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FACTORS OF EFFECTIVE INTERDISCIPLINARY ONLINE TEAM LEARNING

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ABSTRACT

The pandemic has forced higher education to radically change the teaching format from face-to-face mode into virtual or hybrid format. Also, intensive courses, workshops and seminars have been conducted totally or partly online. These formats include lots of students` team work in order to succeed. Starting to work virtually with strangers might be difficult for students. Our paper presents how we developed and conducted two interdisciplinary team learning projects during the academic year 2021-2022 and the results we got. Our projects were implemented in the BSc degree programs of engineering, business administration and nursing at two Finnish UAS and at two foreign partner universities. After the courses we collected qualitative data from students´ learning diaries and other reflections and performed content analysis which revealed that there are supportive and hindering factors for virtual team work and they should be considered while designing the learning experiences.

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1   INTRODUCTION

At this time with the pandemic, the learning curve for virtual cooperation has been dramatic, for both companies and public organizations, including universities and other educational institutes. The digital transformation combined with a pandemic has both forced and allowed us to work and learn on distance. We have witnessed a dramatic growth of meetings in virtual platforms within the two past years (2020-2022) and those platforms have become everyday tools in studying as well. Our students are now used to work both alone and together virtually, but what type of factors are affecting their collaboration in the virtual context?

Previous research gives consistent hints that getting along with each other is essential in groups, in terms of both performance and well-being. The term used for this is cohesion, which is also related to concepts such as involvement, coordination, communication and trust [1]. To successfully continue working together virtually, these factors must be considered.

Also, we need to underline the importance of common understanding and shared interpretation. Unshared understanding is often regarded as hindering collaboration and communication, but on the other hand, versatile knowledge based on various disciplines is needed especially in contexts where the aim is to innovate and create new ideas and solutions. An argument can be made that in order to have both shared and opposing views in a team, coordination must be wisely used, in order to understand the different phases of cooperation: when innovating you need to accept various views without confrontation, and when making decisions you need common acceptance among team members. This is an interesting paradox as both convergence and divergence are needed in order to produce good team performance.

Psychological safety is an old concept [2] but during the last decades it has been further developed, researched and applied to different team work situations and learning by e.g. Edmondson [3]. Psychological safety (PS) is a "condition in which person feels included, safe to learn, safe to contribute and safe to challenge the status quo without fear of being embarrassed, marginalized or punished in some way [4]. Psychological safety has been found, e.g., to facilitate team learning [5].

In this paper, we aim to shed light on the topic of how to support cohesion and psychological safety in virtual student teams in order to achieve good team learning performance. We describe preliminary findings from our teaching experiments which were two interdisciplinary intensive courses, which we have planned and executed at two universities of applied sciences in Finland together with two partner universities abroad.

2 METHODOLOGY AND DATA COLLECTION

The first course implementation (hybrid version) was organized in autumn 2021 simultaneously both in Finland and in one location close to the western border of China. There was a time difference between the locations which had to be considered in the course implementation. This course consisted of students´ pre-work online and one face-to-face intensive week at two campus locations and at two touristic destinations. During the intensive week, the multicultural group of students from different BSc engineering disciplines (mechanical, material and environmental engineering) learned different waste management and energy related issues and how to use a multi-criterion decision-making tool (MCD). This tool was then used by the student teams in the touristic sites for solving the team project task which was suggesting a suitable waste to energy solution for the touristic location. The task solution was based on interview data and other data collected by the students on the sites. This data was then processed with the MCD. In the end of the week each multinational team presented their suggestion for the site given to the team. During the week one part of the activities, lectures and teamwork were performed online and another part onsite face-to-face.

The latter course implementation (online version) took place only in Finland during the spring 2022 at one Finnish university of applied sciences. In this implementation, there were students from three different disciplines, namely engineering, nursing and international business BSc students. These students worked in international, interdisciplinary teams of 4-6 students for an intensive week. They were given a problem from a client organization and the teams worked with the problem, innovating solutions to be presented at the end of the week. The students were working only online all the time.

Our preliminary analysis is based on content analysis of written student reflections given after each course implementation. The interpretation of these reflections has aimed to understand what type of meanings the participants have attached with their experiences of virtual teamwork and learning. The reflections have been qualitatively analysed by reading them and analysing how and to what extent their perceptions differ. By comparing similarities and differences, different categories of description have been formed and reflections with similar meanings grouped in the same category.

2.1 Supportive factors

When analysing the different categories, we were able to distinguish two main categories: those elements which *supported the cooperation* and other elements *hindering the collaboration*. Then, we looked at the differences between the different disciplines in terms of how they perceived supportive factors of teamwork in virtual context (see Table 1).

We can notice from the comments that all students mention *respect, listening, sharing ideas, encouragement and having different visions* as supportive factors for virtual team work. All of them are factors describing psychological safety according to the previous research. Students also mention having fun and joy to be important supportive factors in virtual team work and learning. This is perhaps something teachers easily forget when they are planning the learning experiences?

Table 1. Supportive factors experienced in virtual context according to the study field

Engineering	Nursing	International business
-sharing the same goal -respect -encouragement -having fun -inspiring each other -group thinking -agreeable personality types *"Different point of view combined creates good results"*	-focusing on the task -open mindedness -respect -understanding -needing something from each other -listening skills -sharing ideas -making things together -being professional *"We all needed something from each other, they all knew from their field, we made them all together"*	-equal effort -energy and passion -having different visions -coordination efforts such as time management and solving misunderstandings -communication -fun -being professional -encouragement *"My observation is that the team must move forward together somehow"*

2.2 Hindering factors

In Table 2 we can see which factors students perceived to be hindering their virtual teamwork. Our results show that *communication* was the most frequently mentioned factor that was hindering the effective virtual teamwork and learning. The communication problems were caused by many reasons. Students mentioned the following ones: unreliable virtual technology, poor English language skills and communication problems caused by the time zone differences. They also perceived difficulties to communicate in such a manner that the students from other disciplines would understand their message. In addition, they mentioned comprehension problems caused by the language and terminology used and the way of presenting ideas etc. Although students had some training for team development and diversity issues, it seems that not all teams were able to apply this knowledge in practice in their teams.

Table 2. Hindering factors experienced in virtual context according to the study field

Engineering	Nursing	International business
- communication - Internet connection - difficulty in understanding each other - language barrier - difficulties to agree - coping with different personalities - time management - thinking outside the box	- time difference - understanding different personalities - communication - responsibilities taken were not equally shared -misunderstandings -hard to work with different disciplines as ideas are so different	- understanding each other - the lack of communications or difficulties in communicating properly - having a lot of different perspectives, opinions and priorities -problems with some members not being involved in discussions -different levels of expertise
"We had difficulties to communicate: express our ideas and being understood by the foreign team members"	*"Due to different fields some people were very familiar with certain stages but because others are not familiar it would take more time."*	*" It can be frustrating if some study field students are not used to doing tasks like this."*

3   CONCLUSIONS

Students mentioned that the teachers should have forced them to communicate more with each other. When planning especially the hybrid course the teachers decided beforehand that the students were free to use any virtual communication tools. After reading about the communication problems in the reflections and comments in the students` learning diaries and feedback formulas we have to conclude that perhaps it was a mistake to leave the communication issues for the students to organise by themselves only.

There might have been some psychological safety issues meaning that not all students felt safe enough to ask "dumb" questions from their virtual team members while being afraid of losing their face. As cameras were not used much in the students´ virtual team meetings the gestures and body language could not be seen, and this might have caused some of the communication problems too.

Based on both theoretical and empirical analysis, in order to create psychological safety the teacher should design the educational situation so that following four elements are present: *openness* (tell who you are, let people get to know you), *direct talk* (dare to raise the problems and also difficult issues into discussion), *credibility* (be consistent, no nonsense, take responsibility of your sayings) and the most important one *approval* (listen, everybody has a value, dare to reveal /tell about your own failures etc.). These elements form collective trust needed.

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