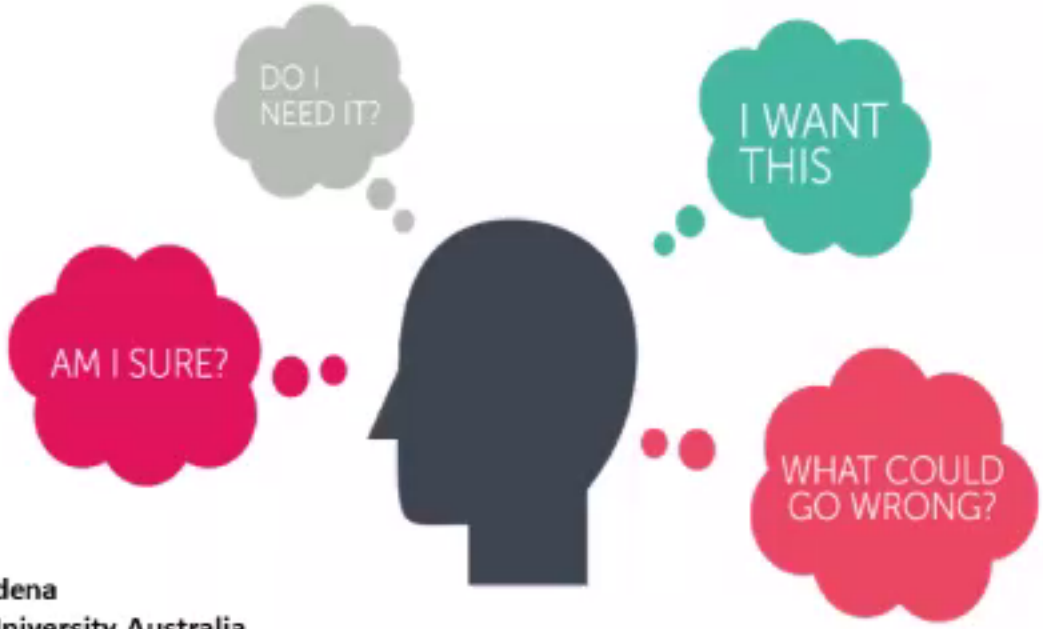
Gamification and E-learning for Adolescents



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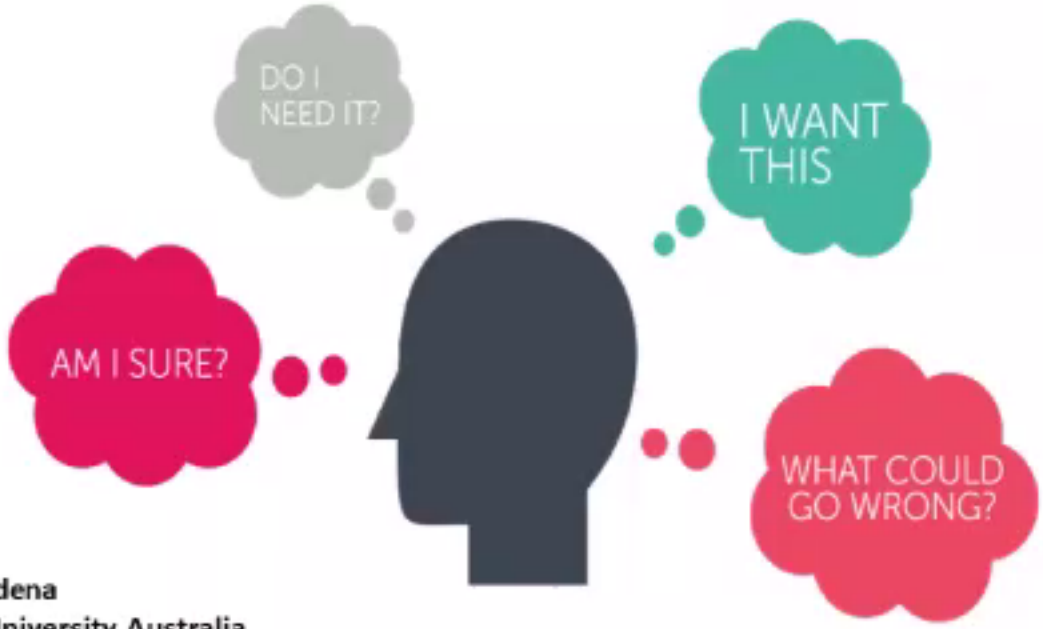

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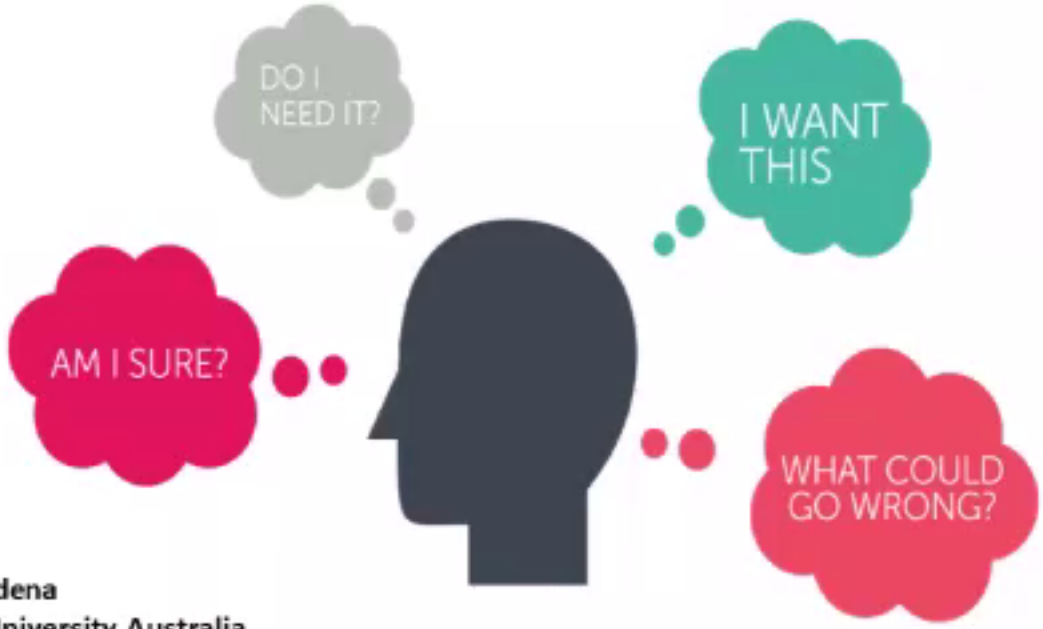

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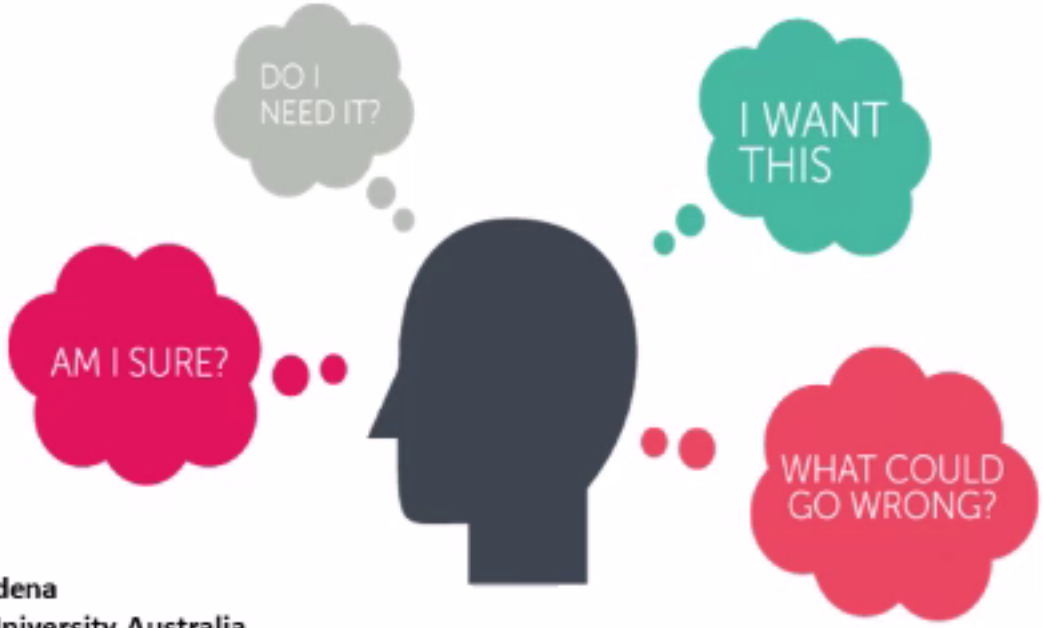

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Outline of the presentation

- Introduction
- Objective
- Overview of the model
- Summary of the Literature
- Findings
- Conclusion

Introduction

- In comparison to more traditional ways of awareness, game-based delivery methods are employed to challenge, engage, and inspire individuals to provide successful learning (Bassiouni & Hackley, 2016).
- Video games were popular in the 1970s as young people's main source of entertainment (Kirriemuir, 2002).
- Many researchers have been working on video games for learning for the past 20 years, and various reviews of the literature on educational games have recently been published (De Aguilera & Mendiz, 2003).
- While there is no obvious causal association between gaming and academic success, frequent players have been recognised as less optimistic towards school by many researchers (Kroustalli & Xinogalos, 2021; Mitchell & Savill-Smith, 2004).
- During recent years "gamification" has gained significant attention among practitioners and game scholars (Challco, Mizoguchi, Bittencourt, & Isotani, 2015; Kroustalli & Xinogalos, 2021). There is a significant body of research supporting the potential of using games as an educational tool (Kroustalli & Xinogalos, 2021).
- However, what has been missing from the current literature is that, up to date none of the studies focussed the influence of the social cognition stage of "persuasion" on gamification in e-learning context through the lens of the social psychology theory of "elaboration likelihood model" (ELM) by Cacioppo and Petty (1986).
- Therefore, this paper presents an illustrative example on how education policy makers could use gamification elements in e-learning context for leaner attitude formation and change resulting in persuasion outcomes through the ELM.

What is a persuasion and attitude change?

- Persuasion refers to human communication that is devised to influence the autonomous actions and judgments of others

- Attitudes are formed and modified as individuals obtain and process information related to the type of information they receive, and the cognitive energy each decides to expend to process that information

Main Objective

The purpose of this theoretical paper is to present an illustrative example on how education policy makers could use gamification elements in e-learning context for leaner attitude formation and change resulting in persuasion outcomes through the ELM.

Overview of the Elaboration Likelihood Model

Theoretical background – Elaboration Likelihood Model

- The Elaboration Likelihood Model (ELM) is a dual process theory of attitude formation and change resulting in persuasion outcomes
- This model was introduced to the academic literature by Petty and Cacioppo in 1981.
- The ELM provides an organizing framework for persuasion that is argued to be applicable to various source, message, recipient and context variables

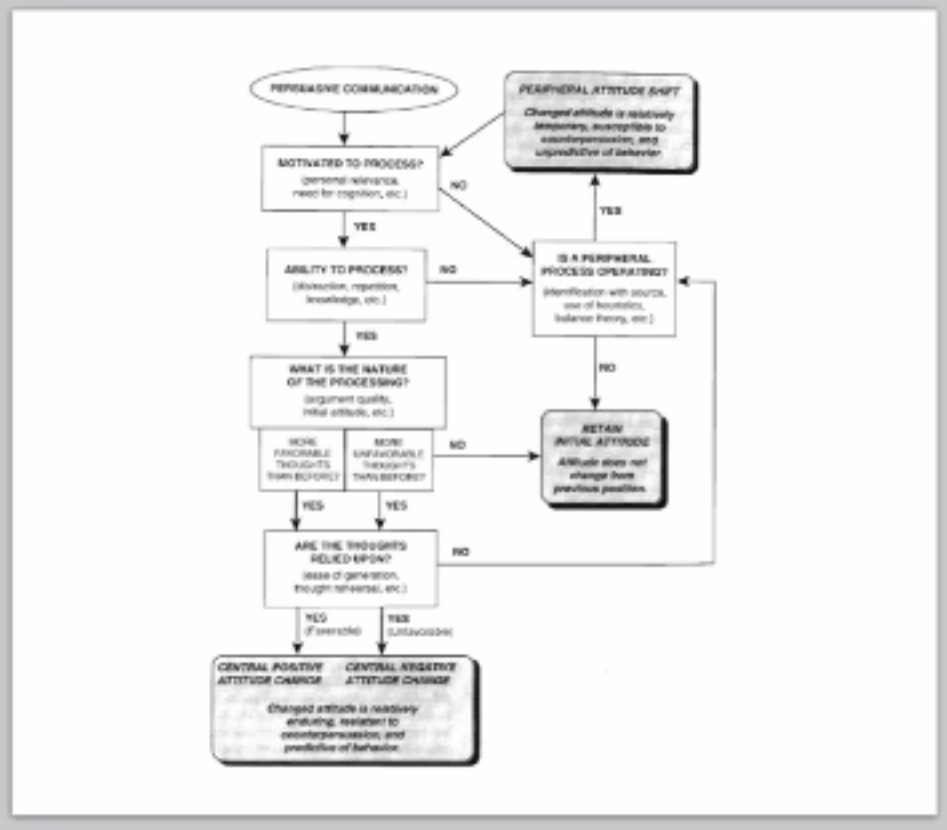
Overview of the Elaboration Likelihood Model

Theoretical background – Elaboration Likelihood Model

- The basic principle of the ELM is the presence of two routes to persuasion: the central and peripheral routes
- There are two distinct routes to persuasion in ELM, the central route, designed for high elaborators and the peripheral route, designed for low elaborators
- The central route is accessed via an individual's thoughtful attention to the quality of the information and argumentation in a message
- The peripheral route is a way to persuade individuals unlikely to scrutinize the message itself but instead turn to affective cues embedded at the message's periphery.
- These peripheral cues include but are not limited to the credibility of the source, the style of the production, and the entertaining bells and whistles folded into its structure, such as the inclusion of music or a colorful logo

Elaboration Likelihood Model Schematic Representation

•**Source:** Van Lange, P., Kruglanksi, A., & Higgins, T. (2011). *Theories of social psychology: An introduction*



Theoretical application for the gamification and e-learning

This section demonstrates the application process of the gamification and e-learning based on the ELM. The ELM model was developed during the mass-media marketing communication days of the 1980s. Issues such as simultaneous media usage and insights from neuroscience raise additional concerns. Theories underpinning the education discipline have largely been left unexamined and, when tested, have a poor record of replication (Evanschitzky, Baumgarth, Hubbard, & Armstrong, 2007). Based on the above literature, this model been applied in various settings in education literature. However, very little research has applied this model to investigate the use of gamification in e-learning settings for adolescents. As a result of the above analysis, author shows, three different gamification-based application methods namely technological context, message content and argument quality in e-learning context.

3.1 Argument quality

The below Table 1 provides the summary of the research which applied ELM model in gamification and e-learning context with regard to argument quality.

Identified central or peripheral route variable	Source	Focus	Tested components
Argument quality	Cyr et al. (2018)	Examined online persuasion through website designing through ELM	Website information quality, appropriateness of the information, completeness of information
	Lee (2012)	Attitude changes occurring during IT acceptance from the perspective of elaboration likelihood model	Educational content delivered by the lecturer, consistency in the delivery method, quality of instructions
	Metzler, Weiskotten, and Morgen (2000)	Examined the influence source credibility, message, quality, and personal relevance on HIV prevention message efficacy	HIV prevention efforts must become both more aggressive and creative to better reach the men, women, and teens at risk for infection
	Urh, Vukovic, Jereb, and Pintar (2015)	The following paper presented the model for introduction of gamification into the field of e-learning in higher education	Good e-learning management means organizing, planning, staffing, leading and controlling all important elements of e-learning Important elements in e-learning are pedagogical, technological, design, administration, human, financial and gamification elements
	Wiggins (2016)	This article examined the use of both game-based learning (GBL) and gamification in tertiary education	Digital or non-digital games or simulations been used for graded assessments
	Yildirim (2017)	Study aimed to determine the effects of gamification-based teaching practices on student achievement and their attitudes toward lessons	The website provided more time to teach lessons as curriculum and blended learning procedure with more devoted time on lessons improves the quality of the learning

3.1 Argument quality

The central route is typically operationalised as argument quality, which refers to the persuasive strength of arguments in a message, because it requires a person to think critically with regard to issue-related arguments and it is related to the users' involvement with the topic of persuasion (Petty & Cacioppo, 1986). Further, Cyr et al. (2018) examined online persuasion through website designing through ELM through measuring the argument quality considering the characterises of website information quality, appropriateness of the information and through completeness of information. Educational content delivered by the lecturer, consistency in the delivery method, quality of instructions represents the argument quality to deliver IT related modules (Lee, 2012). For, HIV prevention message efficacy both more aggressive and creative messages found as efficient in reaching people (Metzler et al., 2000). Urh et al. (2015) identified that important elements in e-learning as pedagogical, technological, design, administration, human, financial and gamification elements. Wiggins (2016) used digital or non-digital games or simulations for graded assessments. Yildirim (2017) measured the effects of gamification-based teaching practices on student achievement and their attitudes toward lessons through providing more time to teach lessons through websites.

Message content	Jia, Xu, Karanam, and Voida (2016)	Presented a survey study investigating the relationships among individuals' personality traits and perceived preferences for various motivational affordances used in gamification	-Extraverts tend to be motivated by points, levels, and leader boards presented through gamification -People with high levels of imagination/openness are less likely to be motivated by Avatars
	Besoain et al. (2020)	This study aimed to prevent sexually transmitted diseases by helping users to remember preventive measures in the risky situations	Gamified system named as UBESAFE was used to increase users' adherence and to engage users in the creation of preventive messages
	Llagostera (2012)	This study reviewed current debates around the gamification term and present definitions, as a basis for the analysis of gamification and persuasion	The rhetoric nature of the games improved epistemic connections and affinities
	Ferrara (2013)	This presentation explored how the native procedurality of video games makes them a potentially ideal way to persuade people to adopt a particular point of view	-Aesthetics comprises sensory elements like graphics, sound, haptics, themes, and motifs, as well as contemplative elements like narrative, story arc, and character development -Rhetoric patterns of the message
	Marache and Brangier (2013)	Graphics and persuasion aspects are associated with perceived gamification, despite the fact of usefulness	-Graphical designs and persuasive graphic designs of the message
	Basol, Roozenbeek, and Linden (2020)	Gamified inoculation boosts confidence and cognitive immunity against fake news	An online fake news game helped the people to learn about six common misinformation techniques
	Weiser, Bucher, Cellina, and Luca (2015)	A taxonomy of motivational affordances for meaningful gamified and persuasive technologies	Increase the competency of the user by guiding and instructing on how to use the site and its features through gamification
	Fan, Xiao, and Su (2015)	Examined the effects of learning styles and meaningful learning on the learning achievement of gamification health education curriculum	Gamification features of the message content includes self-learning features, game rules and feedbacks Games create emotional identity to satisfy players, physically and mentally
	Sailer and Homner (2020)	This meta analysis was conducted to systematically synthesize research findings on effects of gamification on cognitive, motivational, and behavioural learning outcomes	Game Fiction Studies use narrative context (e.g., meaningful stories or avatars) Learning delivery also facilitated by watching instructional videos, and reading textbooks online
	Thorpe and Roper (2019)	This paper discussed the ethical dilemmas raised using gamified approaches to marketing	Information of different schools of ethics to examine gamification as an overall system, as well as its constituent parts

Source developed by author

3.2 Message Content

The message content is applied in ELM under peripheral route to persuasion. Many studies applied ELM based persuasion considering message content, message design or message appeal. For websites, it is the image appeal and navigation designs (Cyr et al., 2018), for entertainment and education, it is the narrative structure of the message (Slater & Rouner, 2002), to frame exercise intentions the message content includes message framing on promoting physical exercise in university students (Jones, Sinclair, & Courneya, 2003), for sport-related concussion education, it is the message design of concussion education programs (Turner, Tollison, Hopkins, Poloskey, & Fontaine, 2019), for youth smoking prevention it is the smoking prevention messages (Flynn, Worden, Bunn, Connolly, & Dorwaldt, 2011), for HIV prevention, it is the message efficacy (Metzler et al., 2000). More personally relevant messages were identified as more effective regarding learning (Dinoff & Kowalski, 1999; Nour et al., 2018). Message content could be further improved through game scoring methods (Besoain et al., 2020; Jia et al., 2016; Sailer, Hense, Mayr, & Mandl, 2017; Tikka et al., 2018). Rhetoric patterns of the message were also identified as an effective sensory element (Ferrara, 2013; Llagostera, 2012).

3.3 Technological Context

The below Table 3 provides the summary of the research which applied ELM model in gamification and e-learning context with regard to message content.

Identified central or peripheral route variable	Source	Focus	Tested components
Technology context	Bondaronk et al. (2019)	Systematically analysed the persuasion contexts of 15 gamified health intervention studies	Web-based solutions, mobile apps with sensors, or exertion-based gaming technologies to deliver the intervention
	Jones, Madden, and Wengreen (2014)	Gamification approach to increase fruit and vegetable consumption in schools	An ambient display was used as a medium, so there was no immediate interaction between the system and its users
	Deterding, Sicart, Nacke, O'Hara, and Dixon (2011)	The use of video game elements in non-gaming systems to improve user experience and user engagement	Reward and reputation systems of gamified applications with economically inspired approaches such as incentive centred design
Technology context	Salvador, Romão, and Centieiro (2012)	An interactive public ambient display system, driven to motivate behaviour changes regarding domestic energy consumption, through a persuasive game interface based on gesture recognition technology	The gamified platform tool identified was a 'Motion-based Ambient Interactive Display'
	Rodrigues, Oliveira, and Costa (2016)	The development of business applications with game feature for e-banking sector	The software's used to develop game elements and game characteristics
	Lippevelde et al. (2016)	Using a gamified monitoring app to change adolescents' snack intake	The development active learning ability from the app, more exposure, goal setting, monitoring, and feedback. Include automatic processes in the app such as rewards and positive reinforcement
	Duncan, Hewlett, Brenkelen, and Jansen (2018)	It was investigated whether a gamified working memory training in combination with an online lifestyle intervention would lead to improved self-regulation and increased weight loss compared to a lifestyle intervention combined with sham training	-Ability to track daily caloric intake via an online tool -Own digital personal diet plans
	Aguiar, Lobo, Peña, and Pérez (2020)	Examined the aspects that motivate a student's intention to use a gamified app as a complementary learning strategy in face-to-face education	Loss of privacy exerts a moderator effect on the relationship between the intention to use the gamified app
	Lucassen and Jansen (2014)	The results of this study provided a detailed overview of the contemporary attitude of marketing executives towards gamification	-Gamification platform should consist virtual badges, leader boards, competition levels to provoke the goals among the consumers
	Troyer et al. (2019)	Proposed a playful environment to tackle school burnout, called TICKLE	-Gamification tools of this mobile location-based application are Cards module and a Diary -The Cards module displays a (geographical) map on which cards are marked similar to performing a quiz or a small game

3.3 Technological Context

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Technology context			-By collecting cards, the youngsters can gather points that can be used to obtain rewards
	Reddy (2018)	Evaluated how teachers are trying to implement positive behaviour for learning in their classrooms and school-wide via an app	The teachers used the app extensively using recording and reporting behaviour through the app
	Oyji, Tondello, and Nacke (2018)	Investigated how different gamification user types responded to persuasive strategies depicted in storyboards that represents persuasive gameful health systems	People scoring high in the 'player' user type tend to be motivated by competition, comparison, cooperation, and reward while 'disruptors' are likely to be demotivated by punishment, goal setting, simulation, and self-monitoring
	Boyle, Earle, LaBrie, and Smith (2017)	The study examined a gamified format for alcohol interventions	Gamified elements including a point-based reward system, the element of chance, and personal icons to virtually represent users, is more effective in reducing short-term alcohol use
	Dale (2014)	This article takes a critical look at the potential of gamification as a business change agent that can deliver a more motivated and engaged workforce	Gamified elements include game design techniques, methods to measure behaviours, set milestone goals, visualize accomplishments (badges, etc.), and bright colours
	Chauhan, Taneja, and Goel (2015)	This study investigated the positive impact of three techniques namely, Augmented Reality, Adaptive Learning and Gamification in present learning scenario and studies how these techniques are being adopted by Massive Open Online Course (MOOC) to generate interactive and more engaging content	Learning process can be gamified with rewards, like points and badges, to motivate learners and engage them in better way. Tools like, Duocho allow for corporate to create their own learning environment with built-in Gamification There are various ways in which course content and interaction is gamified and made interesting. These are self elements such as points, badges, levels and virtual goods, content unlocking, secret tips etc. fills students with a sense of self achievement and allow them to compete with themselves Social elements, includes, Leader boards to allow students to compete with other students.
	Dicheva, Dichev, Agre, and Angelova (2015)	This article reviewed empirical research on the application of gamification to education context	Gamification features of learning context include progress points, progress bars, levels, virtual goods/currency Competition and cooperation/social engagement loops, badges, leader boards, levels, avatars, accrual grading Points
	Seidlein, Bettin, Frankowski, and Salloch (2020)	A new learning space, was developed to meet the medical students' individual learning needs better	A further development of e-learning tools such as the new learning space of this study seems promising and should be accompanied by larger and methodologically more intricate evaluation studies
	Subhash and Cudney (2018)	A systematic literature review of game-based learning systems, frameworks that integrate game design	The gamification features such as leader boards, scoring systems, paper-based games such as cross words and choose-your-own-adventure to gamify the course been introduced

3.3 Technological Context

The below Table 3 provides the summary of the research which applied ELM model in gamification and e-learning context with regard to message content.

Technology context		elements, and various implementations of gamification in higher education	
	Simeški, Bernik, and Radošević (2015)	Discussed the development phases of introducing gamification into e-learning systems, various gamification design elements and their suitability for usage in e-learning systems	Several gamified design elements are found suited for e-learning (including points, badges, trophies, customization, leader boards, levels, progress tracking, challenges, feedback, social engagement loops and the freedom to fail)
	Kuo and Chuang (2016)	This study applied gamification to an online context for academic promotion and dissemination	Platform structure with gamification features include leader boards, challenges in activities and rewards, thematic activities, challenging games and community tools which supports gamification platforms
	Çakıroğlu, Başıbüyük, Güler, Atabay, and Memiş (2017)	This study revealed the effect of gamified instructional process to student engagement and the relationship between engagement and academic performances in a real classroom	Gamified features include leader boards, virtual awards, assigning points
	Dias (2017)	In this paper, the experience of applying gamification in an Operations Research/Management Science course taught to undergraduate management students was described	The use of challenges, points, personalized feedback, badges and leader boards was considered to implement the most important game mechanics and related dynamics
	Saiku et al. (2017)	An experimental study on the effects of specific game design elements on psychological need satisfaction	Gamified features include points, badges, leader boards, games designed with meaningful stories, Avatars visual representations of players within the game
	Bovermann, Weidlich, and Bastiaens (2018)	Examined online learning readiness and attitudes towards gaming in gamified online learning	Technological gamification elements as well as computer skills are important success factors for social interaction, social communication and learning outcomes Scales for measuring online learning readiness include digital badges and progress bars

Source developed by author

3.2 Technological Context

The technology context is identified as another central route persuasion method based on the above Table 3 as the technology plays a vital role in facilitating the gamification platforms used in e-learning. Many researchers identified the effectiveness of several gamification elements in enhancing e-learner persuasion. Some of these elements are; virtual badges, virtual milestones, virtual levels, bright colour themes, rewards, virtual points, (Bovermann et al., 2018; Chauhan et al., 2015; Dale, 2014; Dias, 2017; Dicheva et al., 2015; Kuo & Chuang, 2016; Markopoulos, Fragkou, Kasidiaris, & Davim, 2015) content unlocking strategies , secret tips, leader boards, digital crosswords, puzzle games, trophies, meaningful stories, virtual characters or avatars, outcome scales and accrual grading points (Sailer et al., 2017; Seidlein et al., 2020; Strmečki et al., 2015; Subhash & Cudney, 2018).

Conclusion

- From a theoretical perspective, the application of a social psychology theory for education sector enables to gather more insights about social cognition stages of a human mindset such as attitude change, information retrieval, judgement, decision making and goal stimulation.

- From a practical perspective, findings of this study provide a solid foundation for the future education policy decision makers by showing how to design effective e-learning courses in a way that change the learner attitude using gamification elements.