?

Male

Female

Non-binary / third gender

Prefer not to say

In which country do you currently reside?

What is your educational level?

Secondary school / High school

Bachelor's degree

Master's degree

PhD, MBA, or other equivalent

Other, namely

Prefer not to say

Condition 2: No feedback

Dear participant,

Thank you very much for participating in this survey. I am a master student of the Media & Business master's programme of Erasmus University Rotterdam. This survey has been created to gather data for my thesis research regarding the impact of serious games on media literacy levels and the significance of formative feedback in this context.

Please be aware that your personal information will be kept strictly confidential, and the findings of this survey will be used solely for thesis research purposes. Your participation is completely voluntarily, meaning that you can quit at any time during your participation. Hence, your anonymity is guaranteed. Completing the survey takes approximately 10 minutes.

Please ensure to carefully read the provided instructions and kindly complete the entire survey without skipping any sections. Your thorough input is greatly appreciated. If you have any further questions do not hesitate to email me via:
695123dv@eur.nl

Thank you very much for your time!

Are you at least 18 years old or older? By selecting 'Yes,' you confirm that you meet the age requirement to participate in this survey

Yes


No

I understand and acknowledge the information above and freely consent to participate in this survey. Please indicate your choice below.

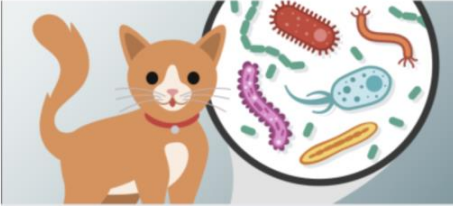
Agree

Disagree

Please read carefully the Facebook post and answer the question given afterwards.




 **Daphne Velber** shared a link
1 h · Facebook for Android

EYE and BRAIN parasites! NGL, this article freaked me out. I don't want to give up Mr. Tibbles so I may have to start buying this.



www.blorp.com
The Brain-Blistering Toxin Lurking In Your Home.
It's not just the fog that comes on little cat feet: it's also toxoplasmosis, an incurable parasite. Doctor Lacrosse's Detox Cat Food may be the last thing you need to detoxify your home.

11 comments

 Like  Comment  Share

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
If I am misinformed by the news media, it is my own behavior that determines how soon I will learn credible information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am in control of the information I get from the news media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am misinformed by the news media, I am to blame	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The main thing that affects my knowledge about the world is what I do myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I pay attention to different sources of news, I can avoid being misinformed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I take the right actions, I can stay informed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I have a good understanding of the concept of media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the skills to interpret news messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I understand how news is made in my country	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident in my ability to judge the quality of news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not sure what people mean by media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm often confused about the quality of news and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How one could indicate the credibility of a social media post?

- Number of likes/shares
- The use of emojis
- The inclusion of verified sources
- The length of the post

How one could apply critical thinking when encountering a social media post?

- Check the number of followers
- Analyzing the sources
- Focus only on the aesthetics
- The post aligns with personal beliefs

What is your age? Please indicate your age in whole numbers

What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

In which country do you currently reside?

What is your educational level?

Secondary school / High school

Bachelor's degree

Master's degree

PhD, MBA, or other equivalent

Other, namely

Prefer not to say

Condition 3: Feedback

Dear participant,

Thank you very much for participating in this survey. I am a master student of the Media & Business master's programme of Erasmus University Rotterdam. This survey has been created to gather data for my thesis research regarding the impact of serious games on media literacy levels and the significance of formative feedback in this context.

Please be aware that your personal information will be kept strictly confidential, and the findings of this survey will be used solely for thesis research purposes. Your participation is completely voluntarily, meaning that you can quit at any time during your participation. Hence, your anonymity is guaranteed. Completing the survey takes approximately 10 minutes.

Please ensure to carefully read the provided instructions and kindly complete the entire survey without skipping any sections. Your thorough input is greatly appreciated. If you have any further questions do not hesitate to email me via:
695123dv@eur.nl

Thank you very much for your time!

Are you at least 18 years old or older? By selecting 'Yes,' you confirm that you meet the age requirement to participate in this survey

Yes


No

I understand and acknowledge the information above and freely consent to participate in this survey. Please indicate your choice below.


Agree

Disagree

Please read carefully the Facebook post and answer the question given afterwards.

 **Daphne Velber** shared a link
1 h · Facebook for Android




EYE and BRAIN parasites! NGL, this article freaked me out. I don't want to give up Mr. Tibbles so I may have to start buying this.



www.blorp.com
The Brain-Blistering Toxin Lurking In Your Home.

It's not just the fog that comes on little cat feet: it's also toxoplasmosis, an incurable parasite. Doctor Lacrosse's Detox Cat Food may be the last thing you need to detoxify your home.

11 comments

 Like  Comment  Share

Please read the feedback explaining why the Facebook post is false

What the story is doing is trying to scare you into buying a much more expensive product than you really need – not quite a scam, but still pretty slimy.

The article also uses a lot of **pseudo-scientific buzzwords** like "natural," toxins" and "detox." In most countries there is little or no legal meaning to any of these words, but they **help make the story sound scientific and also scary.** Though it suggests that the cat food will help with toxoplasmosis, it's careful not to make a specific medical claim.

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
If I am misinformed by the news media, it is my own behavior that determines how soon I will learn credible information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am in control of the information I get from the news media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am misinformed by the news media, I am to blame	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The main thing that affects my knowledge about the world is what I do myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I pay attention to different sources of news, I can avoid being misinformed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I take the right actions, I can stay informed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I have a good understanding of the concept of media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the skills to interpret news messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I understand how news is made in my country	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident in my ability to judge the quality of news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not sure what people mean by media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm often confused about the quality of news and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How one could indicate the credibility of a social media post?

- Number of likes/shares
- The use of emojis
- The inclusion of verified sources
- The length of the post

How one could apply critical thinking when encountering a social media post?

- Check the number of followers
- Analyzing the sources
- Focus only on the aesthetics
- The post aligns with personal beliefs

What is your age? Please indicate your age in whole numbers

What is your gender?

Male

Female

Non-binary / third gender

Prefer not to say

In which country do you currently reside?

What is your educational level?

Secondary school / High school

Bachelor's degree

Master's degree

PhD, MBA, or other equivalent

Other, namely

Prefer not to say

Condition 4: Control group

Dear participant,

Thank you very much for participating in this survey. I am a master student of the Media & Business master's programme of Erasmus University Rotterdam. This survey has been created to gather data for my thesis research regarding the impact of serious games on media literacy levels and the significance of formative feedback in this context.

Please be aware that your personal information will be kept strictly confidential, and the findings of this survey will be used solely for thesis research purposes. Your participation is completely voluntarily, meaning that you can quit at any time during your participation. Hence, your anonymity is guaranteed. Completing the survey takes approximately 10 minutes.

Please ensure to carefully read the provided instructions and kindly complete the entire survey without skipping any sections. Your thorough input is greatly appreciated. If you have any further questions do not hesitate to email me via:
695123dv@eur.nl

Thank you very much for your time!

Are you at least 18 years old or older? By selecting 'Yes,' you confirm that you meet the age requirement to participate in this survey

Yes

No

I understand and acknowledge the information above and freely consent to participate in this survey. Please indicate your choice below.

Agree

Disagree

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
If I am misinformed by the news media, it is my own behavior that determines how soon I will learn credible information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am in control of the information I get from the news media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am misinformed by the news media, I am to blame	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The main thing that affects my knowledge about the world is what I do myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I pay attention to different sources of news, I can avoid being misinformed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I take the right actions, I can stay informed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I have a good understanding of the concept of media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the skills to interpret news messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I understand how news is made in my country	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident in my ability to judge the quality of news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not sure what people mean by media literacy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm often confused about the quality of news and information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How one could indicate the credibility of a social media post?

- Number of likes/shares
- The use of emojis
- The inclusion of verified sources
- The length of the post

How one could apply critical thinking when encountering a social media post?

- Check the number of followers
- Analyzing the sources
- Focus only on the aesthetics
- The post aligns with personal beliefs

What is your age? Please indicate your age in whole numbers

What is your gender?

- Male
- Female
- Non-binary / third gender
- Prefer not to say

In which country do you currently reside?

What is your educational level?

- Secondary school / High school
- Bachelor's degree
- Master's degree
- PhD, MBA, or other equivalent
- Other, namely

- Prefer not to say

Appendix B

KMO and Bartlett's Test

Kaiser–Meyer–Olkin Measure of Sampling Adequacy.		.587
Bartlett's Test of Sphericity	Approx. Chi-Square	69.194
	df	15
	Sig.	<.001

Total Variance Explained

Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings ^a
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	1.761	29.348	29.348	1.761	29.348	29.348	1.717
2	1.246	20.769	50.117	1.246	20.769	50.117	1.336
3	.937	15.610	65.727				
4	.820	13.674	79.401				
5	.651	10.854	90.255				
6	.585	9.745	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Component Matrix^a

	Component	
	1	2
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – If I take the right actions, I can stay informed	.662	-.345
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – If I pay attention to different sources of news, I can avoid being misinformed	.649	
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – If I am misinformed by the news media, it is my own behavior that determines how soon I will learn credible information	.633	-.356
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – The main thing that affects my knowledge about the world is what I do myself	.529	
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – I am in control of the information I get from the news media		.740
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – When I am misinformed by the news media, I am to blame	.409	.667

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

KMO and Bartlett's Test

Kaiser–Meyer–Olkin Measure of Sampling Adequacy.		.714
Bartlett's Test of Sphericity	Approx. Chi-Square	146.874
	df	15
	Sig.	<.001

Total Variance Explained

Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings ^a
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	2.313	38.556	38.556	2.313	38.556	38.556	2.214
2	1.190	19.834	58.390	1.190	19.834	58.390	1.442
3	.776	12.926	71.315				
4	.675	11.248	82.563				
5	.575	9.579	92.142				
6	.471	7.858	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Component Matrix^a

	Component	
	1	2
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – I have the skills to interpret news messages	.776	
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – I have a good understanding of the concept of media literacy	.697	
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – I am confident in my ability to judge the quality of news	.686	
On a scale of 1 to 5 where 1 is strongly disagree and 5 is strongly agree, please tell me how much you agree or disagree with this statement – I understand how news is made in my country	.672	-.388
Attitudes_towards_ML_6R		.746
Attitudes_towards_ML_5R	.473	.621

Extraction Method: Principal Component Analysis.

a. 2 components extracted.

Case Processing Summary

		N	%
Cases	Valid	160	100.0
	Excluded ^a	0	.0
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.532	4

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
14.28	7.046	2.654	4

Case Processing Summary

		N	%
Cases	Valid	160	100.0
	Excluded ^a	0	.0
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.431	2

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
6.21	3.212	1.792	2

Case Processing Summary

		N	%
Cases	Valid	160	100.0
	Excluded ^a	0	.0
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.702	4

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
13.91	9.175	3.029	4

Case Processing Summary

		N	%
Cases	Valid	160	100.0
	Excluded ^a	0	.0
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.436	2

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
5.5000	3.610	1.90002	2

Case Processing Summary

		N	%
Cases	Valid	40	25.0
	Excluded ^a	120	75.0
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.741	5

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
19.7000	23.754	4.87379	5

Case Processing Summary

		N	%
Cases	Valid	40	25.0
	Excluded ^a	120	75.0
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.763	4

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
13.70	13.344	3.653	4

Case Processing Summary

		N	%
Cases	Valid	39	24.4
	Excluded ^a	121	75.6
	Total	160	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.840	4

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
15.08	11.020	3.320	4

Tests of Between-Subjects Effects

Dependent Variable: MediaLiteracy_myself

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.295 ^a	3	.098	.220	.882	.004
Intercept	2039.541	1	2039.541	4563.087	<.001	.967
experimentgroup	.295	3	.098	.220	.882	.004
Error	69.727	156	.447			
Total	2109.563	160				
Corrected Total	70.021	159				

a. R Squared = .004 (Adjusted R Squared = -.015)

Post Hoc Tests

experimentgroup

Multiple Comparisons

Dependent Variable: MediaLiteracy_myself

Tukey HSD

(I) experimentgroup	(J) experimentgroup	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Game	No Feedback	-.0813	.14949	.948	-.4695	.3070
	Feedback	-.0688	.14949	.968	-.4570	.3195
	Control	.0188	.14949	.999	-.3695	.4070
No Feedback	Game	.0813	.14949	.948	-.3070	.4695
	Feedback	.0125	.14949	1.000	-.3757	.4007
	Control	.1000	.14949	.909	-.2882	.4882
Feedback	Game	.0688	.14949	.968	-.3195	.4570
	No Feedback	-.0125	.14949	1.000	-.4007	.3757
	Control	.0875	.14949	.936	-.3007	.4757
Control	Game	-.0188	.14949	.999	-.4070	.3695
	No Feedback	-.1000	.14949	.909	-.4882	.2882
	Feedback	-.0875	.14949	.936	-.4757	.3007

Based on observed means.

The error term is Mean Square(Error) = .447.

Tests of Between-Subjects Effects

Dependent Variable: MediaLiteracy_media

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3.819 ^a	3	1.273	1.603	.191	.030
Intercept	1543.806	1	1543.806	1944.168	<.001	.926
experimentgroup	3.819	3	1.273	1.603	.191	.030
Error	123.875	156	.794			
Total	1671.500	160				
Corrected Total	127.694	159				

a. R Squared = .030 (Adjusted R Squared = .011)

Post Hoc Tests

experimentgroup

Multiple Comparisons

Dependent Variable: MediaLiteracy_media

Tukey HSD

(I) experimentgroup	(J) experimentgroup	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Game	No Feedback	.1000	.19926	.959	-.4175	.6175
	Feedback	-.1500	.19926	.875	-.6675	.3675
	Control	.2750	.19926	.514	-.2425	.7925
No Feedback	Game	-.1000	.19926	.959	-.6175	.4175
	Feedback	-.2500	.19926	.593	-.7675	.2675
	Control	.1750	.19926	.816	-.3425	.6925
Feedback	Game	.1500	.19926	.875	-.3675	.6675
	No Feedback	.2500	.19926	.593	-.2675	.7675
	Control	.4250	.19926	.147	-.0925	.9425
Control	Game	-.2750	.19926	.514	-.7925	.2425
	No Feedback	-.1750	.19926	.816	-.6925	.3425
	Feedback	-.4250	.19926	.147	-.9425	.0925

Based on observed means.

The error term is Mean Square(Error) = .794.

Tests of Between-Subjects Effects

Dependent Variable: Attitudes_towards_ML_myself

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4.558 ^a	3	1.519	2.736	.045	.050
Intercept	1935.577	1	1935.577	3486.091	<.001	.957
experimentgroup	4.558	3	1.519	2.736	.045	.050
Error	86.616	156	.555			
Total	2026.750	160				
Corrected Total	91.173	159				

a. R Squared = .050 (Adjusted R Squared = .032)

Post Hoc Tests

experimentgroup

Multiple Comparisons

Dependent Variable: Attitudes_towards_ML_myself

Tukey HSD

(I) experimentgroup	(J) experimentgroup	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Game	No Feedback	-.2125	.16662	.580	-.6452	.2202
	Feedback	-.4687*	.16662	.028	-.9014	-.0361
	Control	-.1562	.16662	.785	-.5889	.2764
No Feedback	Game	.2125	.16662	.580	-.2202	.6452
	Feedback	-.2562	.16662	.417	-.6889	.1764
	Control	.0563	.16662	.987	-.3764	.4889
Feedback	Game	.4687*	.16662	.028	.0361	.9014
	No Feedback	.2562	.16662	.417	-.1764	.6889
	Control	.3125	.16662	.243	-.1202	.7452
Control	Game	.1562	.16662	.785	-.2764	.5889
	No Feedback	-.0563	.16662	.987	-.4889	.3764
	Feedback	-.3125	.16662	.243	-.7452	.1202

Based on observed means.

The error term is Mean Square(Error) = .555.

*. The mean difference is significant at the .05 level.

Tests of Between-Subjects Effects

Dependent Variable: Attitudes_towards_ML_R

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5.913 ^a	3	1.971	2.235	.086	.041
Intercept	1210.000	1	1210.000	1371.927	<.001	.898
experimentgroup	5.913	3	1.971	2.235	.086	.041
Error	137.587	156	.882			
Total	1353.500	160				
Corrected Total	143.500	159				

a. R Squared = .041 (Adjusted R Squared = .023)

Post Hoc Tests

experimentgroup

Multiple Comparisons

Dependent Variable: Attitudes_towards_ML_R

Tukey HSD

(I) experimentgroup	(J) experimentgroup	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Game	No Feedback	-.5375	.21000	.055	-1.0828	.0078
	Feedback	-.2000	.21000	.777	-.7453	.3453
	Control	-.2625	.21000	.596	-.8078	.2828
No Feedback	Game	.5375	.21000	.055	-.0078	1.0828
	Feedback	.3375	.21000	.378	-.2078	.8828
	Control	.2750	.21000	.558	-.2703	.8203
Feedback	Game	.2000	.21000	.777	-.3453	.7453
	No Feedback	-.3375	.21000	.378	-.8828	.2078
	Control	-.0625	.21000	.991	-.6078	.4828
Control	Game	.2625	.21000	.596	-.2828	.8078
	No Feedback	-.2750	.21000	.558	-.8203	.2703
	Feedback	.0625	.21000	.991	-.4828	.6078

Based on observed means.

The error term is Mean Square(Error) = .882.

Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
experimentgroup * Credibility_R	160	100.0%	0	0.0%	160	100.0%

experimentgroup * Credibility_R Crosstabulation

			Credibility_R		Total
			.00	1.00	
experimentgroup	Game	Count	10	30	40
		Expected Count	5.8	34.3	40.0
	No Feedback	Count	4	36	40
		Expected Count	5.8	34.3	40.0
	Feedback	Count	3	37	40
		Expected Count	5.8	34.3	40.0
	Control	Count	6	34	40
		Expected Count	5.8	34.3	40.0
Total		Count	23	137	160
		Expected Count	23.0	137.0	160.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.839 ^a	3	.120
Likelihood Ratio	5.627	3	.131
Linear-by-Linear Association	1.706	1	.192
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.75.

Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
experimentgroup * Critical_thinking_R	160	100.0%	0	0.0%	160	100.0%

experimentgroup * Critical_thinking_R Crosstabulation

			Critical_thinking_R		Total
			.00	1.00	
experimentgroup	Game	Count	7	33	40
		Expected Count	6.5	33.5	40.0
	No Feedback	Count	6	34	40
		Expected Count	6.5	33.5	40.0
	Feedback	Count	2	38	40
		Expected Count	6.5	33.5	40.0
	Control	Count	11	29	40
		Expected Count	6.5	33.5	40.0
Total		Count	26	134	160
		Expected Count	26.0	134.0	160.0

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.532 ^a	3	.057
Likelihood Ratio	8.164	3	.043
Linear-by-Linear Association	.584	1	.445
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.50.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.346 ^a	.120	.046	.66932	.120	1.630	3	36	.199

a. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.191	3	.730	1.630	.199 ^b
	Residual	16.128	36	.448		
	Total	18.319	39			

a. Dependent Variable: MediaLiteracy_myself

b. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.971	.566		5.253	<.001
	Playersatisfaction_newvariable	-.131	.144	-.186	-.913	.367
	Autonomy_newvariable	-.042	.180	-.056	-.235	.815
	Competence_newvariable	.327	.167	.392	1.957	.058

a. Dependent Variable: MediaLiteracy_myself

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			Sig. F Change
						F Change	df1	df2	
1	.422 ^a	.178	.110	.83026	.178	2.601	3	36	.067

a. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.378	3	1.793	2.601	.067 ^b
	Residual	24.816	36	.689		
	Total	30.194	39			

a. Dependent Variable: MediaLiteracy_media

b. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.576	.701		6.524	<.001
	Playersatisfaction_newvariable	.104	.178	.115	.581	.565
	Autonomy_newvariable	-.376	.224	-.390	-1.680	.102
	Competence_newvariable	-.142	.207	-.133	-.688	.496

a. Dependent Variable: MediaLiteracy_media

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
						F Change	df1	df2	Sig. F Change
1	.286 ^a	.082	.005	.69250	.082	1.067	3	36	.375

a. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.535	3	.512	1.067	.375 ^b
	Residual	17.264	36	.480		
	Total	18.798	39			

a. Dependent Variable: Attitudes_towards_ML_myself

b. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.821	.585		4.822	<.001
	Playersatisfaction_newvariable	-.081	.149	-.113	-.543	.590
	Autonomy_newvariable	-.098	.186	-.129	-.526	.602
	Competence_newvariable	.293	.173	.347	1.696	.098

a. Dependent Variable: Attitudes_towards_ML_myself

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
						F Change	df1	df2	Sig. F Change
1	.230 ^a	.053	-.026	.97329	.053	.668	3	36	.577

a. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.897	3	.632	.668	.577 ^b
	Residual	34.103	36	.947		
	Total	36.000	39			

a. Dependent Variable: Attitudes_towards_ML_R

b. Predictors: (Constant), Competence_newvariable, Playersatisfaction_newvariable, Autonomy_newvariable

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.519	.822		1.847	.073
	Playersatisfaction_newvariable	.184	.209	.187	.882	.384
	Autonomy_newvariable	.049	.262	.046	.186	.854
	Competence_newvariable	.024	.243	.020	.097	.923

a. Dependent Variable: Attitudes_towards_ML_R

Block 0: Beginning Block

Classification Table^{a,b}

Observed		Predicted		
		Credibility_R		Percentage Correct
		.00	1.00	
Step 0	Credibility_R .00	0	10	.0
	1.00	0	30	100.0
Overall Percentage				75.0

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	1.099	.365	9.052	1	.003	3.000

Variables not in the Equation

		Score	df	Sig.	
Step 0	Variables	Playersatisfaction_newvariable	1.128	1	.288
		Autonomy_newvariable	6.405	1	.011
		Competence_newvariable	8.769	1	.003
Overall Statistics			10.048	3	.018

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	11.131	3	.011
	Block	11.131	3	.011
	Model	11.131	3	.011

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	33.856 ^a	.243	.360

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table^a

Observed		Predicted		
		Credibility_R		Percentage Correct
		.00	1.00	
Step 1	Credibility_R .00	3	7	30.0
	1.00	3	27	90.0
Overall Percentage				75.0

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Playersatisfaction_newvariable	-.452	.592	.583	1	.445	.636	.199	2.032
	Autonomy_newvariable	1.036	.797	1.690	1	.194	2.819	.591	13.452
	Competence_newvariable	1.173	.674	3.031	1	.082	3.231	.863	12.103
	Constant	-4.646	2.406	3.729	1	.053	.010		

a. Variable(s) entered on step 1: Playersatisfaction_newvariable, Autonomy_newvariable, Competence_newvariable.

Block 0: Beginning Block

Classification Table^{a,b}

Observed		Predicted			
		Critical_thinking_R .00	Critical_thinking_R 1.00	Percentage Correct	
Step 0	Critical_thinking_R	.00	0	7	.0
		1.00	0	33	100.0
Overall Percentage					82.5

- a. Constant is included in the model.
- b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	1.551	.416	13.885	1	<.001	4.714

Variables not in the Equation

		Score	df	Sig.	
Step 0	Variables	Playersatisfaction_newvariable	2.671	1	.102
		Autonomy_newvariable	6.384	1	.012
		Competence_newvariable	8.119	1	.004
Overall Statistics			9.033	3	.029

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	10.111	3	.018
	Block	10.111	3	.018
	Model	10.111	3	.018

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	26.987 ^a	.223	.370

- a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Classification Table^a

Observed		Predicted			
		Critical_thinking_R .00	Critical_thinking_R 1.00	Percentage Correct	
Step 1	Critical_thinking_R	.00	3	4	42.9
		1.00	1	32	97.0
Overall Percentage					87.5

- a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Playersatisfaction_newvariable	.063	.633	.010	1	.921	1.065	.308	3.679
	Autonomy_newvariable	.772	.905	.727	1	.394	2.164	.367	12.765
	Competence_newvariable	1.306	.781	2.794	1	.095	3.690	.798	17.057
	Constant	-5.538	2.799	3.916	1	.048	.004		

- a. Variable(s) entered on step 1: Playersatisfaction_newvariable, Autonomy_newvariable, Competence_newvariable.

Block 0: Beginning Block

Classification Table^{a,b}

Observed	Credibility_R	Predicted		Percentage Correct
		.00	1.00	
Step 0	Credibility_R .00	0	23	.0
	1.00	0	137	100.0
Overall Percentage				85.6

- a. Constant is included in the model.
- b. The cut value is .500

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	1.784	.225	62.713	1	<.001	5.957

Variables not in the Equation

Step 0	Variables	Score	df	Sig.
	MediaLiteracy_myself	3.661	1	.056
	MediaLiteracy_media	.020	1	.888
	Attitudes_towards_ML_myself	5.699	1	.017
	Attitudes_towards_ML_R	1.872	1	.171
Overall Statistics		7.666	4	.105

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.
Step 1 Step	7.844	4	.097
Block	7.844	4	.097
Model	7.844	4	.097

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	123.904 ^a	.048	.085

- a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table^a

Observed	Credibility_R	Predicted		Percentage Correct
		.00	1.00	
Step 1	Credibility_R .00	0	23	.0
	1.00	0	137	100.0
Overall Percentage				85.6

- a. The cut value is .500

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 ^a MediaLiteracy_myself	.403	.367	1.207	1	.272	1.496	.729	3.069
MediaLiteracy_media	-.069	.267	.066	1	.797	.934	.554	1.574
Attitudes_towards_ML_myself	.541	.326	2.759	1	.097	1.718	.907	3.253
Attitudes_towards_ML_R	.255	.269	.893	1	.345	1.290	.761	2.187
Constant	-1.874	1.636	1.313	1	.252	.153		

- a. Variable(s) entered on step 1: MediaLiteracy_myself, MediaLiteracy_media, Attitudes_towards_ML_myself, Attitudes_towards_ML_R.

Block 0: Beginning Block

Classification Table^{a,b}

Observed	Critical_thinking_R	Predicted		Percentage Correct
		.00	1.00	
Step 0	Critical_thinking_R	.00	26	.0
		1.00	134	100.0
Overall Percentage				83.8

- a. Constant is included in the model.
 b. The cut value is .500

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	
Step 0	Constant	1.640	.214	58.548	1	<.001	5.154

Variables not in the Equation

Step 0	Variables	Score	df	Sig.
	MediaLiteracy_myself	6.848	1	.009
	MediaLiteracy_media	3.905	1	.048
	Attitudes_towards_ML_myself	5.394	1	.020
	Attitudes_towards_ML_R	2.880	1	.090
Overall Statistics		15.259	4	.004

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

	Chi-square	df	Sig.	
Step 1	Step	16.217	4	.003
	Block	16.217	4	.003
	Model	16.217	4	.003

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	125.797 ^a	.096	.164

- a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table^a

Observed	Critical_thinking_R	Predicted		Percentage Correct
		.00	1.00	
Step 1	Critical_thinking_R	.00	22	15.4
		1.00	134	100.0
Overall Percentage				86.3

- a. The cut value is .500

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)		
							Lower	Upper	
Step 1 ^a	MediaLiteracy_myself	.805	.364	4.891	1	.027	2.238	1.096	4.569
	MediaLiteracy_media	-.636	.278	5.236	1	.022	.529	.307	.913
	Attitudes_towards_ML_myself	.385	.310	1.542	1	.214	1.470	.800	2.702
	Attitudes_towards_ML_R	.328	.272	1.453	1	.228	1.388	.814	2.366
	Constant	-1.233	1.589	.602	1	.438	.292		

- a. Variable(s) entered on step 1: MediaLiteracy_myself, MediaLiteracy_media, Attitudes_towards_ML_myself, Attitudes_towards_ML_R.

Descriptives

[DataSet1] /Users/Danae/Downloads/AlldataMerged.sav

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
What is your age? Please indicate your age in whole numbers	160	20	57	27.00	5.059
What is your gender?	160	1	4	1.54	.536
List of Countries	157	7	185	87.41	33.730
What is your educational level? – Selected Choice	160	1	7	3.14	1.031
Valid N (listwise)	157				

Frequencies

Statistics

		List of Countries	What is your gender?	What is your age? Please indicate your age in whole numbers	What is your educational level? – Selected Choice
N	Valid	157	160	160	160
	Missing	3	0	0	0

Frequency Table

List of Countries

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Argentina	1	.6	.6	.6
	Austria	1	.6	.6	1.3
	Belgium	2	1.3	1.3	2.5
	Cyprus	2	1.3	1.3	3.8
	France	3	1.9	1.9	5.7
	Germany	1	.6	.6	6.4
	Greece	90	56.3	57.3	63.7
	Netherlands	50	31.3	31.8	95.5
	Spain	4	2.5	2.5	98.1
	United Kingdom of Great Britain and Northern Ireland	3	1.9	1.9	100.0
Total	157	98.1	100.0		
Missing	System	3	1.9		
Total		160	100.0		

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	75	46.9	46.9	46.9
	Female	84	52.5	52.5	99.4
	Prefer not to say	1	.6	.6	100.0
	Total	160	100.0	100.0	

What is your age? Please indicate your age in whole numbers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20	3	1.9	1.9	1.9
	21	5	3.1	3.1	5.0
	22	4	2.5	2.5	7.5
	23	10	6.3	6.3	13.8
	24	17	10.6	10.6	24.4
	25	13	8.1	8.1	32.5
	26	28	17.5	17.5	50.0
	27	32	20.0	20.0	70.0
	28	15	9.4	9.4	79.4
	29	12	7.5	7.5	86.9
	30	6	3.8	3.8	90.6
	31	6	3.8	3.8	94.4
	32	1	.6	.6	95.0
	33	2	1.3	1.3	96.3
	34	1	.6	.6	96.9
	36	1	.6	.6	97.5
	40	1	.6	.6	98.1
56	1	.6	.6	98.8	
57	2	1.3	1.3	100.0	
	Total	160	100.0	100.0	

What is your educational level? – Selected Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secondary school / High school	3	1.9	1.9	1.9
	Bachelor's degree	35	21.9	21.9	23.8
	Master's degree	77	48.1	48.1	71.9
	PhD, MBA, or other equivalent	36	22.5	22.5	94.4
	Other, namely	4	2.5	2.5	96.9
	Prefer not to say	1	.6	.6	97.5
	7	4	2.5	2.5	100.0
	Total	160	100.0	100.0	