

Gamification as a teaching method in community colleges

The place of the elderly learner in a digitalizing society. Experiences of utilizing gamification as a teaching method.

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Introduction

Sastamala Community College and Tampere University are collaborating on research into senior citizens' experiences of gamification and the use of platforms for remote working in community college courses. The sample group for the research comprises students at Sastamala Community College; the age range represented in the sample will become clear as the research proceeds. This article, which is one part of the joint research project, reviews earlier experiences of utilizing gamification as a teaching method in community colleges. The gamification experiments described in the article took place at Kerava Community College and in the *Hae mut! Digistä mua!* project. (*Get me! Digify me!*) Using information obtained through this experimentation, a process is under way to develop gamification methods for integration into existing courses run by Sastamala Community College. The aim is to familiarize students with features of interactive technology and lower the barriers which inhibit people from experimenting with and using new forms of technology. Courses with integrated game features will be introduced in the autumn semester, 2021. On the basis of feedback obtained from users, the courses will be developed further and offered again in the spring semester 2022.

The research will investigate the attitudes of senior citizens towards gaming, in particular the gamification of teaching. It will also study what elements of gaming alleviate possible fears and anxieties. The aim is to ameliorate elderly learners' attitudes towards gaming and persuade them of its benefits. The research will focus on the attitudes and feelings of learners in senior age groups towards games created for teaching purposes. No research has been done before on elderly learners' experiences of gamification as a teaching aid. The findings can be utilized for improving the teaching of elderly learners both in this country and internationally. Many senior citizens are complete novices when it comes to using technology and they have particular needs which must be taken into account in the design of games and user interfaces. The results of the research will be utilized in the future to enhance the teaching of elderly learners at Sastamala Community College. The research findings can also be used to improve the design of mobile services and training programmes aimed at senior citizens.

Research question 1. What kind of feelings and attitudes do elderly learners have towards the gamification of teaching methodology? Research question 2. When technological tools such as platforms for remote working and gamification techniques are used in teaching, does this lower the threshold for elderly learners to experiment with new forms of technology? Research question 3. What technological issues cause anxiety and fear? Research question 4. What kinds of teaching methods inspire enthusiasm and make learning a thrilling experience?

In the course of this research, elderly learners will use and experiment with various forms of interactive technology such as platforms for remote working, online gaming, and mobile videogames. The participants will also have access to video-tutorials which they can watch independently on their home computers or mobile devices. The issues covered in the tutorials are practised and revised with the help of games which the participants play independently on their own computer or smart phone. Stenberg (2014) describes how the wishes and needs of senior citizens regarding technology have been investigated in various surveys and studies from many different angles. Only the views on the subject of senior citizens themselves have so far been largely missing. Assumptions have been made that elderly people are inflexible technophobes who resist all forms of change. (Stenberg 2014, 119 in *Ikäteknologia 2014* Leikas, Jaana (Ed)). Stenberg (2014) also refers to interviews with elderly people conducted for the KÄKÄTE project in 2012, which revealed that one brake on the adoption of technology by elderly people was the lack of opportunity to experiment, thus the interviewees had no way of knowing what kind of application or service would suit them best. (Stenberg 2014, 120-121 in *Ikäteknologia 2014* Leikas, Jaana (Ed)).

Definitions of terminology used in the article

In this article, specialized terminology is used relating to technology, software applications and computer games. Some terms may not be familiar to all readers, so the main ones are defined in the paragraphs below in order to facilitate understanding of the issues discussed.

360°

360° means panorama photographs or videos. Panorama pictures can be taken with a smart phone which has the 360° features. It is possible to photograph one's entire surroundings and view the images on a smart device by rotating it through 360°. A 360° learning environment, or virtual learning environment, means that educational content has been added to 360° pictures or videos, using, for example, Thinglink software. The content may be in the form of sound, text or image, and students can use it independently on their own computer, phone or tablet. A 360° learning environment works on normal smart devices, or can be experienced immersively by using virtual reality glasses (Forssell, M. 2020).

Counter Strike: Global Offensive or CS:GO

According to Eurheil.com (2021), Counter Strike: Global Offensive, or CS:GO, is one of the most popular e-sport games. Several large-scale tournaments, with prize money amounting to hundreds of thousands of dollars, are arranged every month all over the world. The main theme in CS:GO is an on-going battle between terrorists and police anti-terrorist forces. At the beginning of the game, the terrorists are given a bomb, and their goal is to explode the bomb or eliminate all the anti-terrorist forces. The anti-terrorists' goal is to prevent the bomb being exploded or to eliminate the terrorists. A competition game of CS:GO comprises 30 rounds, and the first team to win 16 rounds are the winners.

E-Sport

According to the Finnish Esports Federation, SEUL ry, (2019) electronic sport or e-sport, means competitive sporting activity which is enabled by information technology. It includes both team and individual events, depending on the game and the form of the game. The most common e-sport games are recreational video games played on a computer or game console; they can be sub-divided into a number of different categories or genres. The game becomes an e-sport when it is played competitively between individuals or teams via the internet. In competitive gaming, the players compete with

each other to meet a challenge set by the terms of the game. Not all gaming is e-sport; only that kind of electronic gaming where players compete with each other over the internet in a goal-oriented way.

Platform for remote working

This term refers to software tools for video-meetings, which enable two or more people to see and communicate with each other from different locations via the internet. The communication takes place in real time via sound and video, using smart devices. Many remote working platforms include other features, such as Chat boxes, where participants can type messages for each other (Forssell, M. 2020).

Augmented Reality

Augmented Reality (AR) means a computer-generated display which is superimposed on or integrated with the real-world environment, and which is experienced with some kind of AR projection device. The content may be in the form of images, sound, text, video, or GPS information, which are experienced as additional elements within the real-world environment. AR events take place in real time (Forssell, M. 2020).

Gamification

Plass, Homer, Kinzer (2015) define the term gamification as a way of motivating people to participate in a particular activity by the inclusion of game-like elements and incentives. With gamified activities and game-based learning, the idea is to design activities that will be interesting and motivating for participants and will incentivize them to persist with the learning task in hand. Gamification also aims to lower the threshold for using interactive technology among novice users.

Social sustainability

According to the Finnish Institute of Health and Welfare (2019), social sustainable development means that the prerequisites for well-being are transferred from one generation to the next. Its objective is to reduce inequality in measures of well-being, social participation and health. Prerequisites for social sustainable development include a fair distribution of resources and opportunities, and possibilities for individuals to control their own lives. Social sustainable development also requires social participation, community spirit, and engagement with society.

Virtual reality

Virtual reality (VR) is a synthesized reality which aims to simulate a real-world environment. Virtual reality can be created with 360⁰ graphics and video. To experience virtual reality technology, special VR glasses are needed (Forssell, M. 2020).

Inclusion of senior citizens in a digitalizing society

Digitalization has created challenges for elderly people in managing their daily lives. Online banking, mobile payments, instant messaging and applications for direct payments are bewildering for elderly people who are unfamiliar with mobile technology. Keeping senior citizens abreast of changes and developments in society is one factor in social sustainability. According to Laukka (2018), digitalization means the integration of digital technology as a meaningful and permanent feature of various areas of life. Anne Sakari (2004) warns that the elderly are one of the groups at risk of marginalization as a result of the increased pressure towards digitalization in society. As the world around us becomes ever more technology-centred, concerns have been raised about social equality, and about how the benefits of technology might be spread to the growing population of senior citizens.

At the same time, technology has increased its significance in the lives and homes of senior citizens. Jyrkämä (2014) discusses technology from the point of view of its role in supporting elderly people. Aging is a process of change related to the years we have lived and our situation in life. Elderly people live their daily lives with technology and come across different forms of technology as they go through life. Technology creates challenges; it makes us learn new things and change our attitudes all the time.

Keeping elderly people on board amidst constant changes and developments is an important factor in the sustainability of our society and communities. We live in a society where services are becoming digitalized to an ever-increasing extent; it is simply assumed that everybody has the ability and the possibility to avail themselves of on-line services. In earlier research into elderly people as users of technology, Rahikka (2013) reported optimism that technological solutions would solve everyday problems and make people's lives easier. The use of technology includes features that promote people's well-being, but at the same time it risks deepening divisions and increasing social disadvantage among certain groups. Rahikka (2013) reports that as social and health services moved online, more attention started to be paid to the position of those citizens who do not have the possibility to access services via the internet. People in older age-groups who cannot access internet services are therefore in a disadvantageous position compared with younger age-groups.

In an information society, those who are both socially and technologically marginalized are in the weakest position of all. Some of the causes of marginalization are ill-health, old age, or the costs of access to information technology. Säävälä (2016) points out how difficult it is to manage these days without a computer or smart phone. It is part of the Finnish government's programme to move all official services for the public into electronic form. Many municipalities have moved social and health services online. Brick and mortar banks are few and far between. Yet in an interview with Hilikka Säävälä (Säävälä 2016), Jaana Leikas, a researcher at the Technical Research Centre of Finland (VTT) reports how ill-adapted current technology is to the needs of elderly users. Leikas goes on to say that the prevailing enthusiasm for all things digital has blinded decision-makers to the fact that modern-day technology does not meet the needs of the elderly.

For many senior citizens, the threshold for using a computer for the first time and using it to access the internet looks impossibly high. Erkkilä (2015) refers to Kumar et al. (2013), who reported on elderly people's fears of using computers. These fears have to do with security risks, and with concerns about identity fraud and the vulnerability of the technology. Such fears have been fanned to a great extent by the media, which have reported extensively on online security risks, internet fraud and identity theft. Erkkilä (2015) refers to research by Morris et al. (2015), which found that, although the elderly do have fears and prejudices, they are often interested in finding out about new technologies and applications. Furthermore, according to Doyle et al. (2020), elderly people have been shown to have an open-minded approach to new technology, especially when they expect to gain personal benefit from using it.

New social networks through gaming

According to Alila et al. (2011), social participation is considered a key factor for promoting an individual's well-being. Social networks and participation act as protective mechanisms against disorganisation phenomena, low personal well-being and marginalization. When discussing measures of social participation and the internal cohesion of a society, one problem that is frequently mentioned is that of loneliness. According to Doyle et al. (2010), social intercourse decreases with age, as one's children leave home and people in one's immediate circle die. Computers can improve the lives of socially isolated individuals by enabling them to keep in touch with friends and family members who live far away.

Loneliness and shrinking social networks are daily reality for many elderly people. Could getting acquainted with technology and playing online community games bring something new to the lives of elderly people? In many vocational institutions, it is possible to study goal-oriented gaming, or e-sport, as part of a programme of vocational education. I would like to see courses in e-sports targeted at senior citizens introduced into the educational offerings of community colleges, too. Koskela (2020) interviewed Harry Mälkki, a member of the Grey Gunners, which is one of the teams competing in the CS:GO e-sport game. Mälkki hopes to play a part in lowering the threshold for experimenting with gaming and making it more easily accessible. Mälkki is aware that fears and negative attitudes towards gaming are common among the elderly.

Thinking about elderly people living alone, he believes that community gaming would bring them the chance to make new friends. Gaming is a social activity which involves interaction with others, even if the players do not know each other.

The community college as a learning environment

I have taught community college courses for senior citizens on subjects including mobile technology, mobile phone applications and social media since 2017. On these courses, seniors have also had a brief introduction to virtual reality, robotics, augmented reality, and 360⁰ learning environments. The students have also had the opportunity to participate in the “Joka miehen ja naisen teknologiapäivä” event (“Every man’s and woman’s technology day”), which is arranged under the auspices of the *Hae mut! Digistä mua!* project (*Get me! Digify me!*). Both the courses and the technology-themed events have been popular among senior citizens, who have come to the classes with high motivation to learn, and aglow with the desire to stay abreast of technological developments.

A safe learning environment, where making mistakes is allowed, is extremely important for elderly learners. Interviewees for a study conducted by Erkkilä (2015), “Ikäihmiset tietoteknisinä vasta-alkajina” (“Senior citizens as information technology novices”), reported positive experiences of community colleges as learning environments, which is in line with my own view. According to Erkkilä (2015), the course-based model of teaching was found to be a good way to learn computer skills. The interviewees for Erkkilä’s study reported that the community colleges had provided a safe learning environment, where help and peer support were available. The students mentioned how they had gained from their courses the confidence they needed to start using computers, had found it thrilling to learn about technology, and had been surprised at how committed their co-learners were to attending classes. The amount of psychological peer support that they had received was found to be a significant factor. They reported that the threshold for asking for help had lowered, as other students in the group were at a similar skill level. Being surrounded by people in the same position had made them aware that they were not alone in their learning situation.

Erkkilä's (2015) study showed that successful learning experiences had dispelled the various fears and prejudices which the students had earlier harboured towards information technology.



Figure 1. One of the exhibitors at the “Joka miehen ja naisen teknologiapäivä” event (“Every man’s and woman’s technology day”), was Ovoids. Photograph: Mirikka Forssell



Figure 2. Testing virtual reality glasses at “Joka miehen ja naisen teknologiapäivä” event (“Every man’s and woman’s technology day”), Photograph: Mirikka Forssell

From supermarket slot machines towards games promoting participatory learning

A senior citizen who games brings to mind for many people the image of an elderly person playing the slot machines in supermarket doorways. There are many negative associations and taboos attached to the idea of seniors' gaming. I was working at the "Joka miehen ja naisen teknologiapäivä" event ("Every man's and woman's technology day"), which was arranged on 21.1.2020 as part of the "Hae mut! Digistä mut!" project ("Get me! Digify me!"). At this event, elderly people had the chance to try out Microsoft's HoloLens glasses. This item on the programme was run by Tuusula Community College. There were two alternative demos available: a shooting game, and a display of still objects. I interviewed the Tuusula Community College personnel after the event and asked them what the seniors had thought about their experiences with HoloLens, and which demo had had most takers. It turned out that the seniors had not been offered a choice of demos; the staff had given all of them the demo showing still objects because they thought it was more "suitable" for elderly people. This was a good example of the kind of presumptions which are made about gaming and the elderly; features typical of many games are considered somehow unsuitable for seniors.

The reason I am interested in elderly gamers is exactly because of the sensitive nature of the subject, and the presumptions about it that people make. I have followed for a long time one of the teams which competes in the Counter Strike online community game; the team is known as the Grey Gunners and all its members are over 70 (<https://news.lenovo.com/introducing-the-grey-gunners-lenovos-finnish-senior-e-sports-team/>). These are the people who inspired me to do research into this topic.

Overcoming technophobia

In courses for elderly people, different emotions and attitudes towards technology have arisen. Some students do experience anxiety and fear, but others are bursting with enthusiasm, and want to know and learn more about new forms of technology.

When faced with students' prejudices and negative attitudes towards new forms of technology, I have tried in my teaching to lower the threshold for students to try out and experiment with new technology-related issues. When students feel reluctant to use smartphones or to try out new features, I have attempted to lower the threshold for them by introducing a mobile game as a teaching aid. After the class, the course topics have been revised with the help of a mobile game called Kahoot, in which the students revise the content of the lesson by taking part in a quiz. One aim of experimenting with Kahoot is also to lower the threshold for seniors to try out new kinds of learning environments. In courses for seniors, the students' own attitudes towards technology present challenges. In a lecture about the Android smart phone, given at Kerava Community College on 24.9.2019, the listeners were offered the opportunity to try out virtual reality glasses. At the end of the lecture, the topics covered were reviewed by getting the students to participate in a Kahoot game on their mobile devices. A few of the students were sceptical of the activity at first and questioned its usefulness: "What good is this to me?"

Enhancing motivation through gamified teaching methods

Right from the early days of our education system, different kinds of games have been utilized as teaching aids. As technology has developed, the gamification methods have changed - from doing crossword puzzles in books to playing games on computers and mobile devices either independently or in groups. Amr (2012) makes five points about the benefits of games for teaching. Firstly, games that take place within a simulated environment arouse the students' interest more successfully than conventional classroom teaching. Secondly, students learn fact-based material more easily through games than through conventional teaching methods. Amr's third point is that knowledge learned through game-playing is retained longer in the student's memory. Fourthly, with the help of games designed for teaching purposes, students gain practice in critical thinking and hone their data acquisition skills. Finally, Amr points to positive changes in students' attitudes towards the subject matter to be learned.

Indeed, increased motivation and a more positive attitude toward the subject matter being taught is one reason why games are utilized so much as teaching aids. Particularly in the teaching of subjects considered difficult, different kinds of games are a great boon. For example, a great deal of development work is going into games for teaching maths and languages. As a community college teacher, I noticed how difficult many students found our courses in using computers, smartphones and tablets. The threshold for using these devices seemed impossibly high at first.

With elderly students at Kerava Community College, we practised using Android phones and applications with the help of the game Kahoot. The players used their own smartphones to answer questions in the game. The students were enthusiastic; everybody was keen to participate and a competitive spirit arose within the group. I was struck by how much a game of Kahoot lowered the threshold for using smart phones among these students. The positive experiences gained from this teaching situation encouraged me to continue my research into the utilization of games to support teaching. Mayer (2019) writes about the power of games to motivate and describes five theories of learning motivation. *Interest and personal value theory* posits that people strive to learn when they are interested in and find personal meaning in the subject matter being taught and material related to it. According to *self-efficacy and attribution theory*, students take pains to learn when they experience success in set tasks and notice that their efforts lead to successful learning outcomes. *Goal-setting theory* proposes that learning is more effective when people have a clear learning goal to aim for. According to *self-directed intrinsic motivation theory*, learning takes place when students are in control of their own learning and are motivated by internal incentives. With the *kinaesthetic and social-interaction theory*, learning takes place through social interaction between the learner and the teacher, making use of physical movement in the teaching setting.

Developing senior-friendly games through user-centred design of user interfaces

In the future, I would like to see a scenario in which gaming is considered not only a tool for diversifying teaching methodology, but also as a therapeutic aid. Grey L. West et al. (2017) investigated gaming among elderly people and found that gaming brought them many benefits. For example, cognitive function improved; positive results were achieved on memory tests; an increase in the quantity of grey matter in the brain was discerned. In an interview with Koskela (2020), Harry Mälkki, a member of the Grey Gunners CS:GO e-sport team, reported that gaming brings him excitement, challenges, and experience of success. He believes that gaming has developed and maintained his cognitive capabilities. He had experienced improvements in his ability to concentrate, observation skills, memory, reaction speeds, and in his hand-eye co-ordination.

Accessibility-related issues in the design of user interfaces for the elderly

When designing user interfaces for the elderly, issues to take into account are deteriorating eyesight and hearing, memory problems and declining dexterity. Verma and Hätönen (2011) explain how musculoskeletal disorders such as rheumatoid arthritis, osteoporosis and sarcopenia (age-related loss of muscle mass) impair the operational capabilities of many elderly people. Verma and Hätönen (2011) also describe how changes in the sense perceptions of elderly people weaken their ability to manage independently. In addition to a deterioration in eyesight, the eyes of elderly people also become more sensitive to wind, light, and changes in temperature. Glare sensitivity increases as the eye reacts more slowly to variations in light intensity. Distinguishing between colours becomes more difficult. The amount of light reaching the retina diminishes, so that more light is needed to see. Depth perception weakens, too, which causes difficulty in noticing steps and differences in levels. To accommodate people suffering from eyesight and hearing impairments, an environment must have sufficient lighting, and good conditions for listening and visual perception.

Jaana Leikas, a researcher at the Technical Research Centre of Finland (VTT), describes in an interview with Hilikka Säävälä (2016) how information and communications technology relies on the senses, and in particular on the interplay between sight, dexterity and memory. According to Leikas (2018), poorly designed user interfaces discourage social participation among the elderly; as a result, many senior citizens become depressed and feel isolated. Some elderly people find using modern technology a humiliating experience, because the design of devices takes no account of their reality and their needs. Senior citizens want to feel like fully functional, competent people; the key to supporting this desire is the right kind of user-centred interface design.

Gamified teaching methods used in community colleges

In my experience, senior citizens are not very familiar with a range of different games. Many of the seniors on my courses got their first experiences with different kinds of gamified teaching methods in my classes. In this current project, I am utilizing gamified activities which I developed earlier for use as teaching aids in community colleges in the Central Uusimaa region. The activities have been tested with elderly learners. While testing such teaching games with groups of elderly community college students, I noticed that the games had to be adjusted to allow these students more time to respond to questions, compared with other groups of students with whom I have used similar activities. Also, the multiple-choice answer format has been simplified to a choice between two alternative answers. At Sastamala Community College, the Quizizz platform is being introduced for teaching purposes (<https://quizizz.com/profile/5e838132472865001c613161>). With Quizizz, senior learners can test their grasp of new material in the form of a game. I have developed a set of learning activities called "Threats on the Web: be safe in cyberspace¹". The activities are aimed at elderly learners at Sastamala Community College and are arranged in two parts. In the first part, the students watch a short video about cyber security, malware, phishing, and how to protect oneself against online fraud using Google Image Search. In the second

¹ In Finnish, "Verkon vaarat: Liiku turvallisesti kybermaailmassa"

part, the issues covered in part one are reviewed with the help of a Quizizz game. The game can be played on a mobile device or a computer.

At each step of the game, the players see a question and two alternative answers, from which they select the correct one.

You see that your neighbour has published a public post on social media saying that they will be spending the next month at their summer cabin. What do you do?	
I will warn my neighbour that it's unwise to post information publicly on social media. Criminals might take advantage of such information.	I will wish my neighbour a wonderful holiday.

Figure 3. A game dealing with the risks of the internet aimed at elderly learners

In the past, I have also used the Kahoot platform to develop educational games for revising topics taught earlier in the course (<https://create.kahoot.it/>). The plan is to develop more Kahoot-based games to support language teaching at Sastamala Community College. These games will be tested in practice on courses in the autumn semester 2021. A third gaming platform which will be tried out for teaching purposes at Sastamala Community College is called Seppo (<https://seppo.io/fi/>). In the autumn semester 2021, as remote online courses start up, feedback will be collected on the educational gaming activities mentioned above. In addition, as lessons proceed, teachers will take note of the thoughts and feelings of their elderly students regarding the use of games as an aid to teaching and learning. When the courses are over, participants will receive a feedback form, asking about their attitudes and feelings towards the introduction of gamified activities as teaching aids, and whether they think gamified teaching methods lowered the threshold for them to experiment with new forms of technology.

Conclusions

Keeping senior citizens ever more engaged with our digitalizing society is important for societal well-being. Making digital services accessible to everybody and avoiding the marginalization of elderly people are hallmarks of a society's social sustainability. In the course of this research project, we will find out how receptive elderly learners are to the adoption of gamified teaching methods, and whether such methods are a good way to lower the threshold for older learners to use new technology. In the future, it would be interesting to introduce virtual technology games aimed at elderly people, too. These games could simulate for the players environments in which seniors feel particularly discouraged from using technology and could include educational elements. With the help of virtual technology, seniors could practise in a secure, simulated environment the kind of technology-related activities which they find intimidating. Technology-related activities which could be practised in simulated environments could be, for example, using a self-service check-out terminal in a supermarket, buying a public transport ticket from a vending machine, or dealing with banking business online.

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