

Lay Theories Regarding Computer-Mediated Communication in Remote Collaboration

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Abstract

Computer-mediated communication and remote collaboration has become an unexceptional norm as an educational modality for distance and open education, therefore the need to research and analyze students' online learning experience is necessary. This paper seeks to examine the assumptions and expectations held by students in regard to computer-mediated communication and how their lay theories developed and changed within the context of their practical experiences in conducting a remote collaborative project, through computer-mediated communication. We conducted a qualitative content analysis of students' final reports from an inter-institutional online course on computer-mediated communication and remote collaboration. The results show that students' assumptions were altered and indicate the strong benefits of teaching how to collaborate remotely, especially if a blended approach of theory and practical application are combined.

Keywords: Distance Learning; Computer-mediated Communication; Lay Theories; remote collaboration

Introduction

For distance learning environments, successfully employing computer-mediated communication (CMC) is often deemed one of the most relevant factors (Dennen, 2005; Thompson & Savenye, 2007). CMC has become embedded in the social and organizational lives of people (Walther, 2013). It is frequently used and a common tool for team collaboration, allowing participants to work on tasks without having to be at the same place at the same time. Despite this customary practice, CMC is excessively and still mostly used in private contexts, allowing users to communicate with friends or family. Consequently students of Informatics, software engineering and related subjects are not fully aware of the possibilities and limitations of computer-mediated communication for organizational and workplace environments.

Due to infrastructure and technology advances remote collaborations (RC) are becoming more commonplace and students are likely to encounter CMC in their working life. Nonetheless students, actually have vague ideas about how such remote collaboration through computer-mediated communication works—how they are scheduled and organized; which tools can or should be used; how the communication between the participants in such settings might look like; and which problems might occur when tasks are completed remotely using CMC. These ideas or assumptions often arise from comparison with practices in face-to-face settings, private use of CMC or cultural references to this topic, mainly in TV shows or movies. Such assumptions do not always reflect the reality of the matter but can nevertheless affect the way in which remote collaboration is started or dealt with once a person actually uses it. Considering the structure and purpose, such ideas often have a lot in common with actual scientific theories, which is why they can be called implicit, subjective or lay theories.

In light of how CMC has become commonplace as an educational modality for distance and open education, the need to research and analyze students' online learning experience becomes obvious (Dennen, Darabi & Smith, 2007). In this study we sought to examine what kind of assumptions and expectations students have about CMC. We wanted to know what happened to the students' subjective theories as their knowledge of CMC was developed within the classroom environment. In particular we aimed to investigate if and how students' beliefs changed when they were confronted with scientific theories and new experiences regarding computer mediated communication.

Literature Review

Computer-mediated communication can be defined as the study of how human behaviors are maintained or altered by exchange of information through machines (December 1996). It can be defined as communicative transactions occurring through the use of two or more networked computers (McQuail, 2005). Different theoretical models have been developed to explain how individuals and groups adapt to computer-mediated (vs. face-to-face) communication, how they develop relational communication and organize their collaboration (Ang, Talib, Tan, Tan & Yaacob, 2015; Sheldon, Abad & Hinsch, 2011; Walther, Van Der Heide, Ramirez, Burgoon & Peña, 2015; Walther & Parks, 2002). Researchers have investigated Internet-based social networking supported by social software, including instant messaging, YouTube, e-mail, social networking sites (SNS) and Internet forums (Chen, Yen, Hung & Huang, 2008; Haridakis & Hanson, 2009; Hunt, Atkin & Krishnan, 2012; Ou & Davison, 2011; Papacharissi & Rubin, 2000; St. Amant, 2002; Sun, 2008; Sun, Rubin & Haridakis, 2009). Interpersonal motives for using the Internet include interpersonal utility (Papacharissi & Rubin, 2000), social utility (Kaye & Johnson, 2002), social or interpersonal interaction (Ebersole, 2000; Wolfradt & Doll, 2001), and chatting (Sjoberg, 1999). In our research we focus on text-based interaction, since the fact remains that text-based communication is still dominating the interaction on the Internet and text-based technologies are the most interactive.

Computer-mediated communication can take place in different environments: Students commonly use CMC for personal use, i.e. outside a working environment and outside educational purposes (Knight-McCord et al., 2016). More and more, corporate environments are adopting different modes of CMC for professional communication and collaboration (Carlson, Zivnuska, Harris, Harris & Carlson, 2016) and CMC is increasingly being used for educational purposes (Andersen & Ponti, 2014) or is a subject of academic learning (Howard, 2011; Marsden & Connolly, 2010). Through their personal use of computer-mediated communication and social media, individuals develop ideas of how to behave in this social setting: Understanding how people act in a social setting is influenced by the way people think about and infer meaning from what happens around them (Heider, 1958). Research on human perception, attitudes and behavior, motivation, and metacognition has shown that people's beliefs influence their perception of reality and shapes their behavior (Dweck, 1986; Fiske & Taylor, 2013; Furnham, 2013; Igou, 2004; Kruglanski, 2013; Snyder, 1984). We adopt this perspective to investigate the beliefs that students hold regarding computer-mediated communication. In order to understand how people behave in a remote collaboration setting, it is important to investigate how the conditions of computer-mediated communication are perceived and how people think they should behave under these conditions.

Research into individuals' views of communication technology shows that their experiences with personal CMC in social media influences their expectations and assumptions of CMC in work settings and influences their views about CMC (Treem, Dailey, Pierce & Leonardi, 2015). Literature shows divergent assumptions and findings regarding the influence that prior familiarity with a technology has for its use in the workplace. While there are numerous positive effects to be expected

from CMC in the workplace (Ellison, Gibbs & Weber, 2014), there are good reasons to suspect that individuals' implicit belief systems may not align well with goals in a work setting: The expression of opinions, potential disinhibition, and relationship building in personal CMC could clash with professional communication norms (Cheney & Ashcraft, 2007). The study by Treem et al. (2015) showed that the beliefs that people have regarding CMC in a work setting were related to their prior use of CMC, but in directions contrary to the expectations that prior use of CMC facilitates its use within work: Younger workers and people who had used CMC heavily in a personal context were more skeptical about the use of CMC in the workplace; older individuals and those without much experience with CMC in a personal context were more positive about the different modes of CMC in the workplace.

These views and belief systems that people use in their everyday life are called lay theories, they comprise implicit belief systems that people are not necessarily aware of, neither are they aware of the impact of those theories on their social understanding. Lay theories, like scientific theories, are constructed to make sense of the world, i.e. they serve an epistemic function (Hong, Levy & Chiu, 2001). They are organized knowledge structures, and as such set up a framework for interpreting specific situations and for making inferences about the world around us. With this sense-making function, they offer a starting point for pedagogical processes (Groeben, 2014; Groeben & Scheele, 2000). Lay theories are affected by scientific knowledge—and can be activated or deactivated based on the scientific knowledge that is offered in a particular situation (Levy, 1999). It has been shown in studies in which participants read fictitious scientific articles, the reading influenced participants to judge a social situation more in line with the “scientific” evidence that was presented to them; also, the existing lay theory could be influenced by generating persuasive arguments for a particular theory (Levy, Plaks, Hong, Chiu & Dweck, 2001). If reading a persuasive article in an experimental session can change lay theories, a classroom setting in which scientific papers are read and hands-on experiences are made should have even stronger effects. Consequently, we hoped to find similar effects on our course, in which we provided authentic scientific information and the experiences encountered by the participants in a real-life collaborative environment. After all, the purpose is to educate, inter alia by completing the participants' lay theories and hypotheses about how the object of study works with scientific knowledge and/or practical experiences.

Our research question was how students' understanding of and reflection about computer-mediated communication changes through a course covering scientific theories and practical experience regarding computer-mediated communication. Through the students' reflection of their experiences we aimed to reconstruct and explore the Intuitive Lay Theories that the students held when entering the course.

Method and Material

This study is based on a qualitative content analysis of students' final reports from an inter-institutional online course on computer-mediated communication and remote collaboration.

The course “Computer-Mediated Communication and Remote Collaboration”

The course or module “Computer-Mediated Communication and Remote Collaboration” is part of the master's program “Software Engineering and Management” at Heilbronn University, Germany. The course includes three to seven weeks of remote collaboration with students from Dundalk Institute of Technology, Ireland and Transilvania University of Braşov, Romania. On average, approximately 60 students attend the course from the three institutions and the course takes place

once a year in the summer semester. While the majority of the students from Romania and from Ireland have lived in these countries all their lives, the students from the German course have typically come to Germany for the master program from another country, 90% of the diverse student population originate from the Indian subcontinent, Africa, Eastern Europe, other Asian countries, or South or Middle America. About one third of the students are female and two thirds are male.

For the students from the university in Germany, the course is divided in a theoretical and a practical part. In the first lessons, which are conducted face-to-face, the students are introduced to the different theories of computer-mediated communication, learn about the discourse surrounding CMC throughout the years, and are provided with additional reading material. The practical part of the course takes place online. The students from the universities in Romania and Ireland join for this part only. The students are divided into groups of 4 to 6 members from all three universities, i.e. Germany, Ireland, and Romania. In these teams they worked on a software development project based on a detailed project description by the lecturer.

We examined data from 2011–2016, in which these team sessions took place and were organized on the online group collaboration application Wiggio (see Figure 1). The teams had access to a plenum for all students and staff, in addition they could break out into their team “rooms”. Each team and the plenum had a chat function as well as blog feeds and folders for their documents and project plans.

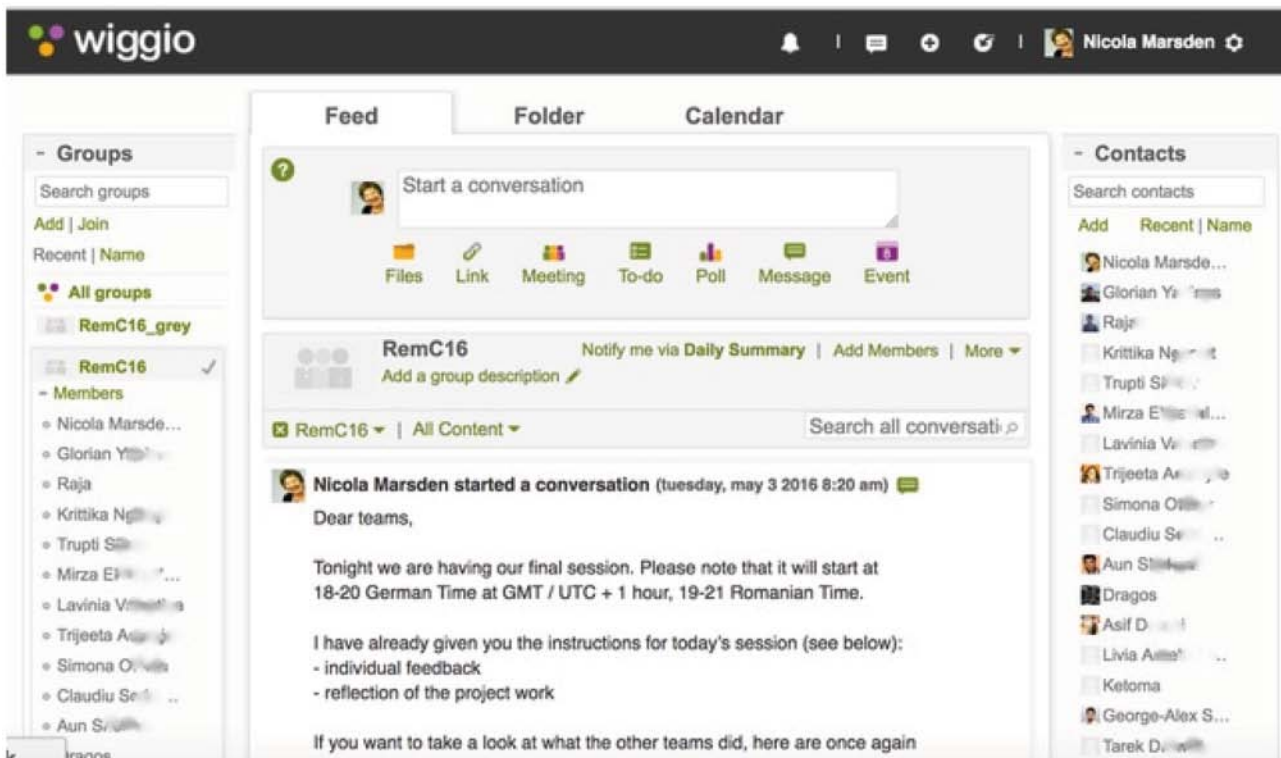


Figure 1: Screenshot of the collaboration platform Wiggio

The goal of the course was to gain knowledge on the theories of computer-mediated communication and students gained hands-on experience by working in remote teams on the tasks given by the lecturer. This approach was aimed at enabling the participants to understand the theories taught prior to teamwork sessions, and then to adopt them in the experienced reality of the sessions.

Final Reports as Units of Analysis

As stated, the students from the Irish and Romanian university joined the module for the online collaboration for the remote team project work. For the students from the German University, this project was only a part of the course, since their course also included the instruction on the theories and research in computer-mediated communication. To get full credit for their course, the students from the German master's program also had to write a final report: During the remote collaboration the students were instructed to document their experiences based on the CMC theories they had learned in the initial class meeting at the beginning of the semester and by reading the required literature provided. At the end of the course, a final report by the students from the German University documenting the process. Instructions on the final reports were detailed and contained advice on the structure of the report in order to provide complete and comparative information. The reports provided an overall description of the virtual team process, a reflection of the participants' own role in the team and an application of the theoretical approaches described in class and experienced in the virtual collaboration. By expressing the lessons learnt during the lecture, the students provided insights into their subjective (lay) theories. Since lay theories are implicit knowledge structures, they cannot be accessed directly. Rather, they need to be reconstructed based on the effects they have. One way to reconstruct these implicit theories is to identify instances in which the implicit theories are disconfirmed, i.e. the person has a reason to question the validity of their lay theory. The students' reflections regarding their experiences in the remote collaboration, their thoughts on the scientific theoretical background on CMC, and regarding the points that they considered noteworthy was used as a basis to reconstruct these implicit belief systems.

Our assumption and hope was to enquire if the initial subjective theories are influenced by the provision of this scientific knowledge and a demonstration of such a participatory experience. If so, we hoped to gain an insight into how the participants' lay theories are altered or maintained by experience and expertise.

Methodology

We examined 38 reports written from 2011 to 2016, which provided detailed information about the team-working process and the issues experienced. Based on these reports we conducted a qualitative content analysis (according to Mayring 2014). This approach conceptualizes the process of assigning categories to text passages as a qualitative-interpretive act, following content-analytical rules. Our focus was on the expressions relating to the underlying subjective theories, revealing expectations about the assumed character and procedure of the remote collaboration sessions. Furthermore, we examined whether there was any impact of theoretical knowledge observed through the practical teamwork. Our analysis was based on the "Lessons learnt" chapters of the final reports.

While examining the material, we focused on such sentences that offered information about how the participants experienced work through CMC and how they understood the theories linked to these experiences. Examining this to their earlier (lay) theories about how working through CMC would be, we also compared their experiences in face-to-face-settings or even earlier CMC in other settings, from which most of their lay theories obviously had been developed.

For the content analysis, a three-staged interpretation procedure (see Figure 2) was followed (Mayring 2014) (a.) Summary: The material was reduced in such a way that the essential content was preserved and abstracted to create a manageable corpus that still reflected the original material. For this, relevant sentences were identified, collected, and paraphrased. (b.) Explication: The material was explained, clarified, and annotated, using a narrow and a broad context analysis for each identified portion of the text. An explicatory paraphrase was made and the explication was

examined with reference to the total context. (c.) Structuring: Based on the theoretical basis, further categories were developed as dimensions for structuring. The material was categorized and the system of categories was re-examined, adding further categorizations and reappraising the material on these. Key examples were identified.



Figure 2: Three-staged interpretation procedure (Mayring 2014)

Categorization

For the process of categorization the participants' statements were initially divided into statements about the influence of:

- the theoretical input on the perception of CMC
- the practical experience on the perception of CMC
- the combination of both theory and practice on their perception of CMC.

A further cross-categorization was made in respect to whether their assumed predictions of Computer-Mediated Communication have been seen as confirmed, disproved, or not affected by their later practical experiences. The grades of impact of the course and the coding instructions for the step were:

- Previous Intuitive lay theories seen as confirmed
- Previous Intuitive lay theories seen as generally confirmed, but the expectation and understanding of CMC has been extended or improved OR learning something completely new which might had been expected
- Previous Intuitive lay theories seen as generally disproved, with only some expectations confirmed by practice OR by learning something completely new which was unexpected
- Previous Intuitive lay theories seen as completely disproved.

The last classification, regarding the impact that the course had made, was particularly helpful to maintain focus with regard to our research question. Since our aim was to reconstruct the Intuitive lay theories which students had entered the course with, statements were only relevant if they held some information regarding the impact of the course. However often students do not explicitly refer to expectations they had prior to the course, rather the material often comprised implicit references to expectations prior to the course. In order to organise statements without explicit and reliable information regarding the participants' lay theories, another step of analysis was implemented: A cognitive hint was used in this step by sorting the paraphrased statements by the ability to attach the phrases "(nearly) as expected" or "(more) than expected" in a reasonable and meaningful manner. The resulting outcome of this step were the statements finally analyzed by content and meaning. In the end, there remained 43 statements by 17 students, which provided information about the students' view of CMC before and after the course. The statements were analyzed in the three-stage interpretation procedure presented in Figure 2 and yielded the topics presented in the following section.

Results

The results provide insight into the intuitive lay theories regarding computer-mediated communication and remote collaboration that the students held. These lay theories can be categorized along the following five topics:

1. Organizational and working process expectations: Theories about how the working process is organized and where/when issues might appear
2. Communicational assumptions: Theories about how communication processes in CMC work and where problems might arise
3. Theories about the personal connections between the team members in Remote Collaboration
4. Theories about the reliability of the technology
5. Assumptions about CMC in general

The following section highlights the underlying lay theories about working remotely through CMC prior to the course and shows key examples for each category.

Organizational and working process expectations: theories about how the working process is organized and where/when issues might appear

In matters of organization it was assumed that working remotely through CMC would take less time and effort for organizational matters such as the scheduling of the online meetings, the preparation prior to these and the distribution of tasks and roles, as well as the difficulties in keeping track of time and common goals during the working process. This led to many corrections of former assumptions about CMC:

"I came to know that setting up online meetings needs more time when compared to face-to-face meetings." [AC 2]

The assumptions were mostly made in comparison to former experiences in face-to-face settings, which seem to be perceived as more intuitive and easier to handle.

"collaborating isn't as easy as in case of a face-to-face communication." [BQ 5]

"a good preparation is even more important for remote collaboration than for face-to-face meetings." [BJ 4]

Some disappointment can also be seen on behalf of the time needed to achieve results through CMC:

"I also learned that in CMC the time taken to exchange information is four times more when compared to face to face communication [. . .]. As a result of this we had to have many meetings which were not scheduled by our professor." [DC 3].

Communicational assumptions: Theories about how communication processes in CMC work and where problems might arise

In regard to communication, the students obviously expected CMC to be easier to grasp than it was, referring to it after the course as 'much more challenging.'

"First of all, using only text to collaborate with other team members and not being able to see whom you are interacting with presented a challenge as we do not know how the other team members are reacting to the text that has been written." [BB 1].

Apart from not knowing how the other team members react to conversational contributions, there was some confusion about the conversational flow. The need to compensate missing cues in the progress of communication, was not expected in particular:

“everyone was talking at the same time in the group chat, so it was a bit difficult to comprehend who was talking with whom and for effective communication with the team members we had to address the person as ‘@Person’ such that, it is clear for whom the message is meant for.” [BB 4].

The same participant experienced and described how difficult it is to eliminate misunderstandings being caused by this lack of cues:

“It was again evident that missing verbal communication meant if there was an issue, it was rather difficult to solve by trying to explain it in text which would have been easily explained if we had verbal means of communication. There are some cues which can be compensated using text but most of the cues are negated in text-only communication.” [BB 5]

Not all participants seemed to have optimistic assumptions about the conversational flow of working through CMC, especially in organizing and planning prior to the meetings:

“In CMC there were multiple discussion going simultaneously. I initially thought that it was a problem as I was not able to understand the context of the meeting.” [DC 5].

“What I have understood is that if proper planning and structure is provided to CMC meeting even they can be successful.” [DC 2]

Furthermore, it seemed most of all surprising and/or frustrating to the participants, how time-consuming it can be to exchange information and come to conclusions cooperatively when communicating only by text:

“when the team was expecting the answer/response form one of the members and due to network problem or may be he/she was taking time to construct the answers, but many times there was a delay in getting the answers. [. . .] a frustrating part to wait for the answer from a member for longer time.” [CF 3].

“there were situations where one member answered or typed the answer very slowly and meanwhile everyone waited. Also while a person was answering the current question, some other members jumped to the next question.” [CD 1].

The data demonstrates that this communicational assumption was barely affected by their prior experiences with CMC:

“During this exercise I realized that although I have used a text-based chat many times before in my life, this time it was a quite different experience because I have never talked (or met) with the participants before so I had no background context to make inferences about missing cues and in the beginning I had no clue on how to improve our communication with these constraints. I became aware of how challenging it is to effectively and efficiently communicate given the fact that you don’t know the group of people you need to work with and that you have a relatively limited mean of communication as it was in our case: a text-based only chat.” [BI 1].

Theories about the personal connections between the team members in Remote Collaboration

Building relationships or at least upholding a good working atmosphere through CMC had been experienced as more difficult than expected. It is fair to conclude that this indicates personal contact through CMC was expected as being quite similar or at least comparable to face-to-face interaction:

“I also understood the role of verbal cues their importance in CMC and of course there is lack of social of cues as compare to FtF communication.” [AG 2].

Accordingly, there seemed to be no systematic thought or expectation about relationships in CMC, especially because of the lack of awareness about cues missing in CMC and Hyperpersonal Interaction until the course took place:

“Until now, I have managed virtual collaborations in a subconscious manner which was driven more by instincts. I wasn’t aware that when I was introducing myself to people online, I used to make a selective representation of myself.” [BQ 1].

“From my past work experience when I was collaborating with people online, I was hostile to people whose opinion did not confer with the idea’s I held. This in turn made the other participant hostile and the communication quickly descended into a conflict and resulted in a very unfriendly atmosphere.” [BQ 4].

Due to such previous experiences, some students seemed to be surprised about how well CMC can work, if the scientific basics are considered in practice:

“Surprisingly this study showed that with a brief introduction of one’s self and the use of social cues in an online setting, people do not require much to interact online and within a reasonable time frame more intimate relationships are formed.” [BD 4].

Theories about the reliability of the technology

Another mostly negative experience had been in relation to technology and coping with technological issues. This was only mentioned in a negative way. Comments included technology not working properly or causing problems because the platform was uncommon or too complicated for the participants and the tasks given. The importance and dependency on technology in CMC seems to have been underrated because all students mentioned technological challenges in their reports and also stated they were rather disappointed by the reliability of the medium:

“The technology failure impacted the whole project. We tried to use video conference at the beginning, but it failed. And wigglo couldn’t save our meeting chat log is very annoying. Technology in CMC team work is considered a risk.” [DA 5].

Therefore, the students seemed to have been expecting the technology to be much more reliable and seamless, finding this issue especially difficult when they were struggling with other problems. The technology seemed to have caused problems, in turn making it difficult to find solutions, due to its limitations. The conclusions about CMC therefore were ambivalent:

“The Irish team [. . .] had a problem to add contents to the blogs since no one was familiar with the tool. Explaining how-to in a chat is close to impossible since one does not know why the other team is struggling (it does not work since it is not precise enough). [. . .]

Using a chat only was a great experience but also quickly showed up some limits” [AH 3].

Assumptions about CMC in general

In general, some students seemed unaware about the possibilities of CMC beyond relationship building and that it could also be used for professional purposes. Some statements directly admit to have underestimated the possibilities of CMC for professional matters:

“Initially I thought that computer-mediated communications just allows its users to build relations, to make friendship with others. . .” [AC 1].

Yet sometimes there was an awareness that remote collaboration could be managed through CMC, with these participants just not knowing how:

“My initial assumption was that through CMC friendship could be made.”

“I never understood how tasks could be done through CMC because in some projects even though all the team members are physically present it is sometime difficult to complete the project. . .” [DC 1-2].

According to the feedback some participants obviously expected the experience to be more similar than face-to-face, with both negative and positive qualities and outcomes. Others seemed to have not been thinking about CMC before the lesson at all, despite having had some experience with it:

“So far I did not think more about the pros and cons of the various tools even though I experienced the differences before as well.” [AH 2].

Consequently 8 students were not expecting that collaborations through CMC could work at all or as well as it was experienced on the course and claimed that it worked better than expected:

“What I have understood is that if proper planning and structure is provided to CMC meeting even they can be successful.” [DC 2].

One participant was critical as it took more time than was assumed:

“after this project I came to know that my assumption is not completely right. It was proved that CMC is also used to do the projects systematically and effectively. [. . .] On the other hand I came to know that setting up online meeting needs more time when compared to face-to-face meetings.” [AC 1-2].

Altogether, 8 participants considered CMC as more time-consuming than expected, while only 2 participants called it faster or less time-consuming. This may not be totally surprising, as text-based communication is not as fast as spoken words in face-to-face-settings. However, one student had a quite ambivalent opinion, with statements in both directions, as s/he admitted that “chat as a medium for communication is very slow (. . .) was totally wrong.” Student [BF1] stated that working through CMC in total still “took too much time, to reach the goal. Working together was very inefficient” and participant [BF9] mentioned that his team “lost much more efficiency than I expected.”

“The chat meetings itself were very inefficient and can be seen as an example of how remote collaboration should not work. [BF 3].

At the same time, most students seemed quite surprised that working through CMC is more challenging and affords more organizational and management efforts than expected. 5 students claimed that CMC affords better and more organizational management than expected, and 10 out of 17 students found it more challenging than expected, to work or communicate through CMC, especially compared to face-to-face (5 statements):

“I jumped into the session with almost no preparation. This led to a somehow bumpy start. In the second meeting I used the experience that I’ve made before and prepared documents, structures and examples to guide the session. With this preparation I felt more comfortable and secure and I think the team results were better than in the first session. That’s why I think that a good preparation is even more important for remote collaboration than for face-to-face meetings.” [BJ 4].

Indeed, this not only addresses the time it takes for chatting, but also the time needed for arranging meeting dates, keeping one another up-to-date in the working process, or distributing roles and tasks. Another issue relating to organizational concerns was in regard to keep track of tasks and the time in the meetings. Some students tended to think of face-to-face as still being easier to handle and or quicker for completing tasks than CMC:

“I have learned that communicating face to face is much more effective and quicker, on the other side computer-mediated communication took four times more time.” [BN 1].

Due to this, 5 students claimed that CMC worked not as good as expected, specifically in regard to it being more time-consuming and less effective than expected, as mentioned by 4 of them:

“With all these technical problems, without knowing each other and without having a deeper understanding of the task, we lost much more efficiency than I expected.” [BF 3].

The most impact on the views of CMC has been addressed in the practical (23) or combined (12) experiences made during the course, with only 8 statements indicating that the advanced scientific knowledge and theories solely influenced the participants' views.

Discussion

The discussion of the research findings have been distinguished along the established 4-dimensional scale mentioned in the earlier section, from full approval of participants' lay theories to partial approval to partial disapproval to full disapproval.

Previous intuitive lay theories seen as confirmed

At first, the results show an unambiguous and clear impression. There were no statements which indicate that the lay theories of the participants have been maintained beyond the experiences of the course and have been therefore classified as showing no alteration of the understanding and view of working practices through CMC. This might lead to the conclusion, that whenever the statements allowed an insight into the participants' intuitive/subjective theories on CMC, it became clear that these were not maintained in their entirety. Consequently the results showed an overall impact of the course on these lay theories.

Previous intuitive lay theories seen as generally confirmed, but the expectation and understanding of CMC has been extended or improved OR learning something completely new which might had been expected

The extent of the course's impact in accordance to the categories described shows a more nuanced view. Only 4 (out of 17) students came to the conclusion that their previous assumptions on remote collaboration and computer-mediated communication were completely wrong or disproved by their experiences, which led them to revoking and adjusting their views according to the new insights into the topic. The change in their views were generally relating to speed of communication, value of CMC and a general expectation of remote collaboration.

Previous intuitive lay theories seen as generally disproved, with only some expectations confirmed by practice OR by learning something completely new which was unexpected

The theory about the value of the course was disproved in the response of some students, correcting the estimated importance of knowledge about CMC in general—realizing that contrary to their original belief CMC was relevant to their professional life.

Previous Intuitive lay theories seen as completely disproved

Students expressed surprisingly clearly, how nearly all of their expectations, from the course value to functionality and use of CMC in communication were disproved by the experiences made during the course, which was encouraging.

The majority of the students that participated realized that their views on remote collaboration and CMC was somewhat inaccurate and the project caused them to alter their assumptions due to their experiences. Findings emphasize that lay theories that were developed in a personal CMC environment influence the perception and behavior in task-oriented CMC settings. They furthermore show that these lay theories may change across contexts and over time in unique ways for different individuals. Our course, which used a blended approach of theory and hands-on experience of CMC for future corporate use in an educational setting, facilitated the adaptation of lay theories and was perceived as a fruitful learning experience by the students.

Conclusion

The research question we hypothesized was to investigate if there occurred or if there was evidence of a change in the participants' understanding of and reflection about Computer-Mediated Remote Collaboration. We wanted to investigate how this works by the occupation with scientific theories of CMC and their practical experiences in conducting a project within student teams through computer-mediated communication.

In concluding we found no cues that might lead to the assumption that the provided scientific theories, sources, and knowledge have been questioned. Nevertheless we are aware that this might be caused by worries the students may have had that their grades would be affected by criticism. Students were advised not be concerned, nonetheless worry and anxiety may have altered the results. Furthermore, we do not claim that the observations and conclusions made in this study have a representative character, we are well aware that our findings are based upon subjective statements, estimations and reasoning about the impacts of the course. However this study provides helpful insight into the widespread and importance of lay theories with regard to CMC remote collaboration and how these are influenced by experiences and knowledge.

Lay theories are not static phenomena or even ideologies, which are defended against external irritation or disapproval. When stressed with non-conformal experiences in practice and provided with additional (scientific) information in an according setting, the participants of our study had little issue in revoking their previous assumptions wherever seemingly inaccurate, according to scientific reasoning and experienced in practice. Not only did the participant's revoke their previous assumptions with regard to remote collaboration and CMC but they also corrected them. This paper, in describing a study within a higher educational setting, adds to the literature and presents results that indicate benefits of teaching how to collaborate remotely, especially where the blended approach of theory and practical application are combined.

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