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Virtual Enterprise Simulation Game as an Environment for Collaborative Creativity and Learning

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Introduction

Learning and creativity are essential resources that enable companies to develop new innovations (Sunley et al., 2019). Further, they enable employees to invent new ideas (such as new products and services),

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explore more efficient ways of collaborating, and find new ways of increasing customer satisfaction (DeFilippi et al., 2007; Jeong & Shin, 2019). These new ideas can emerge in everyday working situations, such as when an employee renews a shop's decorations, helps a bank customer to invest in the stock market, or repairs software in a hospital. These individual processes can be supported by allowing employees to work in teams, enabling them to share knowledge, skills, and expertise (Gallavan & Kottler, 2012; Sawyer, 2012). Learning how to provide support is a key part of effective human resources management and commonly included in leadership training curricula of business schools.

It is generally accepted that both creativity and learning can be enhanced through collaboration (Hämäläinen & Vähäsantanen, 2011; Paulus & Nijstad, 2003; Resnick & Robinson, 2017). We understand the concept of *collaborative creativity* as generating novel and useful outputs from the shared processes and activities of team members, which ensures the output benefits a broader community than the team members themselves (Craft, 2008). Similarly, we see *collaborative learning* as a combination of shared learning processes, such as knowledge building among team members (Khanlari et al., 2017), and shared learning activities, such as the negotiation of shared meanings (Pea, 1993 as cited in Hämäläinen & Vähäsantanen, 2011). In collaborative learning, team members interact with each other through shared learning processes and activities to achieve their joint goals together (Dillenbourg, 1999). Moreover, seeing the value of others as a resource is a prerequisite for collaborative interaction (Arvaja, 2012), which cannot be achieved by splitting the work and solving separate sub-tasks individually (Dillenbourg, 1999, p. 8). Therefore, collaborative learning can be educationally valuable by appropriating different voices, such as 'hearing' each other's

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point of view without rejecting one's own or other's differing voices (Arvaja & Hämäläinen, 2021).

Using digital tools to foster both collaborative creativity and learning has become a topic of interest recently. These tools offer conditions that can help employees generate new ideas and implement them in practice (Oldham & Silva, 2015). In computer-supported collaborative learning (CSCL), digital tools mediate, facilitate, and foster interaction among participants (Ludvigsen & Steier, 2019; Stahl et al., 2014). Thus, besides seeing the team members as resources for each other, digital tools may also provide learning resources (Jeong & Hmelo-Silver, 2010) that foster the generation of novel ideas in CSCL (Lämsä, 2020). This chapter contributes to the on-going discussion with the aim of providing empirical and practice-based examples of fostering collaborative learning and creativity using a special type of simulation software—RealGame (Lainema, 2003).

RealGame is a virtual business game that simulates the supply chain and operations of a manufacturing company. In this environment, teams of participants compete against each other in a shared simulated market. We derive empirical examples from a case where undergraduate business students from seven different countries participated in the simulation game. These students represent future business leaders, studying topics such as management and professional communication based on up-to-date knowledge. Hence, they are the ones whose task will be to consider how teams are led in continuously digitizing work environment. To conduct research on this topic, we asked the students to write reflective essays about their RealGame experiences and analyzed how collaborative creativity and learning manifested in the students' essays.

We begin with a theoretical discussion regarding the similarities and differences of collaborative creativity and learning, then consider these concepts in relation to RealGame. We describe the case and the analytical procedures, then present the illustrative examples. Finally, we summarize the aspects of how RealGame fostered collaborative learning and creativity and discuss possible future research.

RealGame as an Environment for Fostering Collaborative Learning and Creativity

We understand that collaborative learning and creativity overlap, as both can result in significant outputs through complex collaborations (Sawyer & DeZutter, 2009). In their review Hämäläinen and Vähäsantanen have defined that creativity (novel, useful ideas and outcomes using imagination on a spectrum of collaborative and individual activity Craft, 2008) is very close to constructivist approach to learning. Additionally, both creativity and collaborative learning are culturally shared and interactive processes. Furthermore, both involve novelty, but in a different way. The *difference between the concepts relates to the novelty and usefulness of a process or output for the surrounding community and/or the group itself.* Namely, learning refers 'new for learner(s)'; creativity means 'new also for the domain' (see also Moran, 2010). Thus, even though researchers have illustrated correspondence between creativity and collaborative learning (Eteläpelto & Lahti, 2008), we still have to consider them as separate entities. A practical difference between collaborative learning and creativity is associated with the usefulness of an output for the participants themselves or the broader community. Conceptually, creativity entails the generation of novel, useful ideas, and outcomes using imagination on a spectrum of individual and collaborative activity that exceeds collaborative learning (Craft, 2008). In turn, this refers to the construction of assimilating knowledge together based on each other's ideas and thoughts (Arvaja, 2007). This means a process or output is novel to the surrounding community, not only to the participants.

The question of how collaborative creativity and learning could be fostered with digital tools is a current and appealing subject (Ludvigsen & Steier, 2019; Stahl et al., 2014). In the workplace, digital tools can support idea generation and implementation in three ways (Oldham & Silva, 2015): First, employees gain access and exposure to new and diverse information, such as by reading blog posts from other experts, communicating in professional discussion forums, or exposing ideas and products to various audiences. Second, digital tools can improve work engagement by increasing autonomy and interactions with and feedback from other employees. Moreover, employees can use mobile

devices to work remotely while still receiving collegial support through group chat services (such as WhatsApp). Third, employees can receive socioemotional or instrumental support from others. For example, they can interact with colleagues to receive informal support in addition to encouragement and feedback related to new ideas.

We position RealGame as a special kind of digital tool that combines the characteristics of games and simulations (for simulation games, see Sanina et al., 2020). It is a rule-based system where participants manage their simulated company and interact as a team with computer-generated supply and customer markets. Moreover, it illustrates realistic situations for accomplishing various tasks by providing users with control over decision-making functions and by omitting irrelevant or unimportant variables (Lehtinen, 2017). RealGame simulates the management of a manufacturing company, providing a goal-oriented enactment of real-world processes and a shared space for collaboratively creating, sharing, and advancing knowledge (Stahl & Hakkarainen, 2020, p. 11). It also enables iterative experimentation that would otherwise be costly, risky, or even impossible (Sterman, 2011). Thus, it is particularly suitable for fostering the effective learning of complex and dynamic supply chain management-related topics. Further, by being an environment where failures are safe and acceptable, RealGame can stimulate risk-taking propensity, divergent thinking, and flexible mental ability (Bourgeois-Bougrine et al., 2020).

In RealGame, teams manage the supply chain of their virtual manufacturing company while attempting to streamline its operations and profitability. Companies operate in common simulated markets and compete for the same resources and customers. Further, teams purchase raw materials from suppliers, manufacture products as efficiently as possible, and sell their end products to customers. Because the objective is to run the company as profitably and efficiently as possible, key indicators (such as sales revenues, margins, and profitability) are provided that can be analyzed both during and after the simulation.

Unlike traditional business simulation games, RealGame is conducted in real-time and is clock-driven. Decisions need to be made continuously and in synchronous collaboration among the team. Inventory

management is a simple example of the need for continuous decision-making because manufacturing processes consume raw materials as the simulation clock advances. If the participants do not order raw materials sufficiently in advance (considering possible delivery delays), the company will run out of raw materials and the production process will stop. RealGame includes similar time-dependent decisions in the areas of procurement, production scheduling and shift management, customer deliveries, sales offers, product development, and cash flow management. The context is very dynamic, with different functional decisions affecting other functions and delays in cause-effects. Further, the cause-effect may be indirect, meaning decisions can affect other areas via a third area. Due to this complexity, it is difficult to consider every aspect of managing the company and make decisions simultaneously; hence, effective team collaboration is a crucial aspect of RealGame.

In many respects, RealGame represents an authentic, collaborative, digital working environment. Participants can be located anywhere and compete via the Internet. In our case session, all the participants were in geographically disparate locations and it was ensured that no team members knew each other prior to the session. Team members shared the same user interface (see Fig. 8.1), which was used for real-time decision-making and operations. Teams could capitalize on *computer-mediated communication* (Tuhkala & Kärkkäinen, 2018) by utilizing digital tools for scheduling and project management (such as Doodle, Word, and Excel) and by negotiating decisions using synchronous and asynchronous text- and voice-based solutions (such as email, Whatsapp, Teams, and Skype).

In RealGame, specific organizational roles for participants are not scripted or pre-scaffolded (Heinonen et al., 2020; Kobbe et al., 2007). Instead, teams are allowed to organize space and starting points for spontaneous collaboration (Stahl, 2010). Hence, we propose that RealGame provides an immersive, safe environment for collaboratively exploring the dynamics of communication and decision-making. Next, we describe how we conducted our study to exemplify and provide evidence on this topic.

Fig. 8.1 RealGame user interface

Method

The research objective was to examine *how collaborative creativity and learning manifest in virtual enterprise simulation game environment?* For this purpose, we arranged an experiment where international business school students participated in RealGame session and then wrote reflective essays about their experiences. Before conducting the experiment, we informed the students about the study and asked for consent to use their essays as research material.

The international RealGame session consisted of 18 teams of 10–13 participants. The participants were undergraduate students in business studies and came from 10 universities in 7 countries (Belgium, China, Estonia, New Zealand, the United States, Austria, and Finland). The gaming sessions lasted for a total of 14 hours, requiring the teams to work in shifts (which was practical given the geographical dispersion of the participants). Further, it was suggested that each team had at least three team members online at any given time.

After the game, the participants submitted their reflective essays. It was requested that the essay would consider topics such as feelings and expectations toward the simulation experience, teamwork and organizing for collaboration, potential conflicts, threats and critical incidents during the team collaboration, collaboration in the virtual context, and challenges experienced during the virtual collaboration. All together, we received 177 essays, amounting to 477 pages.

We employed qualitative content analysis approach (Patton, 2015) in an inductive manner for data of student's reflective essays. The iterative and progressive analysis process consist of several rounds of reading entire data set and proceeding through three main stages: preparation, organization, and reporting (Elo & Kyngäs, 2008). First, in the preparation phase, two researchers combined the reflective essays into batches including all writings of each team. Then researchers read through actively and repeatedly the entire text, 477 pages, while highlighting relevant extracts in the light of research question. In focusing our attention exclusively aim of the study and research question, the unit of meaning selected and defined to be a whole statement. Each unit of meaning was then targeting to capture students' descriptions of collaborative learning

and creativity. In the organization phase, relevant extracts were coded, categories created, and abstraction were made. Finally, representative data samples were selected and discussed in light of the research literature and integrated into the research report through a detailed analysis of the outcomes.

Collaborative Creativity and Learning in the Participants' RealGame Experiences

Students found that RealGame was an authentic experience that involved them managing a realistic supply chain of a manufacturing company in teams. Student teams worked in a simulated business context where they were required to make decisions collaboratively. These decisions were related to managing the supply chain of their (simulated) company, including purchasing, manufacturing, marketing, deliveries, and invoicing.

Smooth collaboration and communication were particularly appreciated by the teams. There was a consensus among the students that effective collaboration was required for generating useful ideas and for managing the business processes in the game. Moreover, the students found that considering a variety of different aspects was key to a successful decision-making process. The following data extract illustrates how students made business decisions in joint collaboration (Eteläpelto & Lahti, 2008) and elaborated on the appropriateness of their decisions (Craft, 2008) by expressing different perspectives, taking into account alternative understandings, and negotiating the best choices for organizational strategies:

> I have learned from this simulation that it is not necessary to have only one correct choice for the ideas. Different people have different ideas depending on their perspective. Therefore, there could be many solutions for a problem, but to select the best choice; we need to consider many factors and the majority opinions. The simulation also allows me to understand how the real organisations work. It is impossible to

> efficiently manage the organisations without good collaboration in the team.—Sophia (Team 2)

In the game, students appreciated the maintaining of trust between team members. In this respect, they highlighted the importance of a safe environment that provides a fertile soil for open communication and ensures all ideas are regarded as worth sharing. Even though the previous extract highlighted the need to select the best choice among different opinions, some students prioritized discussing different opinions appropriately and respecting different voices:

> It was important for each individual to take care when sharing opinions to give reasons behind this opinion [so] as not to offend or make anyone feel their ideas were not as good. I believe that the learning experience challenges individuals from different backgrounds to come together to use their diverse opinions and techniques to become a cohesive working team [with an] emphasis on interpersonal relationships, concentrating the role of technology, group interactions, and leadership. Each individual will need to be aware of the different barriers [to] communication, to be able to develop trust with one another, whilst valuing and being respectful of cultural differences.—Zhuang (Team 12)

The accounts of Sophia and Zhuang illustrate the importance of considering different opinions and respecting various voices when making decisions. Accordingly, students commented that the simulated business environment fostered their ability to be open-minded thinkers through multicultural collaboration and communication. Open-minded thinking means being willing to consider alternative ways of thinking by considering one's own and other's ideas about an issue. The following extracts show how a student experienced RealGame as an environment for fostering open-minded thinking, which could also be associated with increased collaborative creativity:

> (---) (the game) provided an international platform to interact with people from many different countries around the world. (---) it enhanced further my capability of being open minded and proactive within a team. From a professional learning point of view, (the game) depicted

> an online version of the real business world that built on networking skills and [taught us] how to respond to the changing market environment in terms of the overall business strategy, production, marketing, procurement, finance and HR.—Sofia (Team 8)

When appreciating differing opinions and open-mindedness, students also emphasized the adoption of a 'we' perspective within their teams. Students found that RealGame fostered a continuum in the way their simulated company was managed through shared learning activities and processes, both of which are at the core of collaborative learning. The following student reflection illustrates how students perceived the value of others as a resource, where sharing their own experiences and knowledge was important for attaining mutual goals in their virtual companies:

> What I really appreciated was that people tried to stop by during the day, watching the simulation and following what was going on. That led to the fact that everybody was kind of informed about what was going on. Furthermore, what I did in particular was that I gave a short introduction to my successor, but also shared my experiences and knowledge that I have already gained with him in order to prepare him with first-hand experiences but also that he can already benefit from my learnings.—Helmer (Team 14)

Sharing their own experiences and knowledge briefly between shifts resulted in successful collaboration if students had joint ideas and thoughts about their goals. The student reflections indicated that RealGame also enhanced the students' ability to negotiate a joint strategy before the simulation session to ensure they could achieve common goals in the group. The following data extract illustrates how one student perceived technology-mediated communication as a resource for supporting his team in their negotiations and collaborations (despite some technical challenges):

> Before the simulation we were communicating solely via E-Mail, which was working fine as well. For the simulation itself we only used Skype

> as a communication tool. Concerning the expectations versus the experiences, I honestly thought it would be worse to work within a virtual multicultural team without any [initial] face-to-face meeting. It was a big surprise that everything worked [] well. The biggest challenges [] were the dependence on [] technology, such as the Internet connection, as well as the circumstance that each shift did not know what the others before were deciding, e.g. possible long term strategies. Nevertheless, thinking of the overall situation at the simulation, I found it very exciting to work together with people from around the world only by using virtual tools and I found it quite convenient to work from home.—Mats (Team 17)

The above extract also highlights the central role of creativity in all team activities. Students exhibited flexibility and creativity when crafting workable solutions while appropriating different communication tools and considering both their benefits and constraints.

The joint strategy did not pre-empt the need to reconsider team strategies later in the game. Students found that RealGame placed the teams in challenging situations where they had to critically reflect on the actions taken and collaboratively pursue novel ways to proceed. The following excerpt shows how these challenging situations had the potential to eventually become productive collaborative learning situations (cf. productive failure in Kapur & Kinzer, 2009):

> We constantly ran out of raw materials (---) and we found it difficult to maintain production and make deliveries of sales coming in. This challenge was an important learning factor for the group and once we had realised mistakes that we were making we worked on correcting them.—Marcel (Team 7)

Students recognized that the complexity and versatility of the learning task required participation and collaboration from all team members. RealGame served as a collaborative learning environment that stimulated the students' creativity by involving them in problem-solving that was similar to the challenges of real work life. Thus, the students were able to benefit from learning the subject content and how to learn (Sunley et al., 2019).

Collaboration and creativity were interlinked in the problem-solving activities in RealGame, which is illustrated in the following extract:

> I think from a learning perspective it was very helpful being thrown in the deep end. Although it was challenging, this allowed us to solve problems for ourselves and really work as a team to discuss issues and come up with possible solutions together.—Anna (Team 6)

The ability to frame problems and investigate them is an important work-life competency (Ludvigsen & Steier, 2019). Teamwork in RealGame promoted these abilities and showed the importance of creatively investigating potential solutions to problems. Group creativity and learning transpired from the joint contributions of team members (Sawyer, 2012).

Furthermore, the importance and value of team cohesion and mutual participation were highlighted in the team task. The following example illustrates how the simulation not only supports the learning of content knowledge, but also fosters competencies that are needed in computer-supported collaborative learning and increasingly in working life:

> (---) this online simulation definitely surpassed my expectation of how much I would learn. Learning how to compromise, learning how to negotiate, learning how to speak up, learning how to manage, and most importantly, learning how to work as a collaborative team through an online virtual world. (---) Overall, I was not expecting that this online business simulation would be so interesting and fun. I personally feel that I am not only connected with the business simulation itself, but I was also connected with my team members from my university and the team members from other universities.—Karoliina (Team 4)

Next, we summarize the examples provided in this section and discuss how RealGame fostered collaborative learning and creativity.

Discussion

When business students prepare for future work, their professional competencies involve both domain-specific skills, such as managing a company and leading employees as well as more general abilities, such as critical thinking, problem-solving, communication, and collaboration (Chernikova et al., 2020). When considering domain-specific skills, RealGame considers various nuances of business decision-making, serving as a resource for understanding the logic of how these companies operate in the real world. The students' reflective essays about their RealGame experiences provided indications of employing various general skills, such as negotiating and adopting shared perspectives, aligning with and accommodating personal views to match others, and working together to attain mutual goals. All these skills were practiced in a completely digital environment, where team interactions were carried out with various digital tools.

Practicing domain-specific and general skills moved beyond individual efforts toward collaborative learning. The fact that the teams managed their company in shifts and negotiated a shared vision instead of merely pulling the company in individual directions can, by definition be seen as a requirement for collaborative learning (Dillenbourg, 1999). As the students proceeded with their team tasks, preparing and briefing other team members for the next shift became necessary for success in the game. Hence, the game encouraged the development of a team strategy based on continuous progression rather than every shift simply pursuing their own goals.

Mutual construction and the sharing of knowledge are core competencies in collaborative digital work (Hoadley, 2002; Lipponen et al., 2004). In RealGame, participants were only provided with a brief introduction to the simulation (including the functioning of the user interface) instead of detailed instructions about successful management strategies. Hence, the participants needed to experiment with the game, learn the game logic, and anticipate what other teams would do. In a way, the participants collaboratively constructed a mutual universe where the game actions took place. Moreover, because the participant roles in RealGame were not scripted or pre-scaffolded, the teams constructed

their individual roles within the teams. Technology-intensive working contexts have been found to benefit from sharing or distributing leadership among team members (Charlier et al., 2016; Hoch & Kozlowski, 2014). Further, new insights may emerge when multiple team members assume responsibility for managing and leading collaboration.

Collaborative creativity is supported by accessing and exploring new and diverse information, receiving peer support, and being actively engaged at work (Oldham & Silva, 2015). RealGame is about experimenting with different management strategies that might otherwise be too costly or risky to implement in real life. Indeed, the participants elaborated on how they were able to be more open-minded and consider different solutions to the problems that were part of the game. In accordance with current research literature, these examples demonstrate how challenging situations can stimulate collaborative creativity (Sunley et al., 2019).

To conclude, RealGame fostered collaborative learning and creativity by providing an environment for practicing both domain-specific and general skills. The game challenged the participants to collaborate effectively, as they needed to make sense of the operational environment, the events taking place in the game, and to organize their teamwork accordingly. The business logic in RealGame has been designed to simulate the causalities and business processes of actual manufacturing companies and their business environments. RealGame, thus represents an authentic context where generic operative decisions and strategies can be applied. However, as the decisions and moves made by other teams in the game affect all teams as well as the (computer-simulated) markets, decisions have varying outcomes. Therefore, teams cannot rely on selecting one best strategy that works in every situation, nor can they anticipate all events in the game and plan their decisions and actions accordingly. In these circumstances, the criticality of collaborative creativity is emphasized. The requirement to collaboratively learn, make sense and create new knowledge in order to creatively solve problems in the game was manifested also in the reflection texts written by the participants.

Contemporary work requires versatile skills and competencies, which need to be developed already during education. Learning to creatively and collaboratively solve authentic problems during education prompts

important work life skills. In their reflection texts, the participants linked their game learning experiences to the skills needed in their future work life. RealGame represents a learning solution that has successfully been applied in higher education to foster the development of collaboration skills and the understanding of business dynamics and operations (Palmunen et al., 2013; Siewiorek et al., 2012).

Although this chapter was contextualized to working life, the fact that the participants were students inevitably shifted the focus more toward collaborative learning rather than creativity. Hence, collaborative creativity will be a focal point of interest in our future research. We are currently conducting a project called Well@DigiWork, where we explore RealGame with employees and managers from five large Finnish companies and two health-care districts. We aim at determining whether the gaming sessions stimulate novel ideas that could be implemented in the real working environment. For example, improved strategies could be developed to enable people to manage and cope with the health issues associated with the current conditions that digital work involves.

References

Arvaja, M. (2007). Contextual perspective in analysing collaborative knowledge construction of two small groups in web-based discussion. *International Journal of Computer-Supported Collaborative Learning, 2*(2–3), 133–158.

Arvaja, M. (2012). Personal and shared experiences as resources for meaning making in a philosophy of science course. *International Journal of Computer-Supported Collaborative Learning, 7*(1), 85–108.

Arvaja, M., & Hämäläinen, R. (2021). Dialogicality in making sense of online collaborative interaction: A conceptual perspective. *The Internet and Higher Education, 48*, 100771.

Bourgeois-Bougrine, S., Richard, P., Burkhardt, J. M., Frantz, B., & Lubart, T. (2020). The expression of users' creative potential in virtual and real environments: An exploratory study. *Creativity Research Journal, 32*(1), 55–65.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Charlier, S. D., Stewart, G. L., Greco, L. M., & Reeves, C. J. (2016). Emergent leadership in virtual teams: A multilevel investigation of individual communication and team dispersion antecedents. *The Leadership Quarterly, 27*(5), 745–764.

Chernikova, O., Heitzmann, N., Stadler, M., Holzberger, D., Seidel, T., & Fischer, F. (2020). Simulation-based learning in higher education: A meta-analysis. *Review of Educational Research, 90*(4), 499–541.

Craft, A. (2008). Studying collaborative creativity: Implications for education. *Thinking Skills and Creativity, 3*(3), 241–245.

Creely, E., Henriksen, D., & Henderson, M. (2020). Three modes of creativity. *Journal of Creative Behavior, 0*, 1–13.

DeFillippi, R., Grabher, G., & Jones, C. (2007). Introduction to paradoxes of creativity: Managerial and organizational challenges in the cultural economy. *Journal of Organizational Behavior, 28*(5), 511–521.

Dillenbourg, P. (1999). What do you mean by 'collaborative learning'? In P. Dillenbourg (Ed.), *Collaborative-learning: Cognitive and computational approaches* (pp. 1–15). Pergamon.

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing, 62*(1), 107–115.

Eteläpelto, A., & Lahti, J. (2008). The resources and obstacles of creative collaboration in long-term learning community. *Thinking Skills and Creativity, 3*(3), 226–240.

Gallavan, N. P., & Kottler, E. (2012). Advancing social studies learning for the 21st century with divergent thinking. *The Social Studies, 103*(4), 165–170.

Hämäläinen, R., & Vähäsantanen, K. (2011). Theoretical and pedagogical perspectives on orchestrating creativity and collaborative learning. *Educational Research Review, 6*(3), 169–184.

Heinonen, K., De Grez, N., Hämäläinen, R., De Wever, B., & van der Meijs, S. (2020). Scripting as a pedagogical method to guide collaborative writing: University students' reflections. *Research and Practice in Technology Enhanced Learning, 15*(1), 1–20.

Hoadley, C. (2002). Creating context: Design-based research in creating and understanding CSCL. In *Proceedings of Computer Support for Cooperative Learning* (pp. 453–462). Boulder, CO.

Hoch, J. E., & Kozlowski, S. W. (2014). Leading virtual teams: Hierarchical leadership, structural supports, and shared team leadership. *Journal of Applied Psychology, 99*(3), 390.

Jeong, H., & Hmelo-Silver, C. E. (2010). Productive use of learning resources in an online problem-based learning environment. *Computers in Human Behavior, 26*(1), 84–99.

Jeong, I., & Shin, S. J. (2019). High-performance work practices and organizational creativity during organizational change: A collective learning perspective. *Journal of Management, 45*(3), 909–925.

Kapur, M., & Kinzer, C. K. (2009). Productive failure in CSCL groups. *International Journal of Computer-Supported Collaborative Learning, 4*(1), 21–46.

Khanlari, A., Resendes, M., Zhu, G., & Scardamalia, M. (2017). Productive knowledge building discourse through student-generated questions. In B. K. Smith, M. Borge, E. Mercier, & K. Y. Lim (Eds.), *12th International Conference on Computer Supported Collaborative Learning (CSCL)* (pp. 585–588). International Society of the Learning Sciences.

Kobbe, L., Weinberger, A., Dillenbourg, P., Harrer, A., Hämäläinen, R., Häkkinen, P., & Fischer, F. (2007). Specifying computer-supported collaboration scripts. *International Journal of Computer-Supported Collaborative Learning, 2*(2), 211–224.

Lainema, T. (2003). *Enhancing organizational business process perception: Experiences from constructing and applying a dynamic business simulation game* [Doctoral dissertation, Turku School of Economics and Business Administration]. Publications of the Turku School of Economics and Business Administration.

Lämsä, J. (2020). *Developing the temporal analysis for computer-supported collaborative learning in the context of scaffolded inquiry* (Publication no. 245) [Doctoral dissertation, University of Jyväskylä]. JYU Dissertations.

Lehtinen, A. (2017). *Pre-service teachers and guided inquiry-based science teaching with simulations* (Publication no. 591) [Doctoral dissertation, University of Jyväskylä]. Jyväskylä Studies in Education, Psychology and Social Research.

Lipponen, L., Hakkarainen, K., & Paavola, S. (2004). Practices and orientations of CSCL. In *What we know about CSCL* (pp. 31–50). Springer.

Ludvigsen, S., & Steier, R. (2019). Reflections and looking ahead for CSCL: Digital infrastructures, digital tools, and collaborative learning. *International Journal of Computer-Supported Collaborative Learning, 14*(4), 1–9.

Moran, S. (2010). Creativity in school. In K. Littleton, C. Woods, & J. K. Staarman (Eds.), *International handbook of psychology in education* (pp. 319–359). Emerald Group Publishing Limited.

Oldham, G. R., & Da Silva, N. (2015). The impact of digital technology on the generation and implementation of creative ideas in the workplace. *Computers in Human Behavior, 42*, 5–11.

Palmunen, L. M., Pelto, E., Paalumäki, A., & Lainema, T. (2013). Formation of novice business students' mental models through simulation gaming. *Simulation & Gaming, 44*(6), 846–868.

Patton, M. Q. (2015). *Qualitative Evaluation and Research Methods*. Sage.

Paulus, P. B., & Nijstad, B. A. (Eds.). (2003). *Group creativity: Innovation through collaboration*. Oxford University Press.

Resnick, M., & Robinson, K. (2017). *Lifelong kindergarten: Cultivating creativity through projects, passion, peers, and play*. MIT press.

Sanina, A., Kutergina, E., & Balashov, A. (2020). The Co-Creative approach to digital simulation games in social science education. *Computers and Education*, *149*, 103813.

Sawyer, K. (2012). Extending sociocultural theory to group creativity. *Vocations and Learning, 5*(1), 59–75.

Sawyer, R. K., & DeZutter, S. (2009). Distributed creativity: How collective creations emerge from collaboration. *Journal of Aesthetics, Creativity, and the Arts, 3*(2), 81–92.

Siewiorek, A., Saarinen, E., Lainema, T., & Lehtinen, E. (2012). Learning leadership skills in a simulated business environment. *Computers & Education, 58*(1), 121–135.

Stahl, G. (2010). Guiding group cognition in CSCL. *International Journal of Computer-Supported Collaborative Learning, 5*(3), 255–258.

Stahl, G., & Hakkarainen, K. (2020). Theories of CSCL. In *International handbook of computer-supported collaborative learning*. Springer.

Stahl, G., Koschmann, T., & Suthers, D. (2014). *Computer-supported collaborative learning: An historical perspective.* In R. K. Sawyer (Ed.), The Cambridge Handbook of the Learning Sciences (pp. 479–500). Cambridge University Press.

Steier, R., Kersting, M., & Silseth, K. (2019). Imagining with improvised representations in CSCL environments. *International Journal of Computer-Supported Collaborative Learning, 14*(1), 109–136.

Sterman, J. D. (2011). Communicating climate change risks in a skeptical world. *Climatic Change, 108*, 811–826.

Sunley, R., Harding, L., & Jones, J. (2019). Realising creativity in management education: Putting student energy into action. *The International Journal of Management Education, 17*(2), 172–181. https://doi.org/10.1016/j.ijme.2019.02.007.

Tuhkala, A., & Kärkkäinen, T. (2018). Using Slack for computer-mediated communication to support higher education students' peer interactions during master's thesis seminar. *Education and Information Technologies, 23*(6), 2379–2397.

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