Collaborative Learning via Simulations and Games

Jay Baker

Vanderbilt University

Abstract

Collaborative learning and simulations and games have been studied extensively for their utility in educational settings. An amalgamation of the two, however—collaborative learning *via* simulations and games (CLSG)—has not been researched substantially. Collaborative learning and simulations and games for learning are grounded in sociocultural/situated learning theory; knowledge is co-constructed by learners with each other and with the tools of their context. Learners engaged in a CLSG environment are afforded opportunities to enhance 21st century skills, teamwork skills, and a variety of content-specific skills and knowledge. CLSG contexts include a range of possibilities, from massively multiplayer online role-playing games, to team building sites, to simulated medical emergencies. Such contexts encourage inquiry, risk-taking, creative-problem solving, and student construction of knowledge. CLSG curricula should encourage instructors to take on a role of facilitator, rather than enacting direct instruction. Assessments of CLSG are not traditional paper-and-pencil tests. Rather, learners can be assessed through demonstrating potential for future learning, through choice-based assessments, through assessment inherent in simulations and games, and through practicing reflection. Implications of CLSG for my career in education include implementing aspects of CLSG into teaching high school equivalency classes to adult learners, as well as training other adult education teachers and developing adult education curriculum. In general, CLSG affords educators a motivating and engaging tool to enact in diverse ways in a myriad of learning environments to teach a variety of possible skills. Unfortunately, the benefits of CLSG have been largely unrealized in traditional school settings. As technological advancement continues, CLSG may take on a larger role in schools, which could help bring about higher quality learning for students.

Introduction

The purpose of this paper is to review the literature around collaborative learning via simulations and games (CLSG), and to discuss the relevant implications for educational settings. This includes exploring the implications of CLSG for learners, learning contexts, curriculum, and assessment, and how those implications may impact different learning environments. While not a completely new concept, the possibilities for CLSG have grown tremendously in recent years with the ever-expanding capabilities of technology (Whitton & Hollins, 2008). Thus, I attempt to address the question: *What can collaborative simulations and games afford the world of education?*

First, I provide a brief review of the literature regarding collaborative learning, sociocultural/situated learning, and simulations and games for learning. This leads to a grounding of the rationale for the present paper—an in-depth look at the synthesis of collaborative learning and simulations and games. I explore what opportunities for learning are afforded to learners through CLSG. Next, I discuss the possibilities for different kinds of contexts that may successfully utilize CLSG (both in and out of schools). Then, I explore possible curriculum and instructional design strategies that can inform those who would enact CLSG. Next, I describe the nature of assessment as it relates to CLSG (including potential for future learning, choice-based assessment, inherent assessment, and reflection). Finally, I discuss implications for my own work in education as well as the work of education practitioners generally.

Collaborative Learning

The classic proverb, “two heads are better than one,” is often understood in various problem solving and learning settings. Indeed, humans are socially interdependent creatures, and

have worked collaboratively from their ancient beginnings (Johnson & Johnson, 2009). What is more recent, however, is the advent of designing purposeful collaborative learning experiences in educational settings. Johnson and Johnson (2009) describe how collaborative, or "cooperative" learning has become one of the most widely used modes of teaching and learning:

> From being discounted and ignored, cooperative learning has steadily progressed to being one of the dominant instructional practices throughout the world. Cooperative learning is now utilized in schools and universities throughout most of the world in every subject area and from preschool through graduate school and adult training programs. Its use so pervades education that, almost anywhere in the world, it is difficult to find a textbook on instructional methods, teachers' journals, or instructional materials that does not discuss cooperative learning. (pp. 365-66)

Research has plainly shown the effectiveness of collaborative learning environments. According to Johnson and Johnson (2009), "The application of social interdependence theory to education has become one of the most successful and widespread applications of social and educational psychology to practice" (p. 365).

What aspects of collaborative learning make it so successful? Before exploring this, it is necessary to have a succinct definition of collaboration. I borrow a definition from Roschelle and Teasley (1995): "Collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" (p. 70). This "shared conception of a problem" is at the crux of collaborative learning. When people have a shared conception, they can engage in meaningful discourse and joint activities that will allow them to more successfully navigate and solve problems. This social activity is fundamental to learning. Roschelle & Teasley's research explores the process of collaborative learning—that is,

what happens during collaborative learning the makes it successful. As they describe it, "Collaborative work between peers provides a particularly rich environment for studying learning. The social situation maintains student motivation and naturally elicits verbal communication. Furthermore, several prominent theorists have argued that learning is fundamentally a social activity" (p. 69)

The natural elicitation of verbal communication is a key reason for the success of collaborative learning. "Studies of children's collaborations have found that successful collaboration involves a large degree of mutual engagement, joint decision making, and discussion" (Roschelle & Teasley, 1995, p. 70). These discursive practices are fundamental to constructing knowledge and ensuring that meaningful learning takes place.

> The most important resource for collaboration is talk. Collaborators use the overall turn-taking structure of talk, as well as specific discourse forms such as narration, questions, socially-distributed productions, and repairs in service of their mutual understanding. These discourse forms allowed the students to produce shared knowledge, to recognize divergent understandings, and to rectify problems that impeded joint work. (Roschelle & Teasley, 1995, pp. 94-95)

Indeed, as learners engage in collaborative discourse, they may also become more fluent in the epistemic discourses and practices of different disciplines. Sengupta, Krishnan, & Wright (2014) describe the utility of collaborative inquiry in math and science:

> Research suggests that collaboration can indeed enhance science and math learning through the creation of productive opportunities for shared inquiry and discourse…. Another effect of collaboration was the shared development of mathematical measures

> within each group, which in turn fostered mathematical and physics-related discourse and representational practices. (pp. 5, 9)

Meaningful collaboration means meaningful discourse. Collaborative learning environments should foster opportunities for such discourse and inquiry to take place between learners in order for them to create knowledge and to solve problems. This kind of learning is also grounded in sociocultural/situated learning theory, which I turn to next.

Sociocultural/Situated Learning

Sociocultural, or situated learning theory posits that one cannot separate what is learned from the environment in which it is learned. That is, knowledge does not simply exist in the minds of individuals, but it is fundamentally connected to the context and culture of the learner (Brown, Collins, & Duguid, 1989). Thus, learning should be more of a cultural, experiential process, rather than one of overt instruction (Gee, 2004). With situated learning, "learners work in a 'smart' environment filled with tools and technologies, and artifacts store knowledge and skills they can draw on when they do not personally have such knowledge and skills" (Gee, 2004, p.13). I add that a "smart" environment includes other learners of varying skill and knowledge levels, and that learning is a collaborative process among such a community (Lave & Wenger, 1991). These tools, technologies, and people interact as a system of learning. As stated by Hung (2002),

> The situated cognition perspective as advocated does not deal primarily with the relationship between entities as distinct, instead, it considers the system—context, persons, culture, language, intersubjectivity—as a whole coexisting and jointly defining the construction of meanings. The whole is not composed as separate entities but is a

> confluence of inseparable factors that depend on one another for their very definition and meaning. (p. 396)

Unfortunately, in many learning environments today, learning and instruction simply involves "practicing skills outside any contexts in which they are used by people who are adept at those skills" (Gee, 2004, p.13). Simulations and games can offer engaging contexts in which learners can have authentic learning experiences that are similar to real-world contexts, thus providing a more robust learning environment that aligns with situated theory. Next, I explore more deeply the possibilities of simulations and games for learning.

Simulations and Games for Learning

Simulations and games have become increasingly popular in recent years, both as a form of commercial entertainment and in educational settings. Many game designers, researchers, and educators continually strive to leverage the powerful learning tools that simulations and games provide (Gee, 2003; Barab, Gresalfi, & Ingram-Goble, 2010). Utilizing the contextual and conceptual affordances of simulations and games in teaching is much different from, and arguably more effective than, using traditional teaching practices. According to Clark, Nelson, Sengupta, and D'Angelo (2009),

> Traditional approaches, with their focus on explicit formalized knowledge structures, seldom connect to or build upon people's tacit intuitive understandings. Well-designed digital games and simulations, however, are exceptionally successful at helping learners build accurate intuitive understandings of the concepts and processes embedded in the games due to the situated and enacted nature of good game play…. Games and simulations hold the potential to support people in integrating people's tacit spontaneous

> concepts with instructed concepts, thus preparing people for future learning through a flexible and powerful conceptual foundation of conceptual understanding and skills. (pp. 3-4)

The contextualization of good simulations and games not only allows for a better conceptual understanding of content, but it also prepares learners for future opportunities to make connections and to learn in real-world settings.

Along with content understanding, simulations and games afford learners rich opportunities for developing multiliteracies and engaging in discursive practices, collaboration, and identity work (Gee, 2003; Salen, 2007; Barab et al., 2010). Simulations and games "require an attitude oriented toward risk taking, meaning creation, nonlinear navigation, problem solving, and understanding of rule structures, and an acknowledgment of agency within that structure" (Salen, 2007, p. 9). Such learning opportunities help students to achieve valuable 21st century skills. Barab et al. (2010) claim that "the power of these technologies reflects not industrial-age efficiency but twenty-first-century opportunity: They provide entire worlds designed to help learners adopt roles and engage story lines previously inaccessible to them" (p. 525). Simulations and games "initiate students into practices, literacies and cultures central to the information age" (Squire, 2005, p. 34).

Another benefit of simulations and games is that they can "be started, stopped, examined, and restarted under new conditions in ways that are sometimes impossible in real situations allowing learners to explore the mechanisms underlying scientific phenomena that they experience in everyday lives…as well as phenomena otherwise inaccessible in their everyday life" (Clark et al., 2009, p. 6). Simulations and games also provide a safe setting in which to

practice and assess certain skills, thus providing increased understanding and confidence (Owen & Ward-Smith, 2014).

It is becoming increasingly clear that the productive use of simulations and games will be a vital aspect of educational settings in the future. As simulations and games become increasingly pervasive, it will be crucial for designers, researchers, and teachers to leverage the most crucial aspects of good games (Squire, 2005; Gee, 2003). One of those crucial aspects is collaboration, to which I now turn for examination—collaborative learning via simulations and games (CLSG). In the sections that follow, I examine the implications of CLSG for learners, learning contexts, curriculum and instruction, and assessment.

CLSG and the Learner

I hope to have made clear by this point that collaboration and simulations and games are vital and effective tools for learning and instruction for today's learners. The purpose of this paper, as stated previously, is to explore the largely untapped possibilities of a fusion of these modes—that is, collaborative learning *via* simulations and games (CLSG). What opportunities can CLSG afford to learners, and what is the learners' role in that learning?

CLSG has much to offer to learners of all varieties. Learners can be budding leaders in an organization, teams from a business, school children, or people seeking recreation; CLSG can be adapted to all demographics. CLSG allows learners to interact to build team skills as well as 21st century skills, content-specific skills, and discursive skills.

The role of learners in CLSG is to co-construct knowledge with their fellow learners. This is a quite different from the traditional, "banking" model of education as suggested by Freire (2009). Rather than learners being passive, empty vessels in need of knowledge deposits,

learners are active constructors of knowledge, engaged together in exploring and inquiring into concepts and problems collaboratively.

CLSG positions learners in contexts that allow and encourage them to engage in creative problem solving, discursive practices, and authentic knowledge construction. The fact that these practices occur in an alternate reality allows learners to engage at an even deeper level of learning. Shapira-Lishchinsky (2013) provides a robust description of why CLSG can be essential for learners:

> Team simulations are simplified versions of reality. They capture the essential dynamics of a workplace through roleplaying in a way that allows learners to explore different approaches, test diverse strategies, experience various outcomes, and altogether build a better understanding of key aspects of the real world…. Learning takes place not only during the role-playing stage of [team-based simulations], but also during the investigative stage, when the role-playing is discussed. During the investigative stage, a process of cooperative learning occurs as participants conduct in-depth discussions of the problem at hand and consider a range of possible solutions before reaching a decision. (p. 3)

Learners are also offered the possibilities for meaningful reflection and chances to re-try aspects of the simulation or game in different ways. This iterative, reflection-in-action learning is inherent in many good games and simulations, and is essential to good learning (Salen, 2007).

Lin, Duh, Li, Wang, and Tsai (2013) provide another example of CLSG, as illustrated with a physics simulation. The participants of the study worked in small groups with an augmented reality simulation to help them learn the concept of elastic collision. Lin et al. explain that these learners showed more robust knowledge construction and enhanced learning outcomes.

Whitton and Hollins (2008) offer research on how collaborative video games can function as effective tools for adult learners. They conclude,

> Online gaming communities provide a…platform for collaboration and the ability to learn with others. For example, studies of leisure users of massively multi-user online role-playing games (MMORPGs) have found evidence of collaborative learning, development of communities of practice…as well as the potential for learning a range of group skills, including the etiquette of meeting people, group management, co-operation and social interaction. (p. 223)

Many other studies have shown similar results—CLSG provides quality learning opportunities to learners, and a myriad of content-specific skills and knowledge can be gained through CLSG. Examples include the content areas of science, technology, engineering and math (STEM) (Sengupta et al., 2014); clinical nursing (Owen & Ward-Smith, 2014); leadership development (Hill & Semler, 2001); emergency response for medical students (Fitch, 2007); and medical science and clinical practice for medical students (Heitz, Brown, Johnson, & Fitch, 2009).

One of the primary ways in which learners can benefit from CLSG is through gaining teamwork skills. Many organizations today rely on teams working together to accomplish goals (Tannenbaum, Mathieu, Salas, & Cohen, 2012; Honts, Prewett, Rahael, & Grossenbacher, 2012). Indeed, according to Tannenbaum et al. (2012), "Teams have become so ubiquitous that many employees, and managers, take them for granted and assume they will be effective" (p. 3). With the ever-changing roles and increasing ubiquity of teams in the workplace, it is important to ensure that opportunities for team building and analysis occur (Tannenbaum et al., 2012; Honts et al., 2012). Such team building and analysis can be effectively fostered through CLSG, and

many disciplines and institutions have capitalized on this, be it business (Ritchie, Fornaciari, Drew, & Marlin, 2013), medicine (Fitch, 2007; Heitz et al., 2009), or public school (Shapira-Lishchinsky, 2013). Through CLSG, learners can gain vital 21st century teamwork skills such as communication, cooperation, coordination, interpersonal skills, empathy/perspective taking, trust, service orientation, conflict resolution, and negotiation (Ito, Gutiérrez, Livingstone, Penuel, Rhodes, Salen, … & Watkins, 2013; Gee, 2013; Barab et al., 2010).

CLSG has much to offer to learners of all varieties. Learners can be budding leaders in an organization, teams from a business, school children, or a group of people seeking recreation; CLSG can be adapted to all demographics. CLSG allows learners to interact to build team skills as well as 21st century skills, content-specific skills, and discursive skills.

CLSG and the Context

One of the main affordances of CLSG is that simulations and games can provide learning contexts that mirror real-world situations. Learning in this way is seen as most effective, according to situated learning theories (Gee, 2004; Hung, 2002; Brown et al, 1989). The contexts, or learning environments, that may utilize CLSG are numerous. Massively multiplayer online role-playing games (MMORPGs—such as *World of Warcraft*), team-building sites (especially pertaining to corporate team development), and simulated emergencies in medical schools seem to be among the most prevalent.

What is important about CLSG contexts in general, though, is that they offer such variety of learning opportunities and content to a multiplicity of diverse learners.

The context where the benefits of CLSG go largely unrealized, however, is the traditional school setting. Schools would do well to adopt CLSG into their learning environments, not only

because of the possible content that can be learned, but because CLSG prepares learners to engage in real-life social and work settings. Gee (2003), in describing the benefits of MMORPGs for learning, offers further explanation:

> When players play in massive multiplayer games, they often collaborate in teams, each using a different, but overlapping, set of skills, and share knowledge, skills, and values with others both inside the game and on various Internet sites. In the process, they create distributed and dispersed knowledge within a community in ways that would please any contemporary high-tech, cross-functional-team-centered workplace…. In this respect, games may be better sites for preparing workers for modern workplaces than traditional schools. (p. 3)

Unfortunately, traditional learning contexts continue to rely on traditional teaching methods. True, there are examples of teachers in schools who implement CLSG, as has been shown previously. However, in general, schools primarily rely on instructional practices that position the teacher as the expert and the students as empty vessels to be filled with abstract facts and formulas (Freire, 2009).

A CLSG context, however, puts learners in charge of their own learning. It allows for a diversity of backgrounds, skills, knowledge, opinions and ideas to infiltrate and affect the activity as learners co-construct their experiences through playing or simulating together. The CLSG environment ideally provides "an equitable experience for all users…. It should allow for personalization and customization and provide equal opportunities for all students to participate" (Whitton & Hollins, 2008, p. 225).

CLSG creates contexts in which it is okay—even encouraged—to question, to take risks, and to fail—attributes rarely seen in traditional school contexts. Next, I explore possibilities for

more fully adopting CLSG practices into traditional schools, and key principles that curriculum designers and instructors should consider in this adoption.

CLSG and Curriculum/Instruction

CLSG can offer learners a myriad of learning opportunities in a variety of different contexts. How, then, can curriculum designers and instructors create curriculum and instruction that effectively and meaningfully utilizes CLSG? This is the main question left unanswered, particularly as it relates to schools. CLSG is largely unrealized in schools. Students may have occasional field trips or activities that are specifically intended to be CLSG, and sometimes students are given access to computer games or tabletop games that have aspects of CLSG. However, such opportunities come rarely, and the curriculum and instruction behind them is not often given careful thought.

Occasionally throwing students in front of computer games or tabletop games, hoping that collaboration and effective learning will happen, is not effective. CLSG needs to be intentionally and carefully implemented. As mentioned previously, the main contexts for CLSG seem to not include schools and traditional school curricula (e.g., math, science, literacy, etc.). Since CLSG flourishes in other settings (such as training for emergencies or doing team building activities to achieve 21st century skills), it makes sense to take what is effective from those settings and adopt it more into traditional learning environments.

Paramount to CLSG curriculum design is situated learning. The designer must keep in mind that the power of CLSG is rooted in the context. Learners will most effectively transfer what they have learned to new situations that closely mirror the contexts where the learning occurred (Hung, 2002; Shapira-Lishchinsky, 2013). Thus, the simulations and games designed

should have many aspects of real-world situations and contexts. With this principle at the fore, CLSG could be infused into all kinds of curricula: math, science, social studies, literacy, medicine, business, language learning, leadership, and 21st century skills.

One learning method that can greatly inform CLSG curriculum designers and instructors is problem-based learning. The key principle of problem-based learning is that students work together to construct knowledge and solve real-world problems (Hung, 2002). They engage in critical inquiry and constructive dialogue, seeking to creatively and authentically achieve their goals. This is much the same as the principles of CLSG, perhaps with the exception of solving real-world problems. But again, this is the potential power of CLSG—it allows learners to engage with problems or have experiences that are not necessarily available in their everyday lives (Clark et al., 2009). Yet the skills and knowledge learned can still effectively transfer to real-world settings, and that knowledge is better retained (Shapira-Lishchinsky, 2013).

CLSG curriculum designers must ensure that learners are in control of their learning. Students must be allowed to question, to try out ideas, to fail, and to try again. Students must be encouraged to work as teams, collaboratively discussing plans and objectives and reflecting together on successes and failures. Indeed, success should only be made possible when all learners are working together as a cohesive unit. As a succinct summary, Whitton and Hollins (2008) offers the following criteria for a CLSG environment:

> The environment should support active learning by encouraging exploration, problem solving, and enquiry, providing opportunities to test ideas and gain feedback, practice and consolidation. Opportunities for collaboration should also be provided and, as much as possible, game goals should align with learning outcomes. (p. 225)

Rather than teaching with direct instruction, instructors who teach CLSG curriculum

generally should retain a role of facilitator and guide to the learners—what Brown et al. (1989) refer to as "cognitive apprenticeship." The instructor should scaffold the learning, offering suggestions and aid as needed, but never telling students exactly what to do or how to think. The instructor should let students form their own understandings and conclusions. However, CLSG does offer versatility in instructional approaches. "Collaborative virtual gaming environments can support a variety of pedagogic approaches and can be applied, for example, as both constructivist learning environments and as didactic instructional tools" (Whitton & Hollins, 2008, p. 222).

The instructor can also play a critical role in helping students have meaningful discussions and to facilitate reflection. In this way, the instructor helps students to assess their learning and to prepare to "effectively handle similar challenges in the future" (Shapira-Lishchinsky, 2013, p. 4). This leads us now to a discussion of CLSG and assessment.

CLSG and Assessment

A key aspect of any robust curriculum is the inclusion of meaningful assessments (Wiggins & McTighe, 2011). What do assessments look like in a CLSG context? There are several major components of CLSG assessments that I will address: (1) preparation for future learning (PFL), (2) choice-based assessment, (3) inherent assessment, and (4) reflection.

Preparation for Future Learning

Assessments of learning typically focus on "static stores of skills and information that may not be meaningful in terms of the course of development" (Gee, 2008, p. 104). Such assessments typically are built around sequestered problem solving and direct application

questions (Bransford & Schwartz, 1999). This, unfortunately, is a very narrow way to assess real learning. Bransford and Schwartz (1999) offer another approach:

> An alternative… is a view that acknowledges the validity of these [typical] perspectives but also broadens the conception of transfer by including an emphasis on people's "preparation for future learning" (PFL). Here the focus shifts to assessments of people's abilities to learn in knowledge-rich environments… The ideal assessment from a PFL perspective is to directly explore people's abilities to learn new information and relate their learning to previous experiences. (pp. 68-69)

Simulations and games offers learners a chance to experience "environments that provide opportunities for new learning" (Bransford & Schwartz, 1999, p. 88), thus demonstrating how well they can use skills and knowledge in new situations. This is very much related to choice-based assessments, which I describe next.

Choice-based Assessment

Games and simulations are ideal contexts for what Schwartz and Arena (2013) refer to as "choice-based assessments." Traditional paper-and-pencil tests are designed to see what factual information students "know," or can properly recall at test time. Choice-based assessments, however, focus more on how students *think.* The focus is not so much on what students have memorized, but on how students make choices to successfully solve problems.

Simulations and games can do this effectively, because new and unforeseen problems and circumstances can continually be introduced to the learners, thus allowing for assessment of how the learners react and make choices. This not only allows learners to demonstrate their content

knowledge to a degree, but also shows how learners will grapple with similar situations when they arise in future, potentially real-world settings.

Inherent Assessment

One major advantage of simulations and games as learning tools is that assessment is inherent in them; the learners/instructor can get a sense of the level of learning and understanding of content by virtue of the degree of progression being accomplished. If learners are failing to accomplish the content-specific objectives of the game or simulation, then that demonstrates to the learners/instructor that something is not working or being understood correctly. In like manner, if learners are progressing and succeeding at their goals, then learning is happening to some degree. For example, if success in a simulated medical emergency can only be attained by group members carrying out tasks and collaborating in specific ways, then a successful "round" of simulation indicates that learners performed their tasks and collaborated appropriately.

Video games, in particular, are often created in such a way that the players can only achieve successive levels of difficulty in the game if the prior levels have been successfully mastered to a certain degree (Gee, 2003). For example, in a collaborative game that requires players to work together to explore scientific principles, the players would not progress through the game if, for instance, one player tried to do the exploring only as a solo effort, or if the players applied scientific principles incorrectly. In order to advance to new content and greater difficulty, the players must coordinate efforts and demonstrate a correct understanding of the content to be learned. No formal tests are needed in such cases. Rather than regurgitating

memorized facts on written tests, learners demonstrate what they know through their playing and simulating.

Reflection

Reflection can be an effective, if not crucial aspect of assessment. Reflection allows learners to exercise metacognition, exploring what it is that they have learned, what it is they still don't understand, and how their new knowledge or skills may or may not apply in other situations. According to Whitton and Hollins (2008), "Activities such as debriefing and structured reflection are essential to ensure appropriate mastery of specified learning outcomes, and these activities can be structured outside the virtual world" (p. 224). CLSG allows for intensive, exciting learning and action, with a chance for formal reflection after the simulation or game has come to an end.

There is particular power in group reflection, which would be an inherent part of assessment in a CLSG environment. Shapira-Lishchinsky (2013), in her simulation work with teachers, states that "the fact that [teachers] worked in teams enabled them to reflect on different perspectives, in contrast to a school context where they usually had to make decisions in stressful situations" (p. 6).

Groups can also engage in reflective writing in order to assess their learning and to hypothesize about future implications of their learning. Wills & Clerkin (2009) discuss how incorporating reflective practice into team simulations has given students in business courses a competitive advantage:

> We believe our teams gain their distinct advantage when competing against other university teams because we incorporate these reflective exercises throughout the

> semester during the in-class competition. Team reflective writing requires students to think beyond the game or even the classroom; team members must reflect on the past and project these deliberations into future decisions. As a team, students examine tacit assumptions about their team performance, not only verbally in extracurricular team discussions but also in written two-page reports. (p. 224-25)

Such reflection, whether through discussion or writing, can help teams of learners to engage in ways that produce different ideas, questions, conclusions, and hypotheses about the future. In sum, this allows the group to assess their performance as a whole.

Discussion/Implications

I turn now to a discussion of what the possibilities of CLSG imply for my own practice going forward as an educator, as well as educational settings more broadly. That is, I attempt to connect the theory with potential practice.

My current career trajectory is in adult education, teaching high school equivalency classes to learners who seek a diploma in order to further their educational and career opportunities, as well as for purposes of self-efficacy. A position that I may hold in the near future will also include me training and developing other teachers as well as developing curriculum.

Many principles from CLSG can inform my teaching, my training, and my curriculum development going forward. The content that I teach is specifically focused on math (pre-algebra, algebra, and geometry) and reading/writing skills. As I teach my students, I can attempt to incorporate collaborative games or simulations where the students must work together to solve a complex math problem, or perhaps to write a collective narrative or persuasive essay. After

such experiences, I could engage the students in group reflection. As I train and develop teachers, I can use team-based simulations to help teachers prepare for all kinds of scenarios, much like the work of Shapira-Lishchinsky (2013). As I develop curriculum, I can insert opportunities and suggestions for CLSG, encouraging the instructor to help facilitate group reflections as a form of assessment.

A simple example of how I am already incorporating elements of CLSG in my classroom is through the inclusion of recurring practice test opportunities. When I began teaching, no such practice was being implemented—the students had very few opportunities to experience real test-like conditions, even though the major emphasis of the program is to prepare students to take the high school equivalency test. After discussing the idea with my students and getting their agreement, I started issuing timed, mini practice tests that had questions very similar to what students would see on their actual high school equivalency test—a simulation of sorts. Many students have indicated that this practice has helped them tremendously. Admittedly, there is little collaboration involved in these test simulations, but going forward, perhaps I could implement group discussion of the test questions (after the test is over) in order to facilitate collaborative dialogue around the problems.

In general, implementing CLSG into learning settings can create greater engagement and fun experiences among learners. Gee (2004), in discussing how video games may effectively teach literacy and words, contends that " people learn new ways with words, in or out of school, only when they find the worlds to which these words apply compelling" (p. 3). This is true not juts for "words," but all kinds of subjects and content. People only learn effectively if they find the applicable worlds compelling. Collaborative simulations and games can offer ways to make a myriad of subjects compelling.

Certainly, CLSG is not without its drawbacks—I do not contend that it is a panacea for education. As Roschelle and Teasley (1995) state, "collaborative learning is not homogeneous or predictable, and does not necessarily occur simply by putting two students together" (p. 94). A disadvantage of simulations "is that real-world situations can differ greatly from laboratory-based settings in terms of the intensity of personal involvement in the decision making process and the complexity of determinants and outcomes" (Shapira-Lishchinsky, 2013, p. 4). Video games may not teach traditional school material as effectively as traditional school instructional practices (Squire, 2005). However, collaborative simulations and games may provide, if nothing else, a motivating and engaging way to help people learn.

> Motivation is the most important factor that drives learning. When motivation dies, learning dies and playing stops…. Since good games are highly motivating to a great many people, we can learn from them how motivation is created and sustained…. In a sense, all learning involves playing a character. In a science classroom, learning works best if students think, act, and value like scientists. Games [and simulations] can show us how to get people to invest in new identities or roles, which can, in turn, become powerful motivators for new and deep learning in classrooms and workplaces. (Gee, 2003, p. 3)

As digital media continues to take on an increasingly important role in learning environments, so too does the need increase for research around collaborative games (and simulations) for learning. Currently, there are few studies that specifically address collaborative learning via simulations and games, though the studies that have been done have produced promising results. However, much more research can be done, especially around CLSG in traditional school settings. As the affordances of CLSG become more widely realized and

implemented, educational settings may see vast improvements in quality of learning and level of learner engagement.

References

Barab, S. A., Gresalfi, M., & Ingram-Goble, A. (2010). Transformational Play: Using Games to Position Person, Content, and Context. *Educational Researcher*, *39*(7), 525-536.

Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with multiple implications. Review of research in education, 61-100.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational researcher, 18(1), 32-42.

Clark, D., Nelson, B., Sengupta, P., & D'Angelo, C. (2009, October). Rethinking science learning through digital games and simulations: Genres, examples, and evidence. In Learning science: Computer games, simulations, and education workshop sponsored by the National Academy of Sciences, Washington, DC.

Fitch, M. T. (2007). Using high-fidelity emergency simulation with large groups of preclinical medical students in a basic science course. Medical teacher,29(2-3), 261-263.

Freire, P. (1970/2009). Pedagogy of the oppressed. New York, NY: Continuum.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. Computers in Entertainment (CIE), 1(1), 20-20.

Gee, J. P. (2004). Situated language and learning: A critique of traditional schooling. Psychology Press.

Gee, J. P. (2008). A sociocultural perspective on opportunity to learn.Assessment, equity, and opportunity to learn, 76-108.

Heitz, C., Brown, A., Johnson, J. E., & Fitch, M. T. (2009). Large group high-fidelity simulation enhances medical student learning. Medical teacher, 31(5), e206-e210.

Hill, C. C., & Semler, S. W. (2001). Simulation enhanced learning: case studies in leadership development. Personnel Decisions International, available at: www. personneldecisions. com/learning/pdfs/Simulation-Enhanced% 20Learning_10. pdf.

Honts, C., Prewett, M., Rahael, J., & Grossenbacher, M. (2012). The importance of team processes for different team types. Team Performance Management, 18(5/6), 312-327.

Hung, D. (2002). Situated cognition and problem-based learning: Implications for learning and instruction with technology. Journal of Interactive Learning Research, 13(4), 393-414.

Ito, M., Gutiérrez, K., Livingstone, S., Penuel, B., Rhodes, J., Salen, K., ... & Watkins, S. C. (2013). Connected learning: An agenda for research and design. Digital Media and Learning Research Hub.

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. Educational researcher, 38(5), 365-379.

Lave, J., Wenger, E. (1991). Situated Learning: Legitimate Peripheral Participation. Cambridge University Press, Cambridge, UK.

Lin, T., Duh, H., Li, N., Wang, H., & Tsai, C. (2013). An investigation of learners' collaborative knowledge construction performances and behavior patterns in an augmented reality simulation system. Computers & Education, 68314-321.

Owen, A., & Ward-Smith, P. (2014). Collaborative Learning in Nursing Simulation: Near-Peer Teaching Using Standardized Patients. Journal Of Nursing Education, 53(3), 170-173.

Ritchie, W. J., Fornaciari, C. J., Drew, S. A., & Marlin, D. (2013). Team Culture and Business Strategy Simulation Performance. Journal of Management Education, 37(5), 601-622.

Roschelle, J., & Teasley, S. D. (1995, January). The construction of shared knowledge in collaborative problem solving. In Computer supported collaborative learning (pp. 69-97). Springer Berlin Heidelberg.

Salen, K. (2007). Toward an ecology of gaming. The ecology of games: Connecting youth, games, and learning, 1-17.

Schwartz, D. L., & Arena, D. (2013). Measuring what Matters Most: Choice-based Assessments for the Digital Age. MIT Press.

Sengupta, P., Krishnan, G., & Wright, M. (2014). Integrated STEM in Elementary Grades Using Distributed Agent-based Computation. arXiv preprint arXiv:1402.7252.

Shapira-Lishchinsky, O. (2013). Team-based simulations: Learning ethical conduct in teacher trainee programs. Teaching & Teacher Education, 331-12.

Squire, K., Giovanetto, L., & Devane, B. (2005). From Users to Designers: Building a Self-Organizing Game-Based Learning Environment. Techtrends: Linking Research & Practice To Improve Learning, 49(5), 34-74.

Tannenbaum, S. I., Mathieu, J. E., Salas, E., & Cohen, D. (2012). Teams are changing: are research and practice evolving fast enough?. Industrial and Organizational Psychology, 5(1), 2-24.

Whitton, N., & Hollins, P. (2008). Collaborative virtual gaming worlds in higher education. Research in learning technology, 16(3).

Wiggins, G., & McTighe, J. (2011). The understanding by design guide to creating high-quality units. Alexandria, VA: Association for Supervision and Curriculum Development.

Wills, K. V., & Clerkin, T. A. (2009). Incorporating Reflective Practice into Team Simulation Projects for Improved Learning Outcomes. Business Communication Quarterly, 72(2), 221-227.