

Digging into Game Design for Older Adults

Collaborative User-Centered Game Design with Postsecondary Students

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Abstract: A collaborative team of game design students, instructors, researchers, and older adults worked together to create educational digital games for older adults. A user-centered design approach was utilized in which the needs, desires, and limitations of the end users were taken into consideration at all stages. Collaboration occurred among researchers, instructors, student-designers, and older adults to create several enjoyable interactive learning games. The current paper examines one of the game development team's process through the nine-month course. The data included team observations, feedback from older adults, and a focus group with the team members at the end of the project. The results suggest that the process of requiring young students in their 20s to design for older adults challenged them to think creatively and expand their understandings.

1 INTRODUCTION

Seniors (60+) are the fastest growing population in almost every country in the world, with estimates of this demographic doubling by 2050 (WHO, 2015). In Canada, there are almost 5.8 million seniors, and it is predicted that there will be an increase from 16.1% of the population to 20.1% by 2024 (Statistics Canada, 2015). For the first time in history the number of older adults in Canada has surpassed those between the ages of 0-14 (Statistics Canada, 2015). This has been an ongoing trend among many countries in the world and has led to an increase of research on ageing. The sudden growth of an ageing society may impact institutions, work places, culture, and society (McDaniel and Rozanova, 2011). Technology has been increasingly examined as a tool that may help maintain the quality of life of older adults. Of the technologies, digital games can play an important role in providing the motivation and excitement that allow older adults to pursue areas to improve social well-being, life-long learning, digital literacy, and intergenerational connections (Astell, 2013).

Over the past five years, older adults have become the fastest growing gaming demographic. In 2015, over a quarter of gamers (27%) were over the age of 50 (ESA, 2015). Furthermore, the number of female gamers aged 50 and older increased by 32% from 2012 to 2013 (ESA, 2014). Older adult gamers are

mainly casual gamers (66%), who prefer puzzle games, card, arcade or word games (De Schutter, 2011, ESA, 2016). De Schutter (2011) found that 80% of the older adult gamers surveyed in their study were casual gamers, the other 20% had a wide range of game preference.

Previous studies found that older adults enjoy a variety of benefits from digital games including fun, social connections to others, and cognitive challenge (De Schutter, 2011; Gamberini et al., 2009; Hausknecht, 2013; Schell et al., 2016). For example, a study conducted by Schell et al., (2016) found older adults increased their social connectedness and reduced loneliness levels during an eight week Wii Bowling tournament. However, this was not without some constraints. Other studies have noted that the elderly, particularly those with an impairment may struggle with games (IJsselsteijn et al., 2007; Gerling et al., 2011). To address specific needs and interests of older adult gamers, some researchers have started to design games aimed at older adults. Such as the project Eldergames, where a tabletop game designed for cognitive preservation was implemented (Gamberini et al., 2009). Gerling et al., (2011) also created the game SilverPromenade which was designed for frail elderly. In this study, they used a participatory design incorporating older adults in a care home into the process and attempting to adjust for the specific limitations that arose.

Although older adult gamers make up a quarter of the gaming population, they are often a neglected target demographic group. The game design industry has rarely targeted this population. A further difficulty is that intergenerational interactions are becoming increasingly limited through societal age segregation such as schools, workplace, housing, and families living in different regions (Hagestad and Uhlenberg, 2005). This may mean that young designer's interactions with older adults may be limited. These factors may also contribute to a lack of awareness of differences in the needs of older adults compared to a younger gaming community. Further difficulties may arise due to an I-methodology design approach. This is where designers design a game with the perception that they are representative of end users (Akrich, 1995). Although the designer may, or may not be aware of this, it has implications. Some have argued that when an I-methodology design approach is used then the diversity of gamers may be neglected including aspects as age and gender (Loos, 2014; Romero and Ouellet, 2016). Thus, introducing game design students to varied end users may allow for increasing awareness of diversity.

1.1 Importance of Learning in Later Life

Maintaining cognitive engagement with life is essential to the quality of life of older adults. One way of doing this is through providing older adults with increased learning opportunities. Learning may play an important role in promoting cognitive health in older adults (Beddington et al., 2008). Furthermore, learning habits have been associated with an increased sense of well-being in older adults (Jenkins and Mostafa, 2015). Such learning activities are not only beneficial for the individual, but often have a positive effect on community engagement and well-being (Merriam and Key, 2014).

Unlike younger adults who may be more concerned with degrees and enhancing career opportunities, older adult learners are often engaged in activities for enjoyment. Thus, older adults must be motivated by the content (Kim and Merriam, 2004). Technology is a great opportunity for older adults to engage in informal learning. Our research team has been involved in a number of projects aimed at engaging older adults in technology enhanced learning experiences. We have been trying to find innovative ways to provide engaging learning experiences for older adults.

1.2 Human-centred Design, User-Centered Design, and Participatory Design for Representation

Approaches to innovative designs have undergone a change with increased interest in incorporating the feedback and needs of end users and other stakeholders (Sanders, 2002). User-centered game design has become increasingly popular. It allows for game designers to better understand the end users and their needs. This is important since the game industry is still limited in diversity (International Game Developers Association, 2016). User-centered design is an iterative process whereby the user is considered at all stages of development (Nicholson, 2012). It seeks to collect data around users' behaviors, needs and practices to provide more intuitive systems and interfaces (Perry et al., 2013). Previous studies have also pointed to the need for more participatory design processes to allow for a better representation of such aspects such as age and gender (Romero and Ouellet, 2016). One approach has been to incorporate others (beyond the design team) in the process of design (Sanders et al., 2010).

Extending from user-centered design, Van Abeele and Van Rompaey (2006) suggested that these ideas needs to be pushed further to incorporate the end user early in the process. Vanden et al., (2006) adopted a human-centered (HC) procedure to design game concepts for and with older adults. This procedure started with observing older adults' positive experiences in their daily life. Then, older adults and researchers generated game-ideas and co-designed the selected ideas into some game concepts. Loos (2014) suggested that Vanden et al's HC procedure was a way to avoid some of the pitfalls of I-methodology.

2 RESEARCH APPROACH AND METHOD

In the current project, we used a combination of user-centered design and participatory design approaches to facilitate collaboration between researchers, the instructor, game design students, and the older adults. All stakeholders had some input into the game design and provided feedback throughout; however, as this was a school project there were some limitations to the contributions as the students had the final decisions on what feedback to incorporate.

2.1 Context Participants

This collaboration involved five researchers, thirteen older adults, sixty students, and one instructor. The students attended an art school and were seeking degrees as either game designers, programmers, or artists. Most of the students were in their early 20s. The older adults were aged over 60 and recruited from the community.

There were five meetings in which the researchers and/or older adults came in to provide feedback and guidance. The students formed teams of 5 – 12 students. For this class, students were required to create a digital game for older adults with some form of learning incorporated into the design. Specific criteria:

1. create digital games for older adults that can be played on tablets and/or personal computers
2. create games that can be played both alone and with other players
3. consider the possibility of creating a game that can be played by an intergenerational team
4. embed subject matter content into the games that is appropriate and motivating to older adults (learning)
5. conduct evaluation of the games with groups of older adults

Within the nine-month class they collaborated to create a video game that met these conditions. After the initial meetings, older adults were brought in for consultation.

2.1.1 First and Second Meetings

In our first meeting, researchers explained the project and gave students a profile of what we had learned about older adults and digital gameplay based on previous research. We also presented them with topics of interest based on the over 55+ programs of interest at the researchers' university. The students were asked to consider this information and come up with a pitch for a game idea by the next meeting. However, in this session the researchers, students, and instructor did brainstorming exercises. In this meeting the researchers also had to adjust their criteria, as multiplayer games were not within the scope of the course. Thus, the focus was on older gamers and embedding learning content.

In the second meeting, students pitched ideas to the instructor and researchers, including one researcher over 65. The ideas that were most suitable and engaging were chosen. In previous years, the class had been given free reign on the project. The

researchers noted some initial resistance to the restrictions.

2.1.2 Third, Fourth, and Fifth Meeting

For the third, fourth, and fifth meetings we brought various groups of 5-7 older adults to test the games and provide feedback. In our third meeting, a group of older adults joined us to comment on the art, storyline, and game ideas as they had progressed. There weren't any prototypes at this point and it was still in the early production days. It allowed the students to get feedback on whether the concept was appealing to the age group. Some game design teams asked questions about preference of art style and other aspects.

In the fourth and fifth meetings, older adults came with the researchers to test the prototypes and provide feedback. Both the researchers and the student game design teams asked questions to the older adults and shared their findings with each other. This process also involved extensive observation.

2.2 Data Collection

Data from the older adult participants was collected by the researchers and the game designers. This included print-based questionnaires and observations of older adults playing the games. The researchers also collected data on the process the students went through and their experiences. This included observations, some of their work and progress, as well as final focus group interviews with each game team and the instructor.

2.3 Dig It Case Study

The current study reports on the results from one of the game teams, *Dig It*. This game team was selected since their project was chosen as one to be continued after the class had finished. They had also kept records of adjustments and observations. The team consisted of one game designer/project lead, three modellers/artists, two programmers, and three sound designers.

2.4 Data Analysis

The focus group interviews were analyzed using a thematic analysis approach. Interview recordings were transcribed and imported into QSR NVivo 10. A thematic analysis was conducted on the focus group interview in which the transcript was examined for patterns and themes related to the process and

categories were found that related to the user-centered game approach with older adults (Saldana, 2015). Beyond the limits outlined, a mainly inductive approach to analysing the data was used (Thomas, 2006). The analysis followed the phases of thematic analysis outlined by Braun and Clarke (2006). The transcript was read, initial codes identified, themes were formulated, then refined, and named. A thematic analysis was also done on the surveys the older adults filled out on the Dig It game as well as the feedback, observations and adjustments reported by the team. An examination of the data attempted to find themes that were common to all three sources of data.

3 RESULTS: *Dig It*

3.1 Game Description

Dig It was designed for older adults featuring learning content about archaeology. The game students wanted to make it a game that had intergenerational appeal; thus, grandparents may want to play it with grandchildren.



Figure 1: *Dig It* dig site.

In the teams’ own words “*Dig It* is an archaeological collection game where the user travels the world to geographically accurate dig sites (Figure 1). Players dig up either fossils, gems and/or artefacts. They then take these back to their museum, display them and then run an exhibition to show them publicly. They are given a score based on what they have displayed (Figure 2).”



Figure 2: Museum.

3.2 Older Adult Feedback and Observations

Most of the older adults felt that the game was a great concept and engaging to play. They were impressed with the creativity of the students and expressed excitement in their feedback. This game was rated highly on a scoring from 1-10 on enjoyment. Table 1 outlines some of the questions they asked the participants in the fourth session. Most of the participants rated many aspects highly 8-10, with one participant rating it very low. However, placing objects and inventory were rated relatively lower (Table 1).

Table 1: Rating of different game features.

Question	Average (n = 6)	Highest rating
Smoothness of digging	7.1	10 = Perfect
Finding treasure enjoyable	7.8	10 = Very fun
Placing objects in museum	5.2	10 = very easy
How understandable were inventory icons?	5.3	10 = knew what to do
Desire to find more treasure after museum	7.1	10 = extremely
Navigation difficulty	7.0	10 = very easy

The written feedback and observations were similar to the ratings, with an overall enjoyment, but some difficulties relating to instructions and clarity of purpose, with some difficulty with moving and picking up objects. These aspects were noted in the observations, feedback given to students, and feedback given to researchers in both the fourth and fifth meetings.

3.2.1 Increased Instruction

One aspect that the team members noted was related to this demographic needing more instructions. The older adults liked to have instructions clearly given; they were not as interested in simply discovering through trial and error. For example, written and

verbal feedback from older adults included comments such as “Make sure there’s enough instruction”, “instructions ahead of time about the dig tools”, “add initial instructions”, “I needed to be told what to do.”, “How to collect not evident”.

3.2.2 Clarity in Actions and Artifacts

As this was a learning game, older adults had various questions about the game and they wanted further information. Although this somewhat related to the request for more instructions and guidance, it was also about wanting to be clear about where everything was and what it was. Thus, some participants suggested it was “A bit confusing” and aspects such as “Locating artifacts not clear” or they wanted more information about objects such as “A bit more information about the pick, brush and selection tools would be helpful”.

The team also made observation of the struggles and attempted to address these based on feedback. An example:

Observation: Older adults were not able to tell what treasures were in their inventory. This was because of a lack of information given to the player when selecting items in the inventory.

Solution: Adding information boxes for inventory treasures should solve this problem. When the player selects an item in their inventory an information box will appear, explaining what the object is.

3.2.3 Physical Manipulation of Objects Caused Some Difficulty

There were a few difficulties with physical manipulation of items and the game. Some older adults made comments such as “For me, handling it is a bit hard.” Or others hinted at difficulties by making suggestions such as, “Make it easier to move pieces in the museum”.

The team also observed the struggles when working with the older adults and watching them play the games. Thus, in their observations they noted these. For example:

Observation: Older adults struggled greatly with picking up treasures from the dig spot using their finger. This issue was because the finger print and pressure differed greatly from each individual (i.e., some had a very light touch, long fingernails getting in the way, small fingers).

Solution: A pick-up tool that will make grabbing objects easier. The tool will make the players finger

cover a wider area in-game, so even small fingers or long nails will not stop the player from picking up objects.

3.3 Interview with the *Dig It* Team

Interviews were conducted with the *Dig It* team at the end of the nine months. They were excited to discuss the process and a range of themes emerged.

3.3.1 Thinking outside Demographic; Older Adult Feedback Invaluable

The game design group found the challenge of a target audience outside their own demographic rewarding. It made them think in diverse ways. This was shown in comments such as:

“I think the best thing about doing this was it made us think outside the box, made us really look at people in a different light.”

“You just have to find the undiscovered, sort of hidden gemstones. Pun intended.”

“You wouldn’t want to add less content because they’re at an older age or anything. You want to put just as much content, if not more, but introduce it in a much slower sort of dynamic so that they’re able to not only enjoy the experience but also learn because they’re very, very smart people.”

This also caused a challenge since most of the people they had easy access to to test their designs were not the target group. This caused difficulty as the feedback given by the younger game students within the school was not necessarily relevant for the target demographic, as these respondents commented:

“From a design perspective, I think the hardest thing was when we designed the game the people that we would always have to showcase to were not people that we were building the game for. So a lot of the feedback that we got was good for our generation and not the other one.”

“a lot of people had a hard time recognizing that or seeing the design choices we made as good ones versus it could be better.”

A few other students commented that it was challenging since they were used to designer for younger regular players as seen in these comments:

“Things actually work in the game that would be intuitive and like maybe obvious to people that play games all the time. Whereas that’s not the setting that we’re trying to build for, right?”

“Obviously, we’re working with people who may not actually play games in their spare time at all, or very little compared to people that do on a daily basis.”

“There’s just certain things that would be obvious to maybe people our age about how things work or where your tools are or certain things you have to do. But when it comes to this target audience we kind of had to usher in a bit of teaching just in the game class by itself, not counting the actual education of the fossils, artifacts and all that but rather a bit of education on the how to play it.”

For many of these reasons the respondents felt the feedback received by the older adults was an essential part of the experience. As these comments suggest:

“That was probably the most useful feedback I would say, because I mean I can ask a hundred people that are in their late 20s what they would prefer and I could ask 10 people or 5 people in the range that we’re aiming for and the 5 people’s feedback is going to be more accurate than the hundred people in their mid-20s. So I would say that the older adults’ feedback is the most important part”

“a big part of it was the pace of the digging itself. We had even our teacher and everyone else that played our game saying like, “Oh, it’s too slow. I want it faster. I want like more action.” And then we all would keep saying, let’s step back and think of it from our target audience’s, their viewpoint. And all the feedback we’ve had on the pacing has been generally like that’s the way that they’ve enjoyed it.”

“Yeah, that’s definitely right. Because we can’t possibly fathom how older adults would prefer it until you see it yourself.”

“Like (instructor) was just like, “You should make a timer for digging.” And I was like let’s test it with them because they’re coming in today. Tested it and I added a specific survey question. Do you want what we have which is the gauge or do you want a timer? 100% voted what we had.”

As summed up by one respondent “Yeah. Their feedback was like invaluable. Absolutely.”

3.3.2 Designing for the Target Audience Valuable for Future Opportunities

The students felt that designing for a group outside of their peers was valuable and could be an important skill in their future careers, with one student

suggesting it helped raise interest by design companies:

“I can actually talk from personal experience in this. I met a designer from a game company recently for coffee and just brought the game with me. I just decided to show ... And by the end of it he was like, “Can I have your resume?” ... It’s for an audience that nobody has ever explored and they find that very fascinating. And it will definitely look good ... It’s a great, great experience for any other actual professional game company to look at. “

Another student suggested game companies often also require focus on a target audience; and thus, it enhanced their experience.

“the reality is the game industry companies out there rarely just go and make games for themselves.”

“our group of production students, we had a focus I think is great.”

This included a sense that they had an advantage over other students who had not had the opportunity previously.

“Every other production group beforehand is literally just they create their ideas and they go. Whereas this is better for us because it’s styled the same way as the industry where we have a target audience and this is who we’re building for and let’s focus on that... that experience has been like awesome”

3.3.3 Next Design Would Include More Instructions

The one thing they would do differently in a second design, related back to many of the comments of the participants, that of requiring further instructions to save a lot of “trial and error”.

“Well, we would probably make 100% sure we have a tutorial.”

“That’s a biggie for us... you have to kind of teach some the game mechanics in general first, I think they kind of miss that because we didn’t have a tutorial. So sometimes, unless one of us is right there showing the person how to play, it’s a little bit difficult to understand.”

“The tutorial is the first next thing we’re putting there so that it’s not so hard to understand where you’re supposed to go and what you’re supposed to do.”

“In hindsight, making that introduction much smoother like how to play the game tutorial, that’s definitely one thing I’m doing.”

4 DISCUSSION

This case study of one of the teams involved in the project outlines the students’ process and shows how certain aspects that younger designers take as “intuitive” may not actually be intuitive for older adults. Simply getting feedback and suggestions from their peers does not allow them to understand the needs of a diverse demographic of game players. Thus, the user-centered approach allowed the students to gain insights beyond their own experiences and think of design in different ways.

Also of note, the young game design students pointed out the intelligence of the older adults in regards to making sure that the learning content was extensive. However, they were also surprised at the increased need for guidance and learning of game mechanics, in which they felt younger gamers would be more likely to figure out quickly. The design students seemed to respect the older adults feedback and needs finding it invaluable information.

User centered design is becoming more common for technology design. Yet, students still often design for “themselves”. This can be useful as they are only beginners, learning the skills required for game design. Nevertheless, this study suggests a benefit of including a target audience that is often overlooked within the game design industry and is a different demographic from the students. The students appreciated this as it forced them to think about design considerations from a different perspective. As mentioned by Romero and Ouellet (2016), game design is a great exercise in critical thinking and problem solving. Challenging students to look beyond their understanding and use critical thinking to solve problems can enhance their experience.

4.1 Limitations and Future Directions

One of the limitations was that it took some coordination for all the collaborators to come together. Ideally, students would have liked even more input from older adults but this was not possible for the current study. Currently, analysis is being done on the data collected so far. The students have finished designing their games and two were chosen for further development (including Dig It). We are hoping to test these games more extensively to

determine their appeal and success as learning games with a larger older adult population.

5 CONCLUSIONS

User-centered design and participatory design can be a useful approach to collaborations with students and providing a better gaming experience for older adults. One guideline for future inclusion of older adults in game design is to bring them into the process early and often. It is also important to be aware of the vast differences in the needs and interests of older adults. Thus, increasing the number and age range of older adults who participate would be advantageous. The students were surprised to observe that certain aspects that seemed “intuitive” to them were not as obvious for the older adults. It is important for the students to get an opportunity to observe what is working, to talk to the older adults while they play, and to think critically beyond the student cohort norms.

The Dig It team felt that the user-centered design approach and collaboration with researchers and older adults was a beneficial experience that could be rewarding for the future. This process was a unique experience that allowed for new perspectives to be formed. The older adults also found the games engaging. Overall, such collaborations can allow for a further understanding of different perspectives by all collaborators.

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