

## 優れた生徒の力を引き出すためのゲームデザインを通じた学習 Empowering gifted students to learn through game design

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**概要** この研究の目的は、地方の優れた高校生がゲームをデザインする活動を体験して得た生の経験を探ることである。本研究は質的研究の手法により、ユーザーデザイナーとして活動する生徒たちの現実世界を説明することを試みた。その結果、5つのテーマが示された。ユーザーデザインの手法は、主体性と自信、楽しい経験、参加型の活動、問題解決ツール、そして困難な課題を生徒たちにもたらした。参加した生徒たちは、最小限の教師からの指導のみでゲームをデザインした。

**Abstract** The purpose of this study was to explore the lived experiences of rural, gifted high school students experiences when designing their own games. This study provided real world accounts of students being user-designers. This study employed qualitative methodology. Five themes emerged from this study. The themes were: User-design is achieved through authentic empowerment and ownership, user-design is a fun experience, user-design is a participatory activity, user-design is a tool for problem solving, and user-design is challenging for students. The student's participants designed their own games with minimal assistance from the instructor.

### INTRODUCTION

User-design is a relatively novel phenomenon introduced to the field of instructional systems by Dr. Bela Banathy<sup>[1]</sup>. User-design empowers users in the creation of their own systems<sup>[2]</sup>, which for many scholars represents a major shift in power dynamics. User-design is not user-centered or learning-centered design<sup>[3]</sup>. These approaches do not provide a necessary shift in power dynamics from the hands of the “experts” to the users themselves. User-design is an “anti-colonial” model that empowers indigenous knowledge and fosters democratic principles in the world of design by empowering those who will be using an innovation. It is an approach that allows users to transcend from simply being participants, or informants, to being designers themselves. In this study, user-design was defined as a model where the participants had the power to make decisions in the context of game making.

The foundations of user-design are closely related to Scandinavian models of participatory design, emancipatory design, and stakeholder participation. In fact, Scandinavian countries have been promoting user-design in the

context of interface design<sup>[1]</sup> for at least twenty years<sup>[4][5]</sup>. Scandinavian User-design is an attempt for users to play an essential role in the design process of user interfaces<sup>[1]</sup>. This study was about empowerment and creativity because empowerment and creativity are rarely implemented in classrooms. This reality is nothing new. In the early 1970's, Illich, a distinguished educational scholar, stated that schools inhibit creativity and freedom<sup>[6]</sup>. In order for pupils to be creative, the educational system should, perhaps, allow pupils to make decisions so that they can develop their individual strengths. A logical way of accomplishing this task could be through user-design. In this study, students were empowered and learned through game design. The purpose of this study was to describe the human experiences of rural, gifted high school students as user-designers<sup>[7]</sup>. The question that guided this research study was what is it like for rural high school students to have the power to design their own game?

### RESEARCH DESIGN

This was a phenomenological study<sup>[8]</sup> involving rural,

gifted high school students' experiences as a designer of their own games. The unit of analysis for this study was the individual participants (rural, gifted high school students). The study was conducted at the Clarion Area High School. I captured a dimension of students' experiences as being the designers of their own games by recording the anecdotes and stories that illustrated their experiences<sup>[8]</sup>. Due to the emergent nature of qualitative studies, I did not have a set number of a priori interviews. I observed their behaviors in the classroom, audio taped the participants' interviews, and collected weekly reflection papers. I did not limit or set a precise number of participants ahead of time (Rubin & Rubin, 1995)<sup>[9]</sup>. I tape recorded and transcribed each interview myself using garage band. I kept memos for each interview in case an accident happened and to assist me with data analysis. These memos included my personal notes for each interview as well as my reflections from both observation and interviews. I follow the recommendations given by Graneheim & Lundman<sup>[10]</sup>. I generated condensed meaning unit descriptions close to text. I reduced the meaning units into chunks of meaning in order to make a more concise version of my meaning units selection. I made my meaning units pages document more abstract. It was not until the next step that I started to interpret what the participants reported. In the next step, I took the condensed meaning units and interpreted their underlying meanings. As I interpreted the participants' experiences of being a user-designer, I moved upwards again on the ladder of abstraction so that I could start generating themes. Because Graneheim and Lundman recommend that qualitative researchers generate sub-themes prior to themes, I first generated sub-themes. I generated them by looking for common patterns, e.g., frequency and how relevant the codes were to my research questions. Once I isolated the sub-themes, I then grouped them into more abstract patterns, which emerged as my study's themes. My data analysis process consisted of a systematic approach to generating themes moving up the ladder of abstraction from what the participants told me in their interview responses to my abstract interpretations of their experiences through common patterns.

## FINDINGS

Five themes emerged from this research study. The themes were: User-design is achieved through authentic empowerment and ownership; user-design is a fun gaming experience; user-design is a participatory activity; user-design is a tool for problem solving; and user-design is challenging.

### User-design is achieved through authentic empowerment and ownership

Several participants reflected on their experiences and reported that they had the freedom to design their own game. One of the participants, James, went even further to express feelings of authentic empowerment and ownership, two concepts repeatedly mentioned by Banathy<sup>[7]</sup> as being crucial for real user-design to occur. Robert provided detailed descriptions about his design process.

*I think it is pretty interesting. I really like being able to make it exactly how I like it rather than doing what someone else thought they would like. It's interesting the feeling of being able to do what you want. I am more empowered. You can do whatever you want to make it. (Tom, interview #1).*

*Yeah, it is cool to see how you can just hit a few buttons and then it comes up on the screen. Then, like today, I was getting really getting in to it, putting stuff there like crazy and getting better and better. It gives you the ability to make the game the way you want and improve it and modify it in which direction you wanna go. I like that fact that it is your own game that you are making (James, interview #2).*

Robert gave a descriptive account on how empowered he was in the process of design:

*First I tried to do simple things (such as?) like making movement things to appear and stuff but then I thought about what I wanted to put into the game so I tried to create objects. After that, I planned a variety of things to do (such as?) multiple different strategies (yes), levels, point system, (u hum), I then did some*

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*customization (of what?) of characters (what else?) hmmm, a storyline. [elaborate on that?] In my game, I made very simple storyline but I ended up creating all the characters first and made them functional. My storyline progressed as I did it (Robert, interview #3).*

The participants had the opportunity to construct their own games<sup>[11]</sup>, which in today's educational system is rarely the norm. This is the case because of the teacher-centered orientation of our educational system<sup>[6]</sup>. Our educational system has been, for too long, repressing students from being empowered and in charge of their own learning<sup>[12]</sup>.

### **User-design is a fun experience**

Scholars have argued that students tend to have fun when designing games<sup>[13][14]</sup>. I heard several students talking to each other in class saying that they were having a great time because they could be creative. At one instance, James said, "Man, I call the shots... I am going to create a car game." From a constructionist perspective<sup>[15][16][17]</sup>, children tend to create their own projects and express their creativity through design. This seemed to be the case in my study as well.

In a brief yet critical account, Robert described his experience as fun because he had the power to design his own game. In another interview, he went further and stated that his experiences were fun because he applied mathematical concepts to fit his own needs. Perhaps, what he really meant was that empowerment allowed him to express himself<sup>[14]</sup>.

*Haaa... I felt good about designing those games. It was a very fun thing to do, I mean... you are designing games... haa, I like being able to make the choices and making the game the way I want it (Robert, interview #1).*

*It was pretty fun and... since I could use mathematical formulas to find out exactly how far it would go since I had to calculate the distance (Robert, interview #1).*

Robert was probably also making an association between user-design and formal school learning. This is another

interesting finding to report because scholars have stated that it might be possible to transfer or associate particular experiences to real life practices if the individual is encouraged to reflect about his own learning in the process<sup>[18]</sup>.

### **User-design is a participatory activity**

The participants of this study were not simply informants in the design process<sup>[19]</sup>. They were involved, engaged and had a stake in the design of they own games, which according to the scholars are traits of participation. From my observations of how they designed their games, it seemed that they were forming a community of practice<sup>[20]</sup>. According to Wenger, communities of practice can be understood as groups of people who are passionate about a particular activity and learn to improve their abilities as they interact with one another.

One of the participants, Tom, reported low levels of participation throughout the study. He had to ask for technical help in order to design his game. Tom understood the value of having his colleagues who are as passionate about having the power to design games as he did, and how they can offer significant inputs that extension of their designs but his limitations with technology impacted his level of participation.

*Robert was working a lot with gravity, so, when I went to work with gravity or when he went to work with different random movement, we helped each other on that. It usually works out (Tom, interview #2).*

*It is definitely different in the structure of the class. Well first I use, I try to make the game pretty simple at first and then, I go and I modify it step by step and I see where I am going with it. Yeah. We help each other a lot (Tom, interview #2)*

Brockbank, McGill, and Beech stressed the importance of being engaged with others in a social environment to improve one's learning<sup>[21]</sup>. The scholars argue that by collaborating, learners have the opportunity to think about their own performance and identify the systematic process that they engaged in. Gargarian identifies early phases of

design in the musical domain where there is no data on which designers can build confidence<sup>[22]</sup>. The scholar goes further to state that composers often investigate musical artifacts from other composers to help their designs. This seemed to be what Tom was referring to when he reported that he could get “help from others.”

### User-design is a tool for problem solving

There were a multitude of accounts among participants in this study that suggested that user-design was a problem-solving tool. Two of the participants' experiences included accounts pointing to an association between problem solving and user-design. Based on my observations of Tom and Scott, they were solving problems to seek recognition from their peers.

*Well, its nice to be able to think through your troubles when designing games and try to solve them. Ha, it probably helps me with like, some reasoning skills... some problem solving too (Tom, interview #1).*

*I think it helped me with problem solving... ha, in the way that if say your game is not working it right you have to go through it figure it out what was wrong and solve the problem. I think it helped me with my problem solving skills (Scott, interview #3).*

This result might be a surprising finding for user-design scholars. However, gaming scholars have been reporting that problem solving is a consequence of game playing and design for some time<sup>[23]</sup>. Prensky suggest that game playing might assist with kids problem solving and critical skills<sup>[24]</sup>. However, the motive for why designers solve problems isn't clear. It appeared to me that players reported that their experiences resulted in them solving problems because they had to figure out possible solutions either by asking classmates or through trial and error so that they could come up with a superb design and be competitive with one another. This possible conclusion has theoretical justification. Prensky called this kind of learning “discovery learning” which he defined as learning the ability to solve problems and searching the data for clues<sup>[25]</sup>. From what I saw in the classroom, this was indeed what

the participants did.

### Challenges of user-design

Creating a game, even for students with an average IQ of 130, wasn't a simple talk. Part of the problem was due to tool limitations and because design is difficult<sup>[26]</sup>. Gamemaker Lite didn't offer all tools available to design. I heard students complaining about the how they could not do exactly what they wanted because the software did not allow it. This might explain why most participants ended up using similar sprites and their games incorporated concepts of gravity, simply because it was available. Tom, Robert and Scott indicated that there were technical limitations when designing his game.

*...Because you are still limited by the capabilities of the computer and the teacher that is teaching (Tom, interview #1).*

*I don't think I can make anything but... [Do you like to design your own games?] Yes, very much Just because I can do whatever I want and... Well, its nice to be able to think through your troubles when designing games and try to solve them (Tom, interview #3).*

*When you are making your game, it's your own. Essentially, you might be limited by like, what you can do with the tools you are working with (Scott, interview #1).*

*Power to control the game but not completely. When designing sprites there was that you could not create anything but a square sprite or rectangle so didn't have a curve edge ever yeah. Power is control over som aspect of something. I had control of most aspects of my games, yes (Robert, Interview #3).*

Although they had the power to design whatever they wanted, they were still dependent on the tools given. Therefore, building external artifacts, such as a game<sup>[27]</sup> was difficult because of technological impediments. Tom wasn't completely clueless about Gamemaker. He entered the study with a limited knowledge of Gamemaker. For this reason, perhaps, he was able to identify Gamemaker'

s limitations early in the process of design. During my observations, I heard Tom say, “I can’t believe it. I can’t use this function.”

Kafai argued that constructionists have focused their efforts on allowing students to construct their own games rather than embedding lessons in the games with the belief that students would construct knowledge patterns in the process<sup>[28]</sup>. I would argue that having freedom to design has its limitations also because the current system doesn’t necessarily expect students to take on anything other than subordinate roles<sup>[6]</sup>. Tom’s response above clearly reveals that designing his own system wasn’t an easy task and that perhaps, being empowered to design his own game isn’t a simple process.

## CONCLUSION

Carr-Chellman<sup>[1]</sup> and Banathy<sup>[7]</sup> indicate that true user-design has to be empowering and it must allow users to have ownership of the systems they make. This study confirmed these theoretical accounts. The students reported that they had the power to design their own game, which resulted in participants making final decisions about their own games. In addition, they took pride and ownership of their own creation. Overall, their experiences were fun. Some participants indicated that their overall experience was fun because it was challenging and due to the fact that they were in charge. A few reported that their experience was fun because they could experiment and be creative. McLaren has argued that the current educational system inhibits creativity and is anti-democratic because students rarely make decisions<sup>[12]</sup>. Freire prefers to call the system oppressive<sup>[29]</sup>. By having the power to design their own systems of learning, the students were challenged and had a voice to decide what they thought was good design. The results were overwhelmingly positive.

Almost all students reported that receiving help from their classmates was necessary. A few indicated that the teacher could be a helpful resource in the process of design. A community of designers was formed throughout the course of this study<sup>[7]</sup>. In addition to user-design being a participatory endeavor which assists students to achieve higher levels of sophistication in their games, this research study also presented the thesis that user-design

could be used as a tool for problem solving in micro level investigations. Students reported that user-design could be an avenue for reasoning, in a form of trial and error tool or by simply being a model for problem solving. Participants solved problems to compete and built identity. This study confirmed the theoretical accounts made by Higgins<sup>[30]</sup> and Hooper<sup>[13]</sup>, where the scholars argued that games support the development of logical thinking and problem solving.

The five students reported a multitude of challenges when doing user-designer related tasks. One of the reasons was because design is difficult as an enterprise<sup>[26]</sup>. The experiences the participants reported indicated that the lack of guidance was difficult and that having a set of guidelines would be beneficial. This finding supports the argument made by a multitude of scholars (McLaren, 1999; Carr, 1996; Carr-Chellman, 2007; Carr-Chellman, A., Cuyar, C., & Breman, J, 1998; Ackoff, 1974)<sup>[12][3][1][31][32]</sup>. However, if they were to choose power over guidelines, they would opt for power. A few participants indicated that the teacher was not as helpful in assisting them in creating their games as they might have liked (Doll, 2008)<sup>[33]</sup>. Some students indicated that Gamemaker as a tool was challenging and that the process of design was frustrating. However, playing games was among the most rewarding activities. Perhaps, this was the case because building motivating games for learning is fun<sup>[34][13]</sup>. The students had the power to design what they wanted, under the circumstances. In the end, I feel comfortable asserting that these participants did reach the level of Banathyan user-designers.

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