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Producing games as a pedagogical strategy

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Creativity and Playfulness: Producing Games as a Pedagogical Strategy

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Abstract: This article explores how student behavior and interactions change when teachers use "producing games" as a primary pedagogical strategy (Papert, 1980; Ejsing-Duun and Karoff, 2014). Based on student and teacher actions and responses, as well as on students' production—observed during fieldwork—this paper emphasizes the importance of understanding how students explore creativity and playfulness while producing in learning situations.

This paper is based on a large research project called "Children as Learning Designers in a Digital School (2013–2015)," funded by Denmark's Ministry of Education. The study includes fieldwork in five Danish public schools, involving about 500 students, and it is based on six interventions in the first, second, fifth, sixth, and tenth grades. The article's empirical data consist of observations, participatory observation, and productions students created during the interventions.

This paper presents an analysis of how students are creative and playful while producing learning material as games, during two interventions in the research project. The study is based on a specific understanding of the creativity (Boden, 2004) and playfulness (Karoff, 2013) that occur in learning situations.

We want to approach creativity and playfulness as new ways of playing it safe when using material, through six areas of change that inform "how today's kids play and learn, and, more generally, how they see themselves, relate to others, dwell in place, and treat things" (Ackermann, 2013, p. 119). As a result, this paper contributes to the field by analyzing and discussing how educators deal with children's production processes in a school setting and how teachers can conceptualize and nurture play and creativity as drivers for learning. We further argue that playfulness is necessary for creativity to occur. From this point of view, understanding how learning activities can support creativity—an essential twenty-first century skill—becomes more accessible.

Keywords: Production of games, creativity, playing, learning.

1. Introduction

This paper addresses the question of how creativity and playfulness inform and qualify learning processes in schools. More specifically, it explores how student behavior and interactions move toward creativity and playfulness when teachers use "producing games" with digital tools as a primary pedagogical strategy (Papert, 1980; Ejsing-Duun and Karoff, 2014). Based on student and teacher actions and responses, as well as on students' production—observed during fieldwork—the paper's goal is to emphasize the importance of understanding how students can explore playfully and be creative while producing in learning situations and how teachers can facilitate this process.

Production as a pedagogical strategy shows good learning results. Previous research has elucidated how children learn through production (Papert, 1980). Here, the focus is on how teachers can frame production as a way to work toward learning objectives by creating an environment that allows children to explore a subject matter (Papert, 1980). Cebeci and Tekdal (2006) have also shown how production has a positive learning potential when young people are making podcasts about relevant academic subjects. Students need to be actively engaged in creating products that are personally meaningful to themselves and others. Kress (2010) points out that the abstract aspects of teaching become tangible through different materialities. When producing games, students translate abstract aspects into tangible and interactive dynamics in environments that, if carefully framed, allow students to explore the subject matter through meaningful productions. Making games is not a new idea in education. However, according to Kafai (2006, p. 36), "Far fewer people have sought to turn the tables: by making games for learning instead of playing games for learning."

Our contribution to this approach is to analyze how Danish children work creatively and playfully with digital game production in a math setting. Games are particularly relevant to achieving math objectives since they are state machines, and making these requires understanding a variety of mathematical capabilities, such as speed, algebra, calculations, and geometrical shapes.

Creativity (Boden, 2004) and playfulness (Karoff, 2013) occurred in this study's observed learning situations. By introducing six dimensions that inform how children play, learn, and create, based on Ackermann's (2013) work, we sought to explore how students use materials and design processes to explore. As a result, this paper's main contribution is to show how students can be creative in various ways when extracting knowledge from game experiences and information on game genres in schools. Furthermore, we seek to challenge the common understanding of creativity as "something totally new created out of nothing." Instead, we urge teachers to frame and embrace the disruptions and necessary copying that allow children to be productive and, sometimes, even creative.

The next section introduces the research context. Section three presents the theoretical points of departure, while section four analyzes a number of learning situations that arose during our empirical research. Section five discusses the concepts of creativity and playfulness in the context of learning.

2. Research context

This paper is based on a large research project called "Children as Learning Designers in a Digital School (2013–2015)," funded by Denmark's Ministry of Education. This empirical research consists of fieldwork in five Danish public schools, involving about 500 students and 30 teachers, and it is based on six interventions in the first, second, fifth, sixth, and tenth grades. The schools were chosen from a pool of candidates to guarantee geographical and socioeconomic dispersion (Levinsen et al., 2014). The project explores the area of students' production and involvement, and, more specifically: 1) how students' digital production affects learning processes and the quality of learning results regarding subjects and transdisciplines and 2) how information and communications technologies that allow students to act as designers of their own learning practice in terms of form, framing, and content affect their learning, engagement, and motivation.

Due to the project's complex nature, a mixed methods approach was used. In their research, Johnson and Onwuegbuzie (2014) sought to overcome incompatible findings within a complex field. This, in turn, has led us to follow a strategy linking fieldwork inspired by ethnography and design-based research that emphasizes experiments and collaboration with practitioners (for a further elaboration of this methodology in Levinsen et al., 2014, see also Magnussen and Sørensen, 2010 and Cobb et al., 2003). As Johnson and Onwuegbuzie (2014, p. 16) suggest, the "Bottom line is that research approaches should be mixed in ways that offer the best opportunities for answering important research questions." The present study's empirical data consist of observations, participatory observation, and productions created by students during the research project. In this paper, we focus on two significant situations to illustrate a tendency in our observations, which are both presented in the following two subsections.

2.1 "Did you make this yourself?"

This example is taken from a mathematics intervention in which children in fifth grade (approximately 11 years old) were instructed to program games using iPads and the software application Hopscotch. The children were extremely engaged in creating good games, and, thus, they worked intensely on their products. They asked for extra lessons on mathematical subjects relevant to their games. They also assessed each other's products throughout the project (Misfeldt and Ejsing-Duun, 2015).

Simon is a student for whom math is hard. From the beginning, he failed to complete the tutorial—a sequence of tasks designed by the teacher that introduced students to programming with Hopscotch. However, he was highly engaged in the process of making a game. In the morning on the project's third day, he found the teacher before class had started to show her his progress. She looked at the game that he had made and asked him whether he had made it himself. He replied that he indeed had developed it himself. She inquired about several features of the game, and he had difficulty explaining how they had been made. He continued to work on the game throughout the next period. As he uploaded his finished game, an icon indicated that he had retrieved a coded game from the Hopscotch community and remixed it. In the end, as other students presented their games, he followed their information with interest and then presented his own game. After he had received feedback on the game, he continued tweaking it in terms of speed and points awarded and so on.

Once the project was finished, the teacher emphasized Simon's motivation as a particular success and benefit. He was captivated by the process, and he kept working with the subject matter. He did not ask for much help but worked anyway. She pointed out that he has academic difficulties and, normally, has a hard time following lessons and presenting anything to the class. Without doubt, Simon felt ownership—and was proud—of his game.

2.2 "Are you fooling around?"

This example is taken from a mathematics intervention with children in first grade (approximately eight years old). The children were introduced to the program Geogebra, using computers. The assignment was to create a shape using this mathematical tool. Afterward, the game called for the children to exchange shapes with their classmates and imitate another shape. Oliver is a boy that often goes his own way. In the beginning of the intervention, he refused to use Geogebra and, instead, drew his shapes in Paint (a Microsoft program). In the second week, he used both programs, still preferring Paint and often running both programs at the same time. However, he did draw a mouse in Geogebra, using shapes of circles in different sizes. The teacher told him to use Geogebra for his assignment, and, thereafter, he closed Paint or immediately switched to Geogebra whenever the teacher came near. In the end, as other students evaluated their assignment, he changed his mouse picture, drawing on top of what he had already made and, instead of evaluating it, redesigned the figure. Contrary to his classmates, who all did almost the same green star with blue corners, Oliver apparently needed to play around continuously with the shapes and tool's possibilities. The only way to do that was to avoid attracting the teacher's attention and do something different as compared to the others.

3. Creativity

According to Boden (2004) creativity can have three forms, none of which creates something out of nothing. The three forms of creativity relate to the subject matter—in Boden's words, the "conceptual space"—in three different ways. The first form is *combinatorial* creativity, which exploits shared conceptual structures to create analogies or metaphors. As an example, Boden mentions how a journalist might compare a politician with an animal, creating a conceptual pathway between the two. The process, thus, is guided by associative forms. In the game production, the material of game knowledge is used when relating to the production process as a metaphor for the subject matter. The second form, *explorative* creativity, relies on culturally accepted styles of thinking (i.e., artistic genres). This conceptual space is restrained by a set of generative rules and is explored when being creative in an explorative manner. When producing games, players need to explore the rules' structure throughout the game production, since it has to be playable. The last kind of creativity implies that this conceptual space is altered altogether. This is what Boden (2004) calls *transformative* creativity. As she says:

> A given style of thinking, no less than a road system, can render certain thoughts impossible—which is to say unthinkable. The difference, as remarked above, is that thinking styles can be changed—sometimes, in a twinkling of an eye. (p. 6)

To combine, explore, and transform are all essential ways in which creativity can happen, according to Boden. Indeed, Ackermann (2013) has seen these modes of practice among children growing up in the digital age. This author suggests six areas of change in how children today combine, explore, and transform.

3.1 Creative ways of being productive

In her paper "Growing up in the Digital Age: Areas of Change," Ackermann (2013) identifies six areas of change that appear to inform how kids currently play and learn and, more generally, how they treat things, see themselves, dwell in places, and relate to others. In our research, we found these areas inspiring as a framework for understanding production and creativity, not only as something children do but also as ways in which they do it. In the following discussion, we present Ackermann's (2013) six areas.

According to Ackermann, *sharism* is the first dimension characterizing today's children. They share even before they think of the finished state of their productions, not keeping things to themselves. *Fluid selves* is another aspect, where children explore different versions of themselves through multiple digital, virtual, and physical realms. *Crossing borders* is the third dimension. Ackermann (2013) points out that children move between worlds and urge others to cross both cultural and geographical borders. The fourth area of contemporary children's renewed approach to the world is the *literacy* dimension, in which children have new ways of expressing their experiences. They manage to blend text, sounds, and images, and, often, they borrow from

those who inspire them. They invent new genres of writing by remixing, repurposing, and reconfiguring. As the fifth area, Ackermann (2013) mentions *a culture of gaming* or *"simuling*," which she uses to challenge the myth of gaming as escaping from reality. She states (p. 125):

> Games, like play, are more like a vacation. They offer a *voie royale* into the realm of "altered possibilities" which allow returning to "real life" better prepared, refreshed, stronger . . . Kids use fantasy not to get out of but into the world. They make up fictions, or dramatize everyday events, in order to de-dramatize the sometimes hard-to-handle reality. Intelligence itself, to Piaget, is about establishing a dialog between what is and what could be!

Simuling indicates a creation of an alternative world that is true and believable in its own right, in contrast to simulating, which implies pure reproduction. Ackerman´s point is that children today use the digital tools that they are presented with, or already have, to try out playful exploration in ways rarely possible with pre-digital tools. These children expect immediate feedback and use these tools to "simule" various ways of doing.

Tinkering, in Ackermann´s (2013, p. 126) perception, is exploring and extending the understanding of technology or situations through using and "making things 'do things'" and this is her last, characteristic way children today create—as *bricoleurs*, *makers*, *hackers*, and *hobbyists*. By trying things out, mixing things, and mending things together, they explore the possibilities of the world through what they create together. Through an iterative process of tweaking things, they empower their creations. The core point here is that they act before they think—or rather, they think while acting.

3.2 Playfulness in creative processes

Playfulness, in our understanding, is related to a way of being, in which goals and usefulness are not always at the center of activities (Karoff, 2013). Ackermann (2014, p. 1) addresses being playful in creative processes as a necessary aspect since "'coming at things obliquely'—through suspension of disbelief (pretense), artful détournement (displacements), and playful exaggeration (looking at things from unusual angles)—allows [one] to break loose from the habitual" To reach the stage in which one combines aspects normally not associated, explores the unknown and the known in fresh ways, or even transforms the area of interest, one needs to break habits and, sometimes, even perform what appear to be useless activities. Transgressing boundaries in playfulness is a driver for practices of change—and thus for creativity. These processes should not be tamed because, as Ackermann (2014, p. 8) suggests:

> [B]eyond our rational mind's temptation to plan ahead and to stick to the plan (unless proven wrong or irrevocably cornered), and the blind maker's insight-less errings, the playful wanderer enchants us through his own wondrous musings. S/he knows to look at things obliquely, cares to see what others don't, and uses his/her intelligent hand—and connection to the materials—to bring forth the unexpected.

This approach means that creators need to relate to the conceptual space within their interests without following a plan toward predefined objectives.

4. Analysis

Based on our study, we present the following important findings. First, "copying" material and reworking premade material are important aspects of creative production that can lead to learning. Second, an important part of creativity often is exploring and trying things out in a playful—even foolish way—without any specific goal in the quite near future.

4.1 Copy-cat or innovator?

Creative exploration, frequently, is based on a close imitation of something children already know extremely well, building upon existing knowledge and something already produced, which is often mistaken for copying. When Simon made a game by using the programming app Hopscotch, he downloaded an existing game and tweaked the codes and graphics: he hacked the game as a bricoleur and took literacy beyond print, as he managed to navigate the game's digital layers (Ackermann, 2013). He took the initiative to present his work to his teacher and, thus, shared it without paying attention to whether it was finished (Ackermann, 2013). While hacking the game, he was simuling a creation of an alternative world, which implies the faithful reproduction of the original—in this case, an attempt to mimic an existing game (Ackermann, 2013).

Being a student who is challenged by math, Simon would probably have been lost in the rather complex process of learning to program and invent a game from scratch, had the teacher insisted that this was required. However, Simon was engaged in changing variables and observing how values affect speed, positions, and geometrical shapes—all of which were matters relevant to the subject at hand, the conceptual space. Simon might not be an innovator, since he did not combine areas of knowledge or transform the conceptual space, but he worked creatively, exploring the field of interest and rehearsing and applying his knowledge of math. He explored literacies beyond print as he reconfigured the game code that he had "borrowed," and he hacked the game through an iterative process. He also sought the opportunity to explore the area even further as he shared it with the teacher, without thinking about what stage his work had reached.

Simon is not the only student who took a premade game as the point of departure for programming with Hopscotch. The data contain more examples of students who tweaked previously made games and applied pre-programmed blocks to their game. In this way, Hopscotch enables differentiation. This was made more challenging by the teacher, who prompted the students to present their games to the class. In the presentations, she pushed the entire class to explain features of each game, and then she had each student who had designed a game unpack how he or she had actually made it. In addition, the teacher challenged the class to find ways to improve their games and to explain how to do this. Through this process, the teacher kept focusing on the conceptual space in which students inquire about and explore through their design processes—namely, algebra, variables, and algorithms. She thereby facilitated negotiations of their productions that related these to learning goals (Ejsing-Duun et al., 2013).

4.2 Destructive or disruptive?

Furthermore, in Oliver's class, imitation and copying seemed the main way to produce shapes, but Oliver did something else. While Oliver was trying the Geogebra program without a specific goal, he drew a funny mouse, coming up with a story and telling it to a friend, within just 10 minutes. By analyzing the situation using the concepts of sharism and tinkering bricoleurs (Ackermann, 2013), an interesting observation is the ways "messing around" with the digital tool facilitates creative and playful behavior (Itu et al., 2009). This is a piece from the field notes:

> Oliver opens Geogebra. His teacher has given him an assignment. He must draw a figure. Afterwards, he must give his figure assignment to a classmate. His classmate, then, must be able to make the same figure. Oliver makes a circle, he draws two lines across, some ears of two other circles, and, now, he has a mouse. He moves the lines within the mouse and talks with a mousy voice. Oliver laughs, he turns to Ida-Marie, the girl next to him. "Look," he says. He modifies his voice into a mouse voice, as he moves the two lines up and down, and it looks like a talking mouse. Ida-Marie is listening to the story, and Oliver says that his mouse is moving toward a dangerous mission. Ida-Marie laughs. Oliver continues to move the lines faster and faster, and the mouse eventually shouts very loudly.

Oliver did not know the program or digital tool extremely well, since he preferred Paint, as mentioned previously. However, in this situation, he messed around with the features, trying things out and drawing a mouse using circle shapes. He was not at all tuned into the assignment's goal, but, instead, his practices were explorative, ending up in a story told to his friend. In other words, they were playful. According to Ackermann's (2013) concept of "tinkering," Oliver let the tool guide him, playing with features and possibilities as he messed around with the program. Neither the story nor the drawing were planned beforehand. Instead, Oliver was developing both while creating them, and, while he was doing this, he shared them. As Ackermann (2013) points out in her definition of sharism, sharing is the center of accomplishments, and Ida-Marie became Oliver's audience, as her laughs made the lines move even faster.

Fooling around with digital tools is a well-established practice in classes, while introducing something new to students' production processes. The data include several examples of students tinkering and fooling around while thinking. Teachers' ideas of learning practices are challenged by this type of creativity, primarily because the activity's goal is blurred. As Karoff (2013) mentions, this is quite distinctive to playfulness, and, using Ackermann's (2014) idea of looking at things obliquely, Oliver's practices seem to be driven by this process. He brought something unexpected to life, in connection to the material with which he was working. By introducing his classmate Ida-Marie to his unexpected exploration, he underlined the importance of sharing

creative unexpectedness with others in order for the process to remain meaningful. In this specific case, the teacher was constantly keeping an eye on him, making sure that he did what he was supposed to do. She understood his fooling around as being destructive and not heading toward the planned goal.

5. Discussion

In our study of several schools and teachers, a recurring conception was that children often are not very creative. Many teachers expressed the worry that if teachers showed students an example of a premade product, the students would make a variation of just that. As Ackermann (2013, p. 125) writes:

> A big problem among educators today is to come to grips with what they view as "plagiarism": students' tendencies to pick-up and pass-on readymade imports that have not been "massaged" long enough, or mindfully engaged.

Some teachers in our observations seemed to evaluate creativity as inventing something "new" and previously unseen, which depends on the product, not the process. Another reoccurring idea was that being creative is to find new and smart ways to solve specific problems related to educational objectives.

In order to prevent aimless copying of other people's work or purposelessly goofing around, the educators in this study made different suggestions. In planning interventions, some teachers considered not showing the children any examples to prompt more unique solutions. To prevent students from goofing around and keep students on track, another suggestion was to have them make a plan from the outset. Hence, being not goal oriented was often understood by teachers as being disruptive. Another idea repeated was that good products require early analysis and planning.

However, some teachers, such as the math teacher who planned the Hopscotch game programming intervention, allowed students to find their own path after the initial tutorial. This is particularly a good idea when students are unfamiliar with tools, as was the case in the two situations analyzed in this paper. The tutorial was designed to ensure that students were presented with the tool's features and that students related to the conceptual space in the same way that the tutorial's tasks related to this. The students could then fool around with the tools, as shown in Oliver's story, trying out their features by copying and remixing content, as Simon did, to discover the tool's limitations and possibilities.

We argue that learning activities with digital tools that allow playfulness can support creativity—an essential twenty-first century skill. However, allowing students to fool around and embracing copying could be a road that leads nowhere or that is even directly destructive. This is a challenge within school systems that are increasingly goal-oriented. Teachers need to be alert to situations that emerge, to relate them to the conceptual space whenever possible, or, even better, to teach students to do so themselves. However, learning need not be only linked to a specific, narrow curriculum. When Simon messed around with the pre-programmed game, he was learning about games, about genres, about programming, about presenting, and so on. However, if teachers want their classes to learn about algebra as a group, then they should not develop objectives but rather formulate criteria that could guide the "messing around" and thus encourage exploration and combinations of materials.

The teachers' task is to maintain the students' focus on an examination of the conceptual space and to motivate the children to explore the subject matter continuously, understanding it by combining knowledge fields or even transforming their understanding of it. The children do this by qualifying and refining their products. As Ackermann (2013, p. 121) points out, "Digital natives are known for their launching of half-baked ideas and creations." For these "half-baked" ideas to be qualified further, the teachers' role is to provide time and space for continuous refinements. Thus, teachers cannot merely give students a task, send them into production mode with possible supervision, and evaluate products at the end. On the contrary, working in an iterative process has proven to be highly efficient, in which teachers and students have time-outs during the class in which they assemble and re-evaluate students' productions in their current stage in relation to the conceptual space, identifying criteria for the ongoing production together. As Sørensen and Levinsen (2014, p. 7) point out:

Ongoing evaluations with feedback and/or feed-forward can be used as short time-outs, where students and/or the teacher show and tell something that others can learn from, for example, when students have found out how to animate a graphic element.

Throughout this ongoing evaluation and production process, teachers need to remain aware of what students are combining, exploring, and transforming and how this relates to the conceptual space. The challenge is to inquire about the students' intentions behind "messing around" and bring these into the conceptual space—or, if unrelated, dismiss them as such. Through this inquiry, teachers qualify the children's creativity in relation to the conceptual space, and, in connection to this space, make students refine their work, not only once, but again and again.

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