Using Gamification to Decrease Anonymity in Larger Learning Environments

Full Papers

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Abstract

Anonymity in large classrooms can lead to incivilities. One goal of teachers should therefore be to decrease anonymity in the classroom by using immediacy, like talking to students and knowing their names. However, this is not always feasible if the class size is significantly larger than regular classes. Our approach tries to get the participants to install our developed artifact called C4mpUs on their personal devices, in order to create a gamified learning environment that enables a playful opportunity to connect with other peers. This way anonymity is broken down by students themselves rather than by the instructor. Our findings show that students tend to approach other participants they haven’t met before, rather than only connect with familiar peers. However, more research will need to be done to determine on further extending the level of participation when it comes to diminishing anonymity as well as on how to integrate pedagogy.

Keywords

Anonymity, gamification, mobile learning, larger learning environment

Introduction

During the past few years there has been a significant growth in smartphone sales (eMarketer 2014) and mobile device usage (comScore 2015). Especially among students, the mobile device ownership is noteworthy (Pearson 2013). Therefore, it is not surprising that there is a growing market for educational apps (Shuler et al. 2012) that can enhance a course and learning effectiveness (Riconscente 2011). Especially in highly frequented courses, where the amount of participants exceeds the regular class size, the level of interactivity among students or between teacher and students can drop (Hansen and Jensen 1994). This is where mobile apps can help the teacher as well as the students to better stay in touch, interact with each other and get better feedback. The importance of social interaction and involvement can be seen in studies that have shown that a lack of assistance by the teacher or the anonymity among students lead to potential dropouts (Heublein et al. 2009). Two common reasons why a student drops out of college are lack of motivation and performance issues (Heublein et al. 2009). It is therefore necessary to provide interaction among the participants and create interactive tasks. Here it can be of the essence to create a class environment where the relationship among students is improved, collaborative learning is supported, feedback is encouraged and interactivity is endorsed.

Our long-term goal is to create a mobile learning app, in correspondence with mobile learning theory, which will improve learning and teaching methods. It will need to address aspects such as social technology, device usability, and interaction learning (Koole 2009). This paper, as part of our long-term goal, will show how an artifact, which is a part of our educational mobile app, can decrease anonymity during, before, or after classroom hours. The entire developed application is called C4mpUs, however, we will reference the developed artifact concerned to decrease anonymity with the same name from this point on. In order to increase motivation, gamification is being used as a sustaining part of C4mpUs. Gamification has been successfully used and tested in several different fields (Hamari et al. 2014) such as tourism (Xu et al. 2013), health (King et al. 2013), or education (Lee and Hammer 2011).
This paper will briefly discuss the design and the development of C4mpUs and how design science helped to create it. The objective is to establish new personal connections between students, that didn’t know each other before, and intensify interaction among students that were already familiar with each other. We will show that students in a large classroom are mostly not familiar with each other but that they are willing to get to know their peers if they are given the opportunity. We hope that, due to better interaction, this will lead to a better learning environment where students do not only seek feedback from their teacher but also from their peers.

Teaching with Technology

Over the past few decades technology integration in schools has been a significant research interest (Lowther et al. 2008). Specifically, how the different technologies have been introduced into teaching and how they enabled new types of experiences has been a focus point (Dede 1996). It is, however, not enough to introduce a new technology to a classroom setting because “it is not the technology which changes things; it is the way in which people use the technology that has the potential to change our classroom practice” (Carr et al. 1998, p. 5). One challenging difficulty is to overcome the mindset of the teachers. It is necessary to address their views about teaching, learning and technology (e.g. Bitner and Bitner 2002; Sandholtz et al. 1997; Zhao and Cziko 2001). An important question that needs to be addressed now, in this context, is what a teacher needs to know in order to appropriately incorporate and use technology in their classroom (Zhao 2003). One important framework that was developed over the past few years, that tries to address these issues, by proposing a model for framing mobile Learning, is the Framework for the Rational Analysis of Mobile Education (FRAME) (Koole 2009).

FRAME

The FRAME model describes how social interaction, human learning capacities and mobile technologies come together to form mobile learning. It tries to explain to some extent how students are able to benefit from mobile technologies, how it is important for teachers to make course content and material available for mobile access, as well as how to implement a productive mobile learning environment in a formal and informal setting. It further considers the option of students moving between different physical locations as well as virtual ones, sustaining the fact that it is possible to collaborate with other people, use systems or information at any given point in time or location. One base assumption that is made by Koole for her model is that mobile devices are as important as learning and social processes. Furthermore, she also emphasizes the importance of constructivism for the model (Koole 2009). Constructivism, which is an educational philosophy is characterized by Smith and Ragan as a "belief that reason is the primary source of knowledge and that reality is constructed rather than discovered" (Smith and Ragan 1999, p.14–15). Figure 1 shows the composition of the FRAME model.

![FRAME model](image)

Figure 1. FRAME model (Koole 2009)

The intersection we will focus on in this paper is the interaction learning intersection that is evenly spread out between the criteria of interaction, situated cognition and learning communities. Interaction, however,
does not only refer to the interaction between a learner and an instructor or between a learner and content but also between two learners. Situated cognition references the need for an authentic context. This means that learners can directly interact with each other and that the output of learning activities is meant for real communities (Koole 2009). Learning communities in contrast, is the effort to bring together learners with mutual goals and let them solve mutual problems (Reigeluth and Squire 1998).

**Background**

In order to solicit better interaction between learners we chose to use gamification. However, when considering to add gamification to a learning environment it is necessary to keep in mind that the defined learning objectives are being enhanced and not reduced by gamifying the learning experience. Thus, it is necessary to identify learning objectives first, and then determine if there is an adequate possibility to add gamification to further enhance the learning experience. The process of adding game elements and game mechanics to a non-game context is not simple. By just gamifying learning activities, without considering its effects, has already led to criticism calling it "pointsification" (Robertson 2010) and exploitive (Bogost 2015). Design science can be helpful to prevent these issues when it comes to create an adequate artifact. This section describes how gamification is being used in a persuasive manner in order to help modify the behavior of students to better engage with their peers and overcome anonymity in large classroom settings.

**Gamification**

Gamification has gained popularity during the past few years (Deterding et al. 2011b). One of the most common definition since its first appearance in 2008 is that it is "the use of elements of game design in non-game contexts" (Deterding et al. 2011a, p.2). It is often used as an attempt to influence and encourage users to change their behavior and increase their motivation (Kapp 2012; Werbach and Hunter 2012). These characteristics make it an appropriate tool for example, for influencing students who show a lack of interest in learning. Furthermore, through the use of gamification the use of an application can be more engaging, leading to a user to spend more time with it (Zichermann and Cunningham 2011). Nonetheless, in order to create an adequate artifact that uses gamification, it is necessary to satisfy several requirements. These requirements include several steps. The first step is to identify the main goal or what needs to be accomplished. The next step is to identify the interests and goals of the targeted audience. Based on the first two steps it is necessary to choose adequate game elements that support motivation, and finally, the last step is to check for the effectiveness of the implemented system (Aparicio et al. 2012). An example for gamification in the context of sport activities is Nike. They created a community called Nike+ that enables its users, who have bought a sensor to track their sports performance, to gain NikeFuel points for their sports activities. For good performance users are rewarded badges and are also able to compare themselves to other members. (Blohm and Leimeister 2013)

We will use gamification in order to give students the opportunity to better connect with other peer students in a large classroom setting. Gamification is supposed to act as a trigger for students to familiarize themselves with their peers.

**Anonymity**

Students, attending large classes, do not only feel frustrated because of the lack of interaction during class, but they also feel anonymous among all of their fellow students (Ward and Jenkins 1992). This anonymity in large classrooms can further lead to deindividuation and incivilities (Forni 2002; Harris 2006).

Deindividuation leads individuals to let go of their personal characteristics and believes, and take on the identity of the group (Harris 2006). Festinger defines this as “individuals are not seen or paid attention to as individuals” anymore (Festinger et al. 1952, p.382). Individuals in such a group setting consider their actions not only to be insignificant, because it only accounts for a fraction of the whole, they also act very uncommon to their regular behavior. This can be explained by the fact that the group identity does not have to match the ones from the individual (Harris 2006).

Incivilities are also linked to anonymity in the classroom (Forni 2002). Feldmann describes them as "any
action that interferes with a harmonious and cooperative learning atmosphere in the classroom” (Feldmann 2001, p.137). As an instructor it is therefore necessary to counteract anonymity and its resulting incivilities before they tend to escalate, especially in a larger classroom setting (Pearson et al. 2001). It is possible to counteract incivilities by keeping classroom sizes small and using immediacy, like talking to students when they enter the class, or knowing their names. This helps to individualize all participants and thus, reduce anonymity (Forni 2002; Harris 2006). However, when considering courses which are frequented by hundreds of students this approach does not seem feasible. C4mpUs will try to overcome this problem by using mobile technology and offering a gamified approach for getting to know each other.

When considering Classroom Response Systems (CRS) or Group Creativity Processes (GCC) for example, it can, however, be beneficial to support anonymity (Davis 2003; Fies 2005). In regard to CRS, anonymity is important (Nicol and Boyle 2003) for allowing students to actively participate during class, without the fear of being ridiculed by other students or being undermined by more dominant peers (Davis 2003). In contrast to a CRS, a GCC can also profit from anonymity in order to reduce evaluation apprehension (Connolly et al. 1990; Valacich et al. 1992).

This calls for an artifact that on the one hand, decreases anonymity for the purpose of diminishing incivilities and on the other hand enables anonymity so that single students can’t be pointed out by the group itself. However, in this paper we will only focus on diminishing anonymity.

**Influencing Behavior**

Trying to explain or understand human behavior is very difficult as it consists of many different aspects that can be approached on many different levels (Ajzen 1991). A good example for the complexity behind human behavior is smoking. Even though an individual is presented with evidence that this behavior has negative effects on his/her health does not guarantee that the individual will quit. Behavior is therefore not always in alignment with rational or logical thinking and is therefore hard to predict (West 2009).

Researchers such as Prochaska and Velicer (Prochaska and Velicer 1997) and West (West 2009) try to explain human behavior and how it can change over time. The former created the Transtheoretical Model of Health Behavior Change, also known as the Stages of Change Model, which states that there are six different stages that an individual has to go through in order to change his/her behavior. However, the model has been criticized for various reasons such as the time frames that are supposedly between the different stages as well as its linear approach (Littell and Girvin 2002; West 2005).

In contrast, West (West 2009) proposed the SNAP model as seen in Figure 2. It illustrates different states when considering to stop a specific behavior and move to a new one, in this case moving from smoking to a not smoking behavior. He emphasizes the importance that there can always be a transition from one state to another “depending on the momentary balance of wants and needs” (West 2009, p.280). This means that this proposed model has not a linear approach and allows an individual to switch behavior at any given time.

![Figure 2. SNAP model (West 2009)](image-url)
**Persuasive Technology**

Even though it is difficult to understand human behavior there are several attempts to influence it. One attempt is through the use of technology or also known as “persuasive technology” (Fogg 1999; Fogg 2002; Lockton et al. 2010). An example of persuasive technology combined with gamification is the previously mentioned Nike+ community. Members are able to track their movement through sensors and are able to gain points and compare their activities with the rest of the community. One of Nike’s goal is to get their users to exercise more and better track their progress and performance (Blohm and Leimeister 2013). But not only technology has an influential effect on people. For example, other researchers like Redstrom (Redström 2006) go even so far to say that design in general can influence the behavior of individuals.

In order to create persuasive technology, it is important to choose the right approach. For this purpose, Fogg (Fogg 2009) created an eight-step design process for creating persuasive technologies. Even though the mentioned process can be done in sequence it is not a strict requirement. Nonetheless, it is important to choose a simple behavior to target, and not exaggerate when it comes to the goals that are trying to be achieved. Furthermore, it is essential that only a single behavior is targeted in order to avoid setting the aim too high and not realizing any kind of behavioral change. Once a behavior has been selected it is necessary to find a receptive audience that is adequate for taking on this new behavior. For this purpose, designers will also need to identify the reason what is preventing the behavior in the first place and what an appropriate technology channel would be. Fogg (Fogg 2009) stresses out that this channel should already be familiar to the target audience, because otherwise more than one behavior is being targeted. The next step is to find relevant examples that resemble the targeted behavior, audience, and technology channel. This is imperative for trying to imitate those successful technologies and then test them repeatedly. As a last step it is up to the designers to extend the created technology by e.g. targeting a less receptive audience, or make the targeted behavior more demanding (Fogg 2009).

Our goal for this study was to get participants to connect with their peer students. For the purpose of the technology channel we chose to make use of the personal smartphones of the participants. This way we could unsure that they were already familiar with the technology.

**Research Approach**

This research concerns itself with the creation of an artifact called C4mpUs, as well as the scientific self-observation in teaching. Considering these aspects two research approaches were considered and seemed most appropriate for the context of this work. On the one hand, Action Research (AR) was considered as an approach due to the self-assessment and improvement of teaching quality. On the other hand, Design Science Research (DSR) was examined because of the creation of an artifact that enabled the improvement of the applied teaching method and teaching in general. Even though it has been argued that both approaches have a lot of common characteristics (Cole et al. 2005; Järvinen 2007), there are still some significant differences between both of them (Iivari and Venable 2009). One difference being that design science research is concerned with the design of an artifact and its usefulness, whereas action research puts an emphasis on the own organizational context and how to solve a given problem. Carr and Kemmis defined AR as being "simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out.” (Carr and Kemmis 1986, p.162). The purpose of design science is that it "creates and evaluates IT artifacts intended to solve identified organizational problems” (Hevner et al. 2004, p.77). Kuechler calls this contribution a “solid definitional base point from which to evolve” (Kuechler and Vaishnavi 2008, p.13).

**Design Science Research Approach**

For the field of IS, "DSR involves the construction of a wide range of socio-technical artifacts such as decision support systems, modeling tools, governance strategies, methods for IS evaluation, and IS change interventions” (Gregor and Hevner 2013, p.337). An artifact is here categorized as an artificially created object that can have a material character. Further, it can also be a process such as a method or a software (Goldkuhl 2002, p.4-5). One popular used DSR method for example is from Peffers et al. (Peffers et al. 2007) who
split their design science research method into six steps. These are 1) problem identification and motivation, 2) define the objectives for a solution, 3) design and development, 4) demonstration, 5) evaluation and 6) communication. Research entry points were further identified. These points show that research can be initiated because of a problem that needs to be solved, finding a solution for an objective, for a design and development centered approach, or because of a client or context initiated reason (Peffers et al. 2007).

Our approach is to decrease anonymity in order to create a better learning environment. For this purpose, we used the approach by Peffers et al. (Peffers et al. 2007) and created C4mpUs during the design and development phase. This research can therefore be categorized as a problem-centered approach. According to Hevner et al. (Hevner et al. 2004) artifacts can be defined as constructs, models, methods, or instantiations. Instantiations are declared as a "form of intellectual or software tools aimed at improving the process of information system development" (Hevner et al. 2004).

Approach

In accordance to DSR C4mpUs was created to decrease anonymity in the classroom. It integrates gamification in an effort to persuade students to connect to previously known students, as well as establish new connections with unknown peers through face-to-face communication. In an effort to address multiple issues concerning the classroom, the entire application offers multiple functionalities that enable the student to interact with peer students or with an instructor. However, for this paper we will concern ourselves only with the possibility to decrease anonymity.

Our approach will rely on extrinsic motivation through the use of gamification as well as the teacher triggering certain behavior. Ryan and Deci (Ryan and Deci 2000) explain how human motivation is essential for people to act. They point out three different kind of human motivations. The first one is amotivation, which is the lack of motivation to perform any kind of specific behavior. The next one is extrinsic motivation, which represents the motivation to do something because of an external solicitation. Lastly, intrinsic motivation is led by self-interest without the need of an external solicitation (Ryan and Deci 2000). As can be seen in Figure 3a the instructor acts as an initial trigger and explains students the functionality of C4mpUs as well as how students are able to gain points. Points are being rewarded by the system for establishing a connection with a fellow student.

![Gamified Learning Environment](image1)

**Figure 3. Decreasing anonymity in a gamified learning environment**

This approach is realized through a native mobile application called C4mpUs that runs on both the currently most used operating systems (Smartphone OS Market Share 2015), Android and iOS. Since C4mpUs was developed for two operating systems it was also necessary to take in account the different usability requirements. For this purpose, it was necessary to consider the respective design guidelines. This for example lead to two different navigation styles (Android Design - Design n.d.; iOS Human Interface Guidelines 2011). C4mpUs provides students with a unique QR code that identifies them within the specific course as shown in Figure 3b. By using an integrated scanner, students are able to establish a connection with their fellow students.

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1Icons made by Freepik from www.flaticon.com
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students by scanning the QR codes of their peers. Since the QR code is stored on the personal device of a student the next step requires some form of face-to-face interaction in order to ask the other student to let them scan their code. After a user scans a fellow student the application asks the user if they have previously known each other. This question was used in order to determine if this was an old connection being established between two students, who already knew each other, or if it was a new connection between two unfamiliar students. For each new connection students were rewarded points. A ranking gives an overview, as shown in Figure 3c, on how many points a single student has reached and how the rest of the class is performing. This is intended as a motivation to keep establishing new connections. Since the application is intended to be installed on their own devices (Bring Your Own Device - BYOD), students are able to use this functionality beyond the classroom limits, in respect to time and location.

Evaluation

C4mpUs was introduced and used from late October 2014 to early February 2015 in an introductory course for information systems. During this time 272 students chose to download the app and participate in the course. 81 of those users chose to interact with their peers and make a connection. The collected anonymized data, as seen in Figure 4, shows us how many connections were established during that time frame. One connection is defined as the action of one user scanning the QR Code of a second user. Two peaks represent the introduction of the artifact (12/02/14 - 49 connections) as well as the solicitation to use it (12/16/14 - 208 connections). Only for these two times this specific functionality was mentioned and encouraged. For the remainder of the course it was up to the students to establish connections on their own.

![Figure 4. Connection](image)

Classes took place every Thursday from 9:45 AM to 11:15 AM as well as every other Tuesday from 4:45 PM to 6:15 PM. From a total of 289 connections 9.34% were made outside classroom hours. In terms of connections between students, who were already familiar with each other, about 34.26% specified that they knew each other before while 64.36% didn’t know each other prior scanning. The remaining students circumvented the question by quitting the application.

Discussion

The gathered data shows that students are willing and motivated to talk to and connect to other students even using non classroom hours. This is an indication that gamification and teacher solicitation did contribute to student motivation. The data has further shown that almost two-thirds of the connections were made between students who didn’t know each other beforehand. This sustains the fact that students tend to act anonymously in a large classroom setting but that they are willing to interact and connect with their peers if they are given the opportunity to. Furthermore, the dispersion, of when students connected with each other (refer to Figure 4), shows that it is necessary to give students the time to familiarize themselves with a new technology (12/02/14 - 49 connections) as well as make time during regular classroom hours to use and revisit this technology (12/16/14 - 208 connections).

It still needs to be pointed out that more connections would have been possible if more students chose to participate. However, since the usage of C4mpUs was completely voluntary we are still content with the
amount of students who chose to partake. The lack of participation can be credited to several things such as, lack of appropriate device, motivation, or attendance. In an attempt to further increase usage it would be possible to extend the functionality of the system and the amount of extrinsic motivation. For example, rewarding extra credit for using C4mpUs can significantly increase extrinsic motivation. Instead of just relying on a teacher to solicit interaction it would be feasible to further extend the application to include an automatic trigger as a reminder. In reference to the interaction learning intersection of the FRAME model, it is necessary to further address interaction between learner and instructor, as well as learner and content.

Furthermore, even though C4mpUs contains elements to support the device, learner, and social aspect, when it comes to mobile learning (refer to Figure 1), it still needs to further address several other areas in the interaction learning intersection. From a pedagogical point of view, C4mpUs is not contributing to any kind of learning. Till now it is only enabling the students to decrease anonymity. However, since the literature advised to target only one behavior at a time we are content we the results. As a next step we will try to further integrate pedagogy to the mix in order to achieve an overall better learning environment.

**Conclusion**

We implemented and evaluated an artifact called C4mpUs that integrates gamification and gives students the possibility to get to know their peers in a gamified context. In order to gain points in the course, where C4mpUs is being used, it is necessary to interact with other students by scanning a user’s personal QR code. The interaction requires face-to-face communication as the developed application is installed on the personal smartphone of a participant and a user does not have access to another user’s device, unless he/she asks for it. The designed artifact was created by using Peffers DSR approach.

Even though our application showed that students are willing to connect with their peer students, it is still necessary to further address the issue that they only tend to do so when instructed or during classroom hours. More research is necessary on how to increase the number of participants that know each other and how to use this for the pedagogical goal of a lecture. One possible extension would be to send out learning tasks that are solved in a group. This way participants would be encouraged to reconnect and work on a class specific task. Students could then send back an evaluation of their task to the instructor in order to let him/her know how well they managed to solve or work it.

The results of the artifact presented in this paper are encouraging since 64% of the established connections were made with unknown peers. However, more research is necessary in order to connect even more students with each other and then determine how this new environment can be further put to use.

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