

## A Study on the Serious Games Design Framework via Potential Outcomes - Focused on Construal Level Interventions

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### ABSTRACT

*Although many studies have considered the outcomes and impacts of serious games, little is known about the factors which affect a user's perception or interpretation in games during the process of decision making from theoretical perspectives. This study aimed to explore the process of user perception from the perspective of construal level theory, and to suggest a theoretical design approach through literature review and synthesized into a series of assumptions with persuasive and educational aspects in serious games. Serious games reflect the potential of the game mechanism for changing players' perception, and helping with knowledge acquisition of the users. The potential to use construal level theory for effective serious games interventions was suggested, and a Serious Games Design Framework was proposed via potential outcomes from recent advanced research. Finally, implications of the application of the suggested model with various-related purposes and directions for future research were discussed. The model could be useful not only for game researchers and designers, but also for game marketers in attracting potential consumers.*

**Key words:** *Serious Games, Construal Level Theory, Serious Games Design Framework, Game Design, Game Research.*

### 1. INTRODUCTION

With the pervasion of gaming culture, serious games have been paid attention with various positive effects on game users [1-3]. Serious games, thus, have been applied to various areas such as government, education, corporate and advertising etc. In addition, serious games have been primarily used as teaching or persuasion tools which give players a new way to interact with game contents so as to learn skills and knowledge, promote physical activities, and support cognitive ability [3], [4]. A lot of recent studies have identified benefits of serious games in a variety of domains [5], [6].

Serious games are defined as purposive digital games primarily focusing on specific goals with entertainment [4], [5]. Such games are designed for clear and careful goals not just for entertainment. Therefore they have persuasive and educational advantages. They can also drive users to be deeply involved in

specific situations in a secure manner, which are almost impossible to happen in the real world [6].

One of crucial functions in serious games is to change user perception or behavior after playing games. Changes in user behavior or perception are usually made by intentional interceptions on the point of user selection in serious games [4], [53]. Thus, in designing serious games, it is required for game designers to consider user-centered approaches with strenuous theories for consistent and effective design tactics [4], [50].

Taking into account the goals of serious games, therefore, considering psychological factors for persuasion during the process of a user's decision making is of great importance. Regarding decision making, problem solving and reasoning in gaming activity are all essential elements on which game designers and managers should carefully focus.

Related to decision making, Construal Level Theory (CLT hereafter) is an established concept that has been used to provide insight into how individuals approach decision-making tasks [53]. People are able to create autobiographies in their minds, reformatting their past and future [7], [8]. CLT holds that people generally make their decisions on their perceived "distance" (or mindsets) to any object or event. Information

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circumstances when making decisions in the problem solving activity [10].

Opposing viewpoints in a context discussed that individuals thinking concretely pay attention to feasibly solve the problem immediately [15]. For concrete problem solving styles, people thinking concretely performed better at solving logic puzzles than those who were trained to think abstractly. The concrete thinking individual construes targets as unique and specific and does not think globally. This focuses on details, and information helps problem solving and develops more immediate solutions [14]. Any individual can approach a problem or decision making from varying abstraction levels, depending on the nature of the situation. The situation provides better decision making approach needed for success. Thus, the application of CLT to the field of serious games generally will be helpful to the game users.

According to the mindset model of action phases [16], the pre-decisional and the post-decisional phase of the decision making process are goal-pursuit that differs in terms of mission and task that is to be solved by the individual. The pre-decisional phase or mindset arouses a deliberative cognitive orientation which accelerates the mission of choosing between possible action goals. The post-decisional phase or mindset arouses an implemental cognitive orientation which accelerates the mission of implementing the chosen goal [16].

Previous research found that people tend to be more willing to adopt a framed message when the frame fits with their representations. A fit between message orientation and decision status mindset is likely to lead to increased ease of decision making processing which should yield the enhanced evaluations of the focal message and greater likelihood of persuasion [17]. Hence, messages framed using psychologically distant and close orientation will provide a better fit for game users in a pre-decisional mindset and post-decisional mindset. It is therefore important to consider the balance between psychological distance and pre-post decisional mindset in terms of serious game developments.

## **2.2 Message matching effects**

Construal levels can influence the preference for certain types of information or message in making predictions [22]. Previous research report that they tended to prefer information about more global tendencies, when participants were allowed to seek new information before making a prediction about a target and when the goal was to predict the target's behavior in distant rather than near future conditions [9]. Likewise, Nussbaum et al. (2006) found that people are more confident in psychological experiments when the experiments are expected to occur in the distant than near future [18]. Nussbaum and his colleagues (2003) mention that confidence in predictions of future events is also greater for high-level construal people [19]. These findings imply that individuals with abstract mindsets prefer making predictions on the basis of information at higher construal levels. Also, the finding evidence suggests that construal levels influence judgment and decision making by a preference for information, or experiences that match the individual's abstract or concrete construe. These consequences can be the evidence of the matching effect in terms of persuasion message. Information or message that matches an

individual's goals is more important because it is perceived as more valid [20] and receives more elaboration [21].

As we noted, important and effective consideration in serious games developments regarding Construal level is message matching [22]. If a distant cue in games (e.g., mission messages) is at the same distance as perceived distance, persuasion effects of the message is much greater than those in non-congruent distance. Specifically, if a temporally distant messages (e.g., long time ago) meet with similar level of spatial distance (e.g., in a far-away place), users could effectively follow the intended storylines offering from the serious games with a little cognitive effort.

Such message matching effects have been applied to pictures and words congruency experiments [23]. For example, pictures showed a much greater matching effect with concrete messages, whereas words did with abstract messages. Such matching cues had significant effects not only on user selection related to preference but also user behavior change related to self-control and goal-setting [12], [23].

Given that persuasive message appeals can be framed using either psychologically close or distant orientation, it is important to match that factors will be more effective depending on the playing the game situation and instructional objectives. As highlighted in the previous, construal level theory provides insight into how and why humans make certain types of decisions. The theory articulates that individuals' perspective solves the problem at hand, or determines the decision differently depending on whether an individual uses high-level (abstract) or low-level (concrete) cognitive thinking [9], [10].

The current study suggests that the persuasive impact of messages, through the intervening CLT, should apply to serious games development from outline design planning to build design process. CLT appeals frame using psychologically close or distant message which depends on where game users are in their decision making process at the time they evaluate the message. In the pursuit of this aim, we will discuss important factors for serious games outcomes and impacts: pedagogy, cognitive, affective learning outcomes. And then we will present detailed components of serious games based on the unique properties of digital games: multi-modality, interactivity, narrative, social use, specific experiences, and feedback.

## **3. SERIOUS GAMES**

### **3.1 Underlying factors for serious outcomes and impacts**

The use of serious games can provide an additional value and means to increase interest in training, education and persuasion of user performance outcomes. The most important outcomes and impacts for the serious games concern the perception and behavioral change linked to playing games. This is also related to learning, cognitive, and affective aspects that playing digital games can have.

Garris, Ahlers, and Driskell [24] found that the potential of games can lead to players' learning outcomes such as technical and motor skills, cognitive outcomes such as procedural and strategic knowledge and affective outcomes such as beliefs or attitudes. Similarly, O'Neill, Wainess, and

Baker [25] identified five components associated with cognitive impacts - content understanding, problem solving, collaboration, communication and self-regulation. Likewise, Wouters, van der Spek, and Oostendorp [26] suggested that games might have cognitive learning outcomes, which they divided into knowledge and cognitive skills, motor skills, affective learning outcomes and communicative learning outcomes.

In summary, previous research suggests that players enjoy playing games. They can themselves be viewed as positive outcomes of playing games. Also, perceptual and behavioral consequences of serious games improve learning, cognitive, and affective aspects. These components can be integrated with underlying factors for effective development of serious games: Pedagogy, Cognitive, and Affective learning outcomes. This classification reflects the potential of games to change players' perception and behavior in addition to helping them knowledge acquisition.

### 1) Pedagogy outcomes

Regarding serious games, most researchers argue that accomplishing a pedagogy is a key to their effectiveness [27], [28]. A growing number of previous studies with the use of serious games can promote learning and produce very positive results [1], [2], [5], [6]. According to Annetta et al [29], a multi-player educational gaming platform was designed for students, and they combined content with pedagogy showing potentials to advance gaming theories and problem-based solving approaches in multi-player educational gaming platforms. Likewise, another study shows that success of serious games improves the acquisition of information in the user's memory [30]. This has been found to considerably enhance the process of learning [31].

Further potential benefits of serious games include improved self-monitoring, problem recognition and problem-solving, decision-making, better short-term and long-term memory, and increased social skills such as collaboration, negotiation, and shared decision-making [32]. Several researches of these games for learning were reported to technical skills, motor skills, teamwork, and improving self-regulation [24], [25]. Furthermore, another factor for the success of serious games has been found to improve the players' concentration and attention levels [33]. This not only benefits the acquisition of information, but also increases the learners' motivation and learning experience, thereby improving the cognitive and affective influence.

At the heart of designing effective serious games, there is a significant assertion as to the exact role of pedagogy in serious games. According to de Freitas and Oliver [27], pedagogy needs to be a central aspect of serious game design. The four dimensional framework (4DF) has been proposed by S. De Freitas and M. Oliver, and its value has been shown in a number of studies [34], [35]. The framework for evaluating serious games has brought together four dimensions of the learner, the pedagogic models used, the representation used and the context of learning.

The learner specific dimension has relevance to profiling and modelling the game user to facilitate a match between learning activities and the required outcomes. The second

dimension analyses the pedagogic view of the learning activities in the serious games such as associative, cognitive, situative learning theories or learning and teaching models. The third dimension is the representation, how active the learning experience needs to be, what levels of fidelity are required and how immersive the experience needs to be. Finally, the context of learning delineates where the learning is taking place, what resources the learner has access to as well as the topic being studied. The table 1. shows the framework schematically [36].

Table 1. Four Dimensional Frameworks [36]

Learner Specifics	Pedagogy	Representation	Context
Profile	Associative	Fidelity	Environment
Role	Cognitive	Interactivity	Access to learning
Competences	Social / situative	Immersion	Supporting resources

### 2) Affective outcomes

Affective learning outcomes may focus on a change in the attitude or beliefs of the game user. Attitudes refer to internal states that influence the choices or actions of an individual. Beliefs can influence learning success through attention and conceptual processing toward goal-congruent information.[37] This might relate to a change from a negative to a positive learning attitude towards subjects, but also to a change in behavior that is exhibited in daily lives or for therapeutic purposes. The emotions into the decision cycle are motivated by affective variables like beliefs or attitudes that there is a complex interaction between cognition and emotion [38]. The other main emotion-caused factor is self-efficacy which refers to an individual's personal belief or confidence in their ability to particular perform tasks and behaviors [39] as a powerful predictor of both effective coping behaviors and training success [40]. The self-efficacy applies the game research such as in predicting game user activities. Videogame or game self-efficacy is defined as "an individual's confidence in their ability to interact with videogame systems" [41]. The game self-efficacy can be influenced by intended game experience.

Emotions are systematically affected by the knowledge and goals of the user [38], [42]. Moreover, Connolly et al. [43] propose that games are good for learning affected by motivational variables such as interest and effort, as well as learners' preferences, perceptions and attitudes to games. Furthermore, emotion theories predict that local processing is suitable for dangerous situations, in the way that it encourages focusing on the potential threat and thus enhances the likelihood of dealing and eventually escaping from it [44,45]. Thereby, in case confronting the dangerous and a difficult condition in gaming world, a more detail-oriented or local processing style may be activated in terms of affective aspects. All these would imply that serious games need more elaborative approach through the psycho-factors.

### 3) Cognitive outcomes

Cognitive learning outcomes can affect the knowledge and cognitive skills. Knowledge refers to encoded knowledge

reflecting both verbal and non-verbal situations. A cognitive skill runs to more complex cognitive processes such as causal reasoning, goal appraisal and problem solving. In problem solving, for example, learners have to apply knowledge and rules to solve new problems. In those situations, people are sometimes forced to make decisions under time-pressure. Such decision making skills require the ability to attend to and perceive the pertinent information in a situation and predict how the situation may develop [46]. Furthermore, cognitive activities operate continually throughout the experience of emotion. Given the complex relationships between affect and cognition, some key user states that are highly relevant to users' experiences can be considered a blend of affect and cognition to serious games developments that many variables contribute to or influence task or performance.

Wouters, van der Spek & Oostendorp [26] suggested that games might have cognitive learning outcomes, which they divided into knowledge and cognitive skills, motor skills, affective learning outcomes and communicative learning outcomes.

In general, the performance of complex tasks with game activities will involve different types of learning outcomes such as pedagogy, cognitive, and affective aspects. That is also related to construal level. To give an example, Trope and Liberman [47] identified how high-level construals can comprise of either affective or cognitive aspects of an event (watching a film), depending on whether the central goal of the event was affective (getting into a good mood) or cognitive (learning about the topic). They found that temporal distance when it comes to high level construal increased interest in cognitive values and lowered affective values of the film when the goal was cognitive (i.e., information), but decreased cognitive values and enhanced affective features when the goal was affective (i.e., amusement).[47]

Overall, due to the interrelationships between pedagogy, affection and cognition, considering these factors to serious games development that is sensitive to a user's affective states not only that their cognitive states is likely to be more effective, useful, psychologically appropriate, enjoyable-all factors that may lead to wider use and acceptance. All these would imply that serious games need more elaborative designs through user-centered approach inducing the Psycho-factors. The table 2. shows the comprehensive underlying factors of serious games

Table 2. Comprehensive underlying factors of serious games

<b>Pedagogy</b>	<b>Affective</b>	<b>Cognitive</b>
<b>Learning outcomes factors</b>	<b>Psychology factors</b>	<b>Cognitive processes factors</b>
Learner Specifics Pedagogy Representation Context	Interest & effort, Preferences, Perceptions, Beliefs or attitudes	Decision making Problem solving Causal reasoning Goal appraisal

### 3.2 Serious games core components

A possible effects of serious games need to be based on the unique properties of digital games that could be relevant for such effects. Six characteristics of digital games will be

considered: multi-modality, interactivity, narrative, social use, specific experiences [2], [48], [49] and feedback [50].

#### 1) Multi-modality

The multi-modality of digital games is dominated by continuous advancement of game technology, which has primarily focused on the visual and auditory senses. Recently, haptic modality has been included in the technological improvements of digital games. The latest technological advance enables new modes of input, among other advantages, "natural" conversations with digital characters in the game world. In sum, contemporary digital games are high-fidelity simulation environments that can involve various senses and create very convincing, immersive experiences [51]. The technological capabilities of modern digital game system (engines) also allow for creative, multi-perspective representation of complex, abstract space, issues, and processes, which are potentially useful in terms of education, didactics, Psycho-Pedagogy [48]. Thus, the multimodality property of digital game technology is relevant to both motivational and cognitive issues in the modeling of serious game's impact on perception and behavior change.

#### 2) Interactivity

Interactivity is one of core elements, especially digital games. With the digital games, interactivity is defined as a game property that allows users to influence the quality and development of events occurring in the game world [52].

A very important of all the imaginable manifestations of digital game interactivity is the enhanced self-reference they create for players. Interactivity use creates a game empathy and vicarious experience, and players perceive them as the center of events or as the driver of change and progress. Game events are closely connected to player action through interactivity. The player has caused the event through their choice and decision based on intentions. Thereby, the player is immediately affected by the event. Overall, interactivity that digital game uses clearly creates a more direct than watching a non-interactive movie, self-related connection between player and game world events. This self-connection holds important implications for game experience and cognitive processing of game content [49].

#### 3) Narrative

Narrative plays an important role in a foremost a prodigious variety of genres as well as digital games [49]. Stories are not only perfect carrier for information but also information storage. Thanks to it, they are deeply embedded in our cultures and personal histories. Contemporary games contain much more complex narrative structures, and specific techniques to combine player interactivity with a coherent narrative framework have revealed.

In narrative-driven games, players explore an ample world with great and small stories connected to one main plot reflecting real and fantasy. Therefore, careful balance of open elements the players can explore interactively and secure the coherence and logical structure of the story. The capacity of digital games to tell reasonable, comprehensive, and interesting stories is, in terms of serious games effects, relevant both to

issues of playing motivation and to processing of game content [49].

#### 4) Social Use

With the growing number of game population, digital games allow them to play together for making global internet connections. An internet-based large-scale computer game is organized within virtual game worlds like massive multiplayer online role-playing games (MMOPPG). Playing together changes the quality of digital games and opens new possibilities for entertainment in both cognitive and motivational dimensions of game impacts. Specifically, online interaction among players and opportunities to create or co-create parts of a game world together hold implications for the appeal and the impact power of serious game applications [49].

#### 5) Specific Situations

Serious games are the specific situation of playing a game that allows to user freedom to fail, experiment, interpretation with digital game use. Game play serves as a bridge between reality and fantasy. Unlike real world, gaming worlds permit player in the illusory experience and sensibility. Illusory, or fantasy can occupy players' minds and facilitate role-play in contexts that would not be feasible, or desirable in real world action. That experience as the specific situations of playing a game allows an individual to enter realms of fantasy and imagination. Consequently, playing digital games is simulated confrontations with unknown, impossible, even immoral behaviors. Furthermore, the observation that digital game players perceive the playing situation as playing a game is helpful for learning[1,48,49]. This experimental, free nature of game play has important implication for serious game effects on perception and behavior change.

#### 6) Feedback

Instant feedback in serious games can improve a player's self-knowledge and his/her involvement [50]. Especially, informational feedback influences the individual's emotions of competence and self-determination when a result enhances motivation. The motivation is important and is sometimes the key determinant of effectiveness for players to make connections with game content. Motivational games can produce powerful identities through emotions and endeavors that players add to the game [4], [50], [53].

### 3.3 Serious Games Design Framework

Serious games have great potential tools for learning promotion and intervention. Due to the fact that some purported evidence on serious games impacts has been proven pedagogy, cognitive, and affective learning outcomes as well as the unique properties of digital games (multi-modality, interactivity, narrative, social use, specific experiences, and feedback). When outline design planning, these factors can help to identify focal points in designing and can improve game users with knowledge, skills and the right attitudes and behavior.

In all likelihood, the serious games are an efficacious way for learning to various areas. The use of digital device (computer game or mobile game) in aspects of teaching

ecology, as a construal level theory particularly, is the effective user centered approach from theoretical perspectives. Because the considerable body of literature establishes that construal levels affect judgments and choices. Also, psychological distance as a decision factor of construal level has found that differences in construal level leads to differences in the ways that individuals make judgments and decisions about psychological distance [47]. The survey implies that individuals' construal levels affect the gaming activity during the execution of game missions. Therefore, building design process, matching effect of construal levels depending on high or low level construal should apply serious games. Last but not least, balance between psychologically distant and pre-post decisional mindset is the question pressing for serious consideration. To give an ennobling experience to game users, informational feedback is also important factor.

On the whole, we presented in the present study multiple factor which is combining with serious games design framework focused on potential outcomes of serious games. Fig. 2 shows essential points that need to be considered in serious game design and development process. This design framework could induce psycho-pedagogy to game users. To put it more concretely, first, pedagogy learning outcomes could match between learning and the required outcomes, and could enhance associative, cognitive, situative learning, thereby better has clear fidelity through rich vicarious experience. Second, affective learning outcomes or emotional effects can give game user a more internal change derivation including self-efficacy, beliefs and attitudes, preferences, dealing with potential threat in addition increase users' interest and effort.

Third, Cognitive learning outcomes could develop technical and motor skills, content understanding, problem solving, decision making, better short-term and long-term memory et al., about game user, thinking the purposes, what kind of knowledge they get. In this respect, the usefulness of construal levels and serious games characteristics will influence the game users that will affect the learning, emotions, cognitions, and their perception and behavior will change for the intended direction with knowledge acquisition ultimately.

## 4. DISCUSSION

Since digital games are highly appealing to toddler and elders, it is natural to use the game format in persuasion, especially when it is otherwise hard to draw attention of this population to topics. The benefit of digital gaming is no longer limited to entertainment. In this context, a new movement of serious games for learning has been proposed to apply digital games for various-related purposes such as learning, new knowledge acquisition, behavior and perception change. Serious games have the potential to alter the lives of many people in fundamental ways. Up to now, thus, plenty of researches have been conducted to evaluate the use of serious games in the educational surroundings [1], [2], [5].

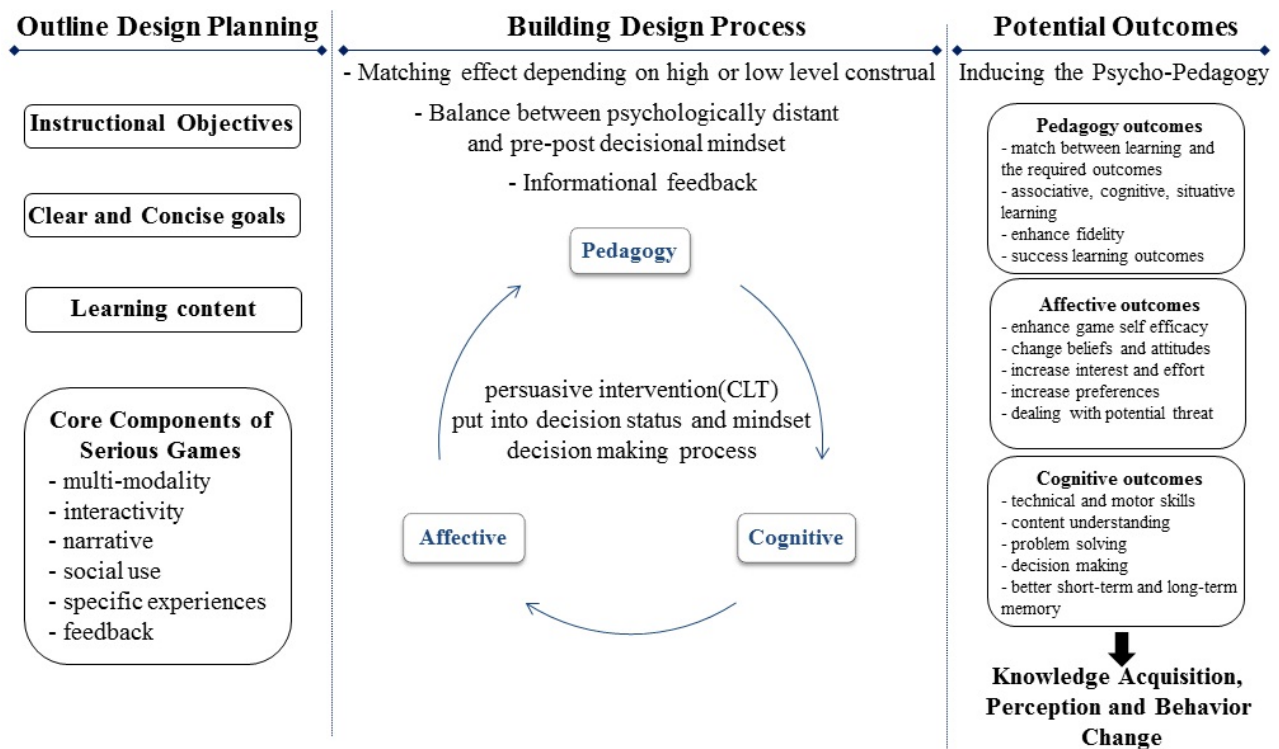


Fig. 2. Serious Games Design Framework via Potential Outcomes

The current study suggests that “Serious Games Design Framework via Potential Outcomes” (see fig. 2.) could apply to serious games development from outline design planning to build design process as prerequisite, which could have the improving effects based on potential outcomes of serious games. Moreover, intervening CLT also highlights the major focal points in serious games designing. Designers need to consider CLT for users, with purposes of their serious games, as the tools of persuasion and learning. And the decision makers in industry ask for the CLT benefits of Serious Games before the establishment within training programs.

In that serious games can be applied to a broad range of application areas which are many sectors and organizations from public policy, military, healthcare, corporate, military, and business to education the world, when considering the potential of serious games to support learning. Serious games are used to supplement existing teaching and learning materials and resources (see [2]). Thus, if game users are using a serious game that is applied to serious games design framework, they will enjoy their learning process, and will learn better and more. This work has a strong practical application, as the tutor method is available and can be applied not only to one specific subject, but to good many others as well.

In the domains of learning, serious games are a better medium for education and intervention when active participation and behavior rehearsal are demanded. Besides, serious games are able to be a better channel to gain attention. For example, teachers are trying to apply serious games for students. Also, doctors or therapists can use serious game-based training programs for patients with both mental and physical problems. Therefore, the serious games design framework (see fig. 2) is to initiate the elaboration and

continuous enhancement of serious games impacts serving both as useful format and as persuasive method. Many different future works can be carried out in our work.

Our review of the serious games used for various-related purposes indicates that CLT interventions to serious games can provide valuable persuasion methods. First, game users should choose or determine their directions whenever they meet new problems or mission. In the selection (or decision) process, if designers consider message matching effects, they may be able to predict user selection effectively and lead the users into the desirable intentional points. Second, regarding decision making process, psychological distances should be employed to maximize persuasion effects. Such design tactics would cause effective results in user perception and behavior. Third, we can also consider different characteristics of users from CLT perspective. High-level construal people are more attracted to abstract messages, as low-level construal people are to concrete cues. For low-level construal users, cues should be in the proximal distance to maximize persuasion effects in games. Concrete goal-settings are much congruent to low-level construal users whereas abstract missions are to high-level construal users.

In the game design progress, serious games providers and researchers can take advantage of the focal factors of the serious games design framework when the particular purpose of an education or intervention design requires behavior change. First, the decision to choose the intervention improves people's self-knowledge of the matter from unawareness of issue to decide to act or acting. Secondly, the serious games design framework could play a key role in bridging the gap between the main purpose of serious games and psychological aspects, activating mental cycle. Thirdly, it will be future collaborative

research and development section to apply the serious games design framework as an intervention in serious games to decision making process. Also, it helps in identifying characteristics for the design of serious games. Useful, well-designed games are to provide users relevant information needed to determine. Hereby, underlying methods and concepts affects both the terms of the mental process and the mind sets.

Another challenge for researchers is to sort out which particular elements or features of the game actually contribute to effectiveness. When designing for persuasion and education, serious game designers and researchers need to work closely with digital game providers. And extensive fields relate researchers to incorporate the theoretical elements and implement game features based on theories in order to maximize the effectiveness of serious games such as physiological psychology, cognitive psychology, social psychology, perception, emotion, personality, organizational behavior, clinical psychology, educational psychology and consumer behavior etc. These elements are combined with further domain-relevant methods and concepts, and they are applied within a broad range of serious game application fields.

The areas of serious games seem to converge on the notion that transcending the present requires and is enabled by the human capacity for abstract mental representation. We hope that the present research on psychological distance, its relationship to level of construal and its consequences for serious games such as pedagogy, cognitive and affective outcomes are helpful to game designers, marketers, and game researchers related to human perception and behavior.

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#### REFERENCES

- [1] E. M. Raybourn, “A new paradigm for serious games: Transmedia learning for more effective training and education,” *Journal of Computational Science*, vol. 5, no.3, 2013, pp. 471-481.
- [2] H. R Lee and E. J Jeong, “Creative Evolution of Digital Leisure Culture, Serious Games,” *Journal of the Korea contents association, The Korea Contents Association*, vol. 13, no. 12, 2013, pp. 48-61.
- [3] M. Zyda, “From visual simulation to virtual reality to games,” *IEEE Computer Society*, vol.38, no. 9, 2005, pp. 25-32.
- [4] J. P. Gee, *What video games have to teach us about learning and literacy*, New York: Palgrave MacMillan, 2003.
- [5] D. Michael and S. Chen, *Serious games: Games that educate, train, and inform*, Course Technology PTR, USA, 2006.
- [6] B. Sawyer and P. Smith, “On Serious Gaming For Life, Serious Games Summit,” *Game Developers Association*, San Francisco, 2008.
- [7] H. Markus and P. Nurius, “Possible selves,” *The American Psychologist*, vol. 41, 1986, pp. 954-969.
- [8] C. Sedikides, T. Wildschut, J. Arndt, and C. Routledge, “Nostalgia: Past, present, and future,” *Current Directions in Psychological Science*, vol. 17, 2008, pp. 304-307.
- [9] Y. Trope and N. Liberman, “Construal-level theory of psychological distance,” *Psychological Review*, vol. 117, no. 2, 2010, pp. 440-463.
- [10] Y. Trope, N. Liberman, and C. Wakslak, “Construal Levels and Psychological Distance: Effects on Representation, Prediction, Evaluation, and Behavior,” *Journal of consumer psychology*, vol. 17, no. 2, 2007, pp. 83-95.
- [11] A. L. Freitas, P. Salovey, and N. Liberman, “Abstract and concrete self-evaluative goals,” *Journal of Personality and Social Psychology*, vol. 80, no. 3, 2001, pp. 410-424.
- [12] K. Fujita, Y. Trope, N. Liberman, and M. Levin-Sagi, “Construal levels and self-control,” *Journal of Personality and Social Psychology*, vol. 90, no. 3, 2006, pp. 351-367.
- [13] F. R. Kardes, M. L. Cronley, and J. Kim, “Construal-level effects on preference stability, preference-behavior correspondence, and the suppression of competing brands,” *Journal of Consumer Psychology*, vol. 16, 2006, pp. 135-144.
- [14] A. L. Freitas, P. Gollwitzer, and Y. Trope, “The influence of abstract and concrete mindsets on anticipating and guiding others’ self-regulatory efforts,” *Journal of Experimental Social Psychology*, vol. 40, 2004, pp. 739-752.
- [15] D. V. Thompson, R. W. Hamilton, and R. T. Rust, “Feature fatigue: when product capabilities become too much of a good thing,” *Journal of Marketing Research*, vol. 42, 2005, pp. 1-24.
- [16] P. M. Gollwitzer, *Mindset theory of action phases*, In P. Van Lange, A. W. Kruglanski and E. Tory Higgins (Eds.), *Handbook of theories of social psychology*, London: Sage, 2011, pp. 526-547.
- [17] H. Kim, A. R. Rao, and A. Y. Lee, “It’s time to vote: the effect of matching message orientation and temporal frame on political persuasion,” *Journal of Consumer Research*, vol. 35, 2009, pp. 877-889.
- [18] S. Nussbaum, N. Liberman, and Y. Trope, Y, “Predicting the near and distant future,” *Journal of Experimental Psychology, General*, vol. 135, 2006, pp. 152-161.
- [19] S. Nussbaum, Y. Trope, and N. Liberman, “Creeping dispositionism: The temporal dynamics of behavior prediction,” *Journal of Personality and Social Psychology*, vol. 84, 2003, pp. 485-497.
- [20] H. Lavine, and M. Snyder, “Cognitive processing and the functional matching effect in persuasion: The mediating role of subjective perceptions of message quality,” *Journal of Experimental Social Psychology*, vol. 32, 1996, pp. 580-604.
- [21] R. E. Petty and D. T. Wegener, “Matching versus mismatching attitude functions: Implications for scrutiny of persuasive messages,” *Personality and Social Psychology Bulletin*, vol. 24, 1998, pp. 227-240.



- [22] S. J. Katz and S. Byrne, "Construal Level Theory of Mobile Persuasion," *Media Psychology*, 2013, vol.16, pp. 245-271.
- [23] K. Fujita and J. J. Carnevale, "Transcending Temptation Through Abstraction : The Role of Construal Level in Self-Control," *Psychological Science*, vol. 21(4), 2012, pp. 248-252.
- [24] R. Garris, R. Ahlers, and J. E. Driskell, "Games, motivation, and learning: A research and practice model," *Simulation and Gaming*, vol. 33, 2002, pp. 441-467.
- [25] H. F. O'Neil, R. Wainess, and E. L. Baker, "Classification of learning outcomes: Evidence from the computer games literature," *The Curriculum Journal*, vol. 16, no. 4, 2005, pp. 455-474.
- [26] P. Wouters, E. D. van der Spek, and H. van Oostendorp, *Current practices in serious game research: A review from a learning outcomes perspective*, In T. M. Connolly, M. Stansfield and L. Boyle (Eds.), *Games-based learning advancements for multisensory human computer interfaces: Techniques and effective practices*, Hershey, PA: IGI Global, 2009, pp. 232-250.
- [27] S. de Freitas and M. Oliver, "How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?," *Computers & Education*, vol. 46, no. 3, 2006, pp. 249-264.
- [28] M. Seeney and H. Routledge, *Drawing circles in the sand: integrating content into serious games*, In: T. Connolly, M. Stansfield, and L. Boyle (eds), *Games-Based Learning Advancements for Multi-Sensory Human Computer Interfaces, Techniques and Effective Practices*, Hershey, London: IGI Global, 2009.
- [29] L. A. Annetta, M. R. Murray, S. G. Laird, S. C. Bohr, and J. C. Park, "Serious Games: Incorporating Video Games in the Classroom," *Educause Quarterly*, vol. 29, no. 3, 2006, pp. 16-22.
- [30] A. D. Baddeley, "The episodic buffer: A new component of working memory?," *Trends in Cognitive Sciences*, vol. 4, no. 11, 2000, pp. 417-423.
- [31] C. Fadel, "Multimodal learning through media: What the research says," White Paper, Cisco, <http://www.cisco.com/web/strategy/docs/education/Multi-modal-Learning-Through-Media.pdf>, 2008.
- [32] A. Mitchell, and C. Savill-Smith, "The Use of Computer and Video Games for Learning: A Review of the Literature," *Learning and Skills Development Agency*, London. <http://www.lsda.org.uk/>, 2004.
- [33] J. Kirriemuir, and C. A. McFarlane, "Literature review in games and learning," White Paper, Future Lab, [http://www.futurelab.org.uk/resources/documents/lit\\_reviews/Games\\_Review.pdf](http://www.futurelab.org.uk/resources/documents/lit_reviews/Games_Review.pdf), 2006.
- [34] S. De Freitas, F. Liarokapis, G. Magoulas, and A. Poulouvasilis, "Developing an evaluation methodology for immersive learning experiences in a virtual world," *Conference in Games and Virtual Worlds for Serious Applications*, 2009.
- [35] S. De Freitas, G. Rebolledo-Mendez, F. Liarokapis, G. Magoulas, and A. Poulouvasilis, "Learning as immersive experiences: using the four dimensional framework for designing and evaluating immersive learning experiences in a virtual world," *British Journal of Educational Technology*, vol. 41, no. 1, 2010, pp. 69-85.
- [36] J. P. V. Staalduinen and S. de Freitas, *A game-based learning framework: Linking game design and learning outcomes*, In: M. S. Khyne (ed.), *Learning to Play: Exploring the Future of Education with Video Games*, Peter Lang, New York, 2011, pp. 29-54.
- [37] R. Gagne, *Conditions of Learning* (3rd ed), New York: Holt, Rinehart & Winston, 1977, pp. 98-112.
- [38] G. Mandler, *Mind and body: Psychology of emotion and stress*, New York: Norton, 1984.
- [39] A. Bandura, "Self-efficacy: toward a unifying theory of behavioral change," *Psychological review*, vol. 84, 1977, p. 191.
- [40] E. Salas and J. A. Cannon-Bowers, "The science of training: A decade of progress," *Annual Review of Psychology*, vol. 52, 2001, pp. 471-499.
- [41] D. Pavlas, K. Heyne, W. Bedwell, E. Lazzara, and E. Salas, "Game-based Learning: The Impact of Flow State and Videogame Self-efficacy," *Proceedings of the human factors and ergonomics society 54th annual meeting*, 2010.
- [42] N. L. Stein and L. J. Levine, *Making sense out of emotion*, in: W. Kessen, A. Ortony, and F. Kraik (Eds), *Memories, thoughts, and emotions: essays in honor of George Mandler* (Hillsdale, NJ, Erlbaum), 1991, pp. 295-322.
- [43] T. M. Connolly, E. Boyle and T. A. Hainey, "survey of students' motivations for playing computer games: a comparative analysis," In *Proceedings of the 1st European conference on games-based learning (ECGBL)*, Paisley, Scotland, 2007, pp. 25-26.
- [44] J. Forster and E. T. Higgins, "How global versus local perception fits regulatory focus," *Psychological Science*, vol. 16, 2005, pp.631-636.
- [45] R. Friedman and J. Förster, *Activation and measurement of motivational states*, In A. Elliott (Ed.), *Handbook of approach and avoidance motivation*, Mahwah, NJ: Lawrence Erlbaum, 2008, pp. 235-246.
- [46] K. O'Brien and D. O'Hare, "Situational awareness ability and cognitive skills training in a complex real-world task," *Ergonomics*, vol. 50, no. 7, 2007, pp.1064-1091.
- [47] Y. Trope and N. Liberman, "Temporal construal and time-dependent changes in preference," *Journal of Personality and Social Psychology*, vol. 79, 2000, pp. 876-889.
- [48] U. Ritterfeld and R. Weber, *Video Games for Entertainment and Education*, In P. Vorderer and J. Bryant (Eds.), *Playing Video Games-Motives, Responses, and Consequences*, Mahwah, NJ: Lawrence Erlbaum, Inc, 2006, pp. 399-413.
- [49] C. Klimmt, *Serious Games and Social Change. Why They (Should) Work, Serious Games: Mechanisms and Effects*, By Ute Ritterfeld et al., Taylor & Francis, 2009, pp. 248-270.
- [50] M. Prensky, *Digital Game-Based Learning*, New York: McGraw Hill, 2001.
- [51] W. Wirth, T. Hartmann, S. Böcking, P. Vorderer, C. Klimmt, H. Schramm, et al, "A process model of the formation of spatial presence experiences," *Media Psychology*, vol. 9, 2007, pp. 493-525.
- [52] D. Hefner, C. Klimmt, and P. Vorderer, "Identification with the player character as determinant of video game

enjoyment,” Lecture Notes in Computer Science, vol. 4740, 2007, pp. 39-49.

- [53] M. Asgari and D. Kaufman, *Motivation, learning, and game design*, E. Richard Ferdig (ed.), Handbook of Research on Effective Electronic Gaming in Education, Information Science Reference, New York. Vol. III, Chapter LXVII, 2008, pp. 1166-1182.
- [54] H. R. Lee and E. J. Jeong, “A Preliminary Study of Serious Game Effect Model: based on Construal-Level Theory”, Journal of Korea Game Society, vol.14, no.4, 2014, pp. 105-120.

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