Enactivism and Game Authoring: A study of Teacher Online Experience from Sociocultural Perspectives

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Abstract: This study explores an online learning world where game development was a center piece and social learning was an inherent feature rather than imposed. Grounded in enactivism, this paper examines the affordances of this environment, focusing on sociocultural perspectives. This qualitative case study involved 35 participating educators. Data included educators' online interactions and written work. The results showed that the learning environment afforded ample opportunities for social learning, as reflected in the extent and ways the educators interacted and collaborated with each other. A total of nine categories of interactions were identified, illustrating the diverse types of social communication. Culture of learning, trauma, and games contributing to the formation of a culture were some major themes identified in educators' reflections.

Résumé : Cette étude explore un monde de l'apprentissage en ligne où la conception de jeux est considérée comme un aspect important et où l'apprentissage social constitue une caractéristique inhérente plutôt qu'imposée. Fondé sur l'énactivisme, cet article examine les perspectives offertes dans cet environnement particulier, à partir d'un point de vue socioculturel. Trente-cinq éducateurs ont participé à cette étude de cas qualitative. Les données comprenaient des interactions en ligne de la part des éducateurs ainsi que leurs travaux écrits. Les résultats ont montré que l'environnement d'apprentissage en ligne offrait de nombreuses opportunités d'apprentissage social, comme en témoignent l'étendue et la manière dont les éducateurs interagissaient et collaboraient les uns avec les autres. Au total, neuf catégories d'interactions ont été définies, illustrant les divers types d'interaction sociale. La culture de l'apprentissage, les traumatismes et les jeux contribuant à la formation d'une culture sont quelques-uns des thèmes majeurs identifiés à partir des réflexions des éducateurs.

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Introduction

Our society is facing various challenges, ranging from the threat of the COVID-19 pandemic to the societal shift to a participatory culture as evidenced by increased civic engagement in digital worlds. Scholars (Bakker & Wagner, 2020; Dede, 2008) have convincingly argued that reconsideration of education from both practical and theoretical perspectives is necessary to address the challenges in this ever-changing era. Enactivism, a paradigm that has gained growing attention, claims to be more encompassing and has the potential to address the issues brought by these new challenges (Hutto et al., 2015; Li, 2010). Yet, limited work has explored enactivism in the field of educational technology, owing largely to its recent emergence. Gaming, with its inherent nature of embodied action, can help us narrow this gap by providing an ideal setting to study enactivism.

The educational value of digital games (hereafter games) has been widely accepted. Games, however, do not work in and of themselves in teaching (Gee, 2016), calling for attention to educators. Two great barriers to integrating games into the classroom, even for game-based learning (GBL) enthusiasts, are that educators have little to no knowledge or guidance regarding how they would integrate games into their instruction, and the challenge of aligning games with existing curricula (Watson & Yang, 2016).

Game building in a formalized educational context may help educators overcome such barriers. Well-designed instruction, modeling, and resources could provide GBL guidance that is typically otherwise lacking in educational practice. When involved in game building, educators not only develop a better understanding of GBL (An & Cao, 2017), but through the production of custom educational games, learn how to better align games to one's established curriculum (Whitton, 2012).

Further, enactivism endorses social interactions as fundamental to all learning (Vygotsky, 1978), highlighting the importance of understanding the way people interact, collaborate and enculturate (Steinkuehler & Tsaasan, 2020). While voluntary social learning initiated by learners rather than imposed by the instructors is noted to be far superior, we have limited understanding about social interaction as an inherent feature in the context of GBL (Ke, 2020). Within this limited work, even less has focused on online education. This study, therefore, aims to deepen our understanding of enactivism through the exploration of an online enactivist world

where game development was a center piece and social learning was carefully designed as an inherent rather than forced aspect. Focusing on two important enactivist concepts: affordances and perceptions, this study investigates the undertakings of educators, mostly practicing teachers (hereafter teachers), as game designers through the sociocultural lens.

Theoretical Framework

Enactivism provides the theoretical grounding for this study. Unlike mainstream perspectives such as behaviorism and constructivism, enactivism rejects the dualism between mind and body, self and environment (Hutto & Myin, 2017). It considers mind, body, and the environment as inseparable and mutually engaged. At the core, enactivism stresses five interconnected ideas: autonomy, sense making, embodiment, co-emergence, and experience (Di Paolo et al., 2010). "What makes living organisms cognitive beings is that they embody or realize a certain kind of autonomy-they are internally self-constructive in such a way as to regulate actively tier interactions with their environments" (Thompson & Stapleton, 2009, p. 24). Such acknowledgment of interactive autonomy implies that a main function of cognition is sense making (Di Paolo et al., 2010). Enactivism stresses the importance of embodiment to cognition, as it regards learning as doing (Varela et al., 1991). Often explaining the interplay between an organism (e.g. a person) and its surroundings through dynamic systems theory, enactivism regards co-emergence as "the change of both a living system and its surrounding environment depends on the interaction between the two systems from which learning occurs. When a system and an environment interact, they are structurally coupled and…co-emerge" (Li, 2012, p. 787). Experience, another core concept of enactivism, is closely tied to the idea of embodiment. In fact, "experience is…itself a skillful aspect of embodied activity" (Di Paolo et al., 2010, pp. 13-14).

Endorsing Vygotsky's sociocultural view (Vygotsky, 1978), enactivism establishes the primary role of social interaction because it constitutes, rather than just provides the context of, social cognition (Herschbach, 2012). Social and cultural activities are argued as fundamental rather than additional acts that mold and transform our behavior. In essence, the world in which we live is social and cultural (McGann, 2014). Interactive sense making is

therefore coupled with the mutual transformation of the people engaged in such processes (Di Paolo et al., 2010). That is, the deeper one interacts with others in the learning process, the more likely they transform each other through enhanced understanding and creation of new insights. Understanding cognition, therefore, cannot be accomplished without thorough examination of social interactions, the interplay of such processes, and the people involved. Also, since the "learning process is embodied and fundamentally affective" (Maiese, 2017, p. 197), enactivists pay close attention to affective variables, for they significantly contribute to cognition.

Enactivism believes that learning occurs through our never-ending interactions with objects and environments, and through such processes, we understand what these objects or events offer us (Davis et al., 2008). A central concept of enactivism is affordance, a term originally defined as "possibilities for use, intervention, and action which the physical world offers a given agent and determined by the fit between the agent's physical structure capacities and skills and the action-related properties of the environment itself" (Clark, 1999, p. 347). This concept is critical for any exploration of enactivism, because it is essential for the research of embodiment. Traditionally, our brain is believed to work in a linear manner from getting input, to analyzing it, and then solving problems (giving output). Denying such an idea, and the dichotomy of perception and action, enactivism regards this problem as solved through continued coordination between the inner and the outer, cognition and doing. In this paper, affordance is extended to include social and cultural systems, hence affordance is the "totality of possibilities of action" (Ramstead et al., 2016, p. 3). Due to limited space available, further detailed description of this concept is not included here.

The freedom education model is an example of enactivist theory in practice. Freedom education stresses the importance of the environment and encourages "free observation and free activity relating to tasks recognized by the learner as desirable to engage in or achieve" (Li & Winchester, 2014, p. 120). Rather than consider the environment as subordinate, freedom education regards it as essential in cognition, because any human activity cannot be separated from the world it situates in. As such, a learner and her world are constantly interacting and transforming each other. Freedom education encourages exploration, puzzle-solving, and playful and spontaneous work while stressing self-actualization and self-initiation. Equally important, since cognition is social and

cultural, freedom education emphasizes the establishment of a carefully designed, enabling learning world where socializing and enculturation are playing central roles. Such design empowers learners to interact with the learning world, the people in the world, and the content of the world, and in doing so, coevolve with the world.

Literature Review

Sociocultural View: Gaming and Emotion

The enthusiasm surrounding gaming naturally spawns social learning in multiple ways. It has been well established that gaming, including game playing and game construction, is largely socially- and culturally-based (Ang et al., 2010; Fonseca et al., 2021). Social interactions are abundant in single or collective game playing, as well as in associated activities (e.g. posting messages in a game community, modding) beyond the gaming software. The process of designing and building games has a similar effect on learners, instilling an excitement to ask questions, share ideas, and try out each other's games (Kafai, 1995; Papert, 1980). Even when learners technically work individually on game designs, more experienced students tend to readily volunteer their assistance to their less-experienced peers (An, 2016). Peer evaluation in game design, therefore, often occurs easily to learners. When watching others play-test their games, students encounter ideas, opinions, and perspectives of which they were previously unaware (An, 2016). Additionally, while testing their peers' games, students may also identify techniques or errors that then give them solutions to apply to their own game designs (Hwang et al., 2014).

Emotion proves a critical component for participation in social learning, especially in a more autonomous atmosphere. Social interactions are considered one of the most influential features on emotion in the online learning environment, while emotion also impacts the likelihood of engaging in social interactions in return (Pekrun & Linnenbrink-Garcia, 2012). This reciprocal relationship is an opportunity for teachers to positively affect learners' emotional states to bolster their self-efficacy and motivation. For example, although often leading to negative emotions and demotivating learners, failures can also provide ideal learning experiences if

guided appropriately. That is, positive emotional support can reframe failures as learning opportunities (Hascher, 2010).

The effects of emotion on learning are not strictly measured on the axis of positive and negative. An emotion's activation—its physiological effect— also dictates a learner's actions (Pekrun & Linnenbrink-Garcia, 2012). Activating emotional states, such as enjoyment or anxiety, generally drive a learner into action—though the quality of that action would vary, with higher quality learning favoring the positive emotions. Deactivating emotional states, on the other hand, such as complacency or depression, will generally decrease a learner's motivation (Pekrun & Linnenbrink-Garcia, 2012). Therefore, it is important not only to emotionally support learners, but also to engage and appropriately challenge them.

Teacher Game Design

Learning through game design is not a new concept and many studies have explored how game building can enhance learning. Yet, such research has predominantly focused on school students as designers (Akcaoglu & Kale, 2016), with limited attention paid to exploring teachers as the game designers/developers.

While limited, the existing work in the field showed that game design provided a meaningful way for teachers to gain pedagogical and content knowledge related to game based learning (Li, 2012), to build their creative skills (Frossard et al., 2015; Li, 2013), and to positively influence their attitudes toward gaming (Li et al., 2013). For instance, one study (Li, 2012) examined 14 teachers' experiences and thinking during their game design and building process. Adopting a case study approach, the teacher-built educational games were analyzed. The results showed that game design and building enabled teachers to reconceptualize their pedagogy and teaching practice. Specifically, the act of game design and development inspired teachers to involve their own students in the process, which in turn resulted in reciprocal learning between teachers and their students. Ultimately, both the teachers and the students acquired deep understanding of the content through such authentic learning. Li and colleagues (Li et al., 2013) also studied 21 preservice teachers' game design as a way to learn mathematics education. The analysis of various data sets, including the preservice teacher-built games, showed that teachers' perceptions and attitudes were positively impacted by the game-building experience. The preservice teacher-created games also showed these teachers' fair understanding of pedagogy and cognitive components.

Another study (Akcaoglu & Kale, 2016) examined preservice teachers' experience during a game design workshop lasting a total of six game sessions, each 3 hours long. The case study analyzed four preservice teachers' work to study the impact of the workshop, including how effectively these preservice teachers could create lesson plans incorporating game design. They concluded that the preservice teachers' lesson plans were more focused on teacher-led activities rather than adopting student-centered approaches. Although problem-solving activities were moderately integrated, high levels of collaboration or exploration were not seen either. The participants' reflections also indicated that the workshop enabled them to develop a basic understanding of and comfort level with the game design process, which in turn allowed them to use the software to create games and lessons where game design is a core hands-on component.

Moving to the field of online learning, very few studies exist that explored teacher game design. One study (An & Cao, 2017) investigated how game design influenced teacher attitudes and perceptions. Using a mixed methods approach, they studied 50 teachers in an online graduate course, and found that the game design process positively impacted the teachers in their attitudes and perceptions. The game design experience increased their interest and confidence in educational game integration, as well as developed more positive perceptions about the benefits of gaming. Yet, teacher perceptions related to collaboration, assessment, or problem solving remained unchanged.

In sum, robust research on teacher game design experience is scarce (An, 2018; Bressler & Annetta, 2021). Even less attention is paid to teacher online learning through game design. This study, therefore, attempts to bridge the gap by exploring teacher experiences and perceptions when learning through building educational games in an online environment.

Research Questions

Aiming to extend enactivism through its practical application, this study investigates affordances and perceptions, two critical concepts of the theory. Through the sociocultural lens in the context of enactivist-grounded freedom education, this work is exploratory and descriptive rather than prescriptive. Specifically, it is guided by the following questions:

1. How did the educators act/enact to the social affordances of the freedom learning environment in their game design and building experience?
2. What do educators with no prior game building or design experience think about game-based learning and associated sociocultural perspectives of gaming?

Methods

Framed in a qualitative, naturalistic research perspective, this case study took a repeated cross-sectional research design where data collection spanned 3 years. The study focused on educators' experience, specifically their social interactions and reflections when learning and creating their own educational games. The case was a graduate course guided by the five enactivist principles: collaboration, freedom, scaffolding, sharing, and reflection (Li & Winchester, 2014). Learning through game building was a center piece of the course, with activities ranging from weekly, small game-creation challenges, to the design and implementation of dream games as a culminating project. The case study approach fits well with the enactivst viewpoint because both share the goals "to place the researcher within the study so as to avoid objectification and to conduct research that is transformative" (Creswell, 1998, p. 83).

Setting

The context of this study was a Mid-Atlantic university with the ethnicity of the student population of close to 60% Caucasian, 20% African American, and the remainder consisting of other ethnicities. Over half of the university students were in the age range between 18 and 21. The students enrolled in the course were masters or doctoral students. The course was an elective education course, often taken by students in the college of education, but sometimes included those in other programs such as health professions or human resources. In this study, the term instructor refers to the instructor of the course.

The course was a 15-week introductory course to digital game-based learning. It was offered online with the first nine weeks focusing on familiarizing educators with the current literature in the field and exposing them to existing games, which offered

opportunities for non-gamers to become adept at gaming while experienced gamers reexamined this media from educational rather than entertainment perspectives. The next six weeks were devoted to instructional game design and building. This process started with a brainstorm session to identify audience and learner needs, followed by a scaffolded idea-generation phase, involving tasks like adapting existing intellectual properties (e.g. a movie) to board games. Next, the educators designed their own dream games, adopting an iterative process of design, prototyping, playtesting and refinement. In this process, the educators were asked to wear a game designer's hat, freeing themselves from the constraints of technical skills, time, or resources, only focusing on the best practices of serious game design. All work to this point was paper-based, which enabled easy modification and improvement of the games based on feedback collected from players. Then, their final project involved transforming the games into digital format using development software. Considering many educators had limited technical skills, they were allowed to implement only some parts of their dream games. Although the teachers were encouraged to use any software they felt most appropriate, the course also integrated small weekly Scratch tasks to help them acquire basic programming knowledge for the game development work. The final phase of the course was sharing and peer evaluating the games, which inspired further ideas of how the games could be improved and used. For most of the weeks, the course had no mandated weekly posts, although a forum was provided for each week. The educators had the freedom to choose whether and what they wanted to share.

A total of 35 (14 males, 21 females) educators participated, which constituted the sample of the study. Amongst them, only two were trainers in organizations while the remainder were practicing teachers in k-16 settings. The participants had different technical backgrounds and gaming experience, but none had been involved in game design or building prior to the course.

Data and Analysis

The data were collected over 3 years in three course offerings. The types of data collected included, but were not limited to, the participants' written assignments, online interactions, and created games. Additional data sources consisted of the instructor's reflective journal and informal conversations with the educators.

This study focused on the educators' written work, particularly their online interactions, although other data offered contextual information. Existing online discussion taxonomies, such as those by Soller (2001), minimally address the role of emotion beyond expressions of encouragement or appreciation. Further, although the field of education has examined how such communities and social practices fit into and benefit formal education (Anderson, 2019), no taxonomy exists for analyzing learner interactions in such a social-media format. Therefore, our iterative analysis process started with open coding (Corbin & Strauss, 1990) by the researchers, who worked independently to identify themes. Coding proceeded with the discussions, from which naturally emerged themes that were then compared with the existing literature in the field. Different themes were articulated, debated, and further discussed by the researchers until agreements were reached. During this iterative process, a constant comparative approach (Corbin & Strauss, 1990) was employed to generate, refine, and recreate themes and codes (Miles & Huberman, 1994).

To ensure reliability and accuracy, certain strategies were adopted including the use of different forms of data for triangulation, and analyzing data independently, followed by cross checking by the researchers. Also used was elimination of initial themes based on disconfirming evidences, paying particular attention to extreme cases and negative evidences (Miles & Huberman, 1994). In addition, for the first research question, one researcher coded the data set initially, then the second researcher independently coded a subset of the data. The results were then compared and discussed until they reached consensus. This process was iterative until all the themes were examined and no new theme emerged. After the themes and coding scheme were finalized, a single researcher coded the data set, which eliminated the need to develop a process for reliability among multiple coders (Vesel & Robillard, 2013).

Results

Affordances

The plethora of discussion posts demonstrated that the course afforded rich opportunities for educators to interact and learn through such social dialogues. It is important to note that the course did not require replying messages.

Yet, the educators autonomously communicated with others frequently, with about 2500 messages posted in discussion forums alone. Amongst them, 1378 messages were replies, indicating

certain levels of interaction occurred. On average, each educator posted 39.4 replying messages. The number of collaborative projects completed was another index indicating the extent of social learning. Again, while no collaboration was required, the educators completed a total of 32 game design projects, of which 22 (~70%) were created collaboratively.

Our discourse analysis examined how the educators interacted. Because the initiating messages tended to be teachers sharing their products or asking questions, our analysis focused on the replying posts to identify the communication patterns. The results showed that the responding messages consisted of the following 7 communication categories: *compliment & agreement, emotional statements, advices, questions and answers, setbacks and errors, effort, and learning and inspiration*. Table 1 presents details.

Table 1

Frequencies of Educator Interactions

Categories	Sub-Categories	Responding Posts (Within-Group %)
Compliments & Agreement (39.4%)		543
	Specific	375 (69.1%)
	General	139 (25.6%)
	Agreement	29 (5.3%)
Emotional Statements (29.3%)		404
	Banter & Nostalgia	126 (31.2%)
	Gratitude	84 (20.8%)
	Fun/Entertained	85 (21.0%)
	Humor/Amused	66 (16.3%)
	Enjoyable Challenge	43 (10.6%)
Advice (11.0%)		151
	Giving	125 (82.8%)
	Receptive	21 (13.9%)
	Seeking	5 (3.3%)
Learning and Inspiration (8.2%)		113
Questions & Answers (7.5%)		104
Setbacks & Errors (3.3%)		46
Efforts (1.2%)		17
Total:		1378

Compliments & agreement were most prevalent as educators frequently chose to support each other's efforts by providing compliments. Almost 40% of the responding messages belonged to this category. Two types of compliments were identified: general and specific. That is, educators liked to either provide general or specific compliments. "Great job!" or "I like it!" were typical examples of general compliments. Specific compliments, on the other hand, referred to statements that focused on a particular idea or component like "I really like the individual sounds for each letter!" Specific compliments constituted the majority, that is, 70% of the comments in this category. *Agreement* was used to reinforce someone else's thoughts, as expressed in one statement, "I totally agree with you that the amount of preparation required for the game building projects should not be overlooked…"

The next most frequently observed interactions were emotional statements, constituting almost 30% of the responding posts. This category encompassed communications expressing appreciation of games and game elements that inspired humor, entertainment, and enjoyable challenges. This category included 5 subcategories: *Banter & Nostalgia, Gratitude, Fun/entertained, Humor/amused, Enjoyable challenge*. Within this category, *Banter and nostalgia* constituted about one third of the responses. Gratitude and fun/entertained comments had occurred in similar frequency, each about 20% of the time. Over 15% responses were humor/amused ones, while about one in ten were feedback about enjoyable challenges.

Specifically, *Banter & Nostalgia* included bantering comments like: "haha, I thought of you while doing this assignment!" Some referred to old school, classic works: "Wow! This really got me thinking back to the 'good old days' of playing video games!" Banter, friendly conversation and statements of new knowledge acquired were examples of these categories.

Gratitude was another commonly observed interaction, often given in appreciation of compliments or assistance. This typically involved game authors expressing their appreciation of other people's feedbacks, ranging from simple grateful statements such as "Thank you SO much!" to more specific responses like "Thank you for the feedback. I will work on that later this week to see how it works."

A lot of comments involved humorous factors. Some examples were: "That crab is an unforgiving trivia host! haha" and "it was a funny ending to have the drink knocked over." Feeling entertained by playing the games was also shared in some of the posts. Typical examples included: "Fun way to incorporate the spacebar-hitting game!" and "Using a countdown timer gave this game urgency that made it exciting!

Enjoying the challenges (i.e. *Enjoyable challenges*), whether it was in playing others' games, or in developing their own games, was another theme that emerged. The following posts exemplified these two types of comments:

- "This [game] was really challenging! My kids and I played it for a long while. Loved it!"
- "[I]t was tricky figuring out how to connect all of her movements together, but really cool watching it all linked at the end of the coding process!"

Learning & Inspiration, Q&A, and *Advice* were the next frequently seen interaction types. These three groups together composed over one fourth of the total responses. *Learning & Inspiration* involved expressions of learning new things from exploring the software or from someone else's games or posts, sometimes including statements of wanting to apply them in the future. For example, one post stated "I didn't know about the feature and would like to try it as we move forward."

Advice included educators making open calls for suggestions and providing suggestions or recommendations to others while *Q&A* included answers to solicited assistance and direct questions. One example of *Advice* was "Maybe the timer could start the same time the player clicks the starfish?" while one example of *Q&A* was "Did you find that sound bite in the Scratch sound files?"

Setbacks and errors and *Efforts* occurred least frequently. Naturally, *setbacks and errors* were inherent parts of any programming experience, although only 5 posts showed frustration, like this: "I do not know why it stopped working. I cannot figure it out! It worked for the first few times I played and then stopped…weird!" *Efforts*, meanwhile, indicated that others' games were played intensely to win or get a high score, saying things such as "It took a bunch of tries, but my hi-score was 9 points!"

Educator Perceptions

What did educators think about social and cultural aspects of GBL? The first recurring theme was the importance of developing a culture for learning that would bring about positivity in gaming. In their discussions, cultural and social learning were intertwined where concrete examples were provided to instantiate the significance of establishing a true sense of community. They articulated how classroom culture directly affects how students behave in connection to social learning.

- The level of collaboration and input from the students will be greater and more impactful if the classroom culture is one that is built on strong communication and respect. [S2]

- This course has been a great example of how a culture for learning can enhance a class experience…[T]hrough participating in this course, we have developed open relationships where we can talk to each other and learn from our mistakes and success. I have tried several of the Scratch assignments and challenges before looking at others and seeing how I could improve mine or make mine more accessible to users. [S1]

Therefore, they advocated to cultivate a classroom culture of "respect, appreciation, patience, and understanding" [S5] so that students would want to be challenged when they would "work, learn, and be vulnerable" [S5]. Such culture should "produce goodwill and positivity in gaming, rather than the griefing and online trashtalk many of [the students] are used to" [A5].

A notable phenomenon was that the educators' examination of gaming through the socio-cultural lens led to their discussion about psychological, impacts of games, particularly those connected to emotion. The topic of trauma, meditation, and addiction were among the most salient ideas explored.

Regarding trauma, two seemingly opposite opinions emerged. The first view focused on possible harmful effects of gaming further disturbing players.

- Let's use a shooting game to explore... If the player is in the military, has had an encounter with guns, or is in a culture where hearing gunshots is familiar, then playing this game may link them to past traumas and may be a difficult experience for them. [S4].

The second view, however, pointed to the positive potential of gaming with its inherent social nature on addressing trauma-related problems. A9, a 57-year-old veteran, discussed how he had played World of Warcraft (WoW) for years, which started as a therapy for his Post Traumatic Stress Disorder (PTSD) but grew into much more. He still played at least two hours a night. After sharing stories of how total strangers became his long-term friends in the game and in real life because of the game, he concluded:

- Why would someone spend that much time in a game?...two words: fun (killing monsters to relieve stress is not bad) but the most important reason is community...There is a dynamic culture represented in the players of WoW...hundreds of sites dedicated just to the community....That guild I mentioned before, after 15 years I am still in touch with many of them constantly even after they have stopped playing WoW. [A9]

The meditation value of gaming was another theme identified. While reflecting, the educators frequently connected social aspects of gaming to their own experience of playing with siblings, friends, and even parents. Others articulated how they were able to build new connectionsand find new friends in the commercial gaming world while playing, and even after playing, certain games like World of Warcraft. They realized the emotional pleasure brought by social gaming and wanted to continue such activities to maintain their psychological wellbeing.

The comment made by A5, a female teacher in her late 20s, exemplified this: "I have been playing games as long as I can remember…I played games with my friends and brothers…which builds a social/collaborative/reflective culture…To this day, I try and carve out at least 30 minutes in my busy schedule to 'unwind' and play video games."

Addiction, a term typically negatively associated with gaming, was actually given a positive spin in these educators' interactions. They realized and attempted to harness the strong motivational capability of gaming for educational purposes. Adopting game based learning so that we could "teach to students' culture" was proposed as the most effective way to educate.

- Students often commit to play games like Fortnite every night or day in class, but do not want to read a page in a book. The best way to combat this and teach to their culture is to integrate these game skills … I have used this more and more in recent years and students become "addicted" to it, just as they do when playing games [A8].

How gaming shapes the formation of a culture was another recurring theme. Reflecting on their own experience, the educators

articulated how gaming has "contributed to the way I interpret American culture … the way people interact with each other, form bounds and ideas." [A6]. Many educators discussed how the gaming world and real world merge together and considered this as "a reason why game playing can be so engaging is its ability to transport the player to another reality." [S1]. They considered social components of gaming as "some of the most enjoyable elements of gameplay and/or design" [A6]. Viewing culture as the specific ways people interact, socialize, form rules, etc., many articulated how culture plays a significant role in gaming. A6 described her experience of playing Call of Duty as someone who was new to the game:

- Because I did not…have down the methods for how to interact with a team and work collaboratively with them, I was abandoned by the team and thus, left for dead. Knowing and understanding a game's culture as established by the rules of the game and by the social interactions of players working together in a collaborative group is clearly of importance for success and satisfaction in game playing. If you do not know the "culture" of the game, you are ostracized.

The specific language used in gaming was another important culture aspect brought into the conversations. A4 described a few games she played when she was young and stated: "these games have contributed to the way people interact with each other, form bonds and ideas. They've also brought the language of game building, coding, into our everyday conversations." In order to immerse into a culture, the educators believed that one must first understand the language as A7 articulated "…even though I did not play the game often, I had enough understanding of the game to talk about it with peers and now could connect with others because of a game."

They depicted that the collaborative culture of game building could promote positive learning through enhanced learner interest and confidence:

- When I reflected on the game applications that I programmed during this course, difficulty actually gave way to self-efficacy, and an "I can do" attitude. This makes me want to engage in further challenges…Thus I think the benefit of game creating in a cultural context is that if the collective thinking of game creators (e.g. students) leads to an attitude of being ABLE to learn, this will only lead to further positive learning….games are not only a function of the individual, but of culture [A10].

The educators also reflected culture through the discussion of how gaming enabled them to connect with others, including their own students.

- Playing games has allowed me to make connections with my students, even if it's an argument over a game….I've been sharing my Scratch project with some students, and they think it's funny that I use Scratch for 'coding' games, and they use it to listen to music during class….Even if you're not a participant in an online culture, your experiences create connections between you and other people, even if you don't know it [A3].

Discussion

This paper extends the research on enactivism through the investigation of a freedom education world in which educators explore GBL. Through the sociocultural lens, this work investigates educators' perceptions and how they act/enact to the social affordances of the enactivist-grounded learning. This investigation of practicing educators, a traditionally under-researched population, contributes to the field of educational technology both theoretically and practically. Several of the results are worthy of highlighting.

Perhaps the most interesting finding is that the educators have enthusiastically enacted/acted on the rich social learning opportunities afforded by this enactivist world. From an enactivist view, affordance is the potential to apply and do what is readily perceived by the viewer. In this enactivist world, various activities are carefully designed to encourage free exploration, problem solving, and enjoyable and spontaneous work. Emphasizing self-initiation rather than imposed work, this world promotes

socialization and enculturation. The educators enthusiastically responded to the social learning affordance of such design, which is partially reflected in the frequent, interest-driven, autonomous, and learner-initiated interactions and collaborations. One evidence is the copious discussion messages that occurred. The fact that this learning world has continuously manifested in hundreds of posts each time is of value because the course does not require replying posts. Since the posts are not linked to evaluation/grades, the interactions are voluntary rather than forced. According to the participants, educators, especially teachers in k-12 classrooms, often have minimal chances to talk with other adults. When opportunities were presented, they eagerly en/acted on such affordances through the dynamic discussion and socialization amongst their peers with shared interests and backgrounds. Another evidence of the rich interaction is reflected in the continued collaborations amongst the educators who voluntarily enacted such a partnership. Again, no mandatory collaboration was asked in the course.

Such enactivist design has also changed the ways the educators interact. Unlike social media, where people tend to freely and willingly exchange their ideas and creations, formal online classes often have requirements for threaded discussions focusing on pre-determined, specific subject matter content (Coleman, N.D.; Wong et al., 2021). In this course, because peer interactions were not mandatedin the provided communication venues, the educators interacted in a social media-style even though a traditional threaded discussion platform was used. The educators autonomously shared what they learned, experienced, and created related to GBL, which lead to engaging conversations and even activated emotional reactions. In other words, content learning became people-based. Content then became an organic part of the social and emotional ecosystem, boosting transformative learning. One could argue that without participation requirements, as are often seen in online classrooms, actions taken in a social-media-style environment more accurately reflect educators' motivation to participate and the authenticity of the content they choose to share.

The examination of gaming from a sociocultural perspective led the educators to delve deeper into the analysis of the status quo against their own experience. Such juxtaposition then led them to question the common perception that gaming is a solitary activity.

Rather, they realized that gaming is a social experience, which is clearly evidenced in the personal experience shared by multiple educators. These educators, particularly the avid gamers, have articulated how they are addicted to gaming precisely because gaming allows their involvement in a community and immersion in its unique culture. Such dynamic exchanging of ideas and personal stories manifestly enhanced their understanding of gaming and GBL.

Another significant finding is that emotion, which is reflected in two perspectives, has played a prominent role in this enactivist world. On the one hand, numerous posts were affection-connected, demonstrating how the educators' interactions often stimulated emotional responses. The fact that two in five posts were complimentary, which directly triggers good feelings, along with over 20% of posts being emotional statements, speaks volumes for the importance of emotion. While few posts were tied to negative affections like frustration, a vast majority of the messages were associated with very positive emotions, such as showing appreciation, encouragement, and approval of others. Even the posts sharing negative feelings were good-natured. This contributed significantly to the overwhelmingly friendly and supportive atmosphere of the learning world.

On the other hand, as shown in the results, the avid gamers understandably highlighted the value of affection in gaming and game design through their reflection of strong emotional ties to gaming. Even the non-regular gamers acknowledged the importance of the psychological impact of gaming and promoted purposeful design strategies that would lead to positive game emotions. When dissecting GBL from a sociocultural angle, the educators autonomously explored the psychological influence of gaming. While it perhaps is commonly accepted in society that gaming can bring strong emotions, these educators' articulations are most prominently associated with hardship-related topics like trauma, meditation, and addiction. Interestingly, such discussions often started with someone sharing their experiences and soon evolved into dynamic exchanges of personal beliefs and strategies of using games to remediate or educate, leading to in-depth dialogues about how GBL could benefit learners. While a few comments were explicit about the possible negative impact of gaming for perpetuating bad cultural influences, a vast majority of the posts drew attention to the benefits or great potential of specific social and cultural aspects of gaming. Such ongoing explorations of gaming

and GBL connected to the emotional wellbeing of learners precisely demonstrate the desired social learning enactivism endorses.

The significance of this result is twofold. First, dealing with adversity and building resilience are some of the most important aspects of learning in the 21st century (Ramos, 2019). The inquiry into such topics thus enhance the educators' content learning of GBL. More importantly, enactivism views that the "learning process is fully embodied and fundamentally affective" (Maiese, 2017, p. 199) which underscores the importance of affective variables in cognition. In this view, one's emotional ties to both self and the world in which they are situated provides the foundation for any transformative learning (Maiese, 2017). In regular academic classrooms (except courses focusing on affection-connected subjects), emotions are rarely placed at center stage or even discussed because cognition has long been considered only as a brain-based process that is independent from one's feeling (Maiese, 2017). In this enactivist environment, the analysis of GBL through the social and cultural lens naturally leads to discourse connected to emotion, which is foundational for learners' meaning making, a core concept of cognition. Such emotion-connected discussions, thus, are likely to produce transformative learning.

Conclusions

The current study, through the examination of data collected from multiple years, enables us to gain more nuanced understanding of how the learning environment shapes the social practices of the community.

Considering that learning is socially situated and in culturally-grounded conditions, this study helps us better understand educator behaviors related to GBL and offers insights into designing meaningful learning situations that promote social learning. Further, our discourse analysis not only provides examples of how educators can improve their practice by attending to language use, but also adds to the barely explored field of online interactions through the sociocultural perspective. In addition, the exclusive online environment established adds to the literature in GBL by providing evidence in a new context. The exploration of affordances and perceptions through a sociocultural lens can assist us when looking into best practices to design enactivist learning worlds. Such exploration sheds light on possible pathways to enhance learning

not only by moving educators from passive knowledge consumption to active contribution, but also through dynamic, self-initiated, interest-driven social interactions in a carefully designed freedom learning world.

Results of this study offer practical implications on how to deliberately establish and nurture a freedom learning world. To this end, two critical considerations are needed for ongoing adaptions. The first critical condition to enhance learning, from an enactivist view, is to have means by which learners can impact each other (Davis & Sumara, 2006). Our results suggest that inspiring emotion is an optimal means. In this study, the educators' enactment to the social learning affordance is often emotion connected, and the learning is at its height when it is connecting to their personal experiences with emotional ties. Cultivating a class culture that incites good emotions should be at the forefront of designing a freedom learning world.

Another important, and perhaps interconnected condition is to offer opportunities to encourage self-starting, interest-driven social learning. As demonstrated in this work, although the course has no required regular exchanges, the embedded tasks and the course structure have afforded opportunities for the educators to actively interact with one another. Therefore, when establishing a freedom learning world, rather than forcing academic social learning, we should focus on people. That is, instead of demanding learners to artificially socialize by requiring a certain number of posts, a better approach is to carefully design the learning tasks and structures so that learners are autonomously sharing, thus creating an ecosystem of conversations that are directly or indirectly connected to the content learning.

Doubtlessly, this study has its own limitations. The first limitation is that a convenience sample of a graduate course is used. With only 35 participants, the findings should be considered with caution. Future studies are encouraged to research enactivist grounded freedom education with larger sample sizes. In addition, this study only focuses on educators' experiences and perceptions. It is recommended that further research approaches include various stakeholder groups, such as students or administrators, in the ecosystem.

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