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VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT INTERACTION IN  
AN ONLINE LANGUAGE COURSE

MA thesis

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**Abstract**

Transferring the variety of interactions of traditional face-to-face classrooms to the online space might be difficult because synchronous communication mode is mono-channel. In order to answer the research question of how the complexity of student-student interaction is retained through the affordances that virtual classrooms can provide, the intervention was conducted, and three types of online learning spaces which offer interactivity in multiple modalities were used to arrange pair and small group activities in the online language classes. A cross-sectional survey design was adopted as a data collection method. The thematic analysis resulted into the framework of virtual classroom affordances which can be used in designing online lesson plans to ensure and enhance student-student interaction. Further suggestions for the practices of teaching languages online are put forward.

**Keywords:** classroom interaction, student-student interaction, synchronous virtual classroom, affordances, online language course, videoconferencing, breakout rooms, digital whiteboard, virtual chat platform.

**Table of contents**

Abstract .....	2
Introduction .....	4
1. Theoretical background .....	6
1.1 Complexity of classroom interaction .....	6
1.2 Virtual classrooms and affordances .....	10
1.3 Online interaction in breakout rooms.....	12
2. Method .....	17
2.1 Sample .....	17
2.2 Tools .....	20
2.3 Procedure .....	21
2.4 Data analysis .....	22
3. Results .....	25
3.1 Perceptions of student-student interaction prior to the intervention .....	25
3.2. Enhanced student-student interaction during the intervention .....	28
3.3 Exploration of technological affordances of modality, agency, interactivity and navigability .....	30
3.4 Virtual classroom affordances operating through gradations .....	33
3.5 Comparison of the digital tools used to build virtual classroom environments .....	33
4. Discussion .....	36
5. Conclusion ... ..	39
Acknowledgements .....	41
Author's declaration .....	35
References .....	38
Appendices .....	38
Appendix A. Google Form questionnaires .....	49
Appendix B. Tasks for pair and small group work in the virtual classroom .....	55
Appendix C. Thematic analysis: virtual classroom affordances .....	58
Appendix D. Graphs to illustrate the intervention results (Jamboard/ Miro/ Kumospace) ....	67
Appendix E. Outcomes of the research .....	74

## **Introduction**

Interaction is the act of communicating that involves the expressions and comprehensions. In the interaction, people listen and talk to each other, negotiating meaning in a shared context. In other words, interaction is the heart of communication, and thus it is essential for learning a language. Students learn words and grammatical structures to communicate with others in the classroom, and it is through the interaction that the language is learnt, because “learning a language is a socially mediated process” (Vygotsky, 1978, p. 126). In an “interactive” classroom, students are involved in joint tasks, working together to perform a purposeful activity which requires using the language in written and/or spoken form (Rivers, 1987).

In the traditional face-to-face classroom, various seating arrangements and grouping techniques are widely used to ensure the productivity of student-student interaction during the lesson, and learners are expected to practise the four language skills (reading, listening, writing, and speaking) through communicative activities by using some authentic materials and working in pair and small groups (Harmer, 2001).

The online synchronous language classroom environment is distinctly different from the face-to-face classroom. Teachers and learners are in different physical locations, and they cannot easily “see” each other, as computer or device screens are often too small. In general, it has been demonstrated that online courses with high levels of interaction have a positive impact on students’ motivation, satisfaction, and learning outcomes (Croxtton, 2014, p. 316), and the virtual classroom that features videoconferencing, online whiteboard, instant messaging, and breakout rooms can give the possibilities of immediate feedback and dynamic interactions among participants of synchronous communication.

However, new pedagogical approaches are required to enable the teacher to decide on the appropriate instructions and tools in order to plan the virtual classroom interactions that would support deep learning and relationship formation in online contexts. Foreign language teachers specifically point out that it would be difficult to transfer the variety of interactions within a face-to-face language classroom to the online space because of “the lack of fluidity and mobility in the virtual setting” (Lukito & Roberts, 2021).

Research data suggest that virtual classroom interactions are influenced by the affordances of a multimodal learning environment since users adapt the available tools (text, voice, image, live video) to their purposes (Hampel & Stickler, 2012; Dey-Plissonneau, 2017; Liu, 2019; Nocchi, 2017).

Thus, the topic to be studied in this research work is the arrangement of pair and small group activities in synchronous online language classes, and the research question is how the

complexity of student-student interaction is retained through the affordances that virtual classroom can provide.

The thesis consists of five chapters. Chapter 1 covers the theoretical background and gives an overview of the relevant theories and concepts developed in the previous research. The framework of the present study is introduced and objectives of the thesis are defined. Chapter 2 contains a description of the sample of the intervention, the tools applied and the methods used for data collection and analysis. Chapter 3 presents the results of the thematic analysis of the qualitative data obtained from the survey. Chapter 4 includes the discussion of the intervention outcomes and focuses on interpreting the results. Finally, Chapter 5 draws conclusions, mentions the limitations of the study and suggests potential future implications of the research findings.

## **1. Theoretical background**

In this chapter, the key concepts related to our research are presented and discussed. The literature review covers definitions and theories that are adopted for the thesis. The relevance and importance of the research problem is established, and the framework for the study is presented.

### **1.1 Complexity of classroom interaction**

The term “classroom interaction” refers to the communication between the teacher and learners, and amongst the learners, in the classroom. It is considered to be one of the primary means by which learning takes place and knowledge is generated in the classroom (Tiwari, 2021; Tsui, 2001).

Even though there seem to be only two sides involved – the teacher and the learners, the classroom interaction is a rather complex process, being a purposeful communication aimed at building knowledge and facilitated with specific methods and tools. Over the years a large number of studies focusing on different aspects of classroom interaction have been published, and it is suggested that there are as many as seven principles that the complexity of this phenomenon can be researched by. These include such aspects of classroom interaction as process-product (What is the relation between teaching practice and learners’ products?), cognitive (How does cognition influence classroom practices?), situated cognition (How do classroom practices provide social interaction?), ethnographic (How do individuals’ own cultures play a role in shaping the process of classroom interaction?), sociolinguistic and discourse analysis (What are the linguistic processes and participation structures of classroom interactions?), critical (How are power relations shaped within classrooms?), and teacher research (How do teachers’ narratives and actions influence the classroom practices?) (Rex et al., 2012). It follows that interaction of teachers and students represents a complex social process of knowledge-building activities which can be studied from multiple perspectives.

In the field of foreign language teaching, the research of classroom interaction began in the 1960s, and since then there have been made multiple attempts to explore the effectiveness of different approaches and teaching methods, including the effect of the language (native or foreign) used by the teacher on the learners’ performance. Later, other factors which lay the foundation of classroom interaction have been studied, such as teacher’s and learners’ social and cultural background, psychological aspects of foreign language learning, etc (Tsui, 2001).

As the matter of fact, the arrival of communicative approach marked the shift in emphasis in how to teach foreign languages and what kind and amount of interaction should

be between the teacher and learners. The aim of communicative approach is to involve learners in real or realistic communication (e.g. in role-plays, debates, simulations, games), where accuracy of the language they use is less important than successful achievement of the task they perform (Harmer, 2001, p. 85). As a result, learners are expected to practise the four language skills (reading, listening, writing, and speaking) through communicative activities by using some authentic materials and working in small groups. While learners interact with one another, the teacher becomes a facilitator and sometimes a co-communicator (Natsir & Sanjaya, 2014).

In the communicative language learning methodology, the concepts of Teacher Talking Time (TTT) and Student Talking Time (STT) are used to refer to the periods during a lesson where the class is either teacher-centred or learner-centred, and it is believed that STT should be around 80% during the course of the lesson (Kostadinovska-Stojchevska & Popovikj, 2019), and the best lessons are the ones where STT is maximised (Harmer, 2017, p. 38).

To ensure the communication variety in the classroom, the stages of learner-centred lessons are typically labelled with a type of interaction pattern (T-Ss for the whole class activity, S-S for pair work, Ss-Ss for group work), and it is pair and group activities that are thought to enhance students' involvement in the learning process, and thus foster their acquiring the language skills.

In fact, "there is no real limit to the way in which teachers can group students in a classroom" (Harmer, 2001, p. 114), and in the 1990s a lot of research was done to examine closely the dynamics of group and pair behaviour in the foreign language classrooms (e.g., Banbrook, 1999; Lockhart & Ng, 1995; Nelson & Murphy, 1993). These studies investigated the tasks and level of interaction that can be beneficial for pair and group activities. It was shown that learners who pooled their knowledge as a group were able to improve their individual language production. This is in agreement with Vygotsky's theory, which states that cognitive development is social, and language development is seen as the transition from social communicative speech to private speech (Storch, 2002).

Since some patterns of peer interaction are more conducive to learning than the others, when creating pairs and groups, the teacher has to consider a number of issues, such as the relationship between students (whether they know each other and like working together or not), language level (the number of weaker and stronger students in a group), randomness and variety (grouping students by chance, giving them a choice which group to join, etc), and decide upon the many grouping techniques available to organise a successful learning activity (Salas, 2005). Moreover, different seating arrangements (Fig. 1) should be provided in the

language classroom for the students to be able to turn easily from working on their own to pair and group work, which enhances the flow of their oral interactions during the lesson (Harmer, 2007).

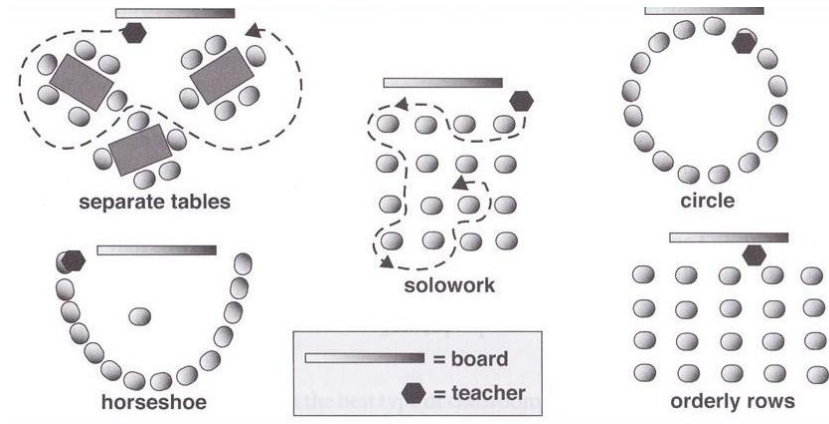


Fig. 1 Different seating arrangements in the face-to-face language class (Harmer, 2017, p. 41)

In the first decade of 21<sup>st</sup> century, with a growing recognition of the impact that technological resources can have on learning environments, the technology-enhanced classrooms would make use of computers, Internet and mobile phones, changing greatly the way in which teachers and students communicated with each other (Wang, 2004), and giving the possibility to interact with wider and extended audiences worldwide, for example via telecollaborative projects bringing together classes from different countries through videoconferencing sessions (Taskiran, 2019). In the online courses, three types of interaction were identified, namely learner-to-content, learner-to-instructor, and learner-to-learner interaction. The importance of students' interaction with their peers in the virtual classroom was especially emphasized as a valuable resource for learning (Martin et al., 2012).

The new online videoconferencing environment offered multiple communication modalities, that is a variety of input channels for communication purposes (e.g. text chat, voice chat, video chat), that could be used in language teaching, and the studies were initiated to research how teachers and learners adapt to this multimodal online environment of the “virtual classroom”, and how new patterns of communication emerge in the process (Hampel & Stickler, 2012).

Even though today one can come across a wide variety of definitions of the virtual classroom, ranging from asynchronous systems, such as Moodle, to interactive virtual worlds, such as Second Life, in the 2010s it was originally related to synchronous online learning that happens in real time, with interactions taking place through videoconferencing, and provides the participants with an experience that is very close to traditional face-to-face teaching. The virtual classroom, comprising a number of interactive tools, such as videoconferencing

software, online whiteboard(s), instant messaging, participation control, and breakout rooms, was assumed to give an abundance of pedagogical opportunities, including learning through cooperation, building the sense of community, increased motivation, and psychological safety (Racheva, 2018).

The benefits of synchronous virtual classroom became especially apparent when compared to asynchronous learning (Fallon, 2012). For example, Chou (2002) demonstrated that students were more engaged in the synchronous discussions, because there were more socio-emotional interactions, which enhanced interpersonal connections, while students attending the course asynchronously suffer from perceptions of isolation and psychological distance. Park and Bonk (2007) discussed the advantages of immediate feedback and dynamic interactions among participants of synchronous communication mode (Martin et al., 2012).

Furthermore, in contrast to face-to-face classroom, interactions in a virtual classroom were found to create more informal and safer emotional environment as learners usually participate from the comfort of their homes, away from physical distractions of the traditional classroom, and the teacher can make the learning process more personalized (Racheva, 2018). In terms of the benefits of reduced cost of travel and added flexibility, the synchronous virtual classroom was likely to outperform the physical one (Martin et al., 2012).

The ability of Zoom and other real-time platforms to display “squares” of the live session participants in either Gallery View or Speaker View was considered as classroom seating arrangements of an online synchronous learning space which are similar to changes in the physical setup of chairs and tables in a traditional classroom (Poorvu Center for Teaching and Learning, 2017). Based on their quasi-experimentally designed research of virtual real-time online introductory learning course in marketing, Francescucci & Rohani (2019) made a conclusion that “using synchronous communication technology may offer an environment that closely mimics a face-to-face classroom format in terms of students’ performance outcomes”, and suggested that future studies of synchronous learning spaces should be done across other disciplines, levels of study and with focus on other classroom tools so that to determine whether different technologies have different impact on students’ performance (Francescucci & Rohani, 2019).

As we can see, teaching and learning in a virtual classroom seem to provide an experience similar to that obtained in the face-to-face one. However, new pedagogical approaches are required to enable the teacher to decide on the appropriate instructions and tools in order to plan the classroom interactions that support deep learning and relationship formation in online contexts (Fallon, 2012; Racheva, 2018).

## 2.2 Virtual classrooms and affordances

As stated by Hampel & Stickler, there is no much research done to examine the impact of the combined use of virtual classroom tools on the interaction and find out “how learners as well as teachers would use different modes to make meaning” (Hampel & Stickler, 2012, p. 120).

In their exploratory study of multimodal interaction in an online language classroom, Hampel & Stickler (2012) analyzed recorded videoconferencing sessions mediated through FlashMeeting desktop application to reveal synchronous participation patterns. According to the quantitative data collected, there were three ways in which the modes of communication were combined in FlashMeeting: complementation, compensation, and competition. Compensation concerned using the text chat to contribute to the discussion that was going on in the audio channel without interrupting the speaker. The text chat was also found to compensate for communication failures in case of audio problems. In addition, parallel conversations conducted in the spoken mode via microphones and in the text chat were shown to be competing, the both modality channels being used for commenting and engaging in social communication (Hampel & Stickler, 2012, p. 132-133). On the whole, the study arrived at the conclusion that classroom interactions were influenced by the affordances of a multimodal learning environment since users adapted the available tools (text, voice, image, live video) to their purposes.

These days the term “affordances” is used to describe our ability to apply tools effectively, making use of their actual and perceived fundamental properties.

Initially, Gibson defined affordance as “what the environment offers, provides, or furnishes” (Gibson, 1979, p. 127), and claimed that in practice human and animal agencies strongly rely on the environment and on what it offers. He also provided a general framework about how organisms perceive objects and their affordances, that is “opportunities for action” (Bardone, 2011, p. 78).

In contrast to Gibson’s meaning of affordances, developed in ecological psychology, Norman (1988), who introduced affordances in the field of design studies and human-computer interactions, considered them in terms of perception, distinguishing between actual (physical) and perceived affordances. Physical affordances are what an object can actually do in terms of its properties, while perceived affordances are what we believe the object can be utilized for. It follows that human’s ability to efficiently use any tool is largely dictated by the relationship with it (Otchie et al., 2021, p. 473), and affordances are the attributes of the tool that provide potential for action.

Technical, or operational, affordances of a tool are believed to be design-driven and the same across contexts and disciplines, as any technology is meant to be used for specific purposes. On the other hand, there exist contextual affordances which are different across disciplines and dependent on the users, who contextualize the perceived potentials and constrains of the tool for their own purposes (Otchie et al., 2022, p. 60).

Kirschner et al. (2004) suggested considering the design of an online collaborative learning environment in terms of technological foundation and selection of appropriate media as well as taking into account educational and social conditions involved in effective task completion and collaboration of the learners. In other words, technology used in education was proposed to be characterized by technological affordances, or usability, along with educational and social affordances, or utility.

The educational affordances determine whether and how learners exhibit a particular learning behavior within the given context; social affordances encourage collaboration at multiple levels. Yet, educational and social functionalities will be useless to teachers and learners if usability aspect of the technology, such as layouts, navigation options and others, is disregarded or overlooked by designers (Kirschner et al., 2004; Doering et al., 2008).

Thus, for an educational technology to be useful, it has to fulfill both components: utility and usability (Fig.2). Utility represents the functionality provided to the user, and usability is associated with how well the user can take advantage of the functionality to accomplish a task (Tang & Hew, 2017).

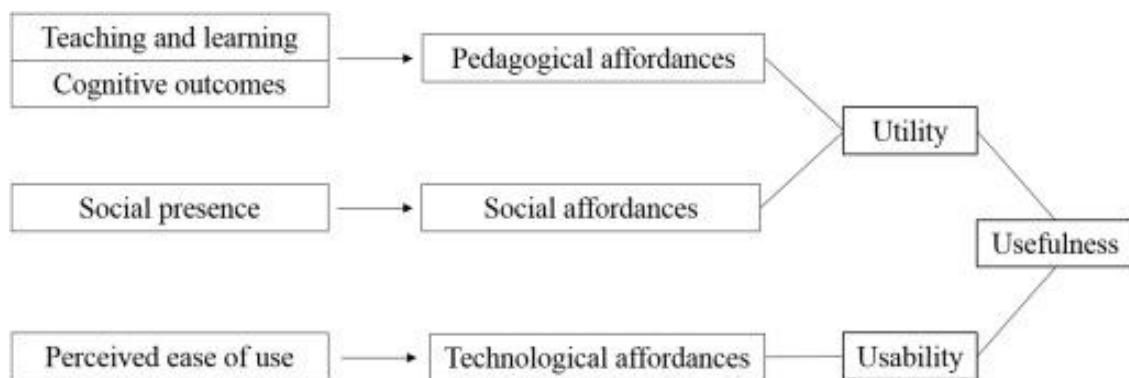


Fig. 2. Usefulness based on affordance perspective (Tang & Hew, 2017).

In the following years, utility, or the technological affordances, of different online learning tools and environments were studied.

The potential of virtual worlds for education was explored in the research of technical and social affordances of language learning experience in the Second Life, which had been engineered in the different tasks. It was shown that in case of non-realisation of the technical affordances engineered in the language tasks “alternative” language learning affordances

emerged and created foreign language interactions, required for working out technical issues, and, therefore, a possibility for learning (Nocchi, 2017).

Utility of videoconferencing tools, which enable live communication, also gained attention. For example, the research of designed (operational) and emerging (contextual) technological affordances of Visu, a videoconferencing platform used for language learning interactions, identified the affordances of multimedia management, giving feedback, and visually guided movement. It was noticed that the user may perceive an affordance but may not enact it, or may not perceive it at all (Dey-Plissonneau, 2017). This indicated the importance of further research of the concept of affordances, which reveals the relationship between users and technology within a specific context and can be used in educational studies to evaluate the learning environment, as suggested by many scholars (Blin, 2016; Liu, 2019).

### **1.3 Online interaction in breakout rooms**

In the context of the COVID-19 pandemic, which broke out in 2020, the shift to emergency online distance teaching required many teachers and students to rely on videoconferencing systems for synchronous communication, and that proved to be challenging. Without much instructional guidance, what most teachers did was trying to replicate the classroom in videoconferencing virtual meetings, which were believed to make learning comparable or better than face-to-face methods. However, it was found out that videoconferencing does not necessarily improve teacher-student or student-student interaction and the teachers' knowledge of technology integration should be improved (Correia & Xu, 2020).

Interestingly, it was revealed that virtual classroom interaction can look very different from what is happening in the face-to-face classroom. Therefore, in order to be able to successfully use interaction as part of language learning when teaching synchronously online, the teacher needs three additional competencies, namely technological, online environment management, and online teacher interactional competencies (Moorhouse & Walsh, 2023).

Willermark & Islind (2022) analyzed what happens when teaching is redirected from the traditional to the virtual classroom, exploring what are the educational affordances of a virtual classroom. Based on the survey taken by over thousand high school teachers, they articulated seven contrasting educational affordances to be found in face-to-face and virtual classroom. The virtual classroom was reported to be more rigidly structured and to offer more one-to-one communication than one-to-many communication. Moreover, many survey participants testified that the interaction in the virtual classroom tended to work badly because of teachers' lack of an overview of the class and bad group work dynamics. They also felt that

the physical classrooms contributed much to being the hubs where students could easily interact, and that that interaction managed only partly to find new forms in the virtual classroom (Willermark & Isind, 2022).

The problem of maximizing the student-student interaction in the virtual classroom became especially critical in the field of language learning because classes conducted via videoconferencing were likely to get more “bumpy” and less and less learner-centered as whole-class discussions are characterized by longer silences and shorter student responses (Moorhouse & Walsh, 2023), teachers tend to talk more to fill the silence, and eventually students get easily distracted and switch off. In a synchronous virtual classroom the communication is mono-channel (Fig. 3), and the teacher may have only one person talking without things getting messy (Wall Street English, 2020). This causes the issues with arrangement of pair and small group activities in the virtual classroom, which are especially essential for the development of speaking skills. As a result, the feature of having breakout rooms was recognized as a must of any videoconferencing software used for running online language classes since otherwise pair and small group would not be really possible.

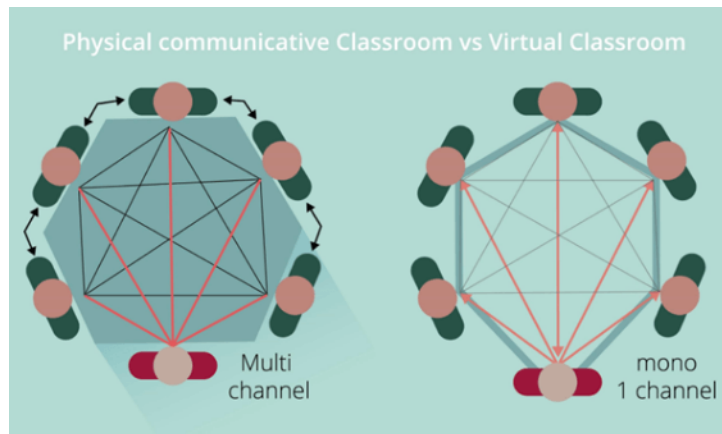


Fig. 3 Communication channels in physical vs. virtual classroom (Wall Street English, 2020)

In Kaban & Yataganbaba’s study (2022) of a number of videoconferencing platforms (Zoom, Microsoft Teams, Adobe Connect and others) breakout rooms were found to be one of the most favourite tools used by language teachers. These findings are consistent with Mohamed’s (2021) research, which presented the students’ perceptions of breakout rooms as beneficial for their understanding of the language tasks and performing group work activities.

However, Cavinato et al. (2020) pointed out that in breakout rooms conversations take longer to develop, and there might be often communication issues, for example, when for some reasons the learners are reluctant to use their cameras and microphones. Another limitation is that the teacher can only monitor one group working in one of the breakout rooms at a time, and thus is unable to provide quick assistance to other students when needed.

On the whole, attempts have been made to develop some suggestions of preparing for the breakout room activities, and the main recommendation is for the teachers to be aware of the best online language teaching practices, to anticipate typical problems that can arise in the breakout rooms in order to avoid potential complications, and to encourage students to participate and stay focused on the task (Kaban & Yatanbaba, 2022).

In the last few years, much effort was made to make a list of recommendations on how to improve the use of Zoom breakout rooms (e.g. Almazmome, 2022; Greyling & Ahmad, 2020; Lee, 2021; Sekhri & Kaur, 2021). These always include the requirement for the teacher to practise using the technology beforehand, and to give clear instructions to the students, assigning them appropriate tasks and enough time for interaction. What is more, whatever the task (a game to play, a text to read, a picture to describe etc), the students must get the access to the necessary material before moving into their breakout rooms (Dubois, 2021).

In the new edition of 2023 Celta Course Trainee and Trainer Books, the units about the online classroom and the use of educational technology were added. The key ideas expressed is that both face-to-face and virtual classrooms are equal, neither being inferior or superior, and the best advice given to language teachers is to consider a range of factors that might influence the use of technology in the classroom and to adapt lessons, activities, and teaching materials appropriately (Millin, 2023). It is obvious that pair and group work activities in the breakout rooms are different from those in the traditional classroom and, therefore, must be adapted, being facilitated with some digital collaboration tool, e.g. a set of discussion questions, an online whiteboard, a link to Google doc, etc. In the language teaching literature one can often see lists of online tools that can be used to “replicate” physical classroom activities and maximize SST (e.g. Lukito & Roberts, 2021).

In fact, the most commonly suggested tools are Google Workplace applications and whiteboards, such as Jamboard and Padlet, which are used for recording learners’ thoughts and/or creating posters, and are usually shared with the whole class in the debriefing session (Palaming, 2022). However, little research has been done to explore the affordances of the learning spaces created by these and other tools, and how these affect the student-student interaction as well as learners’ performance.

According to the most recent research on the online language classes at university level, classroom interaction was found to be dominated by the teachers, who spend much time giving procedural remarks and instructions, increasing the TTT, while group work activities fell behind individual activities. As the matter of fact, the study suggested that teachers should

be aware of that issue and place emphasis on activities to promote student-student interaction in their online classes (Toscu, 2023).

Thus, the research problem is how we can diversify and enhance student-student interaction by arranging pair and group work in synchronous online language classes, and the research question is how the complexity of student-student interaction is retained through the affordances that virtual classroom can provide.

In the present research work, three different online learning environments will be investigated in order to explore the virtual classroom affordances for student-student interaction during work in pairs and small groups in the online synchronous language classes:

- Zoom breakout rooms and Jamboard, a document sharing application of Google Workspace with a number of visualisation tools;
- Zoom breakout rooms and Miro, which is feature-rich digital whiteboard software;
- Kumospace, a virtual chat platform that can be used as a virtual classroom.

In the traditional classroom, the pair and group work is arranged in a variety of ways, while in the virtual classroom the communication is mono-channel and student-student interaction is made possible only through breakout rooms. The assumption is that virtual classroom can be “adapted” by changing its settings by means of various media and communication channels used for student-student interaction.

Zoom is selected as the best videoconferencing tool based on the previous research (e.g. Kaban & Yataganbaba, 2022) and considerations the language teachers should keep in mind (Clandfield & Hadfield, 2017, p. 14-15): the platform allows sending participants to breakout rooms, using the chat to send messages, sharing files and links to external websites, and communicating non-verbally (e.g. “raise your hand” button, reactions button, polling etc).

Google Jamboard is a digital whiteboard that allows users to use text, images, shapes, and drawings to creatively organize and present information. It is reported to improve classroom involvement and foster students’ collaboration. It is highly recommended by language teachers for promoting learners’ proficiency of reading, writing and vocabulary. The teacher can easily share the link with students, who can participate in real-time activities (Castillo-Cuesta et al., 2022). Together with shared Google Docs files it is the interactive tool that is most frequently used in breakout rooms.

Miro is a visual collaboration platform that has a wide range of features and functionalities. In contrast to Miro, Jamboard is much simpler and more limited. Jamboard has a smaller working space, while Miro is virtually an unlimited board. Jamboard has useful features such as sticky notes and file uploads, but Miro provides much more than that, for

example, grouping and locking of board elements, creating templates and mind maps, sharing YouTube videos etc. Miro is in top-10 of most popular visual collaboration software used in business, and has recently started to be widely used for teaching purposes. It is said to enhance the online students-student interaction and increase students' progress in developing their speaking skills (Thach et al., 2022; Chan et al., 2023).

Kumospace is a virtual chat platform that provides an immersive experience of online interaction as it is designed to recreate physical experience and atmosphere of being in a room. It is reported to be effective for the improvement of learners' performance in the conduct of online physics classes (Julie et al., 2022). It is also suggested as an alternative platform to Zoom, which is blamed for causing exhaustion and Zoom fatigue, in order to support learner's emotional well-being through informal connection and engagement via virtual reality (Dailey-Hebert, 2022). The language teachers are recommended to use Kumospace as an interactive environment for conversational activities. Added realism in graphics, avatars with emojis, and mini games make the experience of interaction in Kumospace more vivid and fun, and it is expected that language learners could improve their communicative and pragmatic competence just like they would in physical classrooms (Raine, 2022). In contrast to Zoom and other videoconferencing platforms, Kumospace provides in-person interaction spontaneity and mimics the possibility of speaking or collaborating with one or more peers while moving around between groups.

As we can see, each learning environment offers interactivity in multiple modalities and with different affordances. According to media richness theories, face-to-face interaction is considered to have an optimal level of feedback immediacy and multiplicity of cues (Kock, 2005; Carbajal-Carrera, 2021), that is why we will consider the digital tools that bring different level of interactivity to find out what works best in the virtual classroom.

During the intervention, students in the treatment group will be performing pair and small group activities in their synchronous online language classes by using these different learning environments. Survey method will be applied to design questionnaires that contain a peer interaction satisfaction scale and open-ended questions so that to find out students' perceptions of the virtual classroom affordances. In the control group, students will be performing the same pair and small group activities in breakout rooms in Zoom using only document sharing applications. Both treatment and control groups will take pre-intervention and post-intervention tests to assess their language skills, which will indicate if their performance has increased. The null hypothesis is that there is no significant difference between treatment group and control group performance at the post-intervention test.

## **2. Method**

Qualitative research is inductive by nature and allows building general themes based on the ideas shared by the participants in a study (Creswell, 2002). To explore the concept of classroom affordances the principles of qualitative research were applied in order to gather information and gain deeper understanding of this central phenomenon.

In order to answer the research question, a cross-sectional survey design was adopted as a data collection method. The purpose of a survey is “to generalize from a sample to a population so that inferences can be made about some characteristic, attitude, or behavior of this population” (Creswell & Creswell, 2017, p. 203). Moreover, survey administrated online yields the benefits of time saving, convenience, and rapid turnaround in data collection.

As the intention was to identify the virtual classroom affordances that language learners use for their interaction during small group activities, the appropriate online survey was designed based on the studies of affordances and complexity of classroom interaction, discussed earlier in Chapter 1. The questionnaires consisting of closed and open-ended questions were completed by the survey participants to provide basic personal/ demographic information and their views on the research situation. Questionnaires were distributed via Google forms among the students who attended online English language classes delivered in each of the three different virtual classroom environments under investigation.

The survey allowed reaching every student that could share their experiences, impressions and perceptions in an effective and timely manner. Students could take the survey when they found it most convenient for them and without excessive pressure or anxiety, feeling secure and knowing that the answers they were giving were collected anonymously.

The conclusions were drawn based on the thematic analysis of the survey data of a small-size sample (44 senior students studying engineering at a Ukrainian university), which makes this research an instrumental case study that provides insight into the issue of online learning environment affordances.

### **2.1 Sample**

Participants of the survey are engineering students of the National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute” (Igor Sikorsky KPI for short) who are in their 3<sup>rd</sup> and 4<sup>th</sup> years of study doing for a Bachelor’s degree in Electrical Power Engineering. They are to attend weekly English language classes which are run online in the current 2022-2023 academic year.

The “English Language for Professional Purposes” course, taken by 3rd and 4th years Igor Sikorsky KPI students, combines best practices of learner-centered and profession-oriented communicative ESP techniques and is designed in conformity with the university curriculum entitled “Foreign Language for Professional Purposes” which allows engineering students to improve their foreign language skills to achieve B2 level of English (CEFR) by the end of this two-year course in order to be able to communicate effectively in various types of social, academic and professional contexts of intercultural communication. Thus, all the survey participants are of B1/ B1+ level of English and are taking the English language course to enhance their communicative competence and learn relevant specialist vocabulary.

Within the timeline of the present research intervention, running from February to April 2023, online English language lessons prepared in different synchronous virtual classroom environments were delivered to two groups of third-year students and two groups of four-year students. The survey was distributed only among those students who attended the online English language classes and experienced interactions within specific virtual classroom environments (44 students in total). The survey was completed by 38 respondents, which makes 86% of the students under consideration. Out of the 38 respondents, 25 are 4th year students (66%), and 13 respondents are 3rd year students (34%).

The margin of error of 6 is calculated with 95% of Confidence Level by the Margin Error Calculator (<https://standard-insights.com/margin-of-error-calculator/>) to check how reliable and representative sample results are.

All respondents fall into two age groups: students who are 17-20 years old (39%), and 21-25 years old (61 %), which allows identifying the participants of the survey as young adults.

The engineering specialities that survey participants have been studying at university include: Electromechanical Automation Systems and Electrical Drive, Control Systems of Electric Power Generation and Distribution, Alternative and Renewable Energy Sources, High Voltage Engineering and Electrophysics, Electric Power Plants, and Electrical Power Systems and Networks.

The responses to the questions in the introductory part of the survey about the demographic details indicate that students of all six specialities managed to take part in the survey (Fig. 4).

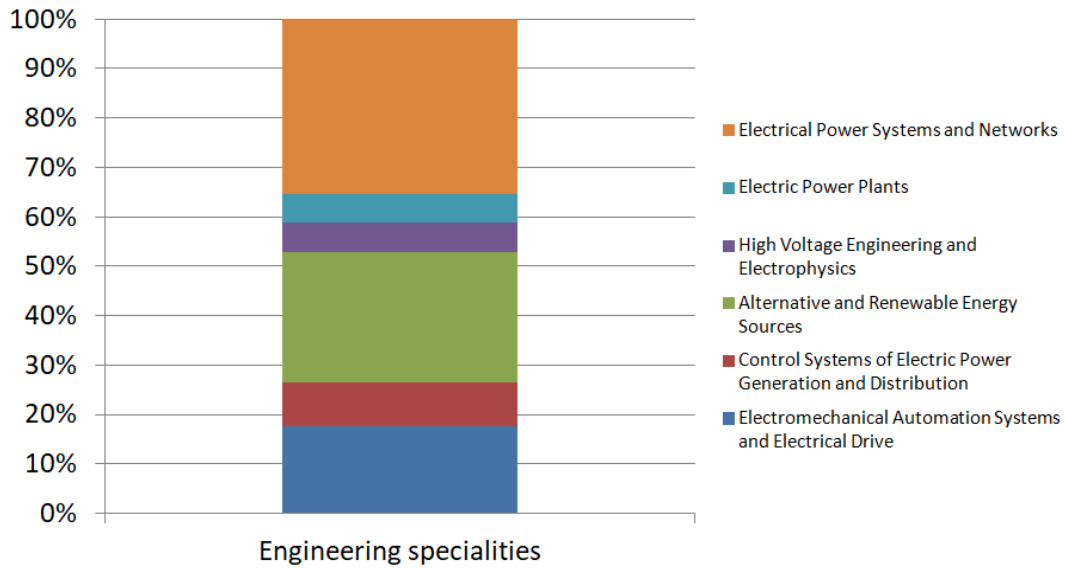


Fig. 4. Engineering specialties studied by survey participants

The gender of the sample is represented by 3% female and 97% male participants, which can be considered as an adequate percentage to demonstrate the regular gender difference among the students at the power engineering faculty. Another supporting detail of that fact is that all 3% female respondents specialize in Alternative and Renewable Energy Sources, which corresponds to the real-life distribution of female students between different specialties of the power engineering Bachelor's degree programme at Igor Sikorsky KPI.

All of the respondents (100%) indicated Ukrainian as their mother tongue in Question 5 of the introductory part of the survey so that it is believed that participants had no difficulty with reading all the questions of the survey, which was written in Ukrainian, and found them comprehensible.

What else is important to note is that students within each academic groups know each other very well as they have been studying in the same group for 3-4 years now. They also know their English language teacher quite well. Before the intervention started in February 2023, they had been attending the online lessons of the same teacher for at least several months before taking part in this survey research.

In addition, the pilot survey data indicated that all of the students have some experience of learning online as in the previous academic years the courses had been delivered remotely because of the COVID-19 breakout and lockdown restrictions. As a result, the students are supposed to have a certain understanding of what it takes to interact in their online language classes and know what Zoom breakout rooms are used for.

## 2.2 Tools

The survey, constructed for the students to share their experiences of interaction in different learning environments and evaluate the affordances of the three designs of virtual classroom, was divided into three parts, which made it manageable and comprehensible.

Students were informed about the purpose of this research study before taking the survey, and anonymity was maintained, even though the questionnaires did not imply obtaining any sensitive information about the students that could compromise their privacy.

The survey includes

- the introductory part, which collects the demographic data, and the previous students' experience of online interaction in Zoom breakout rooms (Q1-Q11);
- the main part, which consists of fixed (5-point Likert scale) and open-ended questions concerning the affordances of the three learning spaces under investigation (Q12-Q21);
- the concluding part, which allows students to compare the three learning spaces they have used in their online language classes (Q27-32) (see Appendix A).

The survey divided into three parts was distributed among students in Google Forms to collect their feedback during the research intervention (Fig. 5) right after they had taken an online language class delivered in one of the three learning environments. All of the forms were created and stored on Google Drive. For the sake of clarity, questionnaires were written in Ukrainian, which is the native language of all the students taking the online language course under consideration.

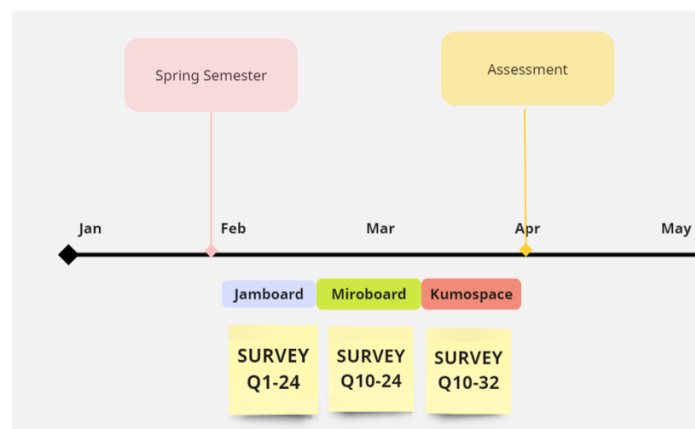


Fig. 5 Timeline of the intervention

Each part of the survey contained closed-ended questions, asking to scale the statements about online interaction from “Strongly disagree” to “Strongly agree”, followed by the request to explain respondent’s choice (“Please explain why” or “Please give an example”). Cronbach’s alpha, which is used to test internal consistency of items scored as continuous variables, was determined and yielded a coefficient of .94, which is a high coefficient.

The survey also contained open-ended questions to inquire about the students' perception of the online classroom affordances and describe their feelings/ experiences/ ideas concerning the online interaction (e.g. If you were to design a virtual classroom, what features would you add to make student-student interaction more efficient? ).

A number of questions in this survey were adapted from the previous studies about students' interaction in breakout rooms (Almazzome, 2022), students' perceptions of group work online (Koh & Hill, 2009) and of the benefits of blended learning for language skills development (Liu, 2019), as well as technological affordances of videoconferencing tools (Kaban & Yataganbaba, 2022).

Questions 18-21 in the main part of the survey inquiring about the technological affordances of the virtual classroom environments were based on the Sundar's MAIN model of interactive media, which proposes that modality, agency, interactivity, and navigability are the four classes of affordances unique to modern interactive media (Sundar, 2008; Hanus, 2016). In particular, the questions were developed to explore the following:

- modality affordances that allow for the multimedia management of audio, video, images, and online chats to process information;
- agency affordances that allow creating one's own content;
- interactivity affordances that allow instant or delayed feedback;
- navigability affordances that allow guided movement through local online spaces.

Question 25 was developed on the basis of six verbs proposed by Davis & Chouinard (2016) to better operationalize how technological affordances exist within digital artifacts.

### **2.3 Procedure**

The intervention for this research took place in the spring semester 2023, from February till April, as part of the "English Language for Professional Purposes" course at Igor Sikorsky KPI. Lessons were conducted according to the timetable online once a week. At every lesson a small group activity was performed by the students who were attending the synchronous sessions. The sessions were in turn arranged in three different virtual classroom environments.

In this study we define virtual classroom as an online space where teachers interact with students in real time, students can voice their questions and interact with peers similar to how they would do this in a regular classroom, albeit over the internet. In other words, virtual classrooms are "synchronous systems where participants are able to engage in "live" virtual meetings and communicate using multimedia services such as streamed video and audio"

(Fallon, 2012). The virtual meeting solutions include video conferencing, digital whiteboards, instant messaging, participants controls and other features required for synchronous learning.

In fact, the difference between virtual classroom and video conferencing tools is that it offers a set of features that are essential to a learning environment. In addition to video and audio conferencing (so teachers and students can see and hear each other) and real-time text chat, the virtual classroom must include interactive online whiteboard (so users can interact on the same page), library of learning materials (essential for providing more structured lessons), and teacher tools and controls (similar to a physical classroom) (Asher, 2023).

Thus, to answer the research question “How is the complexity of student-student interaction retained through the affordances that virtual classroom can provide?” three types of online learning spaces built with different videoconferencing and chatting tools were studied. In particular, online synchronous work in pairs and small groups during a language lesson was arranged with the following tools:

- Zoom breakout rooms and Jamboard, which is a document-sharing application of Google Workspace;
- Zoom breakout rooms and Miro, which is feature-rich digital whiteboard software;
- Kumospace, which is a virtual chat platform that can be used as a virtual classroom.

The pair and small group activities that were arranged in the online language classes were introduced at the different stages: lead-in (e.g. brainstorming words associated with culture and creating wordclouds), controlled practice (e.g. vocabulary gap-fill, matching task, grammar multiple choice test, etc), and freer practice (e.g. writing a summary, presenting a short talk, etc), and were concerned with the development of all four language skills: reading (e.g. finding the correct sub-headings to the text), writing (e.g. writing a covering letter as a response to the job advertisement); listening (e.g. watching the video to check whether the statements given are true or false), speaking (e.g. reporting on the safety precautions at engineer’s workplace) (see Appendix B).

## **2.4 Data analysis**

Forty-four students who attended the synchronous sessions delivered in three different virtual classroom environments were assigned to treatment Group 1 and another forty-four students of the same specialities and year of study who attended to synchronous sessions delivered in virtual classroom environments built with Zoom and Jamboard affordances only were assigned as control Group 2.

Before the intervention all students took the pre-test (January 2023) and after the intervention they all took the same post-test (April 2023) to assess their knowledge and skills of English. Pre-test and post-tests stored on the Moodle platform, which is officially used by the university for testing and examination purposes, were similar in structure and contained Listening, Reading Comprehension, and English in Use tasks.

T-Test Calculator for 2 Independent Means was used to determine whether the average value of post-test scores for both groups was statistically significant (<https://www.socscistatistics.com/tests/studentttest/default.aspx>).

The two groups of students who attended the online English language lessons where they worked in different learning spaces to perform small group activities ( $M=81.14$ ,  $SD=8.1$ ) and those who worked in the same virtual classroom ( $M=76.18$ ,  $SD=8.6$ ) showed a significant difference in their post-test scores because the unpaired t-test results indicate  $t(86)=2.77$ ,  $p=.0034$ . By convention, if p-value is less than 0.05 (the significance level), the result is statistically significant and the null hypothesis is rejected. The evidence is strong enough to conclude that increased and varied student-student interaction in the synchronous online lessons of the language course influences the students' performance. Plots of the test score distribution for each group are presented as histograms (Fig. 6).

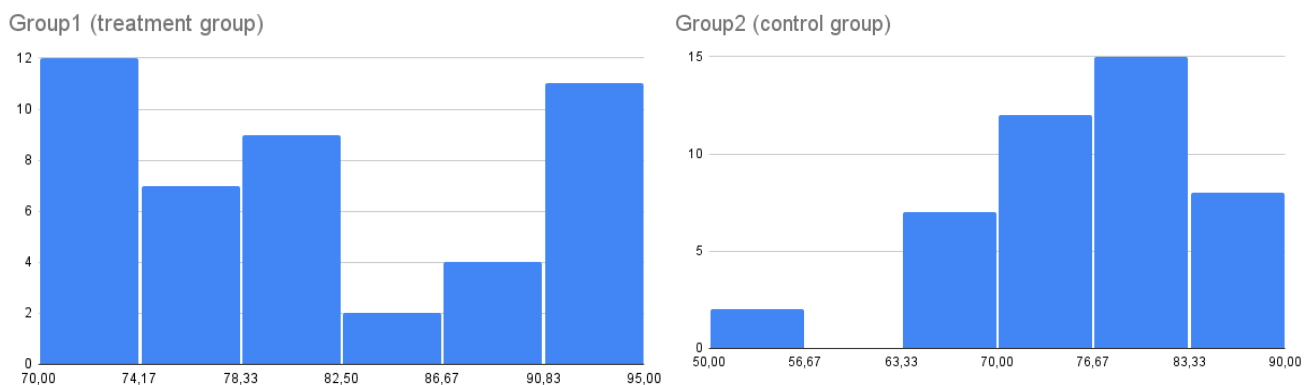


Fig. 6. Post-test score distribution

T-Test Calculator for 2 Dependent Means was used to determine whether the average value of pre- and post-test scores for treatment Group 1 was statistically significant (<https://www.socscistatistics.com/tests/ttestdependent/default.aspx>).

The results from the pre-test ( $M = 76.05$ ,  $SD = 11.56$ ) and post-test ( $M=81.14$ ,  $SD=8.1$ ) indicated that students' performance in Group 1 improved,  $t(43) = 2.4$ ,  $p = .00889$ . (Fig. 7).

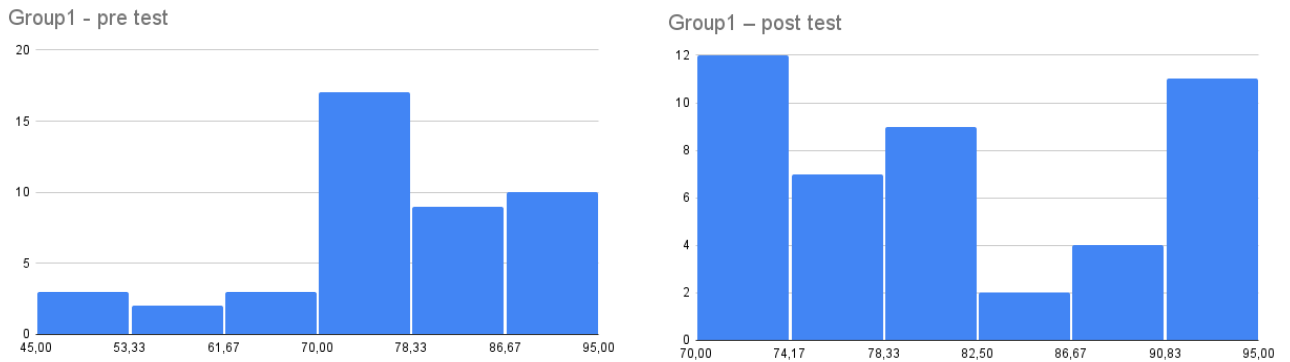


Fig. 7. Pre-test and post-test score distribution for treatment Group 1

Braun and Clarke’s (2006) inductive thematic analysis was used to develop themes from the qualitative data, obtained from the survey. Thematic analysis is a method for systematically identifying, organising, and offering insight into the themes across a dataset. Through focusing on themes across a dataset, it is possible to see and make sense of collective or shared meanings and experiences (Braun & Clarke, 2012; Braun & Clarke, 2012; Creswell & Creswell, 2017; Joffe, 2011).

No specific statistical analysis software was used, the data was analyzed manually. Microsoft Excel was used to store and group the data, Microsoft Word was used for reading participants responses and highlighting, Miro software was used to draw a mind map of the recurring themes. Phases for the analysis suggested by Braun and Clarke (2006) were used for the thematic analysis.

Phase 1. Familiarizing with the data: copying the text-based data from Microsoft Excel to Microsoft Word, translating the responses to open-ended questions from Ukrainian into English, reading the data, highlighting recurring words and ideas.

Phase 2. Generating initial codes: coding interesting features of the data in a systematic fashion across the entire data set.

Phase 3. Searching for themes: collating codes into potential themes, gathering all the data relevant to each potential theme and developing sub-themes.

Phase 4. Reviewing themes: checking if the themes work in relation to the coded extracts and the entire data set, generating a mind map of the thematic analysis.

Phase 5. Defining and naming themes: refining the specifics of each theme, generating clear definitions and names for each sub-theme.

Phase 6. Producing the report: writing the results chapter, providing examples from the data extracts to support the thematic analysis framework.

### 3. Results

This section presents an overview of the collected data and the analysis of the answers to the questionnaires. Feedback from the introductory part of the survey (Q6-11) articulated the participants' perceptions of student-student interaction prior to the intervention and was helpful for identifying educational (pedagogical) and social affordances of the virtual classroom. The main part of the survey (Q12-Q21) allowed generating subthemes in the thematic analysis, and exploring technological affordances of the virtual classroom for the online language course in much detail. The concluding part of the survey (Q27-32) encouraged participants to reflect on their experience of student-student interaction and applying the tools under consideration.

#### 3.1 Perceptions of student-student interaction prior to the intervention

Before inquiring about students' experiences during the intervention, the survey asked respondents to share their views about the importance of small group activities in the language classes (Q4), and whether the student-student interaction is the same in virtual and physical classrooms (Q5). None of the survey participants expressed disagreement with the fact that interaction with peers in small groups is helpful for developing language skills, and more than a half agreed that it is extremely helpful (Fig. 8). Moreover, almost 50% of the students agreed to some extent that there is little difference between interaction in online and face-to-face learning environment (Fig. 9).

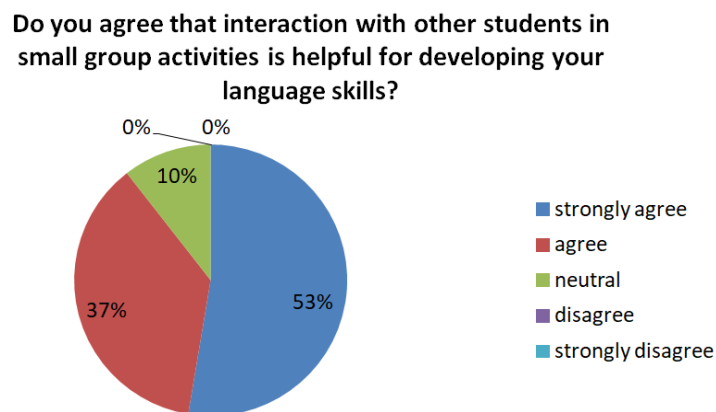


Fig 8. The importance of student-student interaction for language learning

Do you agree that interaction with other students in online language lessons is the same as in face-to-face language lessons?

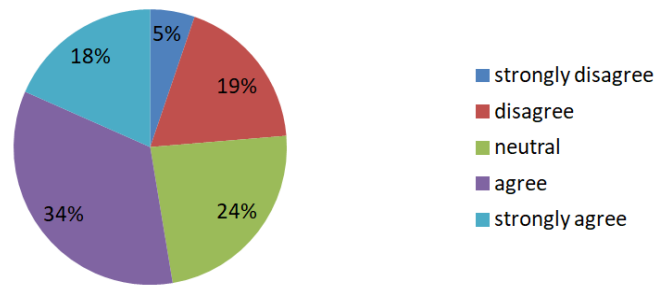


Fig. 9 Small group activities in online vs. face-to-face language lessons

To explain their answers, most of the respondents argued that interaction in small group activities in online and face-to-face language classes is the same because “*you can raise and discuss all the same topics*” and “*the essence of learning a language is verbal communication, and we don’t lose much of this in the online format*”. Such survey responses were expected as videoconferencing chiefly relies on verbally synchronous interactions and enables delivering the content of traditional learning courses online. On the other hand, those who considered interaction in the virtual classroom to be different from that in physical setting say that, first of all, “*there must be some difference by definition because these are two different modes of learning*”, and difference number one is that “*there is no direct contact*”.

Well over 50% of the students believed that there was enough student-student interaction in their online English language course at the moment when the intervention only started (Fig 10). In this respect, it should be noted that prior to the intervention the online English language lessons in this course were prepared and delivered according to the principles of communicative approach by the teacher who holds CELTA qualification and IH Certificate in Online Tutoring.

Do you agree that you get enough interaction with other students in the online language lessons to practise your English?

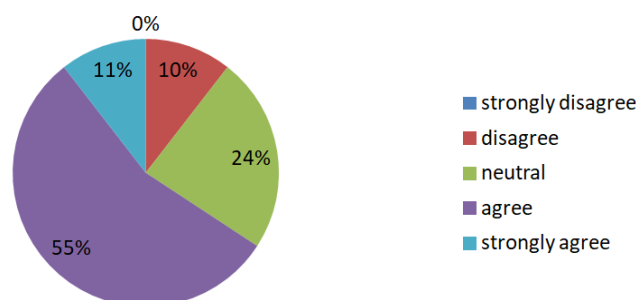


Fig. 10 Evaluation of the amount of interaction in the ongoing online language course.

10% of the survey participants, however, feel that they would welcome more small group work because “students should be more involved in what is happening in the classroom” and they need to practise “discussing things and expressing their opinions in English spontaneously”, which takes time, especially in a mixed-level groups.

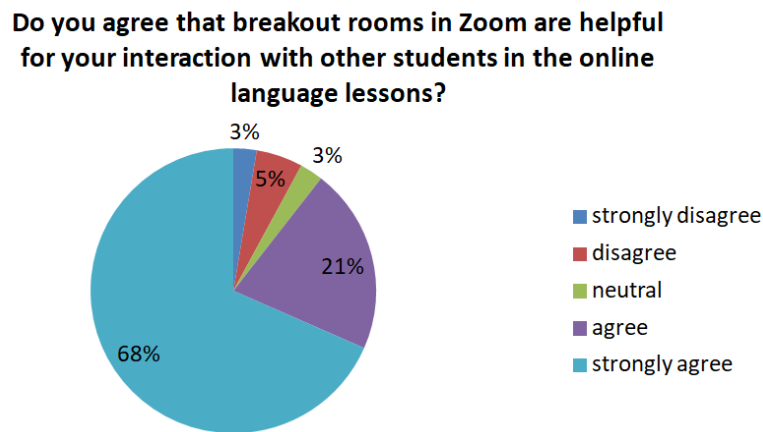


Fig. 11 Peer interaction in Zoom breakout rooms

The overwhelming majority of the survey participants believed that Zoom breakout rooms are helpful to arrange student-student interaction in the online classes (Fig. 11), and reason number one for that is the opportunity to communicate without disturbing the others (e.g. “it allows distributing tasks among students so that they can communicate separately in small groups without disturbing the others”, “the main advantage of breakout rooms is a complete isolation from what is discussed by other students”). The other arguments are related to the convenience (e.g. “It’s a fairly convenient and technically sound solution”, “This function of videoconferencing works pretty well) and usefulness of interaction in the breakout rooms (e.g. “It makes our classes interesting and interactive”, “This is a very interesting and useful feature of the virtual classroom, it contributes to a higher quality of learning”, “It makes not only active students work, but also those who prefer to stay away from class discussions”). It was also mentioned that interaction in the breakout rooms promotes the development of interpersonal skills (e.g. “Group work develops leadership and teamwork skills”, “It is in small groups that everyone has the opportunity to express their opinion”, “It also makes it possible to organize a kind of competition between groups”).

Those who have doubts about the usefulness of interaction in the breakout rooms explain this by saying that not all students may like to cooperate (e.g. “Usually, only few people cooperate in the breakout rooms. For example, if 4 students need to find answers to the questions, only 1-2 students give their answers immediately and the rest do not interact”). It follows that tasks for pair and small group work in the breakout rooms should involve

spontaneous communication and everyone in the group must be accountable for the group's findings to be presented in the main room.

The thematic analysis of the answers given to open-ended questions Q8-9 about benefits and challenges of the interaction in breakout rooms resulted in identifying the main virtual English language classroom affordances. The affordances can be grouped as pedagogical, which are concerned with learning a language in the classroom, social, focused on successful communication and development of soft skills as well as technical affordances that depend on the operation of digital tools and platforms used for interaction in synchronous online sessions. As a result, we can distinguish between the main themes: Language Learning, Socializing, and Technology Use, and the relevant subthemes (Table 1, Appendix C).

Some survey participants also mentioned the issues associated with actualisation of the affordances. For example, students fail to actuate pedagogical affordances when they have a lower level of English than other students working in the same breakout room and it takes them long to find the common ground. Students cannot perceive social affordances if other students are not motivated to participate in the group work; and some settings of Zoom application are said to need some improvement in order to make classroom interaction as effective as possible.

### **3.2. Enhanced student-student interaction during the intervention**

The main part of the survey was designed and distributed separately for collecting the data about interaction in three different virtual classroom environments. Q 10-15 were focused on the purposefulness of student-student interaction and any hindering obstacles involved.

To check if internet connection was good enough for students to join the virtual classroom and take advantages of the interaction, in Questions 11 the participants were asked to indicate any technical issues they experienced during the lesson (see Fig 12, Appendix D). Over 70% of participants had no problems with the Internet connection when they worked in three learning environments. However, it seems that they had more specific technical issues with Kumospace, and this is confirmed in oral whole-class feedback: some students admitted they did not like using Kumospace phone application and decided to re-join the session from the computer. The lowest percentage of "no problems" with Miro might be explained by the fact that if internet connection is poor the objects such as texts become blurred on this digital whiteboard and, thus, difficult to read. Therefore, any slightest technical problem may greatly affect the quality of interaction with the material displayed, which was also reported by a few

of the students in oral whole-class feedback. As a result, although connectivity issues are not related to usability, they can have a direct effect on the experience with the tools.

Fig. 13 (Appendix D) shows how many students had previous experience in using the tools suggested for interaction in their online language classes. As we can see, no one had ever used Kumospace before, and this could have resulted into the effect of novelty that influenced the perception of affordances of the platform. The other two platforms – Jamboard and Miro – seem to be quite familiar to the survey participants.

One of the pedagogical affordances identified earlier was concerned with making the online lesson (stages) interesting and engaging. As seen from Fig. 14 (Appendix D), all students agreed that Jamboard, Miro and Kumospace could make the interaction interesting and engaging. Kumospace, which all of the students used for the first time, is a leader, and it is obvious that the sense of novelty comes into play.

Based on the responses to open-ended Question 15 to explain why use of the digital tool made student-student interaction more engaging, the thematic analysis was further developed, giving more details about Technology Use theme (see Tables 2-4, Appendix C). In addition to the mention of convenience of online interaction, specifics were revealed about the operations that students were able to perform. Technical affordances of virtual classroom were found to correspond to the Sundar’s MAIN model of digital media affordances, namely modality (e.g. *visualise, write things down, make sketches*), agency (e.g. *upload documents, share photos, make notes*), interactivity (e.g. *interact with objects, comment, use emoticons*) and navigability (e.g. *switch from one slide to another, move from one task to another, move around freely*). However, some of these prevail in one of the three learning environments (e.g. visualisation in Jamboard, access to large amounts of information in Miro, and freedom of movement in Kumospace). Indeed, it is of paramount importance that, using the exact quotes from the data extracts, we may classify the three virtual classroom environments under consideration as three components of an online language course: a blackboard (“*Jamboard is an analogue of a classroom blackboard*”), a textbook (“*that application – Miro – can replace a textbook*”), and a classroom itself (“*Kumospace is like a real classroom*”).

This perfectly correlates to the evaluation of potential of each tool to be used for the development of specific language skills (Table 1, Appendix D). According to the survey data, Jamboard is suitable for the development of speaking skills, improvement of pronunciation, and enhancing the knowledge of vocabulary and grammar. Miro promotes the practice of reading skills and helps learn grammar and vocabulary. It can also serve as a good teaching aid for speaking activities. Kumospace, in its turn, fits best when listening and speaking

activities are arranged in the virtual classroom. It seems that Kumospace is also advisable for teaching grammar and vocabulary, but the other two tools are still ranked much higher and, thus, are more attractive alternatives. In addition, Kumospace is reported to be useful for development of writing skills. However, this is only explained by the fact that when working in Kumospace, students had a quick access to an external link to a shared Google Doc file. As Google Doc was among the most popular applications that can be used for taking notes during group work activities mentioned in the oral whole-class feedback, it could be adapted as another component of the virtual classroom that fulfils the function of a notepad or copybook.

When asked if the interaction increased due to the features of virtual classroom, all students agreed that it did. All of the students agreed that Miro increased interaction, and most of them strongly agreed that the amount of interaction increased in Kumospace. Still, about 10% of the participants do not feel that Jamboard and Kumospace can increase interaction significantly (Fig. 15, Appendix D). When explaining the reasons of their neutral opinion, they said that Jamboard is “not suitable for writing assignments”, it takes time to learn how to use the Jamboard tools, and, most importantly, for a better communication you need to use the messengers, such as Zoom chatbox, so even though Jamboard helps with visualisation it could be more convenient to discuss things in the chat. Apart from rich functionality, the greatest advantage of Miro mentioned in the survey is the large space available, which allows dividing the task within the group so that everyone could have a place to work on their own, and then easily combine all efforts as a group work result. It also enables seeing what the participants in other groups are doing, and this increases the involvement of students into the learning process. The highest amount of interaction in Kumospace was reported to be caused by “*application of all language skills, especially speaking and listening*”, and the ability to move across the classroom, which creates the feeling that “*you are not at home but in the real classroom at our university*”. However, being a virtual video chat platform, Kumospace is “*all about interaction, and you will have to interact with other students or objects, even if you do not want to*”, which may be considered as a drawback rather than a benefit.

### **3.3 Technological affordances of modality, agency, interactivity and navigability**

The main part of the survey was also focused on researching how interaction is performed due to potential technological affordances available in the three types of virtual classrooms under consideration through interactive media (Q 18-21). As proposed in the Sundar’s (2008) MAIN Model, the four affordances of interactive media are Modality, Agency, Interactivity and Navigability.

By Modality the ability to appeal to different aspects of the human perceptual system is defined; in other words, it is the possibility to present media via text, pictures, video, or audio (Sundar & Limperos, 2013). From Fig 16 (Appendix D) it is obvious that Jamboard provides great tools for visualization as the overwhelming majority of students used visual and text-based media for communication when working in the breakout rooms. Sometimes they did not have to use the microphones to complete the group work activity (only about 40 % took part in the collaboration by talking to their peers). In addition to offering visualization tools, Miro, on the other hand, required more vivid discussions so that 60% of participants unmuted their mics and about 30 % turned on their cameras to take part in the discussions. A bit higher percentage of video media and a lower percentage of text-based media used with Miro can be explained by the fact that students prefer writing messages on Miro sticky notes while in Jamboard they use both sticky notes and text boxes. In Kumospace environment, the number of students who used their mics for group work participation increased up to 90%, with visual and video media being still used as frequently as with Miro. Moreover, the option of “other media” was chosen by around 20% of the survey participants, and what is meant here is probably interactive emoji reactions available in Kumospace. During the online lessons, students were extremely excited to show their reactions by choosing emoticons to be displayed on their avatars. However, in the survey questions, emoticons are only mentioned as the ones sent in text messages. Thus, some students may have mentioned these emoticons as visual media or other media of Kumospace.

The Agency affordance refers to the agency provided to users that allows them to be sources of information, but also the ability to set preferences and feel like the device “belongs” to the user (Sundar & Limperos, 2013). Thus, Question 19 was about whether students created or shared anything during small group work. Jamboard is again a leader, as different types of visualization (images, sticky notes, highlights, texts) were mentioned. It is easy to notice that creating and sharing texts in Jamboard is more convenient than in the other two environments. In Miro, texts and sticky notes are almost equally often used. Even though texts are the most frequent type of visualizations in Kumospace, these are not as common as in Jamboard. As mentioned above, emoji reactions is a very popular feature used by students to express their current mood during interactions in Kumospace (Fig.17, Appendix D).

The affordance of Interactivity implies that the users are satisfied by making real-time changes to content in the medium (Sundar & Limperos, 2013). In the survey this was researched in Q20 asking about students’ interaction with each other, with the learning material, with the pace of the group work, and with the teacher. Table 2 (Appendix D)

illustrates the responses to the relevant questions about interactivity, and it can be concluded that Kumospace offers the highest degree of interactivity in terms of real-time communication between students and having control over the flow of the group work. At the same time, Miro seems to provide better interactivity between students and the teacher. This can be explained by the fact that on Miro the teachers are observing all the students working on the same board, and they may post a comment to get an immediate reaction. In Jamboard, while monitoring the teacher goes from one framework to another and most often reacts to students' requests only during the visits to the breakout rooms. In Kumospace, which is a video chat platform completely different from Zoom, students were not used to getting quickly in touch with the teacher through the chat. The same situation is with the interaction with the learning material: In Kumospace, about 15% of the participants were not sure if they could find the learning material easily, and it is certainly because they were not quite familiar with the platform that contains a lot of interactive items, including hyperlinks. In this respect, Jamboard and Miro rank higher as the platforms that secure access to the necessary learning material.

While interactivity refers to the ease of changing content, navigability means the ability to move through different possible types of content with ease. Navigability may be thought of as the technology's infrastructure. This technological affordance is present if the experience allows the user to move easily through the medium. As seen from Fig. 18 (Appendix D), about 90% of survey participants strongly agree and over 10% agree that Kumospace provides the greatest degree of navigability.

When asked about problems encountered during small group work activities (Q24), most students mentioned the lack of adequate language knowledge (about 50%) and some technical problems (about 40%), whatever the virtual classroom environment they worked in. 30% of the participants confessed that they did not have enough time to complete the task on Jamboard, while only 13% and 2% of the students experienced this problem with Miro and Kumospace, respectively. Miro caused least problems with understanding the group work objectives (0%) and with communicating with other students (15%) (Fig. 19, Appendix D). There was also no mention of the lack of feedback from the teacher concerning the group work activities with Miro. All this can be explained by the fact that materials displayed on Miro, including teacher's instructions and notes with corrections and feedback, are accessible throughout the lesson to all the students, while in Jamboard each group works on a separate frame, and in Kumospace within a separate room area, so that they may find it difficult to focus on what the teacher is saying.

### **3.4 Virtual classroom affordances operating through gradations**

A number of theories find it a methodologically flawed approach to claim that affordances are either present or absent. Instead, the conceptual assumption is that affordances vary by degrees and it is proposed that artifacts request, demand, allow, encourage, discourage, and refuse (Davis & Chouinard, 2016, p. 2). In Question 25 the survey participants were asked to describe their experiences by completing the phrases that indicate what affordances and at what degree operate in the virtual classroom environments (Table 5, Appendix C). It is this approach that enabled refining the specifics of Technology Use theme, and generating names of subthemes, namely communication channels, transition, navigation, functionality, user-friendliness, and reactions.

When asked what they would change if there were to improve the design of virtual classroom (Q26), most participants expressed much concern about the use of communication channels. They would prefer having a videoconferencing platform integrated with the digital whiteboard, rather than switching between Zoom and Jamboard, or Miro. In Kumospace, they would improve the audio connection between the users located in distant areas, and would add more features to the chat, dividing it into group and private conversation sections. Affordances of transition ranked second as, again, in all three types of virtual classroom environments students would like to have a quicker transition between frames (in Jamboard), displayed tasks/ materials (in Miro), and rooms (in Kumospace). In Miro and Kumospace, both of which represent large areas to work in, navigability was said to require some improvement, and very specific recommendations were given. For example, in Miro the cursors displaying the names of the users should be made smaller so that they wouldn't block the view of the board content. In Kumospace, it was suggested to design "an anchor" which would allow staying permanently in the same room while performing other actions in the same area. As for improvements of functionality, it is a keyword search tool and better visualization and sharing options that were mentioned most often. The buttons to play music and/or sound effects as well as elements of gamification (e.g. collecting "points" for the job done in time) were considered as worthy addition. The main user-friendliness problem was about joining the online session and getting access to the platform, which could be made more secure and fast, without overloading the memory of the user's phone or computer.

### **3.5 Comparison of the tools used to build virtual classroom environment**

As known, in a digital environment, three main types of interaction are identified: learner-to-learner, learner-to-instructor, and learner-to-content interaction (Moore, 1993). In

Q27 (a-b) students compared these types of interaction and it can be noticed that student-student interaction is the highest in Kumospace (88% strongly agree), and the lowest in Zoom combined with Jamboard (34% strongly agree) (Fig. 20, Appendix C). However, this difference becomes that perceptible when the three virtual classroom environments are compared. In general, the number of students who agreed that Jamboard and Miro increased students-students interaction in the online classes is still quite high (only 5% and 2% respectively are neutral about this statement). Furthermore, as shown in the graphs, the virtual classroom environments vary with the amount of interaction provided between students and the teacher (68% strongly agree that it is Jamboard that is helpful for this purpose) and the learning material (66% and 50% strongly agree that Kumospace and Miro, respectively, provide the quick access to the necessary materials during the online sessions). These data support the idea that the three classroom environments under consideration differ in what is the main instrument that turns an online session into classroom: the blackboard on which students work under the guidance of the teacher (Jamboard), the textbook students work with (Miro), or classroom itself where students take responsibility for getting around and using the learning resources to complete the assignments (Kumospace).

From the students' arguments it can be inferred that all three types of classroom environments ensure sharing the learning resources (texts, images, hyperlinks) and interacting with both the teacher and other students, but differ greatly in functionality. Miro was praised for the ease of finding the necessary materials as it is not divided into parts (frames or rooms) and keeps everything in one place. Kumospace was highly appreciated because of its creating the feeling of direct contact, giving the freedom of action, and resembling the traditional classroom. Fig 21 (Appendix C) illustrates the results of comparison of these platforms. 40% considered Kumospace to be much better than the other environments; 47% agreed that it is somewhat better than Zoom with Jamboard, and 42% said it is somewhat better than Miro.

In fact, over 70% of the survey participants agreed that Kumospace makes virtual classroom similar to face-to-face classroom. The reason is that in Kumospace you can move the avatars across the room and there are a lot of opportunities similar to real life (closing the doors, drinking coffee, moving the objects etc). All this adds interactivity and increases interest because, as one of the students says, "*in Zoom, it is boring to see only the teacher's screen*". Still, the other platforms are somehow similar to the physical classroom too, because according to another student "*to make any space a classroom you only need a blackboard and the teacher*", and both Jamboard and Miro are quite similar to a traditional blackboard.

On the whole, over 85% of the students agreed that Kumospace is the best platform for arranging student-student interaction during small group activities online. Almost 53% believed that both Jamboard and Miro can suit this purpose well. When giving explanations of their choice, students point out that it is the atmosphere in Kumospace that makes it so special and encourages interaction (*“It is like a computer game that simulates the reality, you can see your classmates, their actions, reactions, and it feels very natural”*).

When asked which platform is interesting enough to go back to after the classes, 40% expressed their wish to use Kumospace for their online interaction when doing the homework, and up to 30% strongly agreed that it is worth coming back to Jamboard because it contains useful notes and links shared during the online session. On the other hand, Miro is interesting only for 18% of the students as all the resources can be found in the learning management system (e.g. Google Classroom). Still, Miro is extremely popular as the digital board used for studying other subjects (doing projects, creating graphs, collecting data etc). Kumospace also ranks high as a possible space for virtual communication outside the English language classes, although other videoconferencing tools are mentioned as better alternatives (e.g. Google Meet, Discord).

#### **4. Discussion**

Statistical significance testing was done to ensure the reliability of the present research and find out whether the observed difference in the performance scores of the treatment group and control group reflect a pattern other than chance. As the null hypothesis of “no effect” was rejected, it is safe to say that if students participate in pair and small group activities in every lesson of their online language course, and these are arranged in the virtual classroom with different digital tools, they can demonstrate a progress in their performance. However, further interventions should be done to clarify what was most beneficial for students’ improved learning outcomes. For now, it is possible to make the following assumptions. As mentioned above, Francescucci & Rohani (2019) concluded that modern synchronous communication technology may be as efficient as traditional classroom facilities to help learners in terms of their academic achievements. It may be the case then that “adapting” the virtual classroom by making the interaction varied via different digital tools of collaboration can improve learning outcomes. On the other hand, Julie et al. (2022) stated that there was no significant difference in the performance of students who used Zoom and Kumospace when taking their online course in physics. For that reason, the difference in the affordances for student-student interaction in Zoom and Kumospace may have significance only for language learners.

To answer the research question of how the complexity of student-student interaction is retained through the affordances that virtual classrooms of the online language course can provide the thematic analysis was done several times within the framework of this study.

First, we considered the data from the introductory part of the survey about participants’ perceptions they had about student-student interaction in the virtual classroom prior to the intervention. This immediately resulted into generating three main themes – Language Learning, Socializing, and Technology Use, which correspond to the educational, social, and technological affordances suggested by Kirschner et al. (2004) for electronic collaborative learning environments. We also managed to develop the subthemes that represent educational and social affordances available for student-student interaction in the online language classes.

However, the technical affordances identified at this stage of the thematic analysis could be described only as Technology Use, as all survey participants just mentioned the features of Zoom that enable verbal communication during synchronous online sessions, which was convenient for student-student interaction. When thematic analysis was done for the second time, the same themes and subthemes emerged to describe the affordances characteristic of Jamboard, Miro, and Kumospace, which proved that the previously obtained results are valid and applicable. However, even though there was much information about the technical

affordances of each learning environment, and these were found to correlate with Sundar's MAIN model of digital media affordances, Technology Use theme was not yet completely developed. The thing is that affordances of educational technology are closely interrelated, and technical affordances, which are design-driven, are expected to support the required educational and social affordances (Kirschner et al., 2004; Doering et al., 2008). For that reason, the mention of what students technically can do in the virtual classroom is not enough to specify the technological affordance of online language classes.

In this respect, the most productive stage of the thematic analysis was done with the data about the virtual classroom affordances operating through gradations. Question 25 of the survey, which was designed on the basis of six verbs proposed by Davis & Chouinard (2016) to better operationalize how technological affordances exist within digital artifacts, allowed getting a better overview of all the affordances of the virtual classroom, and generating such subthemes of Technology Use as communication channels, reactions, navigation, transition, functionality and user-friendliness (Fig. 25, Appendix E).

Six statements that students were to complete about their experience of interaction in the virtual classroom gained much valuable information about the actual and perceived affordances, as well as the ones that were not actuated (Fig. 26, Appendix E). We suggest this scheme could be used in other interventions and in language teaching practices to learn about students' perceptions of their online learning experiences.

As highlighted earlier, the three virtual classroom environments under consideration were found associated with such components of the physical classroom as blackboard, textbook and classroom desks. Combined with the data on the evaluation of the potential of each tool for the development of specific language skills (Table 2, Appendix D), this suggests that in the virtual classroom each component might be "adapted" depending on what is the objective of the online language lesson (Fig. 27, Appendix E).

In general, the students expressed most positive views about the importance of student-student interaction for improving their language skills. They appreciated having the chance to attend synchronous sessions, which are a good alternative of face-to-face classes due to real-time verbal communication via videoconferencing, and liked group work activities in breakout rooms and the virtual chat platform, which, according to their views, may actually be even more productive than in the traditional classroom.

The positive feedback about interaction in the breakout rooms, where students can concentrate on specific tasks and practice of their language skills, is in line with the results of other studies (e.g. Lee, 2021), which indicated that most students were satisfied with using

Zoom breakout rooms for language classes. The wordcloud diagram shows what key words were repeated in the survey participants' explanations of their opinion, these being "convenient", "interesting", "opportunity", "teamwork", and "not to disturb" (Fig. 28, Appendix E). This demonstrates a great potential of using breakout rooms in the online language course; in fact, according to the experts in the language teaching methodology, it is the feature that is among the most important videoconferencing considerations (Clandfield & Hadfield, 2017, p. 14-15), and it is especially suitable for online adaptation of the teaching technique of peer-checking.

On the other hand, virtual chats, such as Kumospace, proved to offer a higher degree of interactivity and encourage students to be more actively involved in the learning process, thus making the lessons learner-centred (Nocchi, 2017; Raine, 2022). These could be used as a substitute for "hubs of the traditional school" where students could easily interact (Willermark & Islind, 2022), and break a routine to overcome Zoom fatigue (Dailey-Hebert, 2022).

Another interesting point is that when working in small groups students were eager to communicate through "digital emotions" without turning their cameras on: send emojis in text messages, use reactions buttons, share memes and funny videos, doodle and make sketches, "come up closer" and "nudge". This indicates how social affordances of the virtual classroom can be actuated by usability of the technology, and this is one of the most considerable advantages of synchronous communication mode (Chou, 2002; Croxton, 2014; Fallon, 2012; Martin et al., 2012; Racheva, 2018).

In the end, when adapting language classes to the online context, one should be aware of the differences between virtual and physical modes of communication; in other words, in order to run online synchronous lessons the teacher needs to develop "e-classroom interactional competencies" (Moorhouse & Walsh, 2023). Stages of the online language classes should be carefully designed, providing different types of interaction patterns. The framework of affordances developed in the present study is expected to help evaluate and choose the most appropriate digital tools to enhance student-student interaction in the virtual classroom, adapting the online learning environment to the language lesson objectives.

## 5. Conclusion

The affordances of virtual classroom were under consideration in this study. Three different online learning environments were used in the intervention that lasted from February to April 2023. In the treatment group, students participated in pair and small group activities in breakout rooms using Jamboard, Miro, and in Kumospace. The results from the pre-test ( $M = 76.05$ ,  $SD = 11.56$ ) and post-test ( $M=81.14$ ,  $SD=8.1$ ) indicated that students' performance improved,  $t(43) = 2.4$ ,  $p = .00889$ . Statistical significance testing was done to ensure the reliability of the present research. As the null hypothesis of "no effect" was rejected, it is safe to say that if students participate in pair and small group activities in every lesson of their online language course, and these are arranged in the virtual classroom with different digital tools, they can demonstrate a progress in their performance. However, further research should be done to find out what was most beneficial for students' improved learning outcomes.

The thematic analysis was used to develop themes from the qualitative data, obtained from the survey. Three main themes developed – Language Learning, Socializing, and Technology Use – correspond to the educational, social, and technological affordances suggested by Kirschner et al. (2004) for electronic collaborative learning environments.

The subthemes generated further represent educational, social and technological affordances available for student-student interaction in the online language classes. According to the results of the thematic analysis, language skills practice, peer-checking, and raising interest are pedagogical affordances that determine if learners can exhibit a learning behaviour within the communicative methodology context. Diversity of communication, collaboration, cooperation, enjoying direct communication with peers, and development of interpersonal skills constitute the different aspects of socializing and represent social affordances of the virtual classroom of a language learning course. Technological affordances that support language practice and socializing in the online learning classes and make the virtual classroom useful include communication channels, reactions, navigation, transition, functionality and user-friendliness.

Based on the data collected, it was also shown that virtual classroom affordances operate through gradations. This implies that all of the affordances mentioned above are present in a virtual classroom but vary by degree.

The research question is thus answered by providing the framework of the virtual language classroom affordances. These must be considered in designing lesson plans for online language classes in order to ensure, enhance and diversify student-student interaction.

Moreover, a scheme of six statements that was used in the survey to explore the actual, perceived and non-actuated technological affordances is suggested as a questionnaire to be used in other interventions and in language teaching practices.

Finally, it was proposed that virtual classroom can be presented through such components of the face-to-face classroom as backboard, textbook and classroom desks, and these might be “adapted” via appropriate digital tools depending on what is the objective of the online language lesson.

An overarching limitation of the current study is the sample size. The small sample size does not allow making generalization about the obtained results. The sample also represents engineering students who are young adults that study English for Professional Purposes, have experience of online learning, and know each other and their language teacher very well. The results might have been different with learners of different age and different academic background. Thus, to expand the scope of study and generalizability, future research could include collecting data from online language classes of another specialism and different demographic variables. Also, it would be practicable to study the similarities of virtual and physical setting of language classroom based on the students’ performance in online and face-to-face courses.

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**Author's declaration**

I hereby declare that I have written this thesis independently and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices.

Tetiana Maslova, */digitally signed/*

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VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 48

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## Appendices

### Appendix A. Google Form Questionnaires

(originally written in Ukrainian and distributed to Ukrainian-speaking course participants)

*Dear students! This survey aims to research different virtual classroom environments and find out how we can improve our online English language course.*

*There are about 20 questions about your experiences during the synchronous session. Your answers are anonymous, but very valuable for this research.*

*I would be very happy to hear your voice. Many thanks for your help in advance!*

Section 1. Introductory part

#### Q1. Please indicate your gender

Female

Male

Prefer not to say

#### Q2. Please indicate your age group

17-20

21-25

#### Q3. What is your mother tongue?

...

#### Q4. Do you agree that interaction with other students in small group activities is helpful for developing your language skills?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
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#### Q5. Do you agree that interaction with other students in online language lessons is the same as in face-to-face language lessons?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
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##### Q5.1 Please explain why.

.....

#### Q6. Do you agree that you get enough interaction with other students in the online language lessons to practise your English?

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
-------------------	----------	---------	-------	----------------

##### Q6.1 Please explain why.

.....

**Q7. Do you agree that breakout rooms in Zoom are helpful for your interaction with other students in the online language lessons?**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
-------------------	----------	---------	-------	----------------

**Q7.1 Please explain why.**

.....

**Q8. What are the positives of breakout rooms for the interaction with other students in online language lessons?**

.....

**Q9. What challenges have you faced when using breakout rooms?**

....

Section 2. Main part (\*separately designed for Jamboard/ Miro/ Kumospace)

**Q10. What technology did you use in your today's online lesson?**

Zoom, Jamboard

Zoom, Miro

Kumospace

**Q11. Did you have any problems joining the online lesson, and participating? (choose all that apply):**

No problems

Slow internet

Poor sound

Frequent disconnections

Other issues

**Q12. Do you have experience in using Jamboard/Miro/ Kumospace?**

Yes

No

Difficult to say

**Q13. Do you agree that it was motivating/ engaging to interact with other students during small group work using Jamboard/ Miro/ Kumospace?**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
-------------------	----------	---------	-------	----------------

**Q 13.1 Please explain why**

....

**Q14. Do you agree that small group work in this virtual classroom (with Jamboard/Miro/ Kumospace) helped you with your language development?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Listening					
Speaking					
Reading					
Writing					

Grammar					
Vocabulary					
Pronunciation					

**Q14.1 Please explain why**

....

**Q15. Do you agree that in this virtual classroom (with Jamboard/ Miro/ Kumospace), your interactions with other students increased?**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
-------------------	----------	---------	-------	----------------

**Q15.1 Please explain why**

....

**Q16. What did you use to interact with other students during small group work in this virtual classroom? (choose all that apply)**

- Visual media (you used annotation tools/ pictures/ sticky notes/ etc to talk to your peers)
- Audio media (you turned on your mic to talk to your peers)
- Video media (you turned on your camera to talk to your peers)
- Text-based media (you sent a text/ message/emoji/ etc to your peers)
- Other

**Q17. What did you create and/or share with other students during small group work in this virtual classroom? (choose all that apply)**

- image(s)
- sticky note(s)
- link(s) to web resources
- text(s)
- recording(s)
- (coloured) line(s)/ highlight(s)
- emoji(s)
- Other

**Q18. Do you agree that you managed to give and receive instant reactions during small group work in this virtual classroom? (checkbox for each statement)**

- You were able to talk to other students and receive real-time replies from them
- You were able to find and interact with the learning material (books/ handouts/ videos/ infographics, etc)
- You were able to control the flow of the group work interaction
- You were able to ask the teacher for help and/or clarification

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
-------------------	----------	---------	-------	----------------

**Q19. Do you agree that you managed to navigate/ move across this virtual classroom in order to feel comfortable during small group work?**

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
-------------------	----------	---------	-------	----------------

**Q20. How well did this virtual classroom (with Jamboard/ Miro/ Kumospace) help you perform the small group work activity? Please give an example.**

....

**Q21. What were the challenges of interacting with other students in this virtual classroom (with Jamboard/ Miro/ Kumospace)? Please give an example.**

.....

**Q22. What problems did you encounter while doing small group work? Select all that apply**

- difficulty with understanding the objectives of the small group work
- difficulty with communicating with other students
- lack of adequate language knowledge
- lack of instructions from the teacher
- lack of feedback from the teacher
- lack of resources required to do the group work
- lack of time
- technical problems
- other

**Q23. Please end the statements with your own words to describe your experience: When using Jamboard/ Miro/ Kumospace for online interaction, ...**

it was necessary to ...

I had to ....

I found it difficult to ...

I was able to ...

I was not able to ...

I liked to ....

**Q24. If you were to design a virtual classroom, what features would you add to make student-student interaction more efficient?**

Section 3. Concluding part

**Q25(a). Do you agree that Zoom+Jamboard is helpful for interactions in online classes?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
teacher-student interaction student-student interaction interaction with learning material					

**Q25(b). Do you agree that Zoom + Miro is helpful for interactions in online classes?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
teacher-student interaction student-student interaction interaction with learning material					

**Q25(c). Do you agree that Kumospace is helpful for interactions in online classes?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
teacher-student interaction student-student interaction interaction with learning material					

**Q25.1 Please explain why.**

...

**Q26. How would you rate Kumospace as an online learning space for student-student interaction in comparison to**

	Much better	Somewhat better	Same	Somewhat worse	Much worse
Zoom+Jamboard? Zoom +Miro?					

**Q26.1 Please give an example.**

....

**Q27. Do you agree that this technology makes the virtual classroom similar to traditional (f2f) classroom?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Zoom, Jamboard Zoom, Miro Kumospace					

**Q27.1 Please give an example.**

....

**Q28. Do you agree that this technology is the best for online small group interaction?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Zoom, Jamboard Zoom, Miro Kumospace					

**Q28.1 Please explain why**

....

**Q29. Do you agree that it would be interesting to work in this virtual classroom after the online classes?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Zoom, Jamboard Zoom, Miro Kumospace					

**Q30. Do you agree that it would be interesting to use this virtual classroom for communication which is beyond the online English language course?**

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Zoom, Jamboard Zoom, Miro Kumospace					

**Q30.1 Please explain why**

...


**Please feel free to express any concerns you may have about this questionnaire or the research it is focused on (optional).**

....

**Many thanks for your time and cooperation!**

Appendix B. Tasks for pair and small group work in the virtual classroom.

Read some advice on how to pass a job interview, which are given on the following frames (Part 1-3), and prepare a short talk on what is your top-5 tips. Use phrases for discussion to debate your points of view. Be ready to present your final list.



**Useful Phrases For Discussion And Composition**

[www.englishstudyhere.com](http://www.englishstudyhere.com)

**Room 3: 1) learn about the company 2) bring all the document 3) know what Qs to take 4) be honest 5) be on time**

**Room 2: 1) be positive 2) firm handshake 3) know the latest developments 4) control the nerves 5) know about the company and present yourself in the best way**

**Room 1: 1) prepare for different Qs 2) address your weaknesses 3) Appearance makes the first impression. 4) if don't get the job, don't take it personally 5) don't ask about the salary**

Fig. 1. “How to Prepare for a Job Interview” Lesson, Jamboard (3<sup>rd</sup> year of study)

**THINGS ANIMALS DO**


7 Complete the two short texts with the words from the boxes.

breed hatch lay mating nests young

**THE BREEDING SEASON**  
Most animals in the Northern Hemisphere <sup>1</sup> \_\_\_\_\_ in spring. You can hear their <sup>2</sup> \_\_\_\_\_ calls in the forests and meadows. Birds build <sup>3</sup> \_\_\_\_\_ and the females <sup>4</sup> \_\_\_\_\_ eggs. After the chicks <sup>5</sup> \_\_\_\_\_, the parents feed them and teach them to fly. It's important not to bother animals in any way when they have <sup>6</sup> \_\_\_\_\_.

migrate hibernate hunt graze feed

**SURVIVING WINTER**  
Winter is a hard time for animals. It's difficult for them to <sup>7</sup> \_\_\_\_\_. There's no vegetation, no grass to <sup>8</sup> \_\_\_\_\_ on and not much prey to <sup>9</sup> \_\_\_\_\_. A lot of birds, such as storks, <sup>10</sup> \_\_\_\_\_ to warmer climates. Other animals, for example bears, <sup>11</sup> \_\_\_\_\_; they go into a deep sleep for several months.



Room3

**ACTION FOR ENVIRONMENTAL SUSTAINABILITY**

9 Complete the suggestions with the words from the box.

carbon conserve cycle logging plant recycling renewable vegetarian

- Sort your rubbish for recycling.
- conserve water and energy at home.
- Adopt a vegetarian diet and lifestyle.
- Minimise your carbon footprint by using public transport.
- Build more bicycle paths.
- Oppose the logging of rainforests.
- plant trees.
- Invest in \_\_\_\_\_ energy.  
renewable

Fig. 2. “Nature & Environment” Lesson, Jamboard (4<sup>th</sup> year of study)

Watch the video, choose one of the measuring instruments mentioned, and write 3 sentences with "must", "should", "don't/doesn't have to/ needn't" to describe how one can use it

**Modals of Obligation**

Fill in the blanks with the correct forms of must, mustn't, have to, or don't have to.

- Look at the sign! You **mustn't** jump into that forbidden area.
- You **don't have to** call him tonight. You can speak to him face to face tomorrow.
- You **must** submit your application on time.
- May **must** go to the dentist immediately. She's in great pain.
- You **must** buy a ticket there to get into the beach. It's a historical site.
- Gerry **must** get a visa to Nepal. He can't go there in another way.
- The **must** buy another kettle. I've just repaired the old one.
- My dentist says to our daughter that she **must** brush her teeth twice a day.
- You **mustn't** cut your hair. It's very long.
- You **mustn't** cheat in the exam.

**Modal Verbs: Permission**

Adding for permission	Giving permission	Saying someone has permission
may Might I use your phone? Could we visit him?	may You may take this holiday off from work.	may Students may enter the library.

5 Fill in the gaps with an appropriate modal verb. Then, say what they express in each sentence.

- A: ...**May/Can/Could**... I borrow your pen, please?  
The speaker is asking for permission.
- B: No, you **can't** borrow it. I'm using it.
- A: I'm bored. What shall we do?  
B: We **could** go for a walk.  
A: No, we **can't** go because it's raining.

Fig. 3. Measuring Instruments (Modals of Necessity) Lesson, Miro (3rd year of study)

**Arts**

**culture**

**language**

**READING TASK # 2**

**The Cultural Iceberg**

**READING TASK # 2**

**The Blind Assassin** by Margaret Atwood

Complete the book review with the words from the box.

chapter characters final narrator novel opening plot: Price

In the masterly **novel**, **Atwood** recounts the violent death, probably by suicide, of her sister Laura Chase. The first **two** pages several tantalising questions about the history of the Chase family, which is full of painful secrets. It is difficult to put the book down until the last of those questions are resolved on the **two** pages. The **story** is intricate and sophisticated and the **novel** is true-to-life that you may find yourself personally taking or having some of them. The **novel** fully deserves the Booker **Prize** it won in 2000.

**MATCH**

Match the people to what they do.

- the director of photography
- the production designer
- the screenwriter
- appear in a film only as members of a crowd.
- are responsible for all the camera work on the film.
- performs dangerous acts in place of an actor.
- writes the screenplay.

Complete the verbs in the following sentences.

- Revolutionary head **is** **acted** by Kate Winslet as April Winslet.
- I don't like it when a **director** **is** **acted** in the films of Michael Bay.
- Shocking **is** **acted** in the films of Michael Bay.
- She **is** **acted** in the latest James Bond film.
- We decided to **act** in the final scene in black and white. **TO SHOOT**.
- The scene will be **acted** in the final scene in black and white.

Fig. 4. "Culture" Lesson, Miro (4th year of study)

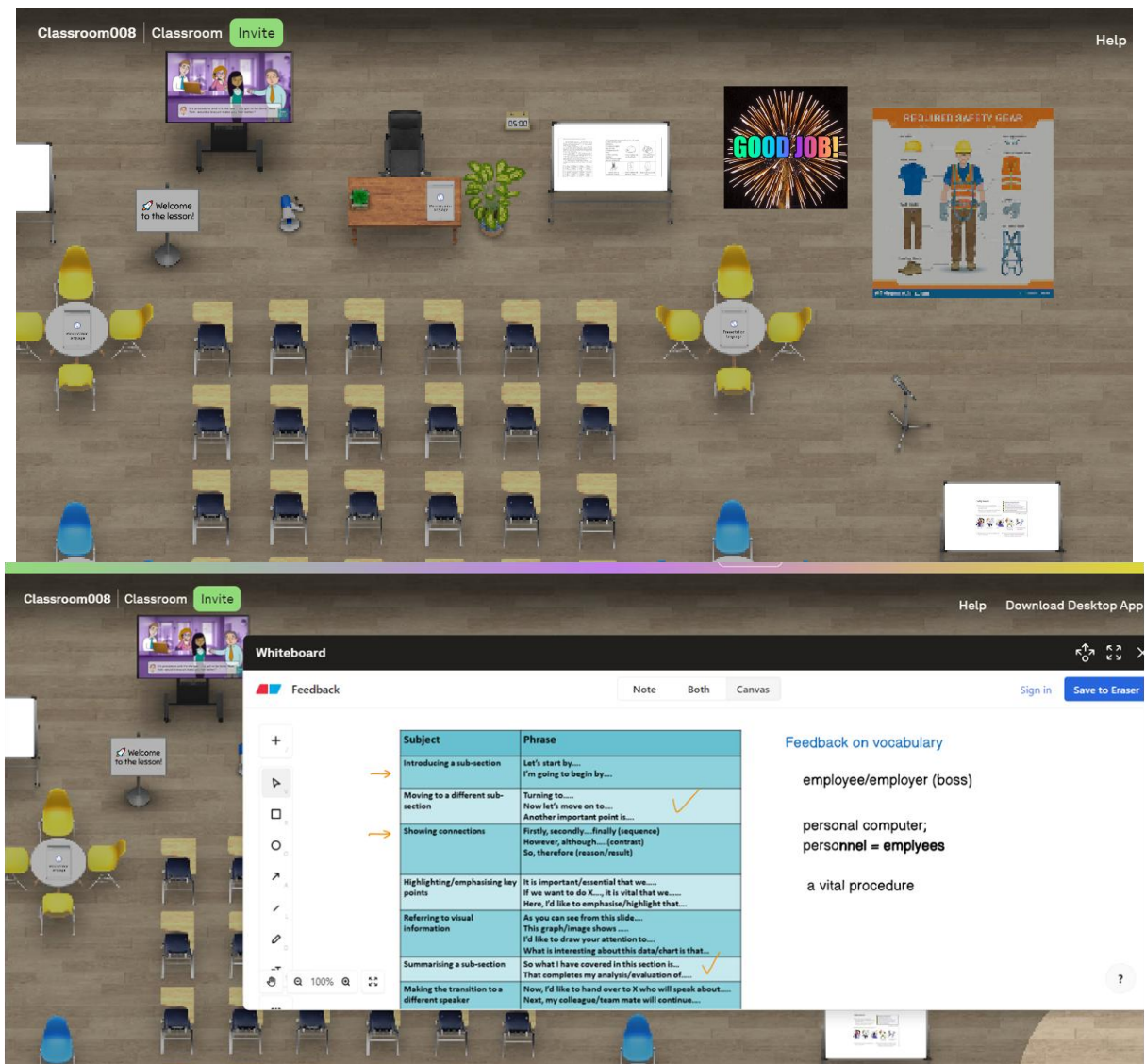


Fig. 5. "Safety Precautions" Lesson, Kumospace (3<sup>rd</sup> year of study)

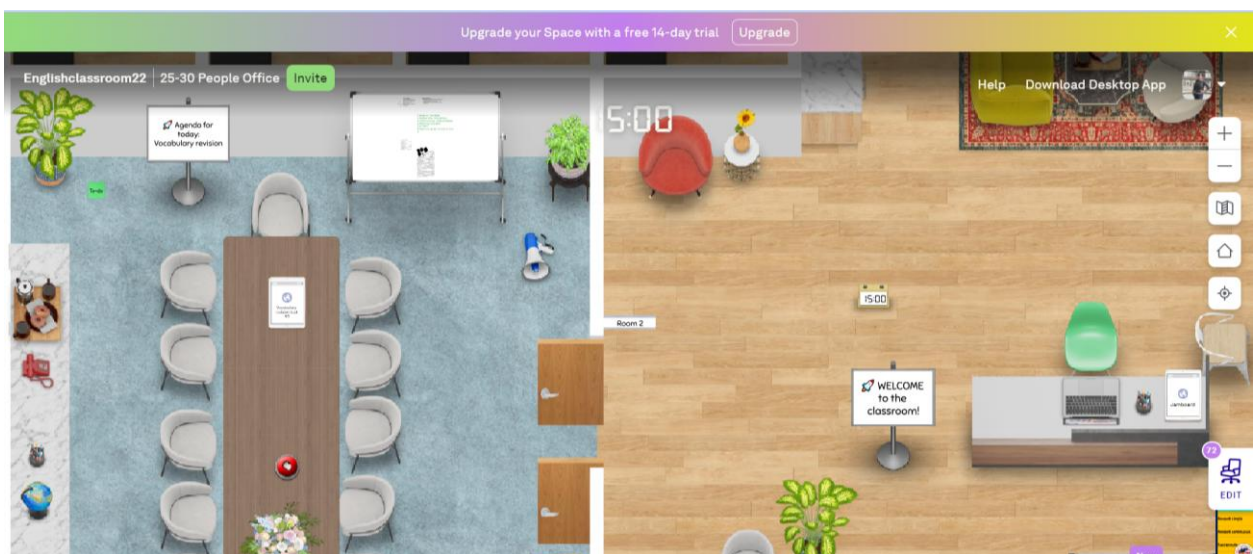


Fig. 6. "Revision for Exam" Lesson, Kumospace (4<sup>th</sup> year of study)

**Appendix C. Thematic analysis: virtual classroom affordances**

Table 1. Affordances of virtual classroom for student-student interaction (based on the survey participants' previous experiences of group work in Zoom breakout rooms).

<i>Affordances</i>	<i>Themes</i>	<i>Examples (sample responses)</i>
Pedagogical	Language skills practice	This is the only way I can practice my speaking skills I can improve my level of English I like doing practical tasks and see how well I can use my English in practice
	Peer-checking, peer teaching	In small groups you can help and correct each other I quite like it because of the opportunity to justify my answers and learn the material together with classmates You can freely discuss answers and work on your mistakes before giving the final answer to the teacher
	Raising interest	It is quite interesting to spend a part of the lesson working in groups. As a rule, everyone likes participating in small groups discussions It also makes it possible to organize a kind of competition between groups, which makes the class interesting and interactive
Social	Diversity of communication	I like interacting with other students to hear something new Each time a different group is formed, and this adds diversity, which is just like in real-life situations
	Collaboration (exchanging ideas, working out shared solutions)	I especially like this approach when the groups separately complete some tasks and then exchange their results with each other (between groups). I like to hear several different opinions on one topic I like it because the opinion of the group is taken into account, rather than someone's individual one
	Cooperation (effective problem solving, task completion)	The task can be divided between students in the group, which reduces the stress of completing the project independently You can split the duties and complete the task much more quickly
	Enjoying direct communication with peers	If I'm with friends in the same group, I like it very much, because we understand each other very well It is great to talk to other students that you

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 59

		haven't seen in person for so long
	Development of interpersonal skills (teamwork, leadership, time management, organizational skills)	Working in small groups develops leadership and teamwork skills When you can work with other students, it improves communication skills, and promotes teamwork and decision making When we work in groups, we always brainstorm, and that way, in addition to the language, we learn organisational skills
Technical	Convenient digital tool for online interaction	Zoom provides the necessary tools for basic communication and comfortable interaction This feature allows you to form smaller groups of people to work on tasks, which, in my opinion, is a very interesting and useful feature that contributes to a higher quality of learning. Communication online is much better when fewer people are involved in conversations.

Table 2. Affordances of virtual classroom for student-student interaction: Zoom and Jamboard

<i>Affordances</i>	<i>Themes</i>	<i>Examples (sample responses)</i>
Pedagogical	Language skills practice	It is very helpful for studying English You can improve the knowledge of vocabulary, and remember new words
	Peer-checking, peer teaching	You can make notes of your ideas You can take notes of what others are saying It is not scary to give answers
	Raising interest	That's a new platform, thus it is interesting Interactive tasks are always more interesting
Social	Diversity of communication	You can participate without saying a word (without using the mic) You can see what other classmates see You can interact with the object so that others can see this
	Collaboration (exchanging ideas, working out shared solutions)	Every student can express themselves
	Cooperation (effective problem solving, task completion)	You can visualize certain points during the group discussion
	Enjoying direct communication with peers	You can make sketches to cheer people up
	Development of interpersonal skills (teamwork, leadership, time management, organizational skills)	The task is clearly divided between students It is very helpful for doing group work

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 60

Technical	Convenient digital tool for online interaction	<p>It is <i>an analogue of a classroom blackboard</i></p> <p>It is a good tool for online learning It is convenient for group work It is easy to use You can <i>create texts</i> Besides words, you can use <i>visualization</i> You can make <i>sketches, doodles</i> You can <i>write things down</i> You can <i>interact with the object</i> so that others can see this</p>
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Table 3. Affordances of virtual classroom for student-student interaction: Zoom and Miro

<i>Affordances</i>	<i>Themes</i>	<i>Examples (sample responses)</i>
Pedagogical	Language skills practice	<p>It is convenient to do reading tasks, and take notes, underline words, highlight the answers When you discuss the questions from the text, you improve your speaking and listening skills</p>
	Peer-checking, peer teaching	<p>On the board, you can find information from previous lessons It is easy to revise the material and create something new</p>
	Raising interest	<p>A large number of functions available in Miro makes this interaction more interesting and versatile</p>
Social	Diversity of communication	<p>I have access to all the necessary resources A large amount of information (photos, hyperlinks, etc.) is available You work separately in groups but see that the others are working in the same classroom too</p>
	Collaboration (exchanging ideas, working out shared solutions)	<p>The results of your individual efforts are visible to others Miro allows you to share photos, videos, audio materials, upload documents etc.</p>
	Cooperation (effective problem solving, task completion)	<p>It facilitates interaction between students, thereby increasing productivity It increases the productivity and simplifies the work to be done</p>
	Enjoying direct communication with peers	<p>You can see the cursors of your classmates and know that they are working by your side</p>
	Development of interpersonal skills (teamwork, leadership, time management, organizational skills)	<p>You can keep all the necessary information in front of you You can build connections between different topics Timers help you manage the time of group work</p>

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 61

Technical	Convenient digital tool for online interaction (modality, agency, interactivity, navigability)	<p><b><i>That application can replace a textbook</i></b>  It is user-friendly and <i>multifunctional</i>  There is <i>large space</i> and simultaneous <i>access to all the information needed</i>  It is convenient <i>to move from one task to another</i> or to any information that is posted there  Miro allows you to <i>share photos, videos, audio materials, upload documents</i>  You can <i>write, take notes, and draw</i>  You don't have <i>to switch between slides</i></p>
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Table 4. Affordances of virtual classroom for student-student interaction: Kumospace

<i>Affordances</i>	<i>Themes</i>	<i>Examples (sample responses)</i>
Pedagogical	Language skills practice	Most information is perceived by ear so you can practise listening skills Listening becomes as important as in real life
	Peer-checking, peer teaching	You can dictate and the other student will write things down. You can split the work and then check each other. You can come up and ask for help.
	Raising interest	A huge diversity of interaction makes classes more interesting It is quite new and unusual experience
Social	Diversity of communication	Actions like drinking coffee help you wake up There is a lot of space in each room for interaction between students You can run around the classroom You can ask to follow you.
	Collaboration (exchanging ideas, working out shared solutions)	You can work in pairs in a separate room to complete all tasks together, and then go to another group to discuss your results with other students You can use the whiteboard for sharing your ideas.
	Cooperation (effective problem solving, task completion)	You can see and know for sure that everyone is busy doing their job. You can find the one you need and solve the problems immediately. We can work together and then have a break to "have a coffee".
	Enjoying direct communication with peers	It is nice to meet up with the classmates under the same roof There are hundreds of emoticons to use to express your emotions
	Development of interpersonal	Students can freely decide which team to

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 62

	skills (teamwork, leadership, time management, organizational skills)	join You can choose and switch between individual and group work very quickly You feel more responsible for what you do because only you decide how to deal with the task
Technical	Convenient digital tool for online interaction (modality, agency, interactivity, navigability)	<b><i>It is like a real classroom</i></b> Kumospace <i>completely replaces Zoom</i> and other applications It is <i>easy to use the embedded hyperlinks to open other applications</i> (Jamboard, Google form, Google Doc) You can enjoy <i>freedom of movement</i>

Table 5. Virtual classroom affordances operating through gradations

	<i>Jamboard</i>	<i>Miro</i>	<i>Kumospace</i>
<b>I had to ...</b> <i>(an artifact demands)</i>	<p><i>Technical affordances:</i> I had to open it/ to understand how it works/ to switch between Zoom and Jamboard/ to have good internet connection/ to quickly navigate between frames/ to learn to use different tools.</p> <p><i>Social affordances:</i> I had to remove unnecessary information brought by other students so that it wouldn't interfere with the task/ to go beyond my comfort zone and apply my knowledge in practice/ to enjoy the ease and interesting aspects of the group work/ to make sure that no one else does the task faster/ not to be distracted.</p> <p><i>Pedagogical affordances:</i> I had to follow the instructions given by the teacher/ to</p>	<p><i>Technical affordances:</i> I had to work with the Miro/ to overload my computer memory storage/ to search for the required material on the Miro, which is convenient for working in groups and without the teacher sharing the screen, but is also very confusing because of its size</p> <p><i>Social affordances :</i> I had to spend some time looking for the specific task/ to communicate with students whom I didn't know well and that affected my work a bit/ to switch between tasks on my own, without the teacher's showing where to go</p> <p><i>Pedagogical affordances:</i> I had to work with other students/ to give answers/ to get down to work and learn new</p>	<p><i>Technical affordances:</i> I had to stay close to the teacher to hear what she is saying/ to leave the separate room to hear what was going on in the hall/ to learn how to refill my cup with coffee and run around Kumospace classroom/ to learn to operate this platform/ to impose a heavy load on my computer memory</p> <p><i>Social affordances:</i> I had to work with other students on our own, far away from the teacher/ to follow the directions given by others/ to around/ to arrange our work in a team</p> <p><i>Pedagogical affordances:</i> I had to study English/ to improve my English language skills/ to speak a lot/ to use translation apps/ to be busy doing something all the time</p>

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 63

	work on the task/ to do tasks properly/ to complete the task and present the answers/ to be creative.	things	
<b>It was necessary to ...</b> <i>(an artifact requests)</i>	<p><i>Technical affordances:</i> It was necessary to have a mouse or the keyboard/ to have stable internet connection/ to have basic computer skills/ to work on the computer, not the phone/ to use sticky notes, text, brush, and eraser and perform functions fast/ to get used to the interface</p> <p><i>Social affordances:</i> It was necessary to quickly remove unnecessary lines or extra information added by another student/ to share visual information</p> <p><i>Pedagogical affordances:</i> It was necessary to have good knowledge of English/ to work in pairs/ to read the text/ to be more attentive in class/ to edit and correct mistakes</p>	<p><i>Technical affordances:</i> It was necessary to navigate the Miro/ to move between pieces of information quite quickly/ to get online and join the session/ to have previous experience of using a similar digital environment</p> <p><i>Social affordances:</i> It was necessary to keep up with the group/ to agree with the group members on the final outcome / to perform tasks together with other students following the teacher's instructions</p> <p><i>Pedagogical affordances:</i> It was necessary to speak in English in order to give the answers/ to know what task to do/ to complete the task by answering questions to the text/ to read a lot / to listen carefully to the teacher's instructions</p>	<p><i>Technical affordances:</i> It was necessary to follow the others moving from one place to another/ to look for some of the tasks in the classroom/ to have access to the Internet/ to move between rooms/ to learn how to “drink coffee” in room 3/ to have a mouse or use keyboard arrows/ to use the keyboard/ to know how to move around/ to learn how to use the Kumospace chat to</p> <p><i>Social affordances:</i> It was necessary to work in pairs, small groups, and individually/ to beg on the same wavelength as the group/ to cooperate with the others/ to manage time to complete the tasks</p> <p><i>Pedagogical affordances:</i> It was necessary to listen to the teacher/ to follow the teacher's directions/ to complete the tasks given/ to practice a lot/ to demonstrate my knowledge of English/ to answer teacher's questions/ to follow the teacher's exact instructions in order to find the material you need/ to work in pairs</p>
<b>I was able to ...</b>	<i>Technical affordances:</i> I was able to add	<i>Technical affordances:</i> I was able to observe	<i>Technical affordances:</i> I was able to move

<p><i>(an artifact allows)</i></p>	<p>comments and pictures/ move and edit elements on the frame/ write text, draw and use different colours/ create a presentation/ take notes and edit the notes of others</p> <p><i>Social affordances:</i> I was able to interact with other students/ to find the necessary information/ share memes and funny emojis/ communicate with other students not only by voice/ share my opinion, reveal my ideas and thoughts/ be better at socializing/ stop being shy/ get involved / multitask</p> <p><i>Pedagogical affordances:</i> I was able to remember the material better/ to brainstorm ideas and create a thematic “board”/ to try harder to complete tasks</p>	<p>what other students are doing in real-time and immediately see the contributions they have made/ to add and edit information the way I liked/ to see the cursors of other participants moving on the Miro / to draw, write notes, add media files and documents/ to work with certain objects together with other students</p> <p><i>Social affordances:</i> I was able to easily control the work flow in our team/ to cooperate with other students/ to exchange lots of beautiful and funny pictures/ to remain anonymous/ to interact with other people/ to share my opinion/ to see the “whole picture” of our work</p> <p><i>Pedagogical affordances:</i> I was able to work hard/ to have everything I need to learn hard / to work in a group without any problems with text communication / to complete tasks easily because the teacher has given clear instructions</p>	<p>around, talk, and write/ to interact with other students in different ways/ to move freely around the virtual room / to sit on the chairs or sofa/ to adjust the volume of the classroom voices/ to draw on the whiteboard/ to turn on music on the player/ to give applause/ to write personal messages to participants and in the general chat</p> <p><i>Social affordances:</i> I was able to work in a team/ to get entertained/ to feel the pleasant atmosphere of working together/ to naturally communicate with others / to do whatever my heart desires/ to “drink coffee” during the breaks and interact with my friends/ to work effectively in pairs/ to show emotions</p> <p><i>Pedagogical affordances:</i> I was able to see the assignment and make notes on it/ to write down the answers and present to the class / to get instant feedback from other students and the teacher/ to practise communication skills/ to check my answers with classmates</p>
<p><b>I liked to ...</b> <i>(an artifact encourages)</i></p>	<p><i>Technical affordances:</i> I liked to use the functionality/ to make use of simplicity and flexibility of the tool/ to use various visualization tools</p>	<p><i>Technical affordances:</i> I liked to use the rich the functionality of the platform/ to use cool visualization tools/ to have instant access to all the materials I need/</p>	<p><i>Technical affordances:</i> I liked to be able to move around/ to do interactive things/ to do various activities/ to interact with everyone and everything around/</p>

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 65

	<p>(pictures, shapes, notes, etc.)/ to save the results of work as a picture or as a PDF file/ to use laser pointer</p> <p><i>Social affordances:</i> I liked to collaborate and present the material with visual aids/ to hear everyone saying what they think/ to work together with other students/ to interact with the teacher and other students</p> <p><i>Pedagogical affordances:</i> I liked to take notes and highlight key ideas/ to work on the task effectively/ to structure my ideas/ to correct mistakes</p>	<p>to have access to a large amount of information that this platform can store/ to enjoy the advantages of convenient, intuitive and easy-to-use interface</p> <p><i>Social affordances:</i> I liked to increase the pace of work within a small group/ to work in cooperation with other students/ to learn how to work in a team/</p> <p><i>Pedagogical affordances:</i> I liked to be able to improve my English language skills/ to practise all language skills, esp. reading and speaking/ to write down the key words on sticky notes/ to revise the material from the previous lessons/ to learn hard/ to work in groups fast and efficiently</p>	<p>to open and close the doors</p> <p><i>Social affordances:</i> I liked to do everyday things, such as pouring coffee/ to feel like you are present in the classroom/ to have freedom of choice/ to close the doors to have confidential conversations/ to enjoy something new and cool</p> <p><i>Pedagogical affordances:</i> I liked to be motivated and not to lose interest/ to stay focused/ to be involved in interesting activities/ to feel like I am in the classroom/ to practise communication skills/ to study in the classroom environment</p>
<p><b>I found it difficult to ... (an artifact discourages)</b></p>	<p><i>Technical affordances:</i> I found it difficult to understand how it works/ to write with a highlighter/ to keep up with the changes on the frame</p> <p><i>Social affordances:</i> I found it difficult to be on time/ work with other students at the same pace/</p> <p><i>Pedagogical affordances:</i> I found it difficult to understand the task/ to remember the rule/ to find the</p>	<p><i>Technical affordances:</i> I found it difficult to understand which student controls which cursor/ to search for the material on a large-scale board/ to find my way around the board at the beginning of the lesson</p> <p><i>Social affordances:</i> I found it difficult to get down to group work with others right away</p> <p><i>Pedagogical affordances:</i> I found it difficult to understand</p>	<p><i>Technical affordances:</i> I found it difficult to get quickly used to the navigation options / to find some locations/ to find what was previously written on the Kumospace endless whiteboard/ to hear the teacher when the door is closed/ to get started working on a new unusual platform</p> <p><i>Social affordances:</i> I found it difficult to overcome temptation to nudge the classmates/ to be lazy and do nothing</p>

VIRTUAL CLASSROOM AFFORDANCES OF STUDENT-STUDENT  
INTERACTION IN THE ONLINE LANGUAGE COURSE 66

	material to complete the task	how to do some of the tasks	<i>Pedagogical affordances:</i> I found it difficult not to get distracted/ to keep notes well structured
<b>I was not able to ....</b> ( <i>an artifact refuses</i> ).	<p><i>Technical affordances:</i> I was not able to copy a part of a picture to insert it into a gap in a sentence/ to direct other students to the material at an exact spot on the frame</p> <p><i>Social affordances:</i> I was not able to stop another student from interrupting me/ to react quickly/ to ask for help</p> <p><i>Pedagogical affordances:</i> I was not able to develop reading skills/ to improve knowledge of grammar</p>	<p><i>Technical affordances:</i> I was not able to download and save images, e.g. those that illustrate the grammar rules, for further reference/ to turn pages of the file attached on the board although other students did it</p> <p><i>Social affordances:</i> I was not able to stop thinking about the origin and manufacturers of the app.</p> <p><i>Pedagogical affordances:</i> I was not able to switch off and do nothing</p>	<p><i>Technical affordances:</i> I was not able to move immediately to the other room/ to contact the teacher from another room/ to write individual messages in the chat/ to get used to the platform right away</p> <p><i>Social affordances:</i> I was not able to overcome temptation to press the applause button/ not to listen to the others/ to keep up with the fast speed of communication</p> <p><i>Pedagogical affordances:</i> I was not able to do without teacher's guidance/ to get used to a quick pace of the lesson</p>

**Appendix D. Graphs to illustrate the intervention results (Jamboard/ Miro/ Kumospace)**

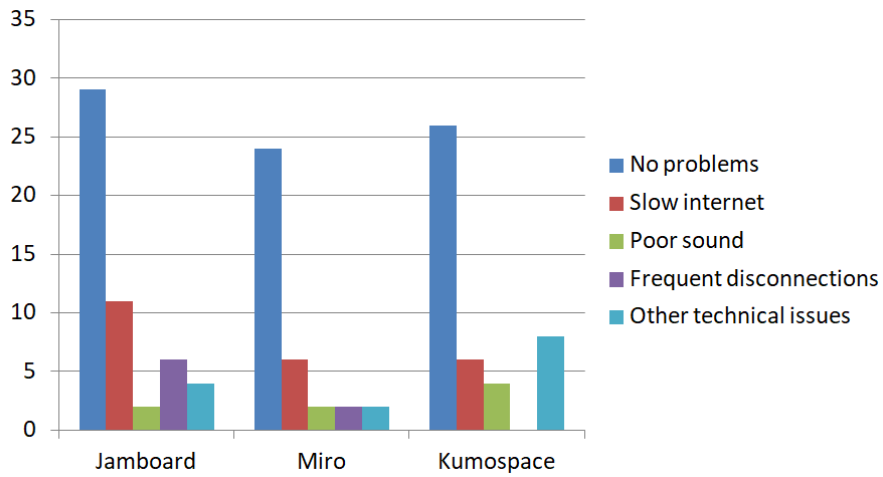


Fig. 12 Problems with joining the online lesson and participating.

**Do you have experience in using Jamboard/ Miro/ Kumospace?**

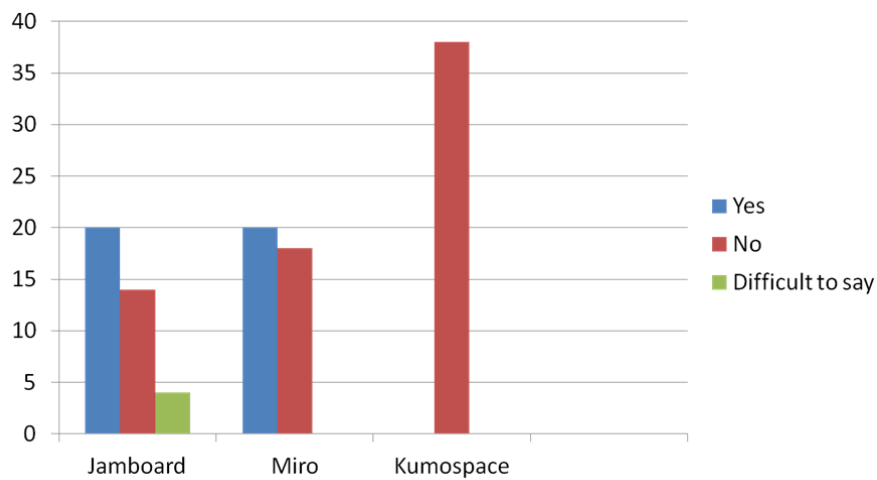


Fig. 13 Students' experience in using Jamboard/Miro/ Kumospace.

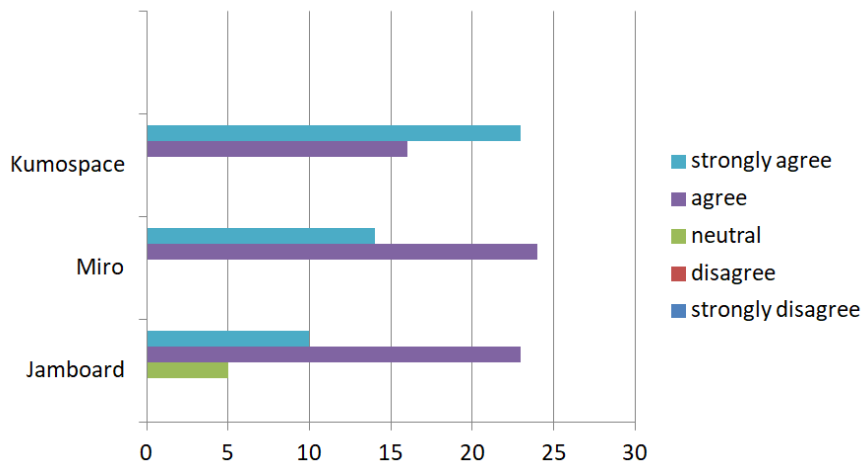
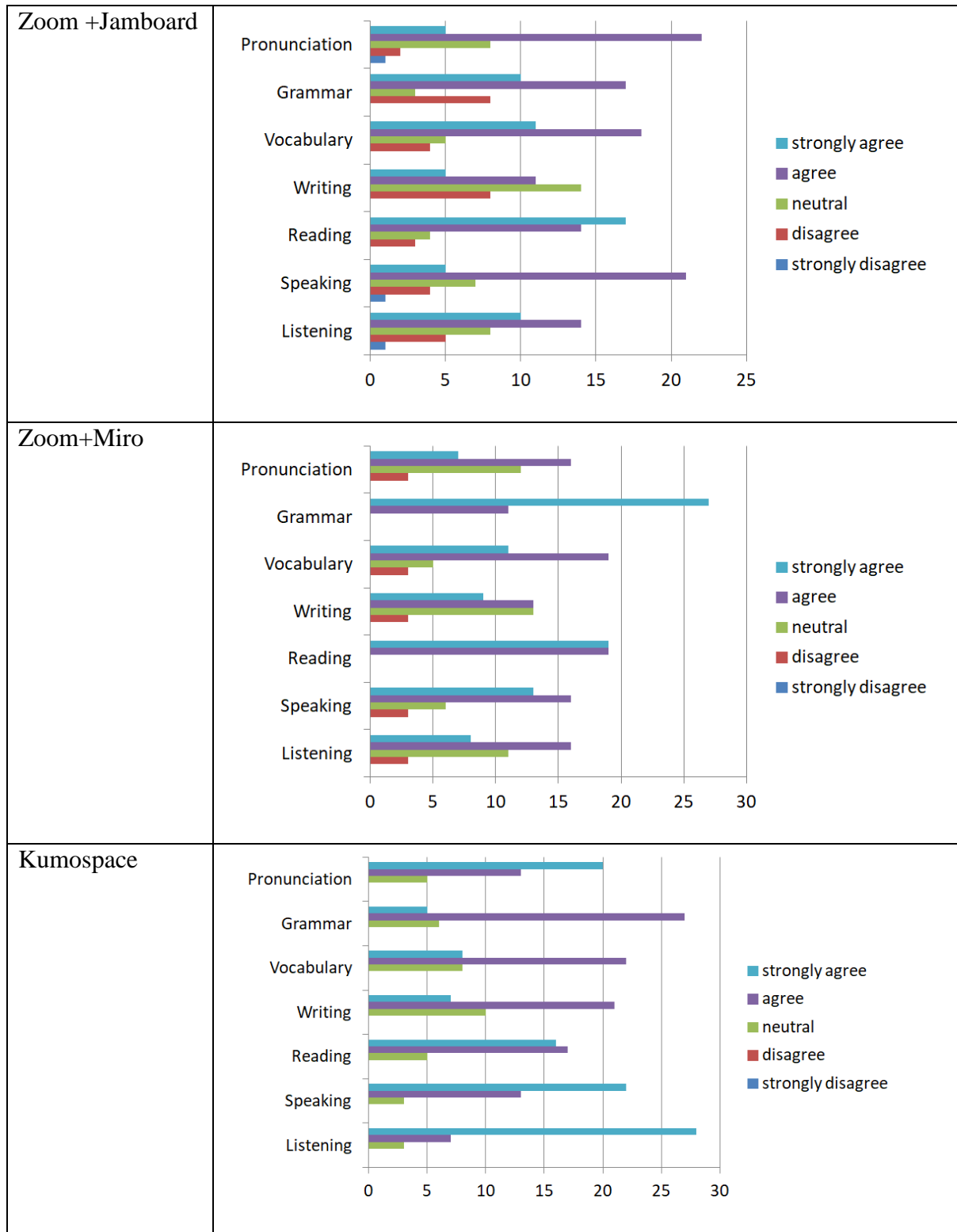


Fig. 14. Using Jamboard/ Miro/ Kumospace makes student-student interaction more engaging

Table 1. Development of language skills in the virtual classroom.



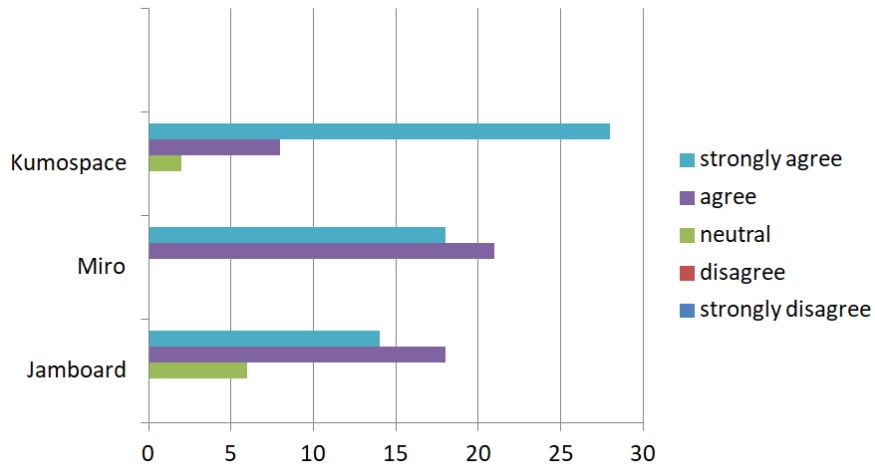


Fig 15. Students' perception of increased amount of interaction in the virtual classrooms.

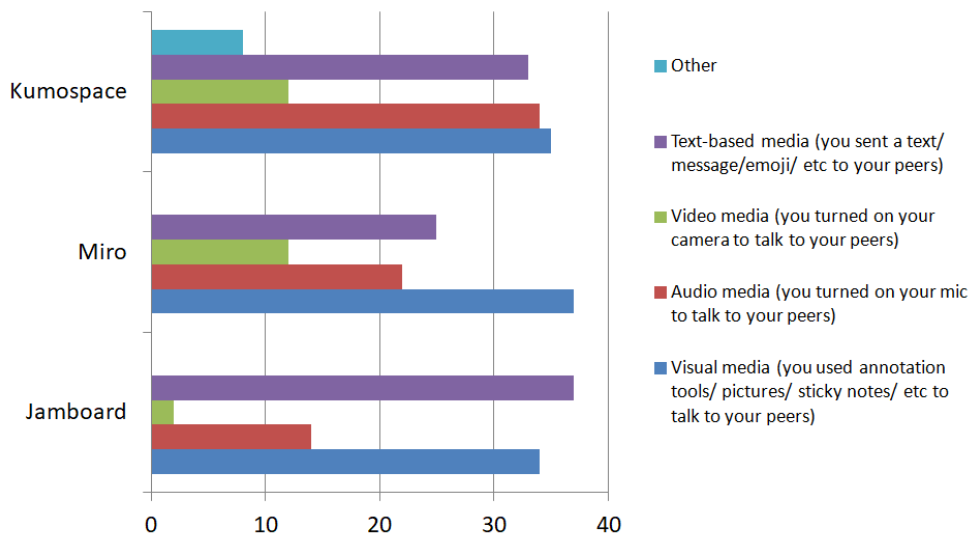


Fig. 16 Technological affordance of Modality

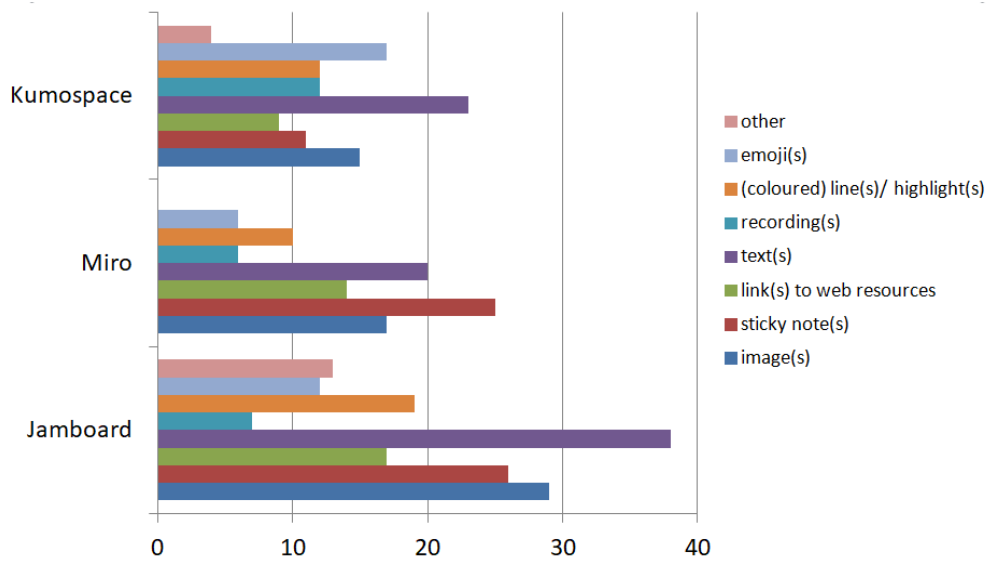
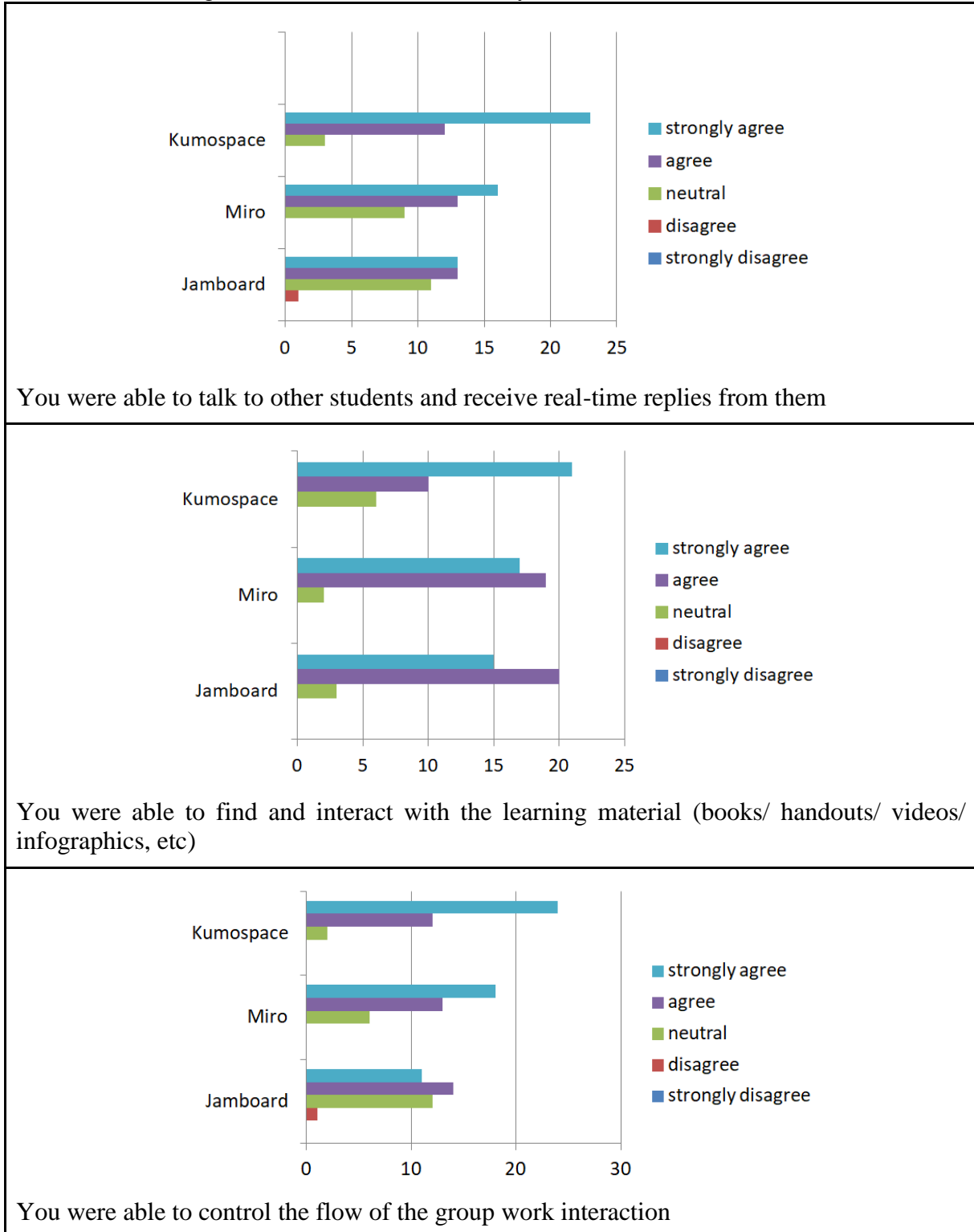


Fig.17 Technological affordance of Agency.

Table 2. Technological affordance of Interactivity



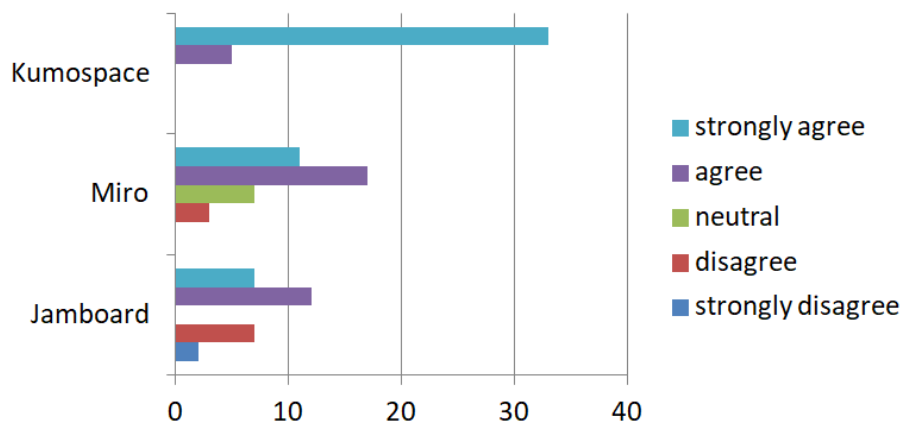
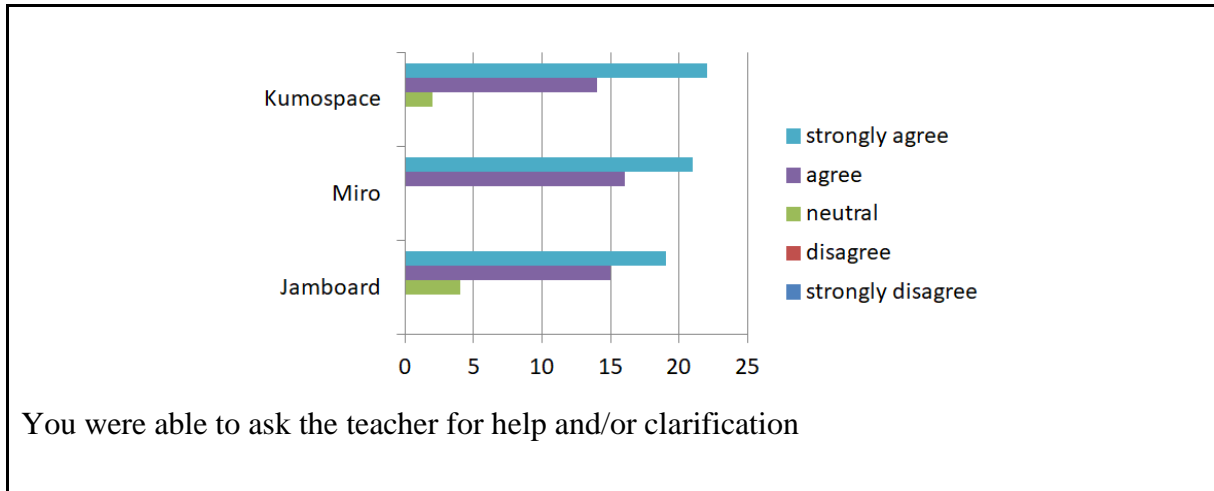


Fig. 18 Navigability of virtual classroom environments.

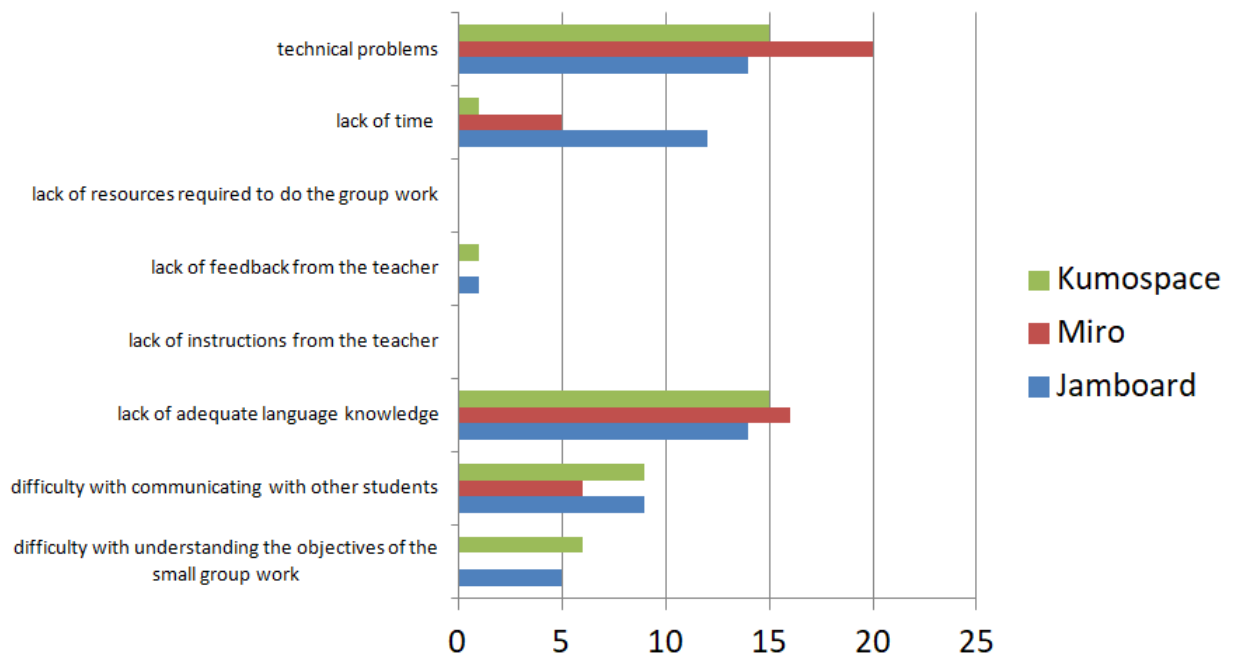
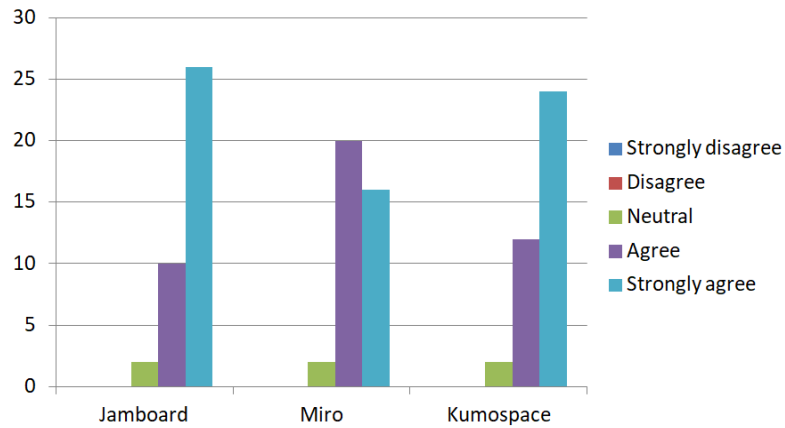
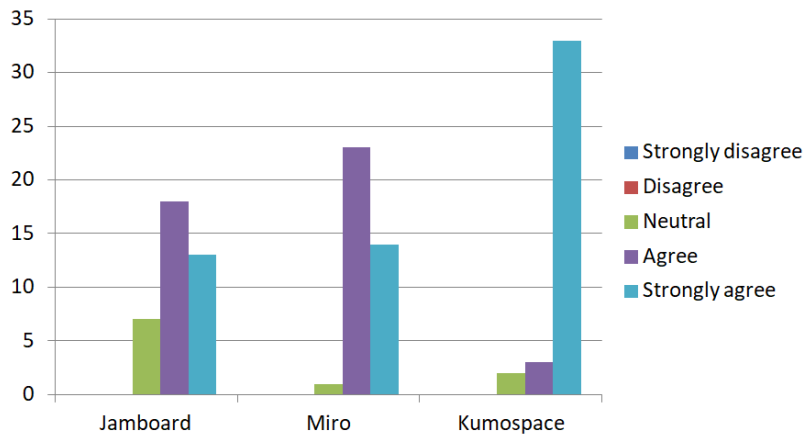


Fig. 19 Issues encountered during the student-student interaction

### teacher-student interaction



### student-student interaction



### interaction with learning material

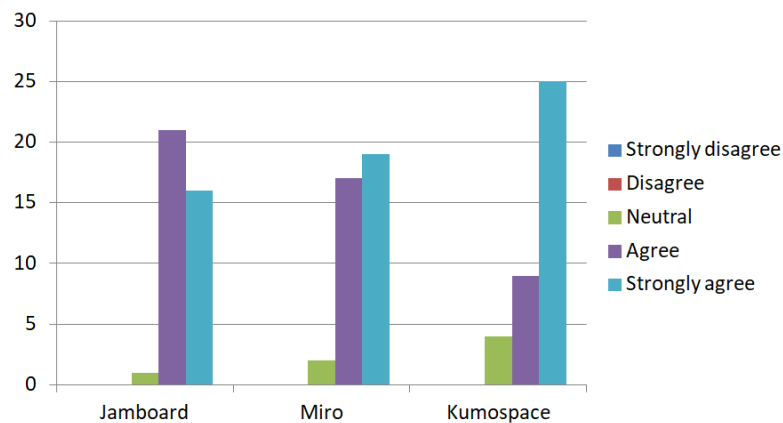


Fig. 20 Interactions in the digital environments

Kumospace in comparison to

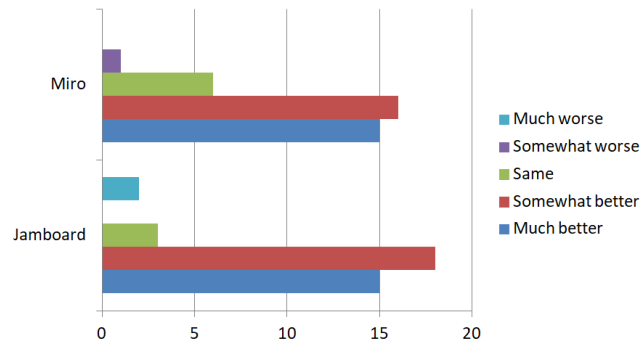


Fig. 21 Comparison of Kumospace with other virtual classroom environments

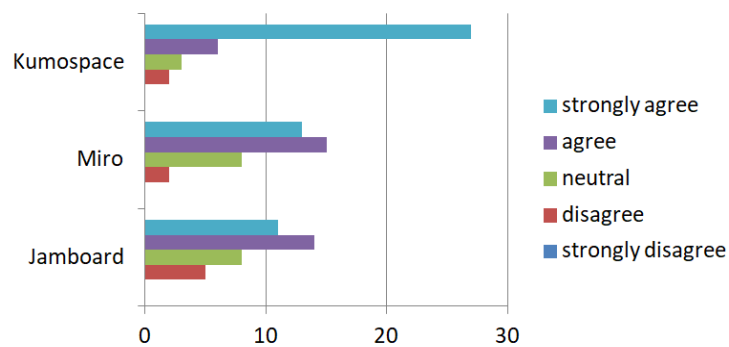


Fig. 22 Which technology makes virtual classroom similar to face-to-face classroom?

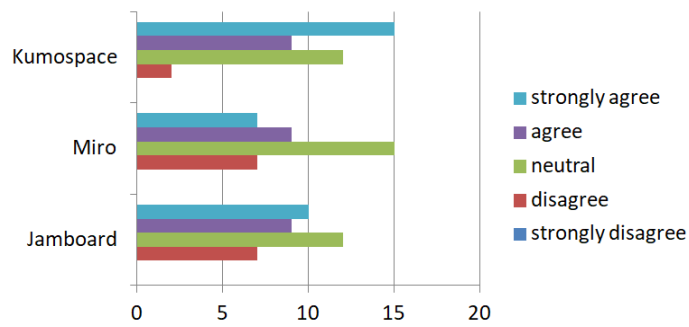


Fig. 23 Which technology is best for online small group interaction?

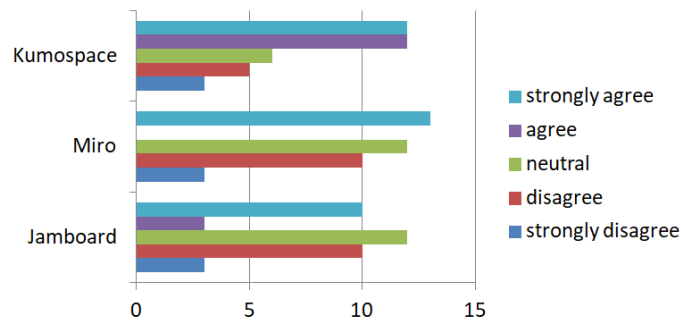


Fig. 24 Which platform is interesting to use after the English language classes?

Appendix E. Outcomes of the research

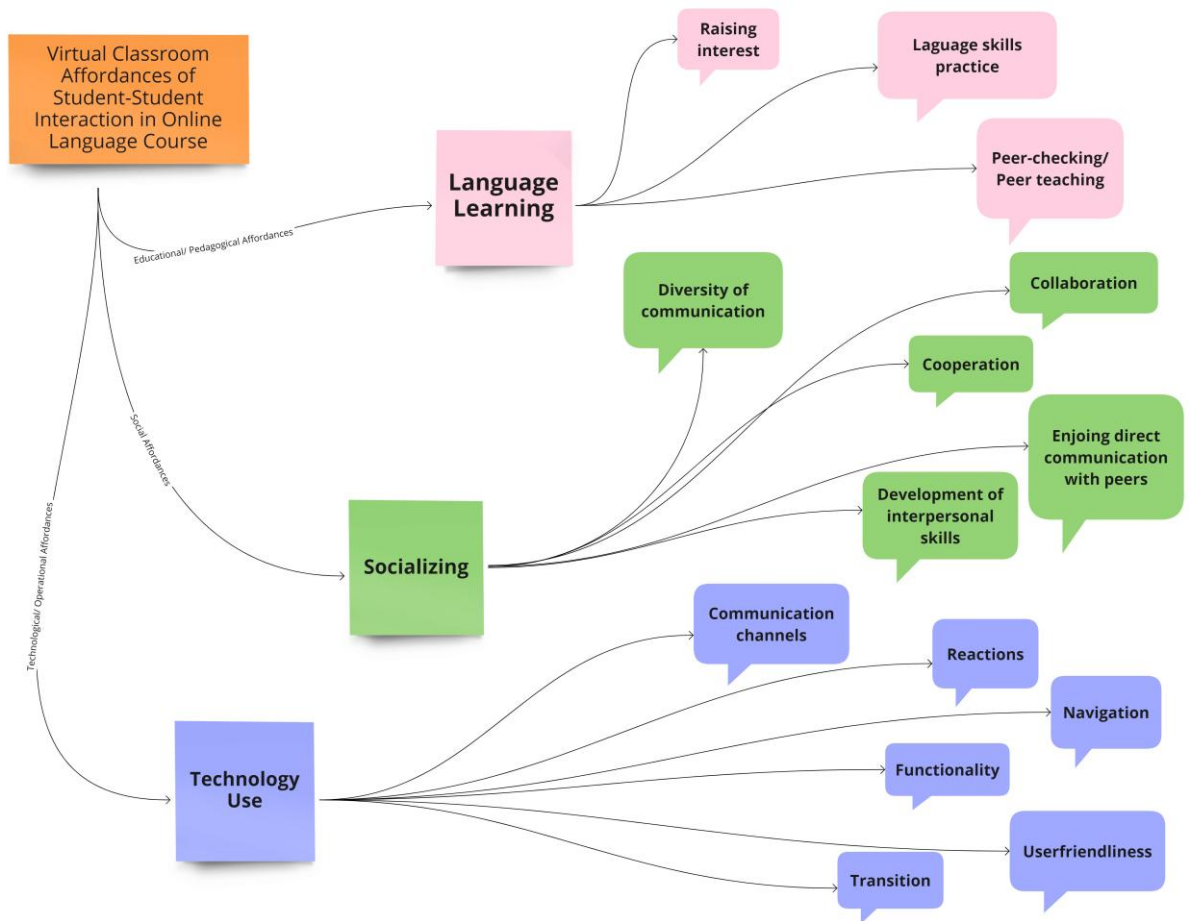


Fig. 25 Mind map of themes and subthemes

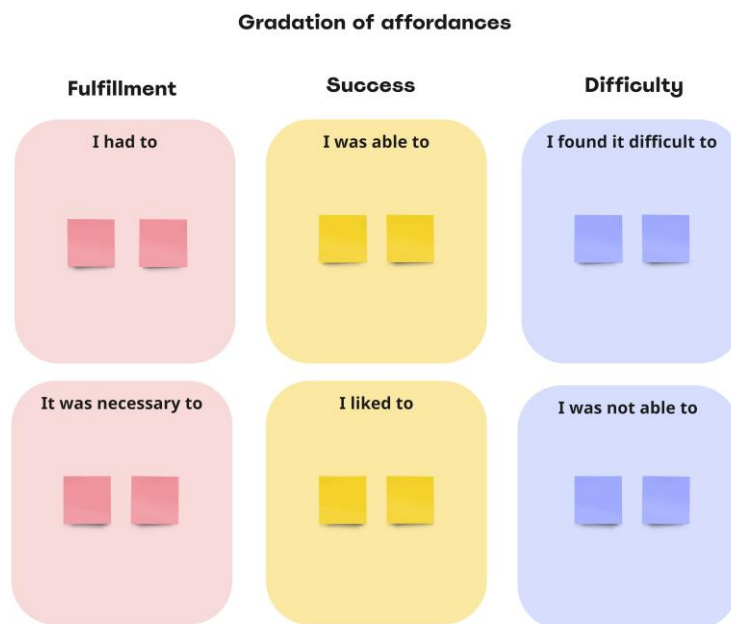


Fig. 26. Gradation of affordances of a virtual classroom

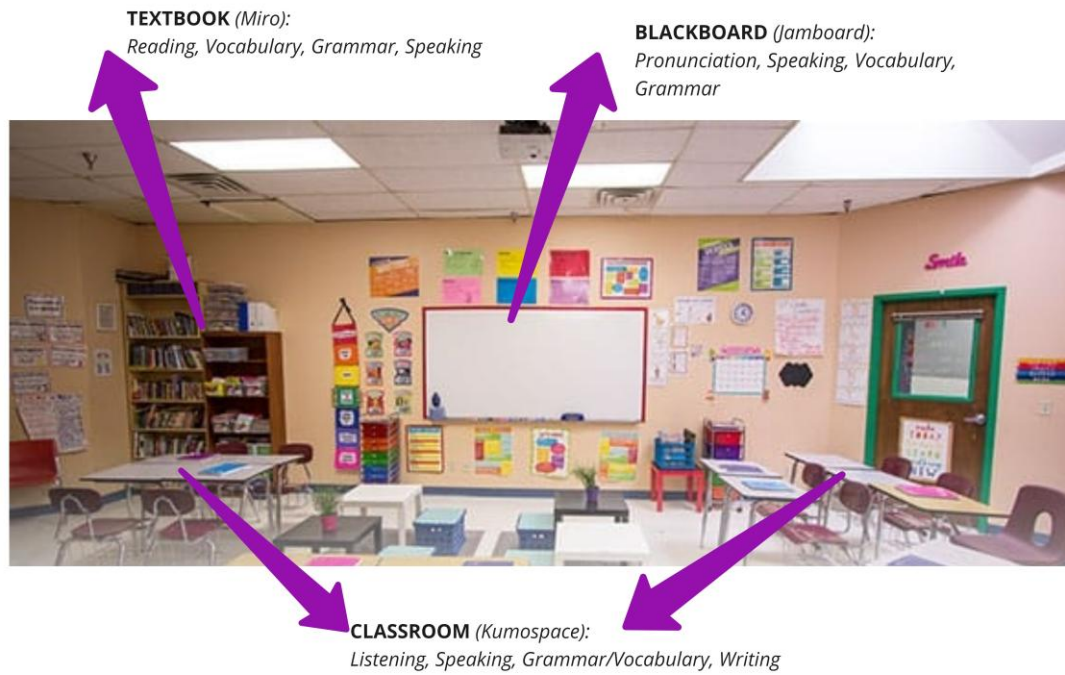


Fig. 27 Components of the virtual classroom

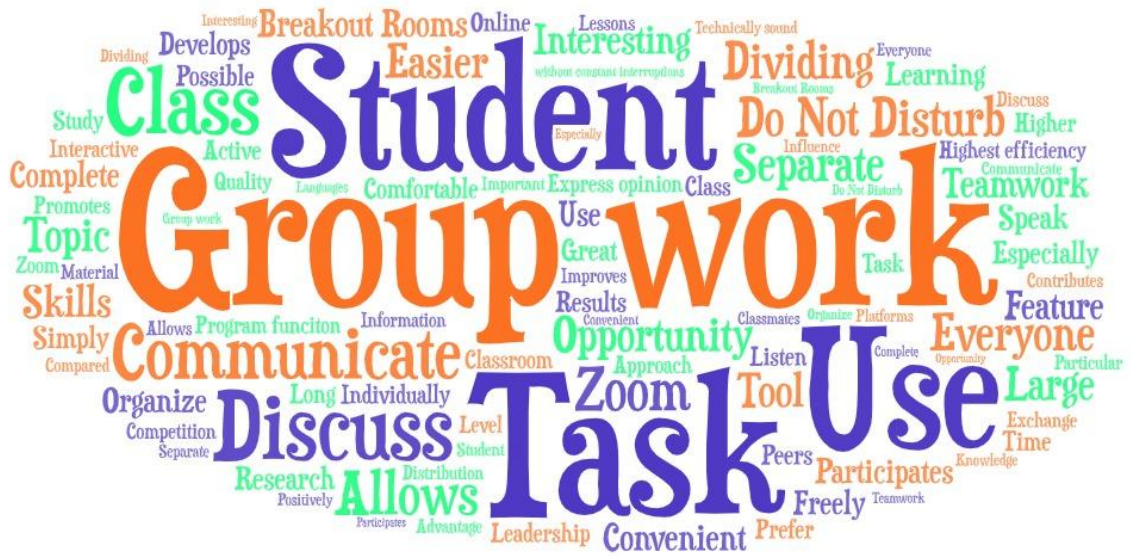


Fig. 28 Benefits of breakout rooms

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