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Interaction Disclosed: Unpacking Student Computer Supported Collaborative Learning

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Abstract

The digitalization of higher education has been on the political agenda for decades. Many universities have invested in *Active Learning Classrooms* (ALCs) which is a technology intense environment designed for collaborative teaching and learning. The aim of this paper is to explore *students' interaction with each during computer supported collaborative learning in an Active Learning Classroom*. An action-oriented approach was applied within the context of a university in Sweden. The framework of interaction order and the concept of 'involvement' and 'mutual monitoring' is used as an analytic lens to examine student collaboration. The results show that the classroom arrangement including the technology set-up played an important role in students' collaboration, causing transparency in activities and makes it more difficult for students to become passive. Contributions includes unpacking the role of collaborative technology and suggesting the concept "involvement disclosure" to shed light on the mechanisms that conditioning students' engagement in this setting.

Keywords

Technology, interaction order, interaction disclosure, higher education, active learning classroom

Introduction

In recent years, many universities have invested in *Active Learning Classrooms* (ALCs), which is a technology-intense environment designed for collaborative teaching and learning activities. The idea behind ALC is for students to learn through active engagement in student groups, and teachers often act as process leader and move between groups (Rands & Gansemer-Topf, 2017). Because of the design with round tables, easy-to-move chairs and shared workspaces, they are intended to simplify group discussions and foster collaboration (Cotner, Loper, Walker, & Brooks, 2013; Park & Choi, 2014; Rands & Gansemer-Topf, 2017). ALCs are designed to facilitate for teachers who want to teach with student-activating methods, and the objective to teach in an ALC is often motivated by the desire to increase the interaction and engagement among students (Fournier, Hornby, & Richards, 2014). Active learning is characterized by teaching forms that stimulate students' development of abilities and skills rather than teaching forms that are geared towards information transfer (Bonwell & Eison, 1991). It is well documented that technology-rich environments per se do not create new teaching and learning practices, as how the technology is used is central (Genlott, Grönlund, & Viberg, 2019; Pareto & Willermark, 2019; Willermark, 2018). Furthermore, research suggests that there are indeed complicated links between room layout, pedagogy, technology, and student outcomes (Soneral & Wyse, 2017; Stoltzfus & Libarkin, 2016). However, there are studies that show that the physical environment affords certain activities over others and that it affects the way students conceive teaching and learning (Poellhuber, St-Laurent, & Roy, 2007; Rands & Gansemer-Topf, 2017; Whiteside, Brooks, & Walker, 2010; Wilson & Cotgrave, 2016). Previous studies show that the flexible environment of ALC inspired both teachers and students to explore different didactic methods (Rands & Gansemer-Topf, 2017) and that both student and teachers felt that the design of ALC brought them closer together (Rands & Gansemer-Topf, 2017). There are also studies that highlight challenges, for example that there is no obvious focus in the room, and that students are exposed to much distraction (Petersen &

Gorman, 2014). However, the focus of this paper is on how the physical and digital environment impact student collaboration. *The aim is to explore how students' interact with each other during computer supported collaborative learning in an Active Learning Classroom*. The theoretical lens of interaction order is used to explore how students interact with each other and how they direct their attention during the collaboration.

Theoretical Concepts

The interaction order is an appropriate framework for analyzing interaction within a given situation, in this case student interaction in an ALC. The framework of interaction order was developed by Goffman (1963) with the purpose to display how the interaction within a situation emerges from the situation itself. Goffman suggests that a situation has its own order, which is co-constructed by the actors' present. As people interact in social settings, we are constantly engaged in the process of "impression management", wherein we try to present ourselves and behave in a way that will prevent the embarrassment of ourselves or others. This is primarily done by each person that is part of the interaction, working to ensure that all parties have the same "definition of the situation", meaning that all understand what is meant to happen in a certain context. According to Goffman the expected activity of a particular situation constitutes the "dominant involvement." Taking a church as an example, we expect different activities from weddings, baptisms, and funerals, even though the physical location is the same. The dominant involvement is the activity that persons within the situation are expected to focus on or relate to. It is simply supposed to be the group's main focus. Usually, the situation's "dominant involvement" is equal to the individual's "main involvement" (Wasson, 2006). The main involvement is the involvement on which the individual is focusing most of her attention, which typically is the dominant involvement of the situation. Still, individuals engage in "subordinate involvements." For example, while waiting for the bus you can start knitting or check the social media feed on your smartphone. In this case, the knitting or the smartphone becomes the subordinate involvement to which the person can direct her attention while waiting. In this case it is just enough of a level of involvement to make the individual feel at ease.

Goffman uses the term "involvement shields" to describe barriers of perception that hinder others from noticing what is going on "behind the scenes." For example, on the train, travelers can pretend to read the newspaper, and thus avoid taking notice of acquaintances who are sitting nearby. Headphones, smartphones and laptops are contemporary examples of artefacts that can be used effectively to shield a person from those nearby, at a restaurant, lecture hall or meeting room. However, "subordinate involvements" can be a threat to the individual's focus on the dominant involvement (Lindroth, 2015; Wasson, 2006). There is always a possibility of turning the subordinate involvement into the individual's main involvement, which is then detached from the dominant involvement of the situation. A subordinate involvement can therefore take the form of a main involvement for that person (or group of persons) and will compete with the dominant involvement of the situation. For example, during lectures that students consider irrelevant or boring, a quick look at notifications on the computer can easily lead to online shopping or browsing a news site. Thus, while the laptop is an excellent tool for student activities, it is also a resource for a wide variety of entertainment. For persons on the other side of the screen, it is hard to tell what is going on (Lindroth, 2015).

The phenomena have hardly arisen as a consequence of digital technology. In fact, Goffman developed the interaction order framework, for the analysis of face-to-face interactions among members of a group. However, it has been used to explore mediated situation as well. The framework has been applied to explore interaction among virtual teams in a corporate workplace (Wasson, 2006) as well as student interaction in higher education (Jones, 2004; Lindroth, 2015). Wasson (2006) uses Goffman's writings to develop an analytical framework that accommodates the new possibilities and constraints afforded to participants in virtual meetings. Jones (2004) used Goffman's foundations to explore students' use of chat and instant messaging in higher education and pointed out that "traditional sociolinguistic conceptualizations of the terms of interaction and the contexts in which it takes place may need to be radically rethought in light of new communication technologies" (Jones, 2004:21). Similarly, Lindroth (2015) used interaction order in an ethnographic study to explore the laptop's role in higher education. He argues that the laptop introduces an "interpretative flexibility" that allows a greater variety of behaviors relative to the dominant involvement. Thus, since the laptop is considered a work-related resource, while the activity as such is hidden, it opens an interpretative flexibility that protects deviant behavior relative to the dominant involvement of a

situation. It can also be used to conceal an improper involvement and give the impression of proper ones (Lindroth, 2015). This relates to the concept of mutual monitoring, to theorize the ways people can use their naked senses to observe and monitor one another. Similarly, in this study, the interaction order together with the concept "involvement shields" and "mutual monitoring" are used to analyze students' interaction with each other and how they perceive the situation in an ALC setting.

Method

An action-oriented approach (Avison, Lau, Myers, & Nielsen, 1999; Greenwood & Levin, 2006) was used to explore the role of the ALC in an instructional design, aiming for student engagement in higher education. As action research merges research and practice, the approach has the potential to produce research results with high relevance (Baskerville & Wood-Harper, 1998) and offers an opportunity to bridge potential discrepancies between research and practice (Burkhardt & Schoenfeld, 2003; Somekh, 2008). The methodological approach is a case study, which includes complementary forms of data collection, as suggested by Koh, Chai, and Lim (2017). It has been highlighted that the choice of conducting a case study depends on the object to be studied rather than merely a choice of techniques or methods (Stake, 1995). Therefore, it is more relevant to discuss the case study as an approach to studying a specific phenomenon that is part of a real-life context (Yin, 2017). It is an approach to studying the particular, with a special focus on what is unique in a specific case in which multiple sources of evidence are used (Walsham, 1995). The unique aspect of this case study is on how the classroom arrangement including the technology set-up affects students' interaction during collaborative learning.

Case Description

The context is a university in west Sweden and students at a three-year Digital Media program, which leads to a bachelor's degree in Informatics. The program involves the overall themes of design and design process, production of content, and strategic communication. This study focuses on the course "Integrity and Democracy in Digital Media" which is a mandatory course given at the end of the first year of the program. The objective of the course is for students to learn about societal issues linked to integrity and democracy in a digitalized society. A total of 31 students and three teachers participated in the course as a whole. In this paper, focus is on the seminars that took place in the ALC which included two teachers and 27 students. The overall idea behind the instructional design was to enhance students' engagement where they actively explore, discuss, and learn more about aspects of integrity and democracy related to digitalization. Given the interdisciplinary subject field, which can be elucidated from many different aspects, the instructional design was planned to utilize this. Thus, the ALC environment was considered suitable for promoting active learning and engaged discussions.

The ALC consists of five collaboration areas and one presentation area. It is equipped with six computers connected to a stand-alone wireless collaboration and presentation system, which includes a built-in media player, web conferencing, on-board recording and streaming, screen sharing for mobile devices, and annotation functionality. The system support "BOYD" (bring your own device) and allows for the students to connect their smartphones, tablets and laptops to the group screen and share content through various services such as Miracast, AirPlay and Chromecast. Each student group sits together at a round table with the group screen and whiteboard (see Figure 1). Furthermore, the groups are also connected to the cloud (in this case Google Drive) so that they can see (and interact) with the other group's work. The teacher can share her screen with one or several groups, and can also provide material (text, pictures) to the group. It can be generic or unique material for each group. For the students, the use of digital technology constitutes an everyday element of teaching. It is often necessary or desirable for the students to bring their own devices to taking notes, engaging in the Learning Management System, sharing external teaching material, etc.

Figure 1. Illustration of the ALC

Students were divided into five groups, with about five students in each group. The ALC was used to boost active engagement among the students, where they shed light on different perspectives of integrity and democracy. The instructional design means that each student group engages in and addresses different aspects of a mutual theme. In total, nine different themes were addressed during three days, following the same procedure (see Figure 2) including:

1. *Introduction*. Teacher give a brief introduction of a given theme (about 10 minutes). E-election constitutes an example of such a theme which the teacher initiated by defining E-election and briefly accounts for the state of the art of the discussion.
2. *Collaborative group work*. Each student group is given unique questions to research (about 20 minutes). For example, the groups address e-election from the perspectives of 1) availability; 2) integrity; 3) technological problems; 4) technological solutions; and 5) economy. Students collaborate at the respective table and connect to the group screen to make simultaneous notes, searches, and presentations.
3. *Presentation of results*. The student groups present their findings to the others (about five minutes), mediated by screen sharing.

Figure 2. Overall instructional design

4. *Peer review*. Students give and receive peer review of their findings from a predetermined student group (about five minutes).
5. *Joint discussion*. The theme ends with a concluding discussion based on the input from all groups.

There was no designated group leader, but only instructions to solve the task together. Given that the students were involved in different perspectives, their efforts were not directly comparable but complementary.

The course responsible teacher had the main responsibility for the teaching and its design including the activities carried out in the ALC. The researcher engaged in the planning, implementation, and evaluation of the activities related to the ALC and had the primary role of supporting teacher and students in this new setting. Thus, interventions were based on the teacher and student needs. A more detailed information about the role division is illustrated in Table 1.

Roles	Researcher	Teacher
Collaboration	Partner for discussing, planning and reflection	
Planning	Support planning	Plan teaching
Teaching	Occasionally assist teaching	Conduct teaching
Pedagogical Evaluator	Evaluate conducted teaching	
Technology Evaluator	Evaluate used technology	
Analysis	Analyse processes, methods, teaching activities, student interaction and student survey	Analyse teaching activities, student result
Research	Theorize about students' interaction in an Active Learning Classroom	
Documentation	Planning, student engagement in the ALC, student evaluation	Planning, students results
Information	Spread research, project results	

Table 1. Role division

Data Production

The data production includes a teacher interview, engaged observations of teaching and learning activities in the ALC as well as a student survey at the end of the course (see Table 2). The term "data production" is used since it would be inconsistent to talk about "data collection," as the point of departure is that the field and data have been constructed (Emerson, Fretz, & Shaw, 2001). The researcher takes an active role in practice reminiscent of a co-designer (Järvinen, 2012). The empiricism can thus not be regarded as something that is simply collected, but it is created together by researchers and practitioners within the framework of what is intended to be studied. By using multiple data production, it was possible to capture more aspects than those that are directly observable. The teacher interview was carried out near the start of the course and focused on: a) the aim of the course; b) the idea behind the course design in general and the ALC activities in particular; and c) the decision and ambition to work in ALC. The classroom participation observations included observations on teachers' introduction, the collaborative work in the student group, and conversations and discussions with the students about their work and actions in the classroom. The survey involved ratings on the course design and ALC activities on a 5-point Likert scale (1=Highly Dissatisfied, 2=Dissatisfied, 3=Neutral, 4=Satisfied, 5=Highly Satisfied) as well as open-ended questions addressing students' experiences of the instructional design and technology usage.

Data Analysis

Overall, the analysis was carried out in order to capture different aspects of student interaction in the ALC. The teacher interview was initially analyzed according to the interview themes. It was then used to map the teachers' objective of course design with the result from the observations and the survey. The observation were used to analyze students' actions in relation to the assignment, classmates, and technology usage. The survey was analyzed by compiling the result of the ratings of the ALC activities as well as analyzing the free text answers according to what opportunities and difficulties the instructional design and the overall arrangement in the collaborative technology-intensive environment brought. Goffman's concepts of "mutual monitoring" and "degree of involvement" were of importance when interpreting and analyzing the

data of students' actions, interactions and perceptions within the studied setting, using an abductive approach.

Number of activities	Method	Actors	Duration
2	Participant observations	Planning meeting with the teacher	5 hours
3	Participant observations	Teacher and student learning activities in ALC	9 hours
1	Survey	Students	-
1	Interview	Teacher	1 hour

Table 2. Overview of data

Results

The results show positive outcomes for the instructional design within the ALC, related to students' overall experience as well as engagement in collaborative teaching and learning activities. Students' overall rating was exclusively high (see Figure 3). When students were asked to rate their overall experiences from the ALC, it was ranked as "Satisfying" (60%) or "Highly Satisfying" (40%). The students describe their experience as follows: *"It constitutes a relaxed and fun set-up that gives room for many interesting discussions"* and *"A nice shift from the more traditional lectures"* and "*Use ALC more*."

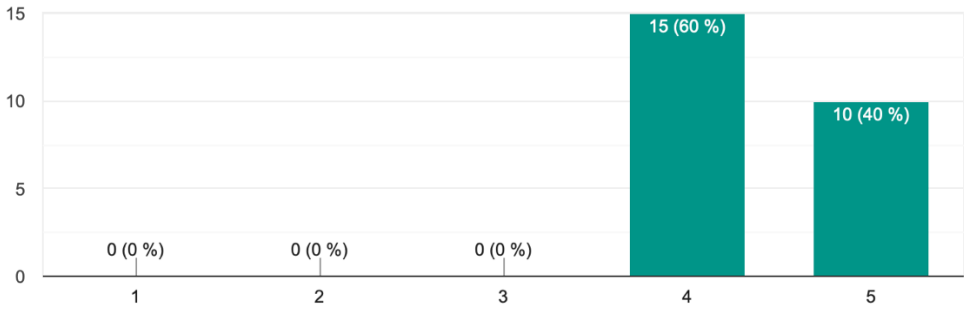

Figure 3 Illustration of student ratings of overall ALC activities.

Collaboration within the Group

The classroom observation together with the student survey testify to a high level of student engagement. Within the groups, students were engaged in the joint activities as shown by oral participation and body language as well as student activities such as shared note-taking and search for information. During the collaboration, students called on each other to connect and utilize the ability to engage in the process. The dimension of technology in the instructional design was perceived to facilitate active collaboration and make the collaboration process more efficient. The possibility to connect to the cloud and the group screen enabled parallel and simultaneous activities. One of the students writes, "*I really like this design because it creates more discussion than I'm used to*" and another student writes "*pleasant and comfortable working method where discussions really can take place. It works smoothly with the screens.*" Within the groups, the dimension of technology made the collaboration more intense as illustrated by: "*The ability to connect to a shared screen provided the opportunity to collaborate in a different more intense way at the table.*" Another student stresses how collaboration becomes easier: "*Thanks to the technology, it was very easy to work with the others at the table"* and that "*nobody is excluded because everyone can connect.*" Thus, the work in the ALC invites more overall engagement, as everyone in the group can be involved in taking notes

in the shared documents, as well as engage in other group activities such as search and screen information or making presentation slides. Furthermore, the set-up makes it obvious and visible if a student is inactive and limits the possibility to "hide" or stay passive during the group work.

Collaboration between Groups

The dimension of technology was not only perceived to facilitate a more active collaboration *within* but also *between* the groups, as illustrated by: "*The ability to connect to a screen also provides the opportunity to collaborate in a different, more effective way among the different groups*" or "*It worked well and was very involving. Giving us all different questions in the same area was interesting because we all got a lot of information and opinions presented to us in a very short time. It was effective and mentally stimulating, and I liked it."* The set-up facilitated the opportunity to learn from the other group processes as the screens reveal what has been discussed (but may not be addressed during the group presentation). The students took advantage of the "digital traces" that were revealed in the shared documents as they asked question such as: "*I see that you wrote X; what did you mean by that?*" The room invites student participation by highlighting their reflections and focuses the discussion on something that many in the class consider important.

Discussion

Goffman has been particularly clear that his analysis of interaction order excludes mediated interaction. Thus, writing such as "immediate physical presence" offers no other interpretations (Goffman, 1963; Meyrowitz, 1990). Furthermore, Goffman argues that the unit of analysis in interaction order constitutes the situation, which is defined as that of *barriers of perception*. Within this notion, Meyrowitz (1990) considers physical space, place, and location as subcategories of the more inclusive notion of *perceptual field*. If the perceptual field is altered, then the situation should change accordingly. As technology changes the interaction within a mediated situation, it should also affect the very definition of the situation, as it increases the perceptual field (Meyrowitz, 1990). Thus, it has been argued that the interaction order needs to be reexamined to explore its applicability to mediated interaction (Lindroth, 2015; Meyrowitz, 1990).

Previous studies have shown how portable technology constitutes a modern example of interaction shields, which allows a more "laissez faire" approach to presence. It makes subordinate involvements more accessible. It is suggested to foster a more liberal view of involvements and even change in the *involvement morale* (Lindroth, 2015). However, this addresses a certain type of use, where technology is tied to *a* person – a laptop or smartphone user who can easily shift between sharing and hiding her activity to others. When the technology is out of sight of others it can simply offer an alibi for subordinating.

However, in this study the instructional design builds on a point of departure where the set-up facilitates transparency. In this case the technology usage has the opposite effect as the very use of (shared) technology not only supports collaboration, but also mutual surveillance among students. The technology acts as an "interaction disclosure" by bringing transparency to a situation and inhibits the possibility for subordinating. It facilitates to identify, challenge and question activities that does not seem to belong to the dominant involvement of the group. Students use different concepts, such as "intense," "tracking," "shared," "open" or "visible" to describe what characterizes the engaged collaboration. In this case, digital technology had a crucial role in creating transparency. That being said, one can imagine other (analog) interaction disclosure as well. Sticky notes, mind maps, text sections can also provide evidence of engagement and enable mutual surveillance. However, in this context the set-up including the collaborative technology had a prominent role as such interaction disclosure.

More specifically, the set-up had a dual role of *facilitating collaboration* and *preventing passivity*. It *facilitates collaboration* because it supports active participation by all group members, as everyone can take notes, build on presentation slides or search for information. It differs from situations where one (or a few) student(s) is "by the pen" and other may have a rather unclear role as idea generators or discussion partners. Thus, the simplicity for all participants to connect regardless of device, makes it easier to contribute in a concrete way in the group's work. It *prevents passivity*, because the shared collaboration areas afford mutual surveillance among the students in a very tangible way. Thus, requires more from the individual, as illustrated by: "*I liked that we got to interact by the screen, it meant that we really 'woke up'*." In this case technology usage acts as a personal billboard, advertising the users' content on the screen

and displays activity as well as passivity. This is utilized by the students to distribute tasks, i.e., "*as you do not search for information you can start to make presentation slides*" and encourage action-taking, i.e., "*that's a good example, write it down yourself.*" It is conceivable that the clear traces of activity (as well as passivity) that the collaborative technology offers lead to changes in the involvement morale (Lindroth, 2015). Yet in this case in terms of increased demands for engaging in the "dominant involvement" of the group.

Limitations

As for the empirical results gained in this study, it has primarily three limitations that should be noted, and that can also serve as areas for future research. First, the data is small-scale and needs to be validated in other studies. Second, the study captures student interaction, during one course. Consequently, studies that investigate how the interaction changes (or not) during long-term use are needed. Third, the study takes place in a Swedish university context. However, the research has broader theoretical implications, as it explicates the role of certain uses of technology when interacting in a collaborative context. Such conceptualization could be transferred into other situations.

Conclusions

The results show that the set-up, with collaborative technology usage, affords active participation in collaborative learning activities in (and among) student groups. The term "interaction disclosure" is suggested as a concept to capture how certain uses of digital technologies bring transparency to a situation. Interaction disclosure can be used as a complementary concept to shed light on the interaction order framework in mediated situations. Thus, it illustrates the multifaceted ways that technology can operate both as an "interaction shield" as well as an "interaction disclosure." Furthermore, the study sheds light on the different logics that come with collaborative versus personal technology usage. The result shows impact on the involvement morale, yet preventing subordinate involvement and promoting active learning by 1) facilitating active and flexible collaboration; 2) preventing passivity and subordinate involvement by mutual surveillance; and 3) supporting the transparency of other groups' processes. This insight can be utilized in instructional design and selection of technology usage to cultivate active collaborative learning.

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