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Linking the Educational Principles of Multiplayer Gaming and Play to Common Core Strategies

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Video games may seem an odd place to find Common Core State Standard implementation strategies. A closer look reveals that educational principles found in certain video game genres might help update instructional strategies that no longer engage contemporary learners. These video game strategies can explain why learners will spend hours playing video games without realizing it and spend only the minimum amount of time doing school work. Incorporation of these video game strategies into teacher training and professional development while educators transition to the Common Core State Standards can help prepare teachers for today's new learner and the new curriculum. Analysis of the Common Core State Standards and video game educational principles shows that the opportunity is large and the time for implementation may be now.

Key Words: Video games, common core, educational principles, teaching strategies, play theory, professional development

INTRODUCTION

High-Quality interactive video games can facilitate learning (Connolly, Boyle, MacArthur, Hainey & Boyle, J. M., 2012; Gee, 2005a). These interactive video games are commonly referred to as serious games, multiplayer online games, and role playing games within the gaming community. They require the user to become a character or avatar in a themed setting. Players interact with the game through their avatar using knowledge (experience) they bring to the game, combined with what they learn while interacting in game play to complete the levels or objectives. In game learning includes information from artificial computer generated players and human players. This combination of knowledge

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leads to the ability to solve problems, think creatively, practice until a task or skills are mastered and eventually arrive at a level of success which indicates mastery of the game.

Today's learner has grown up with technologies that allow for the dissemination of information in ways that were not possible in past decades. This has led to learners who experience knowledge differently than learners of the past. For this reason researchers have concluded that multiplayer video games are a good fit for today's learners and contemporary education (Shaffer, Squire, Halverson & Gee, 2005; Shelton & Wiley, 2007; Jong, Shang, Lee & Lee, 2008). Additional authors have suggested that current routines in education are no longer effective ways to make learning interesting, fun and attractive indicating that a change may be in order (Gee, 2005; Jong et al., 2008; Prensky, 2008; Shaffer et al., 2005). If educators could integrate game-like learning principles into their instructional designs learners may be easier to engage and eager to learn (Gee, 2005a). The learning principles found in multiplayer video games are supported by scholarly research (Gee, 2005a).

A good time to introduce new learning principles is when stakeholders acknowledge a need for change or changes are imminent. Presently, a majority of states and school districts around the United States have adopted Common Core State Standards for learning. Transitioning to the Common Core State Standards (CCSS) may present an opportunity for the educational community. CCSS policymakers are hoping to infuse the educational system with new rigor via curriculum standards that are designed to prepare learners for college and the workforce with a uniform set of standards. CCSS are designed to promote higher order thinking skills which are activated by the presentation of deeper content (Mission, Goals, and Benefits, 2011).

To promote the higher order thinking skills needed by today's learner CCSS are designed around six constructs:

1. Focus on a deeper thorough understanding of pertinent content; help learners develop deep understanding of concepts in new situations.
2. Precise complex and challenging content aligned with college and workforce needs; help teachers determine how to select learning materials.
3. A coherent orderly sequence that provides uniform understandable clarity; provide a clear concise template aiding instruction, comprehension and assessment.
4. Development of confident and capable learners; reduce redundancy to expedite learning.
5. Research based curricula aligned to global standards; make clear the progression of content and learning through the use of big ideas.
6. Provide a means for discerning learner progress through verifiable methods.
    a. Increased informational writing in all subjects
    b. Increased use of authentic performance tasks and project-based learning ("Mission, Goals, and Benefits", 2011)

Researchers point to the virtues of multiplayer video games or digital game based learning for education (Gee, 2005b; Guillen-Nieto & Aleson-Carbonell, 2012; Shaffer et al., 2005; Jong et al., 2008). Gee (2005a) suggests that multiplayer video games and massive multiplayer online games (MMOG's) are actually built on many solid educational principles. He identifies 16 educational learning principles that are embedded in a multiplayer video gaming experience. Following is a list of those principles with relevant research for each principle and a discussion of their implications for CCSS. The learning principles are arranged by their connection to the six constructs of CCSS described earlier. This paper will examine the 16 multiplayer game principles suggested by Gee (2005a) and

compare them to the six CCSS constructs with a look at relevant research that identifies the educational benefit of each.

CONSTRUCT ONE

Focus on a deeper thorough understanding of pertinent content; help learners develop deep understanding of concepts in new situations.

IDENTITY

Chess masters indicate that they actually see themselves as participants in a real world where threats, opportunities, vulnerabilities, desires and apprehension abound (Shelton & Wiley, 2007). Multiplayer video games also rely on the players imaginations but allow them to create an avatar which represents them as players in the game. Their avatars can be changed to reflect player preferences for character type, clothing and weaponry. Learners who are given choices are better prepared to make independent learning decisions that can help them acquire more than knowledge en route to becoming a reflective learner (Kay, 2001). The ability to choose an avatar helps players associate themselves with and in the game.

Learners take on a persona during their time in class. If learners can be taught to associate themselves with their learning they can gain a better appreciation for the topic they are studying. Learners who develop a mental picture of what it would be like to be in the scenario being studied may develop a deeper understanding of the topic. When involved at a deeper level the information has meaning for the learner and will be retained longer (Roberts, 2011). Going deeper is one of the priorities of CCSS ("Mission, Goals, and Benefits", 2011).

INTERACTTION

Gamers enjoy the virtual settings of the games they play. When they enter a game they take on the persona of a virtual character and interact with other virtual and artificially created characters. This interaction deepens the players experience and encourages players to enter a flow while playing the game (Csikszentmihalyi, 1996). Once a player enters the flow of the game they lose themselves in the gaming experience and persist to play without even realizing how much effort they are putting into the game.

Learners need to immerse themselves in the topic and become part of the setting. When learners become immersed in the content they are able to understand and impose meaning on their understandings. Contrast this with a surface approach to learning where learners work to earn a passing grade by memorizing facts or applying procedures without reflection (Tracy & Colby, 2007). Learners, who are immersed focus on the interconnections between the many facets of the content, develop opinions or beliefs about the concept and move towards an intrinsic desire to learn (Tracy & Colby, 2007). CCSS aims to create deep learners who are immersed in their learning so that they experience and demonstrate improved understanding. Tracy & Coby (2007) point out that teachers who do not promote deep immersive learning have not received the proper training, means or time to reach the targeted learning highlighting the need for proper teacher preparation.

CONSTRUCT TWO

Precise complex and challenging content aligned with college and workforce needs; help teachers determine how to select learning materials.

EXPLORE, THINK LATERALLY, RETHINK GOALS

Multiplayer gamers often spend large amounts of time redoing levels or on the same level exploring and looking for missed understandings (Hess & Gunter, 2013). Some will even redo a section to see if they can improve their performance thereby gaining game play advantages. In this process players are able to fill in and reinforce what they have already processed. This enhances their overall understanding of and ability to play the game.

Learners need to take time to explore content laterally and not just as a means to get to the next level. This results in new understandings and changes in the perception of the meaning of the instruction. Leaners who are given time to explore will have the time to reflect and produce new knowledge rather than simply repeating what they have been told (Wickersham & McGee, 2008). If instructors want learners to go deeper they need to provide the learner with a degree of control that allows them to make decisions that allow for extended exploration before moving to the next topic (Wikersham & McGee, 2008). CCSS hopes to focus learners on precise complex and challenging content (Mission, Goals, and Benefits, 2011). This will work if the teacher is given the latitude to prepare lessons that allow for extra exploration. This may be difficult as CCSS also implies that instructors are to reduce redundancy and expedite learning ("Mission, Goals, and Benefits", 2011). Teachers must balance the need for latitude with that of curricular progress.

SITUATED MEANINGS

Players can comprehend information (words, ideas) better when they are able to make connections between the information and the real world of actions, images and dialogues. In this way game players develop situated understanding. Game players are situated in the game as an avatar. This virtual experience engages them in the activities of their screen image. They develop and grow as a character in the game because they are able to make connections between what they cause their avatar to do as the game that unfolds around them. The virtual setting that emerges when the players avatar interacts with other players and the details of the game help to situate the player which aids in their understanding of the various game elements they are experiencing.

Learners, in the game, are not passive in their acquisition of knowledge. Instead they construct mental models of the facts being studied and all learning occurs from within the situation at hand (Goel, Johnson, Junglas & Ives, 2010). Goel et al. (2010) state that each learning setting is dependent upon the situation it is found in and this situation guides all understanding related to that setting. In this way learners extract meaning from the situation that surrounds their encounter with the information they are trying to assimilate. CCSS strives to help learners with precise and challenging content which can be accomplished through situated learning ("Mission, Goals, and Benefits", 2011). Allowing learners the opportunity to learn through their insertion into a learning setting can result in greater understanding and retention of knowledge (Kemp, 2010).

CONSTRUCT THREE

A coherent orderly sequence that provides uniform understandable clarity; provide a clear concise template aiding instruction, comprehension and assessment.

CUSTOMIZATION

Multiplayer game players are presented with different difficulty levels and are allowed to self-select content paths of interest to them. Gamers often have choices in the serious

game environment. Players can choose different degrees of difficulty, settings and tasks accomplishments while playing. These choices provide players with opportunities to choose how they will accomplish mastery of the game. Players select paths based upon both personal interests and self-assessed skills and preferences. These chosen paths provide players with unique experiences (Stairs & Burgos, 2010). Gamers will revisit the same level and make different choices simply to discover new information that was not accessible with previous choices.

Learners who are given the opportunity to interact with content will self-select paths which are effective for their progress towards completion (MacDonald, 2012). When learners are allowed to reflect on their learning experience they can make choices which will benefit their progress towards mastery. Structured well prepared curricula provide essential support for the learner through the use of pre-planned options in presentation and practice (MacDonald, 2012; Riggins, 2006). CCSS specifies that well-planned, clear, content progressions can help the learner progress while using improved problem-solving and creative processes to reach their targeted goal ("Mission, Goals, and Benefits", 2011). This can happen when instruction is set up to allow for the personal needs of the learners through carefully inserted customization options.

WELL-ORDERED PROBLEMS

Serious games are crafted by a team of game writers, artists, software specialists and others who storyboard the entire process from beginning to end. It is important for all involved in multiplayer game design to have a complete view of the process. This template is then used to create an environment which is full of opportunities for challenge and exploration. The overarching plan for the game assures that game players will experience a coherent gaming experience which all connects from beginning to end.

Learners benefit from ordered instructional environments that enable rich immersive experiences (Abell, Jung, & Taylor, 2011). Learners benefit from lessons, objectives, and curricula which are well-ordered and allow for progressive discovery. A well designed curriculum proceeds from a transparent process which is designed to assure an organized robust curriculum (Leinster, 2003). CCSS guidelines state that a coherent orderly sequence is needed in curriculum to achieve consistent understandable clarity for all stakeholders ("Mission, Goals, and Benefits", 2011).

"JUST-IN-TIME" AND "ON DEMAND"

While playing a serious game participants are given bits of information as they progress. These pieces of information may take the form of communication between players (real and virtual), audio or script played during gameplay, or visual clues uncovered while exploring. This information usually proves to be important for the task at hand or some imminent future task. Players are motivated to use and retain this information because it presents them with value towards completion of the next part of the game (Bellotti, Berta & De Gloria, 2010).

Learners need to receive information right when it becomes relevant and useful or when they feel or have a need for it and are ready for it so that they are ready to use the information. Information given too soon, out of context, or with no connection to the tasks is not meaningful or relevant. Leaners benefit from the insertion of relevant information in their learning. While investigating to find the solution to a math problem the disclosure of or review of pertinent information can help learners make the connections and arrive at a better understanding. Research shows that piece by piece delivery of information helps learners achieve higher instructional learner efficiency (Kirschner, Merriënboer & Kester,

2006). This is probably due to the allocation of less working memory when the information is not presented simultaneously resulting in a higher level of understanding with a lower level of mental effort (Kirschner et al., 2006). CCSS endeavors to help learners gain insight through a coherent orderly sequence that provides uniform understandable information ("Mission, Goals, and Benefits", 2011). This can be accomplished when teachers provide information to the learner in pieces which they can handle without mental fatigue and when it becomes relevant leading to increased instructional efficiency.

CONSTRUCT FOUR

Development of confident and capable learners; reduce redundancy to expedite learning.

RISK TAKING

Multiplayer video games encourage risk taking. Players enter the game intent on completing the game but with the understanding that they will suffer many defeats along the way. The players feel free to fail in the game repeatedly but continue on knowing that with practice and repetition they will eventually master that level with enough expertise to pass through to the next challenge. Players know that they can fail repeatedly and still continue to play and this helps take on each task from new angles with the hope they will find a new better way to defeat or accomplish a level.

Learners need to be given the opportunity to try and try again by lowering the consequences of failure and encouraging exploration. If learners could approach each new learning challenge with freedom to fail they would learn from their own missteps and grow as learners until they have mastered the material (Riggins, 2006). This learning scaffold enables the learner to make progress towards mastery. Learners who fear the humiliation or poor grades that usually accompany failure may give up (Riggins, 2006). Leaners need to be freed from the fear of failure when they first encounter a subject so that they can build their skills up and reach a point where they are able to master the content and move on to the next level (Newton & Winches, 2014). CCSS calls for learners to become confident and competent learners. This can be done by building in the freedom to explore and by default fail as they explore without severe penalties. In this way learners are freed to use higher level thinking skills and search for creative connections in their learning.

CHALLENGES AND CONSOLIDATION

Gamers appreciate the opportunity to repeat similar experiences. Similar experiences help players relate what they know to what they are learning. Repeating a process helps multiplayer video gamers strengthen their abilities to solve similar tasks and challenges. This solidification of the gamer's growth helps them gain the experience needed for increasingly difficult challenges further into the game. Each player requires differing numbers and intensity of attempts before they are ready to move on. Game play will not advance until lower level players are capable of completing present tasks so that they will be prepared for future tasks while higher level players are able to move more quickly because their native or nurtured abilities are commensurate with the game level.

Learners need to solve challenging problems often so that the solution becomes second nature; a process that gives lower level learners extra practice and higher level learners extra challenges. Learners are encouraged by challenges which are appropriately sequenced. Problems that are presented in a logical sequence allow learners to interact with the solution at levels where their understanding is adequate to progress further. Each

learner has different aptitude, interest and motivational levels (Subramaniam, 2011). Instructors who create a learning environment that provides instruction at appropriately challenging levels can enhance knowledge and skill acquisition in the learner and that repeated practice helps the learner become better at the learning outcomes resulting in a higher degree of confidence as they learn to master the instructional content (Geddes, 2010). CCSS aims to help learners develop into confident and capable learners and an appropriate amount of repeated practice at the correct level of difficulty can help to bolster student success.

PLEASANTLY FRUSTRATING

Game not too hard or too easy they will persevere over long periods of time while trying to overcome the challenge. They may use a variety of tactics and techniques in the quest to prevail. Players will solicit help from other players through in game communication. These contacts along with information gathered from the game itself help players persevere and persist in their gaming experience. In prevailing they link what they have learned in the past with the present challenge and merge this information into a solution which allows them to overcome the challenge.

Likewise, learners who are challenged at just the right level will take what they know and combine it with what they are experiencing, learning and discovering to prevail over the present challenge and move on to the next one. This is accomplished when the student has choices but is guided towards the successful completion of the challenge by a teacher who facilitates the process (Moore, 2002). Learners need to be challenged but not overwhelmed. The task or performance objective must be doable while remaining challenging and the avoidance of impossibility to keep the learner involved in the problem (Willingham, 2014). Properly challenging curricula helps to keep learners motivated while they work to solve engaging problems through increasing their understanding of the instructional topic (Moore, 2002). CCSS refers to this process as the development of capable and confident learners who persevere through tasks and develop independence as learners resulting in the acquisition of original ideas ("Mission, Goals, and Benefits", 2011).

CONSTRUCT FIVE

Research based curricula aligned to global standards; make clear the progression of content and learning through the use of big ideas.

SYSTEM THINKING

In preparation for and while playing a multiplayer video game participants take time to look at the projected outcome or goal of the game. In doing so they develop a view of what they are hoping to accomplish and how they may get there. Maps guide the player and embedded narrative that uses animation audio and backstory help to fill in details that can help direct the player as they clarify their choices during game play. Knowing where they are headed helps players make connections between what they are currently engaged in or have just accomplished and what lies ahead.

Learners need to understand and make connections between what they are learning and the big picture or global nature of that information. Instructors need to find ways to help learners use their previous and present learning to connect with the big picture. Learners need to see how individual topics are related to other larger topics of study (Tepfer & Lieberman, 2012). One of the challenges of CCSS will be the integration of its stated desire

to foster a clear progression of content and learning through the use of big ideas (Mission, Goals, and Benefits, 2011). Previous attempts to enact curricular changes while retaining cross-curricular connections have encountered difficulties (Boyle & Bragg, 2008). Boyle & Bragg (2008) conducted a longitudinal study (1997-2007) in the United Kingdom and found that cross-curricular connections between subjects dropped as a new national curriculum was introduced. On a positive note, they also found that over the decade being studied connections between English and other subjects did increase while math remained as a solitary subject. Boyle & Bragg (2008) also identify the pressure to engage a new curriculum as causal for the loss of global connections in instruction. This indicates a need for policies and procedures that are designed to improve instruction while instilling a sense of calm as opposed to pressure during roll out of the new CCSS.

PERFORMANCE BEFORE COMPETENCE

When gamers engage in a new game most simply dig in and try out the game. Each game is new and while it may bear some resemblance to prior games played it requires a new set of competencies to master. Gamers enter the virtual landscape of a new game or a new game segment while they are still novices. As they progress, the game and those they encounter provide them with information and knowledge which helps them to become more adept at that game (Jong et al., 2008). Eventually these supports are integrated by the player into competencies which allow them to apply what they are learning to increased game success that eventually leads to game mastery.

Conversely, learners are often expected to become competent before they perform a task. This requires the learner to engage new learning without the benefit of being active in the acquisition of the new knowledge. Learners require support so that they can access new knowledge before they can fully comprehend. Instructional design, peer help and instructor support are needed to help the learner master new material. Learners integrate new knowledge and understandings into competencies by applying what they are learning to the task (Robotham, 2004). The learner's ability to use what they learn will affect their overall competence (Robotham, 2004). Engaged competent learners learn to adapt information and knowledge for each learning task (Robotham, 2004). When learners are able to use performance to adjust competencies then they are developing as learners who see a clear progression of the content through their interactions with the curriculum ("Mission, Goals, and Benefits", 2011).

CONSTRUCT SIX

(A) Provide a means for discerning student progress through verifiable methods: Increased informational writing in all subjects.

PRODUCTION

When playing a multiplayer video game there are a variety of opportunities for the player to create and affect the game. This can result in a game which is refined by and for the player and can create strong ties to the game. This aspect of multiplayer video gaming helps to connect the player to an emerging game which they view as being influenced by their play.

Learners are producers, they 'write' as well as 'read'. Only 38 percent of U.S. high school graduates can read at a proficient level. Empirical evidence shows that learners who are taught to write demonstrate improved reading abilities (Graham & Hebert, 2011). Reading comprehension improves when learners writing skills improve. Their reading

fluency and word reading are also improved when their writing skills progress (Graham & Hebert, 2011). CCSS strives to develop confident and capable learners. Reading factual technical text and writing for understanding are keys to the CCSS. When learners are confident and exhibit high self-efficacy then they make progress and so teachers need to work to build student confidence (Casteel, Isom, & Jordan, 2000). If learners are poor readers their confidence in learning tasks is also low. Teaching learners to write benefits them as writers, readers and learners.

(B) Provide a means for discerning student progress through verifiable methods: Increased use of authentic performance tasks and project-based learning

AGENCY

While engaged in a game the players feel that their progress is the result of their choices, skills, knowledge and effort. Players choose to pursue mastery of a level, skill or task because they know they hold the keys to their success. This leads to persistence to play and continued effort until they accomplish their goal through routes they select.

Learners need to take ownership of their progress. When learners are guided to take ownership for their own learning they exhibit a more sophisticated set of abilities and deeper understanding of the content (Abigail & Laurie, 2005; Krotoski, 2010). Problem-solving, critical-thinking and improved communication skills both collaboratively and as a leader are also developed which lead to a higher level of motivation and confidence in the learner (Abigal & Laurie, 2005). Giving learners the opportunity to take charge of their learning is often called project-based learning. CCSS proposes project-based and authentic assessments ("Mission, Goals, and Benefits", 2011). The use of project-based assessments has potential to give learners the choices which can lead to learners who take ownership for their own learning resulting in greater progress.

SMART TOOLS AND DISTRIBUTED KNOWLEDGE

When playing a multiplayer video game real virtual players encounter artificial non-player characters and other real virtual players. These interactions result in the sharing of knowledge. This knowledge is combined with the discovery of information found in smart tools embedded in the game. These tools help the real virtual players expand on their abilities as do the interactions and understandings gained through other player interactions. In this exchange of information and understandings knowledge is distributed throughout the game and amongst the players (Jong et al., 2008).

Learners contribute to each other's learning and use technology and tools to enhance their abilities leading to a distribution of knowledge that is shared by others and technology resulting in corporate strength. Learners experience distributed knowledge while engaged in the learning process. Each learner contains what can be referred to as distributed authentic professionalism (Jong et al., 2008). Distributed authentic professionalism is the shared knowledge and skills of the corporate learning experience (Jong et al., 2008). This knowledge is embodied in the other learners, instructor and resources that are being used in the learning setting. Each person and resource serves to shine light on the investigation being undertaken. CCSS encourages the increased use of authentic performance tasks and project-based learning (Mission, Goals, and Benefits, 2011). These two goals can be achieved when distributed authentic professionals engage a topic together thereby strengthening the understanding of the group (Wendel, Gutjahr, Göbel, & Steinmetz, 2013).

CROSS-FUNCTIONAL TEAMS

Multiplayer online gamers often need to work in teams. The play of one gamer affects the scenario that all the other players experience. This experience is predicated on the abilities and knowledge of the other players. Success in a multiplayer video game is not in the hands of just one player but the artificial intelligence of the game and other players as each informs and affects the results of the entire game (Wendel, Gutjahr, Göbel, & Steinmetz, 2013).

Learners need to master their skills so that they can complement the skills and understanding of those they work with leading to integration and coordination of learning. Learners have an impact of other learners. This impact helps to determine the overall efficacy of the instructional program. Instructors need to be proactive in setting up a learning environment that helps to maximize the potential for learner integration and coordination. When learners are organized into teams they can cooperate and freely share knowledge because the team is seeking to solve the same problem (Ghobadi & D'Ambra, 2012). Conversely, when learners form teams to compete knowledge sharing is impaired because individual learners perceive the sharing of knowledge as counterproductive towards individual gains (Ghobadi & D'Ambra, 2012). Tangible rewards lead to cooperative learning and intangible rewards lead to competitive learning (Ghobadi & D'Ambra, 2012). In using project-based authentic learning those who implement CCSS will need to structure their lessons to allow for a coherent orderly sequence that accounts for the differing tendencies of cooperative and competitive learners (Johnson & Delawsky, 2013; "Mission, Goals, and Benefits", 2011).

SUMMARY AND DISCUSSION

Serious games motivate learners because they engage them in play. Play can be the most effective tool an educator has (Shelton & Wiley, 2007; Jong et al., 2008). When children play they learn naturally as a result of the play experience. Parents do not have to teach children how to experience play since children simply enter into the game and become part of the experience. As children play they receive feedback based upon their actions and the reactions of the game setting which are determined by the formal or informal rules that drive their play (Shelton & Wiley, 2007). Kolb (1984, p.41) defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience". Kolb's experiential learning theory posits that students learn through concrete experience, formulation of a plan, execution of a plan, and evaluation of the outcome. Once a student has cycled through these stages the cycle will start over again. Unfortunately, when play is replaced by work children no longer engage in learning with the same effortless flow resulting in reduced motivation and less overall performance (Csikszentmihalyi, 1996; Shelton & Wiley, 2007). It is important for educators to realize the potential of play and to work towards making learning more like play so that the learners will enter the flow of learning (Csikszentmihalyi, 1996; Jong et al., 2008). Educational principles found in multiplayer video games can help learners enter the flow of learning. Once in the flow the student will engage with the topic at a deeper level leading to more learning with less perceived effort (Csikszentmihalyi, 1996).

Learners who engage in learning as an extension of play will need to be guided by instructors who are skilled at creating clear concise learning experiences that are designed to bring learners to higher order thinking (Mission, Goals, and Benefits, 2011). This is best achieved by providing the learner with curricula that are structured so that they are challenged at a level that promotes enough autonomy to encourage creativity and problem

solving balanced with enough structure so that they are not overwhelmed by the task (Shelton & Wiley, 2007). Learners who are given the opportunity to gain knowledge and skills in this type of environment access new learning more effectively and make deeper more relevant connections more efficiently resulting in increased recall (Shelton & Wiley, 2007).

Often instruction takes place with a 'content fetish' wherein individual subjects are viewed as measureable facts and teaching facts and testing for facts constitutes learning (Gee, 2005b). Knowing something is more about the action of experiencing the facts in real-world settings and in realistic ways as they come to life than being told about and then tested on those facts (Gee, 2005b). These dreary facts come to life when they are embedded in the learners learning as activities and experiences which become easier to remember, conceptualize and assimilate for future learning (Getting Serious, 2011; Shaffer et al., 2005). If CCSS are to be successful those who implement and monitor them will need to work to make them relevant and meaningful for learners. CCSS does emphasize authentic assessment (Mission, Goals, and Benefits, 2011) and authentic assessments work well with serious game principles (Hall et al., 2013) (see table one). The use of multiplayer video game based educational principles can help to structure instruction so that authentic instructional techniques are used for curricular development.

Table 1. Summary of CCSS Constructs, Serious Game Educative Principles and Relevant Research

CCSS Construct	Serious Games Educative Principle	Relevant Research
Construct One: Focus on a deeper thorough understanding of pertinent content; help learners develop deep understanding of concepts in new situations.	**Identity:** Learner association with the learning outcome.	Kay, 2001; Roberts, 2011
	Interaction: Learner immersed in content and derives meaning from relevant interaction.	Csikszentmihalyi, 1996; Tracy & Colby, 2007
Construct Two: Precise complex and challenging content aligned with college and workforce needs; help teachers determine how to select learning materials.	**Explore, Think Laterally, Rethink Goals:** Learner explores content laterally to extend understanding.	Hess & Gunter, 2013; Wikersham & McGee, 2008
	Situated Meanings: Learner develops understanding through the setting and situation connected to the content.	Goel, Johnson, Junglas & Ives, 2010; Kemp, 2010
Construct Three: A coherent orderly sequence that provides uniform understandable clarity; provide a clear	**Customization:** Learner self-selects from paths provided to aid in their understanding of content.	MacDonald, 2012; Stairs & Burgos, 2010

concise template aiding instruction, comprehension and assessment.	**Well-Ordered Problems:** Learner benefits from pre-planned ordered instruction, lessons and curricula	Abell, Jung, & Taylor, 2011; Leinster, 2003
	"Just-in-Time" and "On Demand": Learner benefits from information when it is needed or useful.	Bellotti, Berta & De Gloria, 2010; Kirschner, Merriënboer & Kester, 2006
Construct Four: Development of confident and capable learners; reduce redundancy to expedite learning	**Risk Taking:** Learner needs freedom to fail and learn from their choices and explorations.	Newton & Winches, 2014; Riggins, 2006
	Challenges and Consolidation: Learner is motivated by successfully applying what they know to new challenges	Geddes, 2010; Subramaniam, 2011
	Pleasantly Frustrating: Learners need to be challenged but not overwhelmed	Moore, 2002; Willingham, 2014
Construct Five: Research based curricula aligned to global standards; make clear the progression of content and learning through the use of big ideas.	**System Thinking:** Learner has a view of the big picture and understands how individual pieces fit together.	Boyle & Bragg, 2008; Tepfer & Lieberman, 2012
	Performance before Competence: Learner needs time to develop the competencies and skills required to perform task.	Jong et al., 2008; Robotham, 2004
Construct Six a: Provide a means for discerning student progress through verifiable methods: Increased informational writing in all subjects	**Production:** Learners who produce by writing have a positive effect on their own reading and learning.	Casteel, Isom, & Jordan, 2000; Graham & Hebert, 2011

Constructr Six b: Provide a means for discerning student progress through verifiable methods: Increased use of authentic performance tasks and project-based learning	**Agency:** Leaner takes ownership of their progress and develops a more sophisticated set of abilities and deeper understanding of the content.	Abigail & Laurie, 2005; Krotoski, 2010
	Smart Tools and Distributed Knowledge: Learner shares knowledge and uses technology and tools to enhance their abilities.	Jong et al., 2008; Wendel, Gutjahr, Göbel, & Steinmetz, 2013
	Cross-Functional Teams: Learner benefits from cooperative teamwork wherein all members use their skills to accomplish a common goal.	Ghobadi & D'Ambra, 2012; Johnson & Delawsky, 2013; Wendel, Gutjahr, Göbel, & Steinmetz, 2013

Teacher training and professional growth are essential (Gee, 2005b). Teachers need to guide instruction using effective instructional techniques just as they have done in the past (Lemov, 2010). Learners who are turned loose to engage curriculum without proper guidance will not succeed any more than learners who are stymied by the restrictive teacher driven curriculums of the past (Gee, 2005b). Instructors must use their understandings of the subject and teaching techniques to guide learners towards the connections in their learning that create a deeper understanding of the curriculum (Gee, 2005b; Lemov, 2010). The key to successful instruction is in providing just enough information but not enough to preclude learners from arriving at their own understanding of the topic. Educational principles taken from multiplayer video gaming can provide a template for understanding how to provide the correct amount of information without preventing individual learning or stifling learner autonomy thereby inhibiting their flow as learners. Ongoing relevant meaningful professional training is needed to prepare teachers for CCSS implementation.

Instructors continuously learn to improve their craft through the experiences, knowledge and skill they bring with them and develop along the way (Slepkov, 2008). Unfortunately, some teachers who are flooded by a myriad of tasks and decisions in their classroom do not make adjustments to their instructional techniques (Little, 1993). These daily tasks overwhelm teachers with the urgency of the classroom making it difficult for them to make progress on their own learning goals (Little, 1993). This results in stunted professional growth and instructional practices that lack quality and flexibility as new research emerges. To overcome these problem teachers need to be guided towards reflections of their own teaching.

In the United States of America the state of California has for over a decade required all new teachers to move through an induction program to clear their credential. During this process mentor teachers meet with the beginning teacher to develop a practice of self-reflective teaching. This type of teaching is called formative assessment. In formative assessment the mentor teacher uses standards to help the beginning teacher see the big picture and as a frame for their conversations (Stansbury, n.d.). Mentor teachers use objective evidence collected from the beginning teacher's classroom instruction to help anchor discussions about effectiveness in the teachers' actual practice. This leads to a comparison of practice to performance criteria called descriptions of practice (Stansbury,

n.d.). This comparison allows the beginning teacher to identify areas of need which can then be targeted for improvement leading to improved instruction and student success. Reflecting on their own process of teaching leads educators to a better understanding of what is working and what needs adjustment (Slepkov, 2008). This system works well because learners gain more from real-life settings than simulations and general knowledge acquisition (Slepkov. 2008). Researchers have called this type of formative assessment 'authentic' professional development (Dickenson, McBride, Lamb-Milligan & Nichols, 2003; Harris & Grandgenett, 2002). Authentic professional development is characterized as learning that is focused on the teacher's classroom (Slepkov, 2008). This type of teacher support is evident in many of the top performing countries in the world (Barbour & Mourshed, 2007).

The ultimate goal of CCSS is to create better prepared learners capable of succeeding in college and the workforce (Common Core, 2010). Multi-player video games are imbued with educational principles that can help to engage todays' learners in ways older industrial age teaching methods cannot (Gee, 2005a). As many states and districts restructure their curriculum to CCSS there is an opportunity to infuse new contemporary teaching strategies into the educational system in the United States. These strategies acknowledge the changing nature of the learner. These changes are the result of innovations and changes in technology and the way the world interacts, works and plays. Educational systems that are able to capture the interest of today's new learner can do so with a blend of multiplayer video game strategies that illuminate the way learners become learners capable of more than 'knowing' but also of having experienced and interacted with the facts in ways that make them authentic learners who have internalized those facts. This can result in a better prepared student population and move learners towards increased opportunities as undergraduate learners and productive workers. Well-constructed instructional plans, like well-constructed multiplayer video games can move learners from barely cognizant learners capable of taking a test to engaged learners capable of taking their learning to an authentic level wherein they can apply what they have experienced in meaningful ways (Shaffer et al., 2005). To move learners to this level of efficacy teachers need to be prepared and trained to work in today's new educational reality.

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