Ready Player One? A Conceptual Analysis on the Dynamics of Critical Thinking and Meta cognition in Game-Based Language Learning

Nadya Supian, Ratnawati bt Mohd Asraf, Wan Irma Sabrina bt Idris, Hasleena bt Hamzah

Abstract: 21st century learning involves mastering the 4 C's, namely Critical Thinking, Communication, Collaboration, and Creativity. One pedagogical application that potentially capitalises these elements is game-based language learning in Multi-User Virtual Environments (MUVEs), such as massively multiplayer online role-playing games MMORPGs for learning English for Specific Purposes (ESP). This paper presents a conceptual analysis of how critical thinking and meta cognition are represented and interact with each other in game-based learning frameworks. We begin with an overview of game-based learning, a review of critical thinking in game-based language learning, followed by an analysis of the role of meta cognition in game-based language learning. Finally, a discussion on 4 game-based learning frameworks will be presented. By studying the interplay between critical thinking, meta cognition and game-based language learning, we argue for the need to develop a holistic framework that explains how these relate with each other, in order to further develop the pedagogical potential of using game-based language learning.

Keywords: critical thinking, meta cognition, game-based language learning

I. INTRODUCTION

Critical thinking remains *sine qua non* for progressive human capital development, with the World Economic Forum declaring critical thinking as one of the vital 21st century skills vital for navigating in an innovation- economy (New Vision for Education : Unlocking the Potential of Technology, 2015). In an era of job uncertainty resulting from labor market changes due to shifting demands and also automation and digitization of manual labor, workers of tomorrow will have to perform in fast-paced work environments. The skill sets of the future now revolve around problem-solving, persistence, initiative, curiosity and critical thinking (World Economic Forum, 2015), and employees must be capable of analytical thinking, assessing available options, seeking solutions to problems and yet, in an assessment for Adult Competencies, the OECD reported that merely an average of 6% of adults displayed problem-solving ability in technology-based environments (Organisation for Economic Co-operation and Development, 2013).

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In our current interlinked global economy, the need for critical thinking skills and communicative competency transcends not only work boundaries, but cultural boundaries as well.

Unfortunately, not all countries comparable competency in critical thinking. This is a cause for concern for countries that lag behind as a nation's economy and well-being hinges on the capabilities of its future manpower. Thus, efforts have commenced to develop manpower with critical thinking in institutions of higher learning, with the aim of closing the competency gap between developed and developing countries. In institutions of higher learning, L2 courses are specifically designed to develop students' communication skills to meet both academic and industry requirements and are known as English for Specific Purposes (ESP). These courses normally incorporate critical thinking as a core competency of the reading and writing component (Muhammad & Mohd Asraf, 2008). Critical thinking in reading and writing involves higher-order thinking skills such as analyzing, interpreting, inferring, and evaluating and is a vital part of an ESP syllabus. However, due to logistical constraints and fixed learning materials that may not cater for very weak L2 learners, the learning gains attained may not reach the targeted outcomes, resulting in inadequacies of both critical thinking and communication skills; heralding a grim economic future if the new generation of workers are continually unable to compete on a global scale due to inadequate training.

Cognizant of this, the efforts taken to simultaneously increase both students' motivation and avenues for learning language include game-based language learning, both within classroom settings and also outside the classroom (Hamari, Shernoff, Rowe, Coller, Asbell-Clarke, & Edwards, 2016; Harvard University, 2016; University of Washington, 2016). Various policies, such as the Australian government's '*Digital Education Revolution*', Singapore's '*Intelligent Nation 2015*' project and New Zealand's *'Digital Strategy Initiative'* (Thomas, 2012) have been initiated, underscoring the value of incorporating technologies to harness the already existing digital landscape inhabited by today's youth. However, although it believed that game-based learning has the potential to improve critical thinking, there is still a gap in the literature that directly addresses this (Cicchino, 2015).

Despite the hype surrounding game-based learning's potential for developing critical thinking skills, there is still a lack of comprehensive frameworks that capture and explain this process from a *language learning perspective*. This paper uses a conceptual analysis to examine the dynamics between critical thinking and metacognition withincurrent game-based learning frameworks, and argues for the need for the development of an updated framework that adequately captures this multifaceted, fluid process.

Methodology

Conceptual analysis entails the study of scutinising concepts in order to establish greater clarity on the "philosophical issue which the concept is involved" (Beaney, 2009; in Boston-Kemple, 2012, p. 41). A close examination of aconcept can potentially enable further information to be discovered through reinterpretation(Machado& Silva, 2007) and indeed can contribute to critical inquiry. Petocz& Newbery (2010) even go on to state that conceptual analysis is to be considered as the primary method of scientific inquiry. This paper presents a conceptual analysis of how critical thinking and metacognition are represented and interact with each other in game-based learning frameworks. We begin with a overview of game-based learning, a review of critical thinking in game-based language learning, followed by an analysis of the role of metacognition in game-based language learning. Finally, a discussion on 4 game-based learning frameworks will be presented.

II. LITERATURE REVIEW

Game-based learning

Game-based learning refers to any learning environment that combines game content and gameplay for the acquisition of new content and upgrading skills (Qian, 2016) to accomplish specific educational objectives, most frequently through the use of video games (Idris, Hamzah, Ahmad, & Zaki, 2016). It is more than merely *play-to-win*, where the objective of the game is to beat opponents by racking up scores, conquests and/or completion of tasks; but rather *play-and-learn*, where the learner uses the game play as a *means to an end*, rather than the end itself. This can be achieved by establishing an equilibrium between the subject matter to be learned and the elements of the game itself (Plass, Homer, & Kinzer, 2015). Game-based learning incorporates cognitive elements inherent in playing games, such as critical thinking, problem solving and metacognitive strategies of designing and executing various tactics into the learningprocess. Essentially, the students will *learn-through-play* to reach their educational goals.

However, it must be emphasized here that game-based learning is more than just adding a video game to the lesson. The game must fit coherently within the instructional design framework, with clear pedagogical objectives, focused content-related activities and guidelines for assessment. At its most basic level, a game can be used for intervention, enrichment and reinforcement (Guido, 2016), which needs to be determined by the instructor prior to embarking upon game-based learning. Games for intervention, based on principles of adaptive learning technology (eg: adaptive hypermedia, intelligent tutoring systems, computerized adaptive testing, and computer-based pedagogical agents) are to assist struggling learners who have difficulty with content and therefore, must be scalable to address the needs and levels of the learner. Enrichment games, on the other hand, are for learners who have already mastered the basics and are capable of more challenges, so the games would feature content-based challenges presented in different media, where learners would need to use higher levels of to complete the tasks. Games for reinforcement are best suited for consolidating content knowledge through a class activity where learners compete with each other (Guido, 2016) and simultaneously assess their own learning performance. In the earlier stages of game-based learning, educational games played an ancillary, rather than primary pedagogical role, as it had great potential for learning vocabulary (Neville, Shelton, & McInnis, 2009; Wu, & Huang, 2017; Zheng, Young, Wagner, & Brewer, 2009).However, educational games such as these were limited in functionalities and scope, and, while engaging enough to present a different medium for learning content, they lacked the thrill of commercial off-the-shelf games (COTS). Game developers took note of this and soon the designs of massively multiplayer online role-playing games (MMORPGs) started blurring the lines between educational elements and entertainment value, boosting its potential for meaningful learning (Peterson, 2012; Qian, 2016).

MMORPGs are simulations of real worlds, and for gamers or players, these synthetic worlds offer a situated context for experiential learning (Shaffer, Squire, Halverson, & Gee, 2005) that transcends the classroom learning experience. It wasn't long before MMORPGs were tapped for their pedagogical potential on a larger scale, with some games - *Second Life*, *World of Warcraft*, *The Sims*, among others, used in actual formal language learning contexts (Ranalli, 2008; Thorne, 2008), as well as enabling autonomous game-based language learning in informal settings.

Game-based language learning

Game-based language learning is rooted in social constructivism (Vygotsky, 1978; Cicchino, 2015; Hamari et al., 2016, Qian, 2016), as the very nature of the social learning experience in a game environment takes place both within the players' interaction with each other and through the collaborative nature of game play (Wu, Hsiao, Wu, Lin, & Huang, 2012). Ang, Avni & Zaphiris (2008) posit that learning can occur at two distinct levels – player-player and player-game. At player-game level, the player 'interacts with the game' to ultimately improve his or her game play, which relates to both behaviorist and cognitive constructivist learning theories; while at the player-player level the players interact with other players, constructing meaning and knowledge through interactions, in accordance with social constructivist learning theories (2008). When engaged in collaborative play, especially with players with varying degrees of experiences, strategies are designed to solve game world problems, resulting in a deeper understanding of the dynamics of the game narrative, from how small quests can lead to an ultimate triumph.

This understanding has far reaching consequences, as Dickey explains, "the narrative of small quests provides a cognitive framework for problem-solving and fosters meta-cognitive skills while simultaneously supporting intrinsic motivation by providing opportunities for choice, control, collaboration and achievement." (2007, p. 266). Thus, the social collaboration in games offer structural support for critical thinking via problem-solving and application of metacognitive skills.

The learning experience from MMORPGs is also consonant with flow theory (Csikszentmihalyi, 1990) - which describes a state of intense focus and utter absorption - placing gamers in an almost trance-like state as they surmount increasingly complex tasks to attain higher levels. The fact that the concomitant learning taking place is almost at an unconscious level is hardly, if ever, noticed, as indeed the learning process has become part of the gaming experience.

Achieving a state of flow requires firstly that the activity must be sufficiently challenging to require adequate focus, as well as being both active and engaging to keep the gamer intrinsically motivated to continue, known as the challenge-skill dynamic (Hamari et al., 2016). A player achieves flow when his or her abilities are tested to the limit, and the thrill of pursuit often culminates in total immersion and engagement. The activity should also have clear indicators of success, with delineated thresholds of performance that separate the winners from the losers.

Early studies on game-based language learning were focused on supporting and enhancing vocabulary acquisition among ESL/EFL learners (Hui-Chan & Chen, 2012). Incidental and informal vocabulary learning was reported to occur though the use of in-games text (Sylvén and Sundqvist, 2012) and it was also discovered that despite available classroom learning, students who engaged in '*extramural English activities'* were found to have a better vocabulary than those who did not, meaning that students who spent time on leisure activities in the target language had more gains in language proficiency. Yudintseva reported that since gameplay utilises a range of learning strategies, such as language repetitions, figuring out contextual clues, interaction with native speakers and peers, and imagery which enables learners to practice and authentically use second language vocabulary, deeper and more meaningful vocabulary acquisition is attained (2015). The manipulation of linguistic knowledge in "situated meanings" (Gee, 2008, p. 36), which refers to how vocabulary knowledge ismediated and consolidated through use in action and problem-solving contexts in interactional dialogue, results in word meanings that come alive in situated dialogue, image, experience, and action (Gee, 2008).

Online games that present a multi-user virtual environment (MUVE) such as *World of Warcraft, Quest Atlantis, Second Life, The Sims, Sim City* and *Active Life* have been studied for their potential in nurturing language learning (Chen, 2016) and one obvious benefit MUVEs have over traditional classroom learning is that it *extends* the learning space to enable the learner to engage in task-based communication independently. In a study by Chen (2016), it was reported that the game *Second Life* provides emotional support for language learning by reducing, and even removing entirely for some, the learner anxiety that often precludes students from attempting to use the target language in real-life settings. The game itself involves selection of an avatar whereupon the direction of the gameplay is then based entirely upon the player's wishes – buying/renting property, engaging in social connections with members from other locations, attending university and even developing relationships. Communication is enabled via text chat, instant messaging, voice chat and notecards within the game (Hundsberger, 2009).

MMORPGs in real time strategy games incorporate social interactions via multiple synchronous text channels and other platforms within the game, such as a "whisper" channel for private chats, built-in mail-style tools and even voice communication features. Additionally, these virtual environments include *guilds*that offer gaming support and discuss gameplay-related issues, and when the competitive instinct to develop one's skills arise, any effort in gameplay improvements is often supported by engaging with online communities for support, gaming walkthroughs and strategy discussion forums (Chik, 2014). Exchanges in these forums are unrehearsed and unscripted, offering opportunities to practice vocabulary and language structures with native speakers from various backgrounds in online gaming communities. In Thorne's study on World of Warcraft (WoW) in-game chat, social action tasks for gameplay in online role-playing games are mediated in L2 (Thorne, 2008), since online gaming worlds consist of a multilingual community, which can feature communicative functions such as negotiation, repair sequences, explicit corrective feedback, and requests for assistance, all in the target language.

Role-playing strategy games offer rich opportunities for vocabulary development, as the learners take on new characters in adventure games they learn to adjust their tone, word choices and even style (Thorne, Black & Sykes, 2009). Since these games can be played away from the classroom, the incidental learning is done at the learner's own volition, which provides more opportunities for prolonged and immersive engagement in the target language In contrast, the L2 classroom is limited by time, space and opportunity for learners to engage in the learning process, hence having an entertainment activity that also scaffolds L2 learning would be a boon for the students. DeHaan (2005) reported that games engages the learner in using contextual clues throughwritten texts or audio directions with the action in the game. A discourse analysis by Peterson (2012) on intermediate level students who played the MMORPG *Wonderland* revealed that social interactions with native speakers in the online community resulted in positive gains in vocabulary acquisition, with students reporting reduced anxiety and being able to establish good rapport by means of politeness, humor, informal language, and small talk. Ranalli (2008) discovered an increase in vocabulary by 14% among his 9 respondents who played The Sims, while Vahdat & Behbahani (2013) reported that 10 Iranian intermediate ESL students who played *Runaway: A Road Adventure* game for approximately 120 hours outperformed 10 students who had traditional drill-and-practice activities for equivalent hours.

The features of *Runaway*, which emphasises mental images of word meanings was found to facilitate vocabulary acquisition, further lending more evidence on the effectiveness of imagery strategy through games. Since gameplay itself involves steps of identifying scenarios, analyzing possible outcomes and determining tasks to execute, the process of maintaining flow is mediated by critical thinking, which shall be discussed further in the following section.

Critical thinking in game-based language learning

While studies have pointed to how game-based learning has a potentially positive effect on the development of critical thinking, the available literature on this is still developing (Cicchino, 2015, Kiili, 2005; Qian, 2016). The link betweengame-based learning and the cultivation of critical thinking that includes scientific reasoning, systems thinking, computational thinking, decision making and problem solving (Binkley, Erstad, Herman, Raizen, Ripley, & Runmble, 2014) is still being explored. One of the earlier studies was by Malone (1980, 1981), who established the link between playing games and sustaining intrinsic motivation, which positively impacted the thinking process. The link between gaming and critical thinking emerged through the work of Prensky, who posited that digital game-based learning had the potential to incorporate both reflection and critical thinking into both the learning process as well as game elements, yet retain its fun vibe (Prensky, 2001). Critical thinking is necessary to active learning and meta-level thinking, especially in the interpretation of semiotic domains during gaming (Gee, 2003), where learners must interpret meanings from verbal and visual mediums.

There are many definitions of critical thinking but each definition relates to specific contexts and domains (Moon, 2008), where the outcome of the thinking process would determine the structure of the thinking needed. Willingham describes it 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" (Willingham, 2007, p. 8). Halpern, meanwhile views critical thinking as "the use of those cognitive skills or strategies that increase the probability of a desirable outcome" (Halpern, 1998, p. 450). Norris and Ennis (1989) defines critical thinking as "reasonable and reflective thinking that isfocused upon deciding what to believe or do", while Sternberg claims that critical thinking refers to "the mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts" (Sternberg, 1986, p. 3). The APA Delphi study in 1990, defined critical thinking as "a process of reflective judgment which manifests itself in reasoned consideration of evidence, context, methods, standards, and conceptualizations for the purpose of deciding what to believe or what to do" (Facione & Facione, 2013, p. 10). The study identified 6 core critical thinking skills, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation. Facione's study also identified critical thinking *dispositions*, which should work in tandem with critical thinking skills - Truthseeking, Open-mindedness, Analyticity, Systematicity, Confidence in Reasoning, Inquisitiveness, and Maturity of Judgment. Halpern's ideas on disposition can be seen as a continuous series of objectives, consciously interlinked, beginning with establishing a desire to remain focused on the task at hand, devising a plan of execution and remaining committed to seeing it through, and ultimately taking responsibility of monitoring progress, keeping options open and seeking out support should the need ever arise (Halpern, 1998). Dispositions should also complement critical thinking, as it would be futile to merely possess critical thinking skills but lack the disposition to act upon them (Halpern, 1998), especially in the workforce. Thus, in the training of critical thinking skills for real-world applications, it would be imperative to develop not only the thinking skill, but place equal, if not greater emphasis, on the fostering of dispositions to ensure efficacious transferability of both.

The ultimate goal of critical thinking is *transferability* in solving real-life problems and improving situations (Halpern, 1998) guided by sound decision-making (Halpern, 2007), and as such, game-based learning and problem-solving are analogous in that they both require the player "to use cognitive processes to resolve real, cross-disciplinary situations where the solution path is not immediately obvious" (OECD, 2003, p. 156). Games provide situation-based learning environments that compel the player to solve complex problems (Squire, Giovenetto, Devane, & Shree, 2005).

Game-based learning adds a dimension to language learning in that it offers the power and freedom for the learner to navigate "problem-solving spaces" where the language learning is an outcome of the problem-solving inherent in gameplay (Gee, 2007, p. 26). These problem-solving spaces in video games are scaled from easy to difficult; thus simultaneously providing built-in checkpoints for monitoring one's language learning progress. Problems are usually presented in a narrative form, and games start off with a setting that is clearly detailed and described, linking the present state of affairs to a past event, thus providing a contextual foundation for the player in character/avatar selection, among others. The game's objectives are usually explicit, and require commitment from the player to focus on the gameplay as much as possible. When the tasks/problems, which usually start out as relatively easy then progressively upscale in complexity, the learner then must engage in "hypothesizing, probing and reflecting" (Hamari, Shernoff, Rowe, Coller, Asbell-Clarke, & Edwards, 2016, p. 170) on actions/options/strategies in order to remainin the game. Ultimately, the act of analyzing and interpreting choices/options and solving problems/achieving tasks, is mediated by metacognition.

Metacognition

Metacognition, often referred to as self-regulation, is viewed as a vital part of the critical thinking process, (Dwyer, 2014; Facione, 1990; Halpern, 1998, Kuhn, 1999). Metacognition refers to executive control of cognitive processes, and is a crucial element in successful learning.

It involves planning, monitoring and evaluating one's performance, and employing the right strategy for problem-solving as and when the need arises.The metacogni-

tive strategies used during gaming form the basis for problem-solving, and indeed, the game environment takes the monitoring phase to the next level by incorporating features that enhance metacognitive awareness and metacognitive control during self-explanation practice such as a pop-up transition feature that "provides indirect support for metacognitive monitoring of reading comprehension by presenting students with information on the performance that promotes self-reflection"(Snow, McNamara, Jacovina, Allen, Johnson, Perret, & Weston, 2015) According to Kickmeier-Rust, Steiner and Albert (2011), there are four types of in-game interventions which have the potential for improving metacognition, namely player forethought, performance, self-reflection, and affirmation questions (in Baron, Heath, & Amresh, 2016, p. 35).Player forethought involves thinking ahead and envisioning the strategies and moves one is about to make in the game, while performance refers to the metacognitive interventions that compel the learner to keep track of his or her own performance through self-monitoring. Tasks or questions that elicit *self-reflection* of the player's content knowledge in turn leads to *affirmative questions,* where solutions to problems reviewed for confirmation.

However, it must be emphasized here that the learning objectives of game-based learning language should encompass a broader scope. Since 21st century skills dictate that critical thinking should also be reflected in communicative competency, game-based language learning should also include game elements that enable learners to include communicating with awareness of cultural sensitivities, norms of politeness and etiquette. One example of this is *Tactical Iraqi*, a 3-D game platform developed for military training of US Iraq-bound Marines that uses "automated speech recognition, spoken dialogue, animated agents and learner modelling" (Johnson & Wu, 2008, p. 520). Considered to be a successful military language training program that "greatly increased operational capability" in the field (Johnson & Wu, 2008, p. 520), the 3rd Battalion of the 7th US Marine Regiment reported zero combat casualties during its tour of duty, a success that was attributed to the language training program. *Tactical Iraqi* was developed to train not only "what to say, but also how to say it and when to say it", covering Iraqi norms of politeness and etiquette. Language learning took place in immersive 3-D videogames simulating social interactions featuring spoken dialogues and cultural protocols, where the objective of the game is not to "shoot and kill", but to win trust and cooperation from the characters by "correctly speaking to and behaving with animated Iraqi characters" (https://www.isi.edu/news/story/155). This type of game play underscored how communicative competence and transfer of critical thinking can make a difference between life and death in combat situations. Other examples of games which combined role-playing in simulated real-life situations within a training framework include Combat Medic (Virtual Heroes, 2014), where medical students role-play as doctors in a simulated battlefield to save injured patients, while simultaneously learning vocabulary and language structures for these situations (in Casañ-Pitarch, 2018). In Hilton Ultimate Team Play (Virtual Heroes, 2007), hotel frontline staff engage in conversations with virtual customers to improve their customer service skills. These games not only serve to develop the language skills needed by students of ESP, but also heighten the learning experience by throwing them into a simulated work environment which challenges them to use their critical thinking skills to solve problems collaboratively, and communicate their ideas and opinions to their team. Once faced with stumbling blocks, be it in problem solving, or in communication, the learners then would review their game play, and devise ways to re-strategise. Thus, learners would need to continuously engage their metacognitive strategies in order to be able to successfully stay in the game.

Up to this point, we have established that critical thinking and metacognition are vital elements in game-based learning environments. The following section shall discuss the extent to which these elements are accounted for in existing frameworks, and how are they represented.

Frameworks of game-based learning

While there are frameworks that explain how games for learning can facilitate problem-based learning, most of them leverage on using games to increase motivation and enhance the learning experience. One of the earlier frameworks was put forward by Garrison, Anderson and Archer, who proposed the Model of Community of Inquiry (Figure 1), which posits that the learning experience takes place in a social context and thus, requires inter subjective agreement. Comprising of 3 domains, - the cognitive presence, social presence and teaching presence (1999), it was originally designed to explain computer-mediated communication to support learning experiences. Critical thinking was expressed in the cognitive presence domain, which was believed to relate primarily with higher order thinking processes , which itself was based on the Practical Inquiry Model, built upon Dewey's "notion of reflective thought'. The four phases of the Practical Inquiry model are the triggering event, exploration, integration, and resolution. However, studies later found that there were imitations of this model, acknowleged by the authors themselves in a retrospective paper published a decade later (Garrison et al, 2010), which reported that learners were not progressing to more advanced levels of integration and resolution. Thus, critical thinking is present but notions of self-regulation, or metacognition were not present in the model.

Fig. 1 Model of Community of Inquiry (Garrison, Anderson and Archer, 1999)

The Input-Process-Outcome Model (in Figure 2) features a *game cycle* comprising of *user judgements, user behavior* and a *systems* feedback to induce engagement in the gameplay and to ensure that the learner "actively constructs knowledge from experience" (Garris et al., 2002, p. 446). Garris et al (2002) emphasises the importance of *debriefing*, - a review and analysis of in-game events that enables players to draw parallels between game events and real-world applications.

In contrast to the cognitive presence within the Model of Community of Inquiry, The Input-Process-Outcome Model highlights both critical thinking and metacognition, as "learning by doing must be coupled with the opportunity to reflect and abstract relevant information" to effectuate real-world applications (2002, p.455). This is also a nod to the notion of "transfer", which is essential to the application of metacognition that is trained within the game, although the it is stated that having an instructor to guide and scaffold learners is critical to learning success.

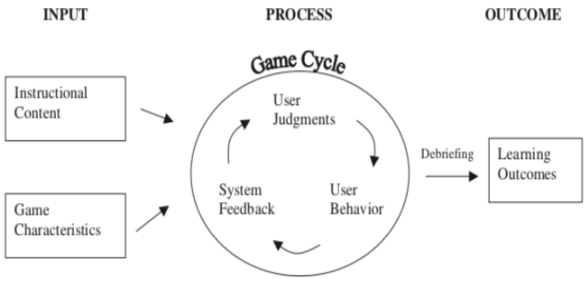

Fig. 2 Input-Process-Outcome Model (Garris, Ahlers & Driskell, 2002)

Meanwhile, Kiili's experiential gaming model (Figure 3), based on both constructivist and pragmatist views on learning, builds upon the flow theory, a critical element to maintaining task engagement and motivation to complete the game (Kiili, 2005).Consisting of an ideation loop, an experience loop and a challenge bank, which serves the as the central point of the model, the main thrust behind Kiili's experiential gaming model is that narrativised challenges, defined by learning objectives, are to be solved using idea generationat both preinvative level and idea level. Preinvative idea generation is freeform and unencumbered by constraints, but at the post-idea generation stage, the player must be more selective in generating effective solutions.

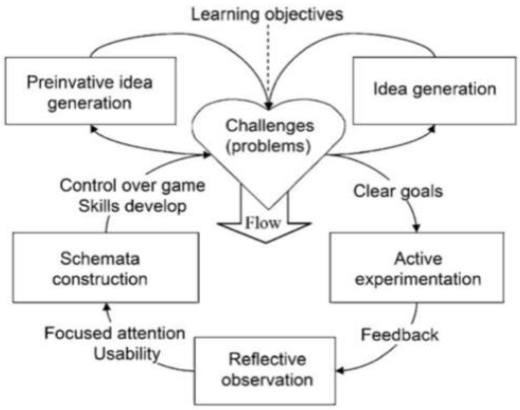

Fig. 3 Experiential Gaming Model (Killi, 2005)

Although the model does not specifically mention critical thinking, it does refer to reflective observation, which can be seen as relating to both critical thinking, that is concerned with knowledge construction through critical reflection, which is a form of metacognition.

Meanwhile, the Educational Games Design Model put forward by Ibrahim & Jaafar (2009) attempted to address critical thinking in its framework, but since their research focused on students' self-learning with integrated self-assessment modules; only addressed the lower levels of thinking in Bloom's Taxonomy, namely knowledge, comprehension and application. The higher order thinking skills, they claimed, were to be developed through problem-solving via content and game design. The nature of the games design mentioned was more general in nature, as it could be adapted to suit the content syllabus. Metacognition is addressed in the self-learning subdomain.

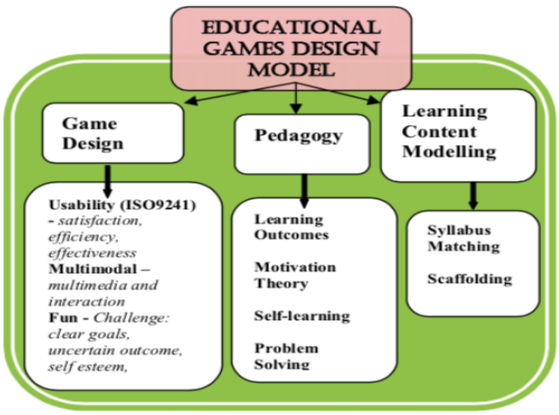

Fig. 4 Educational Games Design Model

These frameworks have attempted to capture the pedagogy of game-based instruction as a tool for engaging learners. All the frameworks mentioned have identified critical thinking as a component, emphasizing its important role in the teaching/learning process,

and metacognition is often implicit and embedded

within the thinking process of game-play. However, as can be seen, all these models refer to pedagogy that is general in nature. Thus, there is still a lack of a framework that addresses critical thinking and metacognition specifically for game-based *languagelearning*.

Conclusion and implications for future research/practice

This paper has presented an overview of game-based language learning, with emphasis on critical thinking and metacognition and how they interact in a gameworld environment. As previously mentioned, critical thinking is represented as a vital component in these frameworks, emphasizing its important role in the teaching/learning process, while metacognition is seen as implicit and embedded within the thinking process of game-play.

There are many games available that develop language in ESP environments, both in universities and training sessions conducted by companies, underscoring the increasing acceptance and popularity of these non-traditional methods of language learning. In role-playing games within a dynamic environment such as MUVEs, critical thinking and metacognition play out differently, if compared to more linear pedagogical platforms, as there are many avenues for feedback in these games,which encourage learners to analyse their errors and develop better strategies, which fosters deeper and more meaningful learning (Gee, 2008). Research has shown that playing games can increase learners' engagement in the learning process, present more adaptive challenges that stimulate not just language learning that is industry-specific, but enhance the use of higher-order thinking skills when solving problems, as well as negotiating with other players on gameplay strategies.

Thus, it is imperative to have a framework that incorporates critical thinking and metacognition in game-based language learning as critical thinking is the cornerstone to the learning process, and metacognition is what both processes and organises critical thinking. The time has come for a new framework to be developed that accurately captures how language learning can be developed through metacognition and criticalthinking in gameplay. The implications of a comprehensive framework are indeed, far-reaching and would potentially contribute significantly to the current knowledge base, as well as expanding the domains of the existing gameworld. Ultimately, the new framework would (1) serve as a guide for language instructors when incorporating games into their lessons, (2) provide an alternative learning platform for language learners with social anxiety issues and/or logistical difficulties, (3) contribute conceptual/theoretical foundations for language researchers when designing future research, and finally, (4) stimulate new ideas for game developers who could design new games specific for language learning in different industries, all of which would be of benefit to learners and workers in developing their skills in the 21st century.

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