Using Mobile Learning to Create a Reciprocal Peer Learning Environment

Completed Research Full Papers

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Abstract

Larger learning environments can be found especially in higher education. They represent a challenge to teachers as they do not only exceed regular class sizes but also demand another teaching approach of them. Keeping up interaction, which is considered the basis of all learning, is hard to keep up, due to the number of students. One approach that is often considered is peer learning. It offers an opportunity to increase interaction and requires students to not only learn but also to teach. However, it is not easy to initiate peer learning in larger learning environments when most students act anonymously in them. Our created artifact called C4mpUs enables students to connect with other peers. It also enables teachers to initiate peer learning without investing too many resources. Lastly, it get students to work as frequently and willingly with newly acquainted peers as they would with someone they have previously known.

Keywords

mobile learning, larger learning environment, gamification, interaction, anonymity

Introduction

For the last couple of years, the number of students has been continuously growing at German universities. Enrollment has seen an increase by nearly one third over the last ten years (Bundesamt 2016, p.14). A part of these new students is already being taught in larger learning environments when it comes to introductory courses. They are faced with the problem that these courses exceed regular class sizes. This leads to a drop of interactivity between lecturers and their participants as well as the participants themselves (Hansen and Jensen 1994). Class size is especially important as it does not only affect the grades of the students (Kokkelenberg et al. 2008) but also the lecturer who acts and speaks differently (Hansen and Jensen 1994; Lee 2009). This leads to dissatisfied students because of insufficient interaction as well as a feeling of anonymity (Ward and Jenkins 1992). Both of these issues should be addressed by educators in order to keep participants involved. Tinto (1993) urges the importance of educational communities, which can determine if students remain in college or drop out. He emphasizes the importance of faculty and their daily actions and how they are "essential to their [students] intellectual and social development" (Tinto 1993, p.206). Especially interactions among learners, as well as learners and teachers, are very important for the learning process (Thurmond and Wambach 2004). Moore (1989) even goes so far to say that interaction is the basis of all learning. He differentiates between the interaction among students, student and teacher, and between student and learning content.

In order to adequately modify a course to address the mentioned issues, it is necessary to previously assess the current circumstances. For this purpose, we will use the approach made by Wegener et al. (2012) who introduced the Didactical Service Blueprinting (DSB) method. It offers an opportunity to analyze and re-structure especially lectures with a higher number of participants. The presented method is also intended to find a solution that on the one hand, makes didactical sense, and on the other hand, considers economic efficiency. We used DSB to analyze and restructure one of our own introductory courses and introduced a mobile learning artifact that supports and encourages Reciprocal Peer Learning (RPL) in a larger learning environment.
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environment. This paper will show how students tend to connect and reconnect with peers they have just met or have known for a while. We will briefly discuss the implementation and design of our educational mobile app called C4mpUs, and show how participants will be able to connect with others, as well as complete tasks together. We will observe this form of peer learning and see how many students actually try to establish a connection with other peers. Further, we will ask them to solve different tasks together and randomly assign them a peer. We will take a look whether or not students behave differently when it comes to completing a task with someone they have previously known or just met.

Background

In order to address the issue of lacking interaction in larger learning environments, it is our goal to initiate RPL among students. We do this by introducing C4mpUs as a collaboration tool. Such tools are a part of social technology which again is also part of mobile learning (Koole 2009). We will first (1) look at what collaboration means and then (2) how peer learning is able to contribute to it. However, in order to determine where collaboration is best needed and didactically valuable, it is necessary to (3) analyze previous approaches. Here we will assess our own lecture using the DSB method and change it accordingly. Finally, since the usage of C4mpUs is completely voluntary, we need to (4) make this technology more persuasive to use. Therefore, we integrate gamification to further increase the motivation of the participants to use it.

Collaboration

Collaboration can be defined as at least two people working together in a mutually beneficial relationship who interact and try to reach a common goal (Hord 1986; Mattessich and Monsey 1992). In order to reach that goal, it is necessary that the partners combine their resources when it comes to their expertise and insights (De Vreede and Briggs 2005). Frey et al. (2006) summarize different approaches on how collaboration progresses. They divide each approach into their distinct level of collaboration, where the the scale goes from the lowest stage, representing no collaboration, to the highest stage, which is full collaboration. For example, Peterson (1991) uses three stages comprised of cooperation, coordination and collaboration, in order to describe interagency collaboration. She emphasizes that cooperation and coordination are essential parts when it comes to collaboration, restating that these stages need to be addressed before being able to reach collaboration. In her interpretation, she defines cooperation as a scenario where two groups, that are not dependent from each other, share information with one another, in order to improve their respective outcome. The coordination stage behaves similar to the cooperation phase. Again, two groups who are independent from each other, work together. However, this time both parties work on common tasks, which results in a commonly useful outcome. Lastly, in collaboration both parties concede some independence in order to achieve a common goal.

In our research, we make use of Peterson’s (1991) approach and show how we try to get students to the collaboration stage. We will try to achieve this in a larger learning environment by introducing C4mpUs, which will activate students to use RPL.

Peer learning

Boud et al. (1999) define peer learning as "the use of teaching and learning strategies in which students learn with and from each other without the immediate intervention of a teacher" (Boud et al. 1999, p.413). Peer learning, as well as peer teaching, is also often referenced to as collaborative learning. Boud et al. (1999) further say that students need to show a set of skills or attributes that is associated and accompanies the use of peer learning. Students need to:

- Connect and collaborate with other peers. This makes them a part of a learning community.
- Work with peers instead of a teacher and reflect and challenge ideas.
- Talk to peers and train their communication skills. This deepens their understanding of the talked about subject and offers an ability to give and receive critique, and consequently learn from it.
- Learning to learn. By interacting and communicating with other peers, students are finding out on how to adequately cooperate with others and reach a common goal. This represents a good preparation for
One specific type of peer learning is RPL. It typically only considers the scenario of students interacting with each other who are in the same class. This excludes such a setting where students come in to help who already attended the course. This means that all the students participating in RPL are considered equals and that they are able to collaborate and make equal contributions as a teacher or a learner (Boud et al. 2014). Peer learning, as well as RPL, offer an educator the opportunity to keep up with growing number of students without having to invest more resources. However, integrating any new service to a lecture requires to analyze the given circumstances from a didactical point of view.

**Didactical service blueprint**

The DSB was developed by Wegener et al. (2012) and offers an opportunity to improve larger scale lectures by examining the current structure and reshaping it. Furthermore, they emphasize the fact that the improvement of the lecture does not have to come at a significant cost when using resources such as e-learning and peer learning. They use the findings of Stostack (1984), who defines an approach on how to design a blueprint for a common service. Over the years that work was further enhanced (e.g. Fließ and Kleinaltenkamp 2004; Kingman-Brundage et al. 1995)) and then used by Wegener et al. (2012) to further develop it and apply it to an educational context, more specifically to large scale lectures.

Blueprints can be defined “as a two-dimensional picture of a service process: The horizontal axis represents the chronology of actions conducted by the service customer and the service provider. The vertical axis distinguishes between different areas of actions. These areas of actions are separated by different “lines”” (Fließ and Kleinaltenkamp 2004, p.396). These lines are the line of implementation, line of internal interaction, line of visibility, and the line of interaction (Kingman-Brundage and George 1996; Kingman-Brundage et al. 1995). Beneath the line of implementation reside the decisions made by management or other people in charge. In the context of learning this refers to the professor or teacher of a given course. Above the line of implementation and underneath the line of internal interaction are the support activities that enable front office personnel to deliver the provided service. In between the line of internal interaction and underneath the line of visibility are the actions that are invisible to the customer, or in our case the students. Measures that are visible to him or her, which are performed by members of the front office, reside above the line of visibility and underneath the line of interaction. Actions that involve both parties reside on the line of interaction. Above the line of interaction are the actions performed by the student. However, since the model does not differentiate between students performing actions on their own or cooperatively, Wegener et al. (2012) introduced the line of peer interaction. All events that take place on this line involve at least two participants working together.

**Persuasive technology**

Trying to persuade a person or a group to adapt a new behavior is not simple. Persuasive technology tries to offer a solution on how to induce such a behavioral change (Fogg 2002; Lockton et al. 2010). Fogg (2009) argues with his psychological model that it is up to the factors of motivation, ability, and trigger, whether or not a behavior is performed. He also offers an eight-step design process for creating a successful persuasive technology (Fogg 2009b). These steps include the necessity to (1) only target one simple behavior, (2) to choose a receptive audience for taking on a new behavior, (3) find the reason what prevents the targeted behavior, (4) choose a technology that people are familiar with, (5) find other persuasive technologies that might be of help, (6) imitate those who have proven to be successful, (7) test, (8) and then expand further if successful. One method, which we also use in C4mpUs, that has proven to be persuasive, is gamification. Kapp (2012) defines gamification as the usage of “game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp 2012, p.10). Most of the time when gamification is being applied under different circumstances it tries to increase the user’s engagement and tries to influence the motivation of the exposed person to adapt a specific behavior (Fitz-Walter et al. 2011; Kapp 2012; Werbach and Hunter 2012) or make a product more compelling (Zichermann and Cunningham 2011). Gamification has proven to be effective in various fields (Hamari et al. 2014) such as education (Lee and Hammer 2011) or health (King et al. 2013).
Research approach

This research lays a focus on the improvement of larger scaled lectures by introducing an artifact that stimulates the adoption of RPL. By developing C4mpUs and analyzing its effect on one of our courses, we decided to use the Design Science Research (DSR) approach. DSR was considered and chosen due to the creation of an artifact that tries to enhance the applied teaching approach and teaching in general. Hevner et al. (2004) define it as an approach that "creates and evaluates IT artifacts intended to solve identified organizational problems" (Hevner et al. 2004, p.77).

Design science research approach

Hevner et al. (2004) did lay a fundamental groundwork for DSR. Ever since, there has been more development in the field and other researchers such as Peffers et al. (2007) created their own approach. For example, they divided their DSR approach into different steps with four corresponding research entry points. In their opinion research is therefore undertaken because of a problem that a researcher wants to solve, an objective that needs to be addressed, a design and development centered approach, or for the reason of a context or client initiated cause.

In this paper, we will use the approach offered by Peffers et al. (2007) and try to achieve our goal to initiate RPL. We will do this by (1) establishing connections between participants, (2) keeping those connections alive, (3) offer individual and helpful feedback delivered by the participants themselves, and (4) offer a teacher the possibility to increase interaction without having to invest remarkably more resources. Since we are trying to address a specific problem our research can be categorized as a problem-centered approach. While introducing RPL we will observe if students engage newly acquainted peers as often as they do previously known ones.

Approach

In our approach, we try to encourage our students to make contact with known and unknown peers in class, and engage in RPL. We hope that this will lead to better prepared students as well as a more socially connected classroom. It is our ambition to introduce an artifact that offers a scalable solution for achieving RPL in a playful manner. Beforehand, we did determine that we do lack collaboration in our lecture between teacher and students, and among students. With the introduction of C4mpUs we try to close that gap. Figure 1 shows our approach and how we try to initiate collaborative actions. We offer both a lecture as well as a tutorial in our course. C4mpUs, which is positioned in between them, can be used in either one, or both. Since the artifact was constructed with mobile learning in mind, we are not being constrained to a specific time or place.

We chose to implement C4mpUs on both major smartphone platforms iOS and Android. When it came to the design aspect we tried to adhere to their respective design guidelines. These give users a feeling of familiarity. They are then able to quickly recognize, due to interaction with other apps in the past, user interface elements such as navigation, buttons, and arrangement. We further implemented push notifications that allows a teacher to make students quickly aware of newly made available material.

In order to properly introduce RPL to the lecture, we made use of Hall and Stegila (2003) findings. They found four common characteristics among different forms of peer-mediated instruction and intervention. These are (1) to train and assign students to specific roles in the peer learning environment, (2) students give other students instructions, (3) teaching staff observes and assists peer learning groups in the classroom, and (4) structures are designed to increase academic as well as social goals for all students. We kept these characteristics in mind when building C4mpUs. For training our students we used the initial tutorial session and taught them how to use the application. We further used the Bring Your Own Device approach. In this case students use their own smartphone instead of a provided one, which allows us to keep costs down, as well as ensure that they are familiar with the device.

As seen in figure 2, we tried to keep the approach to initialize RPL as simple as possible. We divided the process into five steps. The teacher first (1) gives students the opportunity to get to know other peers or rather choose peers they feel comfortable to talk to. Participants are given a unique QR-code within the
application, which can be scanned by other participants. As soon as (2) two of them scan each other they are considered to be connected. After each scan a user is asked if they just met the other person. This way C4mpUs can distinguish their relationship. Once students have connected, (3) the teacher is able to send out tasks, which are then later discussed during the next tutorial. The task (4) requires students to elaborate on the just learned content. Together with the assigned task the students receive the name of one of their previously connected peers. Students then have to seek out the corresponding person and work on the task together. We call the students seeking out their corresponding peer the initiators and the students being talked to the supporters. Depending on the task, the initiator or the supporter can either be the learner or teacher, or both.

We will try to make the interaction for students more demanding by targeting the higher-end of Bloom’s revised taxonomy. In this taxonomy, which is shaped like a pyramid, the cognitive process goes from the lower-order thinking skill, of purely remembering, up to the higher-order thinking skill of creating something new. We will focus on the fifth level, the ability to evaluate. It represents the capability to think critically, which implies that students already have a deep understanding of a given concept and are able to make decisions on their own, based on their experience (Bloom et al. 1956; Krathwohl 2002).

Once the task is completed (5) the initiator rescans the supporter. Only then the supporter is able to rate
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The interaction by awarding up to five stars. The five-star rating is aggregated and shows the teacher how often and how well the given task was completed. The entire process of connecting with peers as well as solving tasks together is fueled by gamification. Each activity of completing a task or connecting with a new peer is rewarded with points, which can be seen in a ranking. In comparison to other applications we lay a focus on face-to-face communication, which is necessary when scanning or solving a task with a peer. This aims to decrease anonymity which may otherwise lead to incivilities in the classroom (Forni 2002).

It is, furthermore, important to consider Fogg’s (2009) three dimensions of his psychological model when trying to persuade students to follow instructions. First, (1) it is necessary that these students have the ability to solve a given task, and are (2) motivated to solve it. If these two requirements are met, then (3) a trigger is useful in initiating the pursued behavior. Fogg’s (2009) compares this to his ambition to practice an instrument. Even though he is motivated and has the ability to do so, he still needs a trigger, such as an alarm clock, to remind him to actually practice. To address these requirements, we made sure that students would learn all the necessary background information for solving the task, in either the lecture, or the tutorial. When it came to motivating we used two approaches. The first one was to send out a task during the tutorial session and give initiators and supporters the time to work together. The second one was to send out a task right after the lecture or tutorial. This was based on the assumption that students would be motivated to complete the given task because they were just confronted with freshly acquired knowledge, which they would like to apply. As a trigger, we integrated push notifications into C4mpUs, which would prompt a notification on students’ smartphones as soon as a new task was available.

Evaluation

C4mpUs was first introduced to students in the winter term of 2014/15 (WT14/15). During that term, it was our goal to determine whether or not students would even consider making a connection with other peers (Kallookaran and Robra-Bissantz 2016). This represents the same approach we used in the winter term of 2016/17 (WT16/17) without the ability to send out tasks. Table 1a compares both winter terms and shows how many students subscribed to our Learning Management System (LMS) that is being used as a default system throughout our university. This number offers a good reference to how many students are actually enrolled in class and how they compare to the number of installations of C4mpUs. The ratio of app installations, compared to the LMS enrollment, rose from 40.6% in WT14/15 (272) to 64.32% (411) in WT16/17. However, not all students who chose to download and install C4mpUs did participate. Out of those 272 installations in WT14/15 only 81 or 29.78% did actually participate in getting to know their peers. For WT16/17 that number rose to 215 users or 52.31% of all the installations. The connections, referenced in the table 1a, refers to two peers scanning each other. Only students with at least one connection did receive a task from the teacher, since it is necessary to solve a problem in a group of two. In both terms, a single student connected on average with 3.48 and 3.50 other peers respectively. As we have mentioned earlier,

<table>
<thead>
<tr>
<th></th>
<th>WT14/15</th>
<th>WT16/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>LMS subscribers</td>
<td>670</td>
<td>639</td>
</tr>
<tr>
<td>App installations</td>
<td>272</td>
<td>411</td>
</tr>
<tr>
<td>Male users</td>
<td>209</td>
<td>311</td>
</tr>
<tr>
<td>Female users</td>
<td>63</td>
<td>100</td>
</tr>
<tr>
<td>Connections</td>
<td>212</td>
<td>654</td>
</tr>
<tr>
<td>Mean Connections</td>
<td>3.48</td>
<td>3.50</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>3.16</td>
<td>2.71</td>
</tr>
</tbody>
</table>

(a) Subscriber stats

<table>
<thead>
<tr>
<th></th>
<th>WT14/15</th>
<th>WT16/17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutorial</td>
<td>89.62%</td>
<td>89.30%</td>
</tr>
<tr>
<td>Lecture</td>
<td>1.89%</td>
<td>3.82%</td>
</tr>
<tr>
<td>Wild</td>
<td>8.49%</td>
<td>6.88%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

(b) Time of connection

Table 1. Winter terms in comparison

mobile learning is able to take place at any time or place. Considering the time aspect, we can see in table 1b when peers connected with each other. We differentiate between lecture (LEC) and tutorial (TUT) time as well as any other time in between (WILD). This means that in both WT14/15 and WT16/17 almost 90% of all the connections happened during the tutorial. Connections that occurred neither during a tutorial or
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In WT16/17 we introduced the new feature of solving tasks together. If an initiator is able to solve a task with the assigned supporter and if the latter one also provides a rating, then the task is considered to be completed. However, if the supporter neglects to rate the interaction then the task is only considered to be partially completed. If there is no interaction at all then the task is incomplete.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Completed</th>
<th>Partially completed</th>
<th>Incomplete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections</td>
<td>TUT</td>
<td>LEC</td>
<td>WILD</td>
</tr>
<tr>
<td>OLD</td>
<td>74</td>
<td>8</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>53.24%</td>
<td>5.75%</td>
<td>41.04%</td>
</tr>
<tr>
<td>NEW</td>
<td>144</td>
<td>10</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>62.61%</td>
<td>4.35%</td>
<td>33.04%</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Table 2. Task completion**

Table 2 gives an overview on how many tasks were completed, partially completed, and incomplete. It also shows us at what time the students collaborated. We further distinguish between three types of connections. If they said they knew each other before, then we categorized it as a previously established one (OLD), otherwise as a new one (NEW). Due to the ability to circumvent the question by exiting the application we also have an unknown type (UNKNOWN). Notice that we will list the UNKNOWN connections but will not further discuss them as they are relatively marginal. Most of the tasks that were completed happened during the time of the tutorial. Connections during the lecture time accounted for the least part. Partially completed tasks were almost evenly spread out for NEW connections. OLD connections mostly worked on the task during the tutorial (50%) or when no class was in session (38.89%).

When taking a look at table 3, it is possible to see how many tasks were actually completed. While 571 tasks were assigned to OLD connections and 955 tasks were assigned to NEW connections, 72.5% and 74.03% were actually not completed. Both OLD and NEW connections did manage to only complete approximately 24% of the tasks.

<table>
<thead>
<tr>
<th>Connections</th>
<th>Completed</th>
<th>Partially completed</th>
<th>Incomplete</th>
<th>Total assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLD % of Total</td>
<td>139</td>
<td>18</td>
<td>414</td>
<td>571</td>
</tr>
<tr>
<td></td>
<td>24.34%</td>
<td>3.15%</td>
<td>72.50%</td>
<td>100%</td>
</tr>
<tr>
<td>NEW % of Total</td>
<td>230</td>
<td>18</td>
<td>707</td>
<td>955</td>
</tr>
<tr>
<td></td>
<td>24.08%</td>
<td>1.88%</td>
<td>74.03%</td>
<td>100%</td>
</tr>
<tr>
<td>UNKNOWN % of Total</td>
<td>8</td>
<td>0</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>80%</td>
<td>0%</td>
<td>20%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Table 3. Aggregated task completion**

**Discussion**

The gathered data shows that the conditions of both winter terms are comparable. The number of students remained almost constant during both terms whereas the installations of C4mpUs did rise from 40.60% to 64.32% compared to LMS subscriptions. However, this can also be due to the fact that the ratio of students owning a smartphone did increase over the past two years. This makes it necessary to look at how many students participated in connecting with other peers. The actual usage of C4mpUs by distinct users rose from 29.78% to 52.31%. We credit this to the introduction of the task feature. The task feature goes beyond simple interaction and introduces a learning component to the artifact. This noticeable surge did happen even though we made the tasks also available through the LMS, if someone didn’t want to or couldn’t use...
C4mpUs. The mean connections a single student obtained throughout both terms did not change noticeably. In either one of them a student connected on average with approximately 3.5 other peers. This is a sign that conditions remained almost constant when it came to approaching other peers. The same holds true for the timing when connections happened, as seen in table 1b. Our approach on initiating the connection between students and encouraging them to interact, and making them aware of the functions of C4mpUs, remained the same. This explains why the timing of the connections is spread out almost identical between both terms.

Looking at table 2 reveals how important it is to make learning material and learning experience available beyond the classroom. The connections happened for both OLD and NEW ones in over 30% of the cases when no class was in session. However, this distribution can easily be influenced by choosing another point in time when to send out tasks to the participants. As already mentioned above, we chose to send out tasks right after each lecture, as well as tutorial. During the tutorial, we discussed the tasks and also gave students some time to reconnect. During the lecture time, no task was send out and no time was made available to students to complete a task. Since we have lots of ground to cover in the lecture we chose to integrate the tasks and discuss them during the tutorial. The timing, when a task is send out and when it is discussed can be changed in future research and will probably result in another distribution.

It is important to notice two things when looking at table 3. First, the tasks that are not being completed are rather high. Tasks that were assigned to OLD connections did not manage to complete or even partially complete them by 72.50%. NEW connections did perform slightly worse and ended up with 74.03% of incomplete tasks. Second, the rate of completion, between NEW and OLD connections, is almost the same with approximately 24%. This means that it didn’t seem to matter whether or not a task is assigned to an OLD or NEW connection.

**Limitations**

In our research, we are only considering the time perspective of mobile learning and neglecting a student’s location. To be more accurate, on when connections happen, as well as when tasks are being worked on, it is necessary to include the location of the users. This way we cannot be certain that the occurrences we observed were actually happening in the room where the tutorial and lecture took place. However, including the location would require us to record location based information of participants. As we didn’t expect users to consent to this procedure we merely made use of timing information through anonymized usage logs. In future research both time and location should be included, while still making sure that students understand the consequences of their approval when they participate in the research.

Most of the tasks we send out were incomplete. This is a sign that we either lacked motivation, ability, or an adequate trigger to get students to seek out their peers and work together (Fogg 2009a). Especially the motivation aspect should be addressed and measured in future research. We assumed that for motivation purposes it would be the best time to send out tasks right after class. However, if this is actually the best time is unknown to us. It would be wise that future research determines the best point in time when considering things such as motivation and diurnal efficiency. Diurnal efficiency may for example vary and effect the association and memory of participants (Gates 1916). Additionally, it is necessary to assess if C4mpUs is actually contributing to the learning success. This can be done by measuring the learning success between students who chose to use C4mpUs and those who did not.

C4mpUs should, furthermore, be improved so that users can’t circumvent the question whether or not they knew each other before. This will make our findings more precise and eliminate our UNKNOWN category. Also, the occurrence of partially completed tasks indicates that students did not know how to rate a task or were not made aware of it. Future versions of C4mpUs should make the user better aware of his or her duty to complete a task.

**Conclusion and future research**

We made use of an artifact that motivates students to get to know other peers in class through the usage of gamification. Building on top of that functionality we added the possibility for a teacher to send out tasks to participants. The implemented mobile application called C4mpUs does now, not only try to enhance the
social connectedness of the class, but also adds learning capabilities. Tasks that initiate peer learning are being rated by students, which allows teachers to get feedback on specific content they redeem important. In our research, we looked at two different aspects. First, we observed how participants connected with others, whether they chose to connect with peers they previously knew or if they approached someone they hadn’t met before. Second, how students behave when being assigned a task that is supposed to be solved with the help of a peer they just met, compared to a previously known peer.

We compared our findings from both winter terms and saw a strong resemblance. During both terms, most students connected during the time of our tutorial. However, several students also chose to do so in their spare time. Future research should focus on how to further enhance the motivation and ability of students, as well as the trigger stimulating them. We believe that this will contribute to a higher number of students engaging in peer learning. Finding an appropriate time to send out tasks will especially be important when also considering the variations in diurnal efficiency. Nonetheless, the results of the gathered data are encouraging. Even though, only 24% of the students chose to complete the tasks, they did so, independently from the type of the connection they had towards their assigned peers. This implies that students complete tasks with newly met students, which they can choose themselves, as often as with others they have previously known. However, more research is needed to determine how to increase the completion rate of the task and during what time students are most willingly to complete them. It is also needed to determine whether or not C4mpUs contributes to the overall learning success as well as if other tasks targeting other stages of Bloom’s revised taxonomy would be more appropriate.

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