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# Editorial

The Editorial Board of International Journal of Research in E-learning (IJREL) is privileged to present a new volume 9(1) 2023. The content of the current issue was divided into three sections. The first is devoted to Research on Distance, Online and Blended Learning in Particular in the COVID-19 Time. The second contains articles concerned with Innovative Methods and Technology in Education. The third concerns Theoretical, Methodological and Practical Aspects and Psychological Determinants of ICT and E-Learning in Education.

The first part of the volume Chapter I: "Research on Distance, Online and Blended Learning in Particular in the Pandemic Time of COVID-19", contains four articles.

Anna Ślósarz from Poland elaborated on article titled "Together or not? The Effects of Individual and Group Work of the Faculty of Philology Students During E-learning Online". The paper put to test a widespread belief that by working in groups distance education students achieve cognitive goals of learning, and develop their social competencies and skills. The subject of the study was the achievements of 655 bachelor and master degree students enrolled in 22 on-campus and blended learning units offered within 2 university courses, full-time and part-time, during and after the COVID-19 pandemic, i.e. in the academic years 2020/2021 and 2021/2022. An instrumental case study was carried out: the grades students obtained for individual work were compared with grades obtained for work done in pairs and groups of threes within the same courses. It was found that a statistically significant difference did not exist. But conclusion includes several additionally interesting research results.

The second article prepared by Agata Popławska, Olena Bocharova, Beata Sufa titled „Challenges Related to the Postulates of Students Towards Education in Post-Pandemic Times". The aim of the research was to learn about the expectations of students towards their own development and education, as well as to determine what their postulates are regarding formal education in post-pandemic times. Extensive empirical material was obtained from 100 people (women) studying at the Pedagogical University of Krakow. Formal and content categories were distinguished, which were arranged in four areas, taking into account the postulates of the surveyed students related to: (1) organisation and course of education, (2) use

of information and communication technology (ICT) in education, (3) fulfilment of students' needs, (4) personal and professional development. The selected areas form a complementary whole in which students' expectations relate to important spheres of functioning of an individual, that is intellectual, psychosocial and physical. The students participating in the survey expect that after the pandemic they will still be able to use experience and skills gained during the remote learning, they want the university to provide a secure physical and social space.

The third article „A Practical Test of Distance Learning During the COVID-19 Lockdown" was prepared by Karol Hęclik, Lucjan Dobrowolski, Marcin Jaromin, Iwona Zarzyka. The article describes the experience of the authors of distance learning at Rzeszow University of Technology during COVID-19 lockdown. The problems associated with the didactic in the pandemic period were discussed. They concerned hardware, software, and teaching rooms. Technical and organisational issues were discussed. The aspect of student involvement in the distance learning process and the learning outcomes achieved by the students was also addressed. Finally, the conclusions that emerged from this stage of work with students were presented, as well as suggestions related to the improvement of the distance learning process for the future.

International team of authors Agnieszka Zofia Gadomska and Dorota Pietrzyk from Poland and Iris Drower from the USA, presented the sudy „Teacher Training and Learners with Special Needs in the U.S. and Poland- the COVID-19 Experience" in which they look at teacher qualifications necessary to provide ICT based education for learners, particularly for learners with special needs (from the American and Polish viewpoint). The Authors analyze the context of preservice teacher training in the COVID-19 conditioned environment with the particular focus of teachers of English as a Foreign Language (who wish to obtain teacher qualifications to teach in Polish public schools).

Chapter II Innovative Methods and Technology in Education consists of two texts.

Lisa-Marie Langesee, Nelli Ukhova, Authors from Germany prepared the article „E-Tutor Tandems in a COIL Course – Design, Implementation and Evaluation", which focuses on the perspective of e-tutors – specially qualified student assistants – and their competence development during the summer semester of 2022. Based on previous research findings, a tandem setting was chosen for their competence development. This paper mainly compares expectations and experiences regarding the competence improvement of e-tutors in a multinational tandem. Several recommendations for action based on conducted research were derived, which impact further e-tutor training.

The article "Adaptive and Intelligent MOOCs: How They Contribute to Improvement of the MOOCs' Effectiveness", was prepared by Alexandros Papadimitriou, Greece. The main objective of this article is to examine numerous studies and research providing adaptive and inteligent MOOCs to address issues, such as

dropout rate, for improving their efficiency compared to conventional MOOCs. Important issues that have been the essential study interests of MOOC scholars in recent years, including dropout rate, completion rate, loneliness, and other topics, were studied. Finally, the research question posed on the effectiveness of Adaptive and Intelligent MOOCs, the learner's characteristics used for adaptation, the adaptive and intelligent methods and techniques used, and the improvements they bring to traditional MOOCs as a compass for designing Adaptive and Intelligent MOOCs in the coming years, are discussed.

Chapter III titled „Theoretical, Methodological and Practical Aspects and Psychological Determinants of ICT and E-Learning in Education" includes one article.

The article prepared by international team of authors Iwona Mokwa-Tarnowska, Poland, Viviana Tarnowska, Great Britain, Magdalena Roszak, Poland was devoted to The Appeal of Gamification for Master's Students of Science and Technology. The authors stressed that a gamified language course for specific purposes can become a highly motivating environment, in which young people develop their creativity, language proficiency and knowledge of technological advances not only in the fields of their interest; they are also exposed to new learning practices due to the application of game-design elements. The ideas presented above will be supported by students' opinions and attitudes expressed during a pilot Moodle course in a gamified format conducted at Gdansk University of Technology in the summer semester of 2021/2022.

We hope that studies and solutions in the present IJREL volume will be inspiring and encourage reflection on how to manage the increasing demand for online education in the current situation.

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# Together or not? The Effects of Individual and Group Work of the Faculty of Philology Students During E-learning Online

## Abstract

This article tested a widespread belief that by working in groups distance education students achieve cognitive goals of learning, and develop their social competencies and skills. The subject of the study was the achievements of 655 bachelor and master degree students enrolled in 22 on-campus and blended learning units offered within 2 university courses, full-time and part-time, during and after the COVID-19 pandemic, i.e. in the academic years 2020/2021 and 2021/2022. An instrumental case study was carried out: the grades students obtained for individual work were compared with grades obtained for work done in pairs and groups of threes within the same courses. It was found that a statistically significant difference did not exist. But the highest grades (on average 83.81) were obtained by students who had worked individually, and the lowest (81.64%) by those who had worked in groups of three. The highest grades were obtained by the final-year students. They showed an understanding of the assessment criteria and the ability to follow such. Also, they wanted to pass on the first attempt in order to have time to prepare for the final examination. International students were reluctant to work in groups. They focused on achieving good grades and preparing for the thesis due to the time limits of student visas and the unrest caused by the war in Ukraine. First-year students who had no experience in adhering to the assessment criteria and problems with communicating due to isolation caused by the pandemic obtained the lowest grades.

K e y w o r d s: assignment, assessment, MOODLE, risk, colleagues

## Models of Student's Remote Work

Expansion of the Internet has redesigned human interaction. University education has also been increasingly moving away from a one-way transmission of knowledge. Developing a variety of skills and social competencies has become equally important as gaining knowledge.

However, during the COVID-19 pandemic students cooperated remotely less and did not spontaneously form small working groups. It can be argued that such learning groups *could increase students' ability to transfer their learning to new contexts* (Ellis, & Han, 2021, p. 511). Collaborative learning triggers *promoting higher-order thinking and problem-solving, enhancing students' motivation and engagement in learning, as well as achieving better academic outcomes* (Ellis, & Han, 2021, p. 511).

Responsible cooperation assisted students in avoiding mistakes, assigning tasks, saving time and effort, and obtaining higher marks. At the same time, it was observed that the majority of the most diligent students, including international students, chose to learn individually. They were found to avoid collaboration with less committed colleagues.

The final year's students were most committed. During short interviews it was found that they had wanted to be successful on the first attempt to avoid problems associated with postponing the final examination's date. In contrast, observation showed that some baccalaureate students joined study groups in order to reduce effort, get support, and transfer responsibility. That was most likely due to problems they had with verbal and non-verbal communication and working in groups secondary to the COVID-19 pandemic isolation. Moreover, they lacked skills in following assessment criteria.

## General Background of Research

According to the assumptions of connectivism, group work results in both: the effective transfer of knowledge and the formation of skills and social competencies (Siemens, 2004; Siemens, 2005; Chatti et al., 2010; Duke et al., 2013). Bo Chang and Haijun Kang also emphasize that online group may optimize learning experience (Chang, & Kang, 2016).

Students learn from each other by sharing knowledge, observing the way other students learn, adapting effective learning styles, allocating tasks, providing advice, and gaining support. Contemporary employers consider collaborative teamwork skills as one of the most important skills of an employee. Natalia Hatalska rightly

noticed that openness to people outside the circle of our closest friends can change our point of view, influence our way of thinking, discover the unknown and give access to the diversity of the world (2021, p. 25). Cooperation has become a way to organize freelancers, small and large companies, and even corporations such as Microsoft, Apple, Samsung, Electronics, Facebook, or IBM (Hatalska, n.d.). However, some authors emphasize that students prefer to work independently (Bernier, & Stenstrom, 2016, p. 1).

Marking assignments in an e-learning course requires the tutor to create a learning community, and provide appropriate learning conditions and clear assessment criteria. E-assessment „requires the development of a learning environment that provides opportunities for teams and individuals to engage in meaningful, measurable collaborative processes" (Gibson, Irving, & Seifert, 2019, p. 246). Marks can be subjective. Therefore, at Qassim University „[a]n e-assessment committee was established for the first time consisting of thirteen members" (Elzainy, Sadik, & Abdulmonem, 2020).

Some authors suggest that the mark should include the results of both – group and individual work (Fernandes, Caetano, 2020). That is because students benefit from group work by „mutual inspiration, crowdsourcing, problem learning, peer learning" (Gurba, 2021, p. 1), sharing workloads, learning from others and from discussion (Wendell, 2022), better self-esteem, interpersonal interaction and social support (Serrano, & Pons, 2014).

However, the contemporary anthropology of Homo Technologicus, Communicans and Educandus (De Martino et al., 2022, p. 138) mandates consideration of additional prospects. Contemporary interdisciplinary research, so called social networking pedagogy, identifies interactions in social networks, possibility of learning, and collaboration in the context of maintaining the individual identity of learners. According to De Martino et al. [s]*haring one's knowledge, information and opinions through social networks call the individual to responsibility for one's social self* (2022, p. 138). Sharing knowledge becomes a very important process shaping identity of an individual and communities.

Nonetheless, 30% of the surveyed students preferred working individually. It could have been due to mediated communication problems, and in the students' opinion unfair–grade allocation resulting from remote group collaboration. Additionally those students, active users of Microsoft Teams, probably perceived communicating on the Web not as a possibility for cooperation or education, but as a tool controlled by the corporations to make users the passive customers and consumers of Websites' content. That is because contemporary communication technologies form *corporeal and mental type that modify the practices and contexts through which human beings shape themselves and build their knowledge* (Seery, 2010, p. 66).

# Methodology

## Aim of the Study

This study aimed to compare the grades obtained by students completing tasks for the unit (course) individually with those obtained by students working in pairs or groups of three to see if cooperation resulted in better grades.

## Hypothesis

The following hypothesis was formulated: *students working individually receive higher grades than those working in pairs or groups of three*.

## Instruments and Procedures

An exploratory, *ex post facto,* search of the MOODLE platform resources was performed. The purpose of the research was to analyze student's marks and attempt to establish the factors that led to receiving given marks. The instrumental, collective case study method was used (Stake, 2005; Creswell, 2012, p. 465–466), which allowed to place the cases within a larger social context, understand the problem better, and make comparisons, which provide better *insight into an issue* (Creswell, 2012, p. 465). Exploratory, descriptive research was conducted. The inductive and deductive stages of qualitative methods were used for data analysis (Patton, 2002; Stake, 2005). For triangulation, the results of the quantitative and qualitative research were compared. Data were entered into an Excel spreadsheet. Features of the Excel program were used to calculate the average grade for each unit of students studying: individually, in pairs, and in groups of three. In addition, Pearson's Chi^2 coefficient and the Kruskal-Wallis index of differentiation were calculated.

## Data Analysis

Results of quantitative research are commented in the context of qualitative research in an attempt to identify trends, variables, as well as similarities, and differences. The qualitative analysis included analysis of individual student and the groups characteristics, and comparing them with results obtained for other groups. The results and conclusions were compared with those published by other researchers.

Calculations were performed using Statistica 13.3 (TIBCO, Palo Alto, CA, USA). The value of the coefficient $p<0.05$ was considered statistically significant.

## Research Material

The research material consisted of grades obtained by students for assignments in 22 units, offered at the Institute of Polish Philology at the Pedagogical University in Cracow in the 2020/2021 and 2021/2022 academic years. Units were delivered via the MOODLE online platform in a synchronous and asynchronous mode i.e. study materials were made available for students at the beginning of the semester thus allowing students to study at the most convenient times. Additionally, students were able to meet the lecturer during scheduled online sessions. Face-to-face meetings were also scheduled for students enrolled in b-learning courses, delivered on-campus.

For each unit, students were required to do an assignment. These included:

1. Stationary or remote presentation of the selected reading accompanied by a PowerPoint presentation, or:
2. Participating in online discussion forum on a topic chosen by the student and related to the subject of the unit. Each post was to be based on a research article or a book chapter.

It was required to respect copyrights law i.e. provide references (names of the authors of articles, illustrations, films, and the numbers of the pages cited). Assessed were: substantive correctness of the content of presentations (maximum 40% of the mark), the composition of the overall presentation, the content of individual slides, use of language, the functionality of the film / graphics, editorial quality, and the adequacy and technical correctness of hyperlinks (10% of the score for meeting each of these criteria). During stationary classes, students discussed the issues of their presentations with the whole group. In case of remote classes, they commented on the forum presentations or their colleagues' posts.

It was students who decided whether they preferred to work individually, in pairs or in group of three.

They were given guidance, examples and evaluation criteria, but their work was not monitored. Therefore collaboration and cooperation (Ellis, & Han, 2021, p. 510) were not separately analyzed in this study but grades for works prepared: individually, in pairs and in groups of three. The conversations held with students revealed that some of them met in person and collaborated face-to-face. However, the majority communicated online.

For the purpose of this research, units were selected in such a way as to provide as much information as possible: delivered as part of bachelor's or masters' degree courses, during the pandemic and post-pandemic, lectures, tutorials, and laboratories, containing on-campus and off- campus components, or fully remote. Table 1 presents units analyzed in this study.

Table 1.
*Analysed units. R – remote, OC – on campus*

| Unit | Class, level | Year | Number. of participants |
|---|---|---|---|
| **Field of study: *Cultural Studies and Media Knowledge*** | | | |
| *Basics of Theory of the Culture* | Lectures R, tutorials OC and R, bachelor's level | First year, 2021/2022, off campus | 25 |
| | | First year, 2020/2021 | 66 |
| *Contemporary Media Systems* | Lectures R, tutorials OC and R, bachelor's level | First year, 2021/2022 | 76 |
| | | First year, 2021/2022, off campus | 22 |
| *Basics of Social Communication* | Tutorials R, bachelor's level | Second year, 2020/2021, off campus | 11 |
| | | Second year, 2020/2021 | 44 |
| *Internet and New Media* | Lectures R, tutorials OC and R, bachelor's level | Second year, 2021/2022 | 58 |
| | | Second year, 2020/2021, off campus | 11 |
| | | Second year, 2020/2021 | 44 |
| *Media in the Society* | Tutorials OC and R, bachelor's level | Second year, 2021/2022 | 57 |
| | | Second year, 2020/2021, off campus | 11 |
| *Literary Film Adaptations* | Tutorials OC and R, bachelor's level | Second year, 2020/2021, off campus | 14 |
| | | Second year, 2021/2022 | 38 |
| *Literature and the Social Media* | Tutorials OC and R, bachelor's level | Third year, 2021/2022 | 38 |
| | | Third year, 2021/2022, off campus | 14 |
| *Social Communication in Cultural Perspective* | Lectures R, tutorials OC and R, master's level | Fourth year, 2020/2021 | 14 |
| *Media Systems and Media Ecology* | Lectures R, master's level | Fifth year, 2020/2021 | 17 |
| | | Fifth year, 2020/2022 | 13 |
| *Literature and the New Media* | Lecture R, master's level | Fifth year, 2021/2022 | 13 |
| **Field of study: *Polish Philology*** | | | |
| *Multimedia in Social Communication* | Laboratory R, bachelor's level | Second year, 2020/2021 | 13 |
| *Literary Film Adaptations* | Tutorials R, bachelor's level | Third year, 2020/2021 | 30 |
| | | Third year, 2021/2022 | 26 |
| **Total** | | | **655** |

The lecturer communicated with the students on the online forum, via the BigBlueButton application, and in the academic year 2021/2022 face-to-face during on-campus tutorials. The lectures were delivered fully online.

## Results of Research

### Assessments of Students Working Individually, in Pairs and in Groups of Three

30% of students completed the tasks individually, 60% in pairs, and 10% in groups of three. The proportions are shown in the *Figure 1*.

The Kruskal-Wallis' test showed that there were no statistically significant differences between grades obtained by students working alone, in pairs or in a group of threes (p=0.2341). However, slightly higher grades obtained students who had worked individually: average 83.82%, median 85.50%; an average achieved for work completed in pairs was 82.42% and median 83.00%; results obtained by students who studied in groups of three were: average 81.64%, median 83.00%. On the other hand, in case of large groups (consisting of 76, 66, 58, 57, and 38 stationary full-time students, and 16 and 15 part-time students) work prepared collectively attracted higher marks.

Details are presented in Table 2.

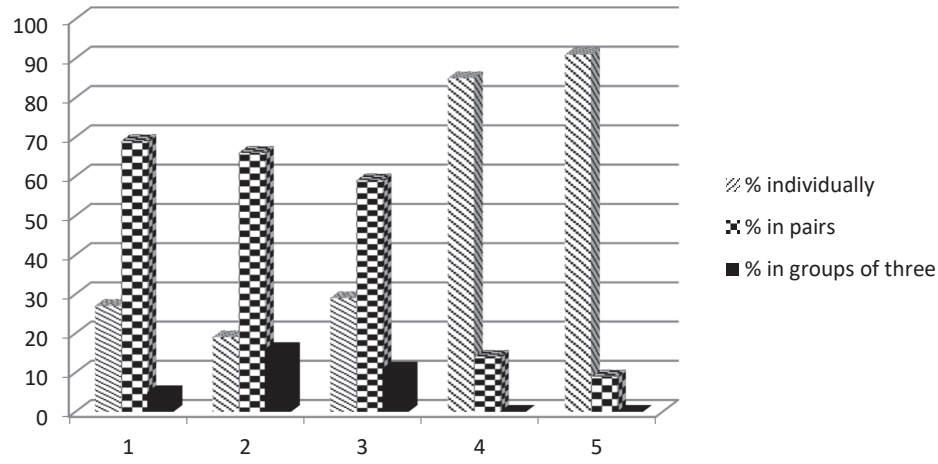


*Figure 1.* Numbers of the surveyed students studying individually, in pairs and in groups of three. 1, 2, 3 – the first, second and the third year of bachelor's degree course. 4, 5 – the first and the second year of master's degree course

Table 2.
*Distribution of grades obtained by 180 students*

| Way of studying | N of students | Average | Median | Minimum | Maximum | Standard Deviation |
|---|---|---|---|---|---|---|
| Individually | 180 | 83.81 | 85.50 | 70 | 100 | 10.86 |
| In pairs | 409 | 82.43 | 83.00 | 0 | 100 | 11.56 |
| In groups of three | 66 | 81.64 | 83.00 | 70 | 99 | 9.58 |

Table 2 suggests that independent studying is more effective and less risky (SD=10.86714) than studying in pairs (SD=11.55655). It is not surprising that the most ambitious students preferred to study individually. This is true about each studied group as in each group some students chose to work independently.

It needs to be observed that standard deviation for students working in pairs was slightly higher than in the case of students working individually also for other reasons i.e. one pair of the students failed to complete the task.

None of the students working in groups of three obtained the highest grade (100%) or the lowest grade (0%) which impacted the smallest value of standard deviation obtained for this group. In addition, a very small number of students studied in groups of three. These were all stationary students studying after peak of the pandemic i.e. in 2022.

The number of students working individually, in pairs, and in groups of three (180, 409, and 66 respectively) is not comparable. This is mainly due to the fact that the number of the first and the second year students was the highest and they preferred to study in pairs and group of threes. On the other hand, the most experienced students, i.e. 4$^{th}$ and 5$^{th}$ year's students, preferred to study individually and were not found to study in group of threes. They valued the option of editing their individual posts on the forum. They preferred individual work to presenting a reading to size an opportunity to define and present their identity and individuality.

Due to the numerous and varied factors influencing student's choice of the way of studying, as well as different fields of study, time of the pandemic, and after the pandemic, it was concluded that a more detailed statistical analysis comparing grades obtained for work completed individually, in pairs, and in the group of threes would be unreliable.

## Results Obtained by Students at Different Years

The Kruskal-Wallis' test of the grades obtained by students enrolled in a particular year of study was repeated three times. Firstly, the grades obtained by students working individually were subjected to this test, then the grades obtained

for work completed in pairs, and finally the grades obtained for work performed in groups of three. In each case the result was $p<0.001<0.05$, which means statistically significant differences in the grades obtained by students in a particular year of a course. A more detailed analysis of the results is presented below.

**Individual work.**

The median of 70% was calculated for the first year students indicating that first year students obtained the lowest median grade. The highest median grade of. 94% was obtained by final years students i.e. students in 4th and 5th year. The number of points awarded for individual work is presented in *Figure 2*.

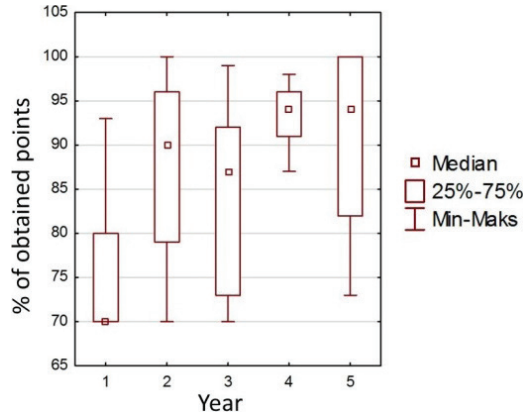


*Figure 2.* Points obtained for individual work by students in different years

**Work in pairs.**

For this method of work, the Kruskal-Wallis' index of differentiation of the number of points obtained was $p<0.001<0.05$ indicating significant differences. The 4th year was excluded from the analysis because only two students worked in a pair. Therefore, the group was too small to be statistically analyzed.

True, there were no significant differences in the grades obtained only between 2nd and 5th year students working in pairs. But *Figure 3* clearly shows that students of the 2nd and the 5th year obtained the best results. The median was 95% and 89%, respectively.

The 1st year students obtained the lowest grades. The median reached only 73%, as visualized in *Figure 3*.

Students in more senior years performed better. The median for the 4th year was 95%. However, only 2 4th year students worked in a pair. Therefore this group was excluded from the chart and analysis.

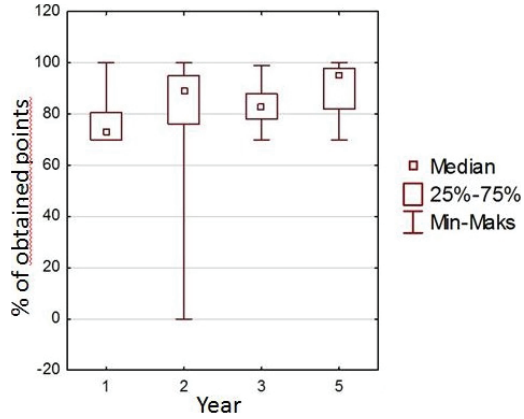


*Figure 3.* Points obtained for work in pairs by students of different years of study

**Work in groups of three.**

Students in the 1st, 2nd and 3rd year decided to work in group of threes. The Kruskal-Wallis score differentiation index for working in groups of three was $p < 0.001 < 0.05$ indicating significant differences. The grades scored by students of the 1st year differed significantly from the grades scored by students of the 2nd and 3rd year.

However, there were no significant differences in the grades scored by students of the 2nd and 3rd year. Students in the 2nd and 3rd year obtained a median score of 86% and 85%, respectively. On the other hand, 9 first-year students obtained median of 70%, i.e. a lower pass threshold. These differences are shown in *Figure 4*.

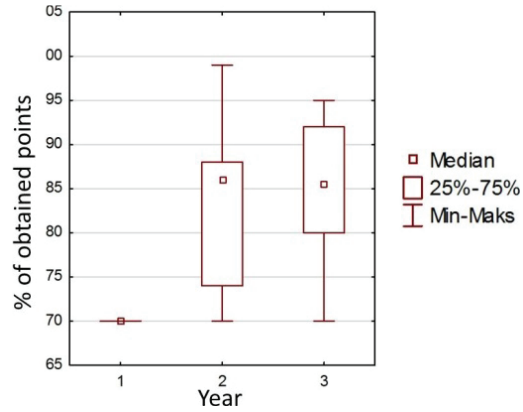


*Figure 4.* Points obtained for work in threes by students in different years

The *Figure 4* suggests that only students in final years were able to work efficiently in groups of three. Students in the 2nd and the 3rd year knew each other from previous years of study from face-to-face interactions. Therefore, their

distant communication was smooth and effective. They were more willing to work cooperatively and obtained higher grades than the 1st year students. On the other hand, the students in the 4th and the 5th year did not work in groups of three. They opted for more independent ways of preparing their assignments.

A high median obtained for more advanced students (86% for students in 2nd year, 85.5% for those in the 3rd year) contrasts with median obtained for 1st year students enrolled in baccalaureate courses (70%).

The above analysis shows that marks obtained for individually completed work in general were the highest. Moreover, more advanced students studied more effectively.

## During and after the Peak of COVID-19: 2021 and 2022

To research the effects of studying in pairs and groups of three in 2021 and 2022 i.e. during and after peak of COVID-19, the Pearson's test was applied and the results were analyzed. The popularity of studying alone in 2021 and 2022 was compared. Pearson's Chi^2 coefficient was obtained (p=0.26195), which signified no statistically significant difference. However, in 2021 about 30% of students studied individually, and in 2022 the ratio decreased to 26%. After the peak of the pandemic, students were slightly more willing to work in pairs and groups. The difference of 4% is statistically insignificant. Nonetheless, it indicates the direction of changes – the beginning of limiting individual work and shifting towards cooperation.

In 2021, the tested students worked either individually or in pairs. The *Figure 5* shows the revival of work in groups of threes in 2022.

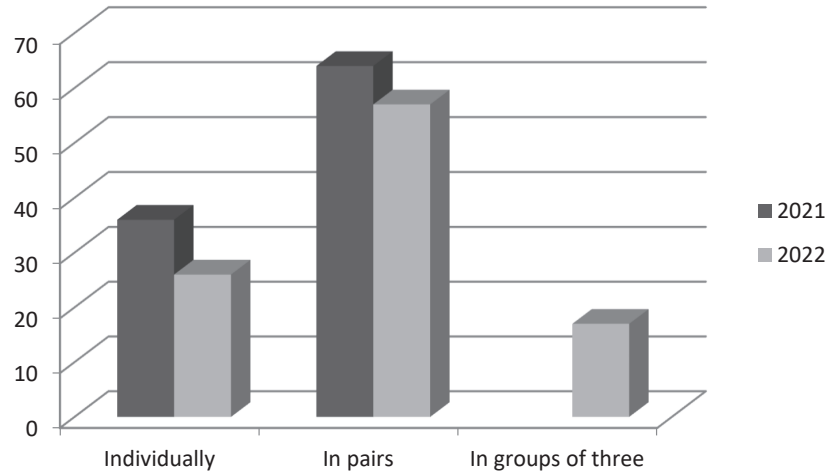


*Figure 5.* Cooperation in 2021 and in 2022

### Cooperation Among Stationary and Off-Campus Students

The prevalence of individual and group work among full-time and part-time students was compared. Pearson's Chi^2 coefficient (p=0.00030) indicated a relationship. Nearly 42% of part-time and only about 25% of full-time students studied alone. These proportions are shown in *Figure 6*.

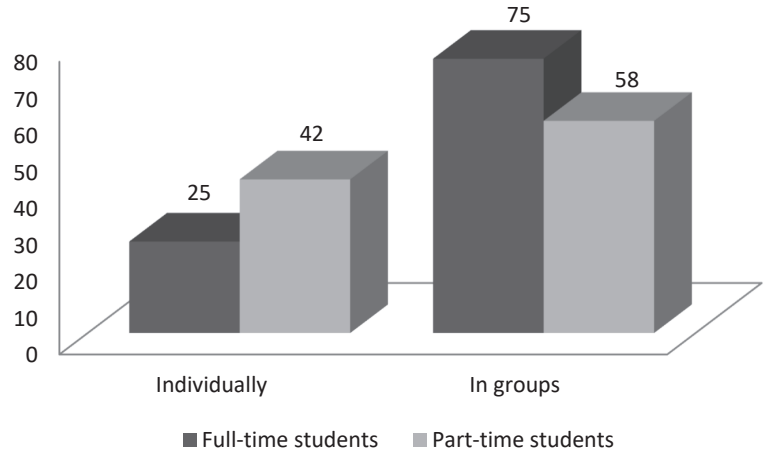


*Figure 6.* Percentage of full-time and part-time students studying individually

The higher rate of part-time students studying individually resulted from the fact that a part of the classes planned as stationary was held remotely, as well as a smaller number of hours of group classes. Therefore, personal ties among the students were weakened making cooperation more difficult.

## Commentary on Results

### Full-Time Students in *Cultural Studies*: Problems with Group Work

In the second semester, on-campus first-year students completed the *Contemporary Media Systems* unit. In the academic year 2020/2021, an average of 81.6% was obtained for 10 individual assignments, and 82.3% for 56 assignments prepared in pairs. In majority of cases, first-year students were inexperienced in following marking criteria. Therefore, they reviewed and corrected their work several times in order to pass or achieve a higher mark. The most ambitious students, including international students, in most cases, did not risk group work but prepared presentations on their own to ensure they obtained high marks. The pandemic

also hindered the emergence of a learning community necessary for e-learning (Academic E-learning Association, 2008), thus limiting students' interactions.

The following year, students were allowed to introduce corrections to their work to pass the unit. It was when the lowest mark (70%) was awarded. This was the modal value for every type of learning: individually, in pairs, or in groups of three. It can be concluded that students who hardly knew other in order to achieve good results opted for individual studying. However, the majority of students looked forward to receiving the support of their peers, and reducing their workload. Some of the students, it seems, did not get a chance to get to know each other. In some cases, pairs were made by students whose names were next to each other on the alphabetical list of students enrolled in the unit.

Second-year on-campus students completed the following units in their 1st and the 2nd year of study: *Internet and New Media*, and *Media in Society*. In 2020/2021, in the former of the units, they obtained an average mark of 95.8% for individual work, and 91.3% for work done in pairs. During the pandemic, female students from Ukraine and Belarus studied independently and with great commitment because they were particularly interested in graduating from a Polish university. A year later, in post-pandemic time, a group of 7 students obtained an average mark of 84.9% for individual work, 33 (one student dropped out) students who studied in pairs received the same mark, 18 students achieved 86.5% for assignments prepared in groups of three. Thus, the results obtained in post-pandemic time turned out to be highest. However, group work did not always go smoothly.

Students progressed to completing the *Media in Society* unit, obtaining an average of 93.9% for individual work, but only 84.3% for assignments prepared in pairs. International and most committed students did not risk working in groups and completed assignments individually.

The third year students completed units: *Literary Film Adaptations* and *Literature and the Social Media*. In case of the former unit, the results were similar: the average for 4 individually prepared assignments was 84% (partially thanks to the high results obtained by two international students), 84.5% for 28 assignments completed in pairs, and 85.5% for those prepared by two groups of three. These students knew each other before the pandemic. They cooperated effectively and aimed at completing units before the final examination. Thus, they were willing to work in groups of three to fairly share the workload.

In the *Literature and the Social Media* unit, five students working individually achieved an average mark of 82.2%, 24 working in pairs – 82.8%, and three groups of three – 81.7%. Grades were similar among those students because of congruous commitment: they focused on completing the course on time in preparation for approaching final examination.

## Part-time Students: Time Saving

First-year students of bachelor's degree in *Cultural Studies and Media Knowledge* completed two units: *Basics of Theory of Culture* via blended learning and *Contemporary Media Systems* delivered online. In case of the first unit, independent work was of a better quality – attracting an average mark of 85%. On the other hand, students working in pairs obtained an average mark of 68.1%, while one pair failed the assignment. Marks awarded for tasks completed individually were much higher than those obtained for work done in pairs. Some of the students dropped out, which complicated work of their colleagues who were left without a pair. Ambitious students preferred to study independently. They did not know their fellow students and preferred not to risk poor-quality teamwork. On the other hand, the less engaged students seized the opportunity to reduce their workload and avoid responsibility. Students enrolled in the latter unit organized their work in a similar way. Again, independent work attracted the highest marks with an average of 82.3%. Six students working in groups of three achieved the lowest marks: 70%. Students working in pairs achieved the average mark of barely 72%. That was because only two students achieved 81% while eight got 70%, which significantly lowered the overall mark.

Part-time second-year students completed the following units: *Basics of Social Communication*, *Internet and the New Media*, and *Media in Society*. Twelve students enrolled in the *Basics of Social Communication* unit knew each other well before the pandemic, so they preferred to study in pairs. In units *Basics of Social Communication* and *Internet and the New Media*, independently studied: the most ambitious male student who, due to lack of time, refined his presentations to the point that no corrections were needed, and the student who re-enrolled in the unit due to failing it. Those students obtained 99%, 96%, 0% and 0%, respectively, because the female student dropped out again (thus, her results were excluded from the study). The average rating for individual work was therefore 99% and 96%. On the other hand, students who studied in pairs achieved an average mark of 90% in *Basics of Social Communication* unit, and 86.4% in the *Internet and the New Media* unit. Both marks, however, are much lower than those achieved by the best student who worked individually.

*The Media in Society* unit required students to contribute to online discussion. There was no time to form groups because the classes were delivered over two days only, towards the end of the semester, and in distance education mode due to the pandemic. Therefore, students were to prepare forum contributions instead of presentations. The average mark for these individual assignments was 83.5%.

In the third year, the same students completed the following units: *Literary Film Adaptations* and *Literature and Social Media*. In case of the former unit, majority of students (10) worked in pairs, achieving an average of 85.6%. Five

students studied individually, including three who changed their enrolment status from full-time to part-time. The average mark for this group was 80%. It was lower than an average mark achieved for work completed in pairs. In case of this group, there was a tendency for group work because the students had known each other for three years. On the other hand, in the latter unit – 10 students who prepared their assignments individually achieved an average mark of 79.9%. Assignments of four students working in pairs attracted only 70%. That was because the students had to supplement their forum posts. Thus, they received the lowest passing mark.

It can be said that a decision to work or not to work in groups was pragmatic. The most ambitious students avoided wasting time and risk of cooperating with students they hardly knew. They preferred to count on themselves and their trusted colleagues. Focusing on writing ambitious bachelor's theses, they tried to avoid wasting time on reviewing and updating other assignments or risking failing the assignment or the entire unit. On the other hand, less ambitious students looked forward to sharing the workload and evading responsibility. They studied in the same pairs in all units.

## Master's Degree Students: Utilizing Experience

First-year full-time master's degree students in *Cultural Studies*... field of study completed the *Social Communication in Cultural Perspective* unit during the pandemic. The lectures were delivered online. The group work was difficult. 14 students completed assignments on their own, averaging 81.5%. The ambitious female student cooperated with a fellow male student from Ukraine. Their work attracted 95%. Students in this unit achieved high results both for individual and group work. They were familiar with the assessment requirements and were experienced in studying at a tertiary level.

Second-year students, on the other hand, completed the *Media Systems and Media Ecology* unit during the pandemic. They knew each other before the pandemic because they had completed undergraduate studies together. They preferred to work in pairs, averaging 90.5%, with four top marks of 100%. Even the dropout of one of the students did not disturb the group work – the remaining student completed the assignment on his own, obtaining mark of 93%. Marks achieved for these assignments formed part of the final course examination grade.

Another group completed the same course a year later. 11 students worked individually, averaging 83.3%. Two befriended female students who were jointly editing the university newspaper completed assignment together achieving 82%.

In the last semester of the course, students completed the *Literature and New Media* unit. At that time they were preparing their master's theses and devoted most of their time to this task. To avoid the need of redoing assignments, they prepared

them very well and on time. An assignment prepared individually attracted an average of 97.8%, and was prepared by a pair of students – 96%. The scores testify not so much about the difference between the mark awarded for work done individually or in pairs, but to the most experienced student's high competencies and mature approach to the task.

Due to small size of groups of students enrolled in master's degree courses, the results cannot be generalized. Nonetheless, two trends can be noted. The first trend: master's degree students achieved relatively high marks, much higher than the bachelor's degree students. The second trend: master's degree students preferred individual studying. However, it might have been due, at least in part, by the pandemic and post-pandemic conditions.

## Polish Philology Students: Individual Success

Second-year baccalaureate students in *Polish Philology* completed *Multimedia in Social Communication* unit. Individually prepared assignments attracted average of 83.4%, and those done in pairs – 79.8%. Therefore, it can be concluded that group working was less effective. The classes were delivered online and thirteen students enrolled in the unit hardly knew each other because specialization *Social communication* was created while they were in their second year. They had limited trust to each other. The most ambitious, therefore, opted for individual success rather than for group work and comradeship.

At the same time, during the pandemic, third-year students achieved an average of 85% for 22 assignments completed individually in the *Literary Film Adaptations* unit; 8 students achieved 81% for works completed in pairs. The results suggest that almost 2/3 of students opted for individual success rather than for cooperation, even though they knew each other for three years and had completed same units.

Interestingly, a year after the pandemic was over, 22 students enrolled in this unit achieved an average of 84.6% for assignments prepared in pairs, 3 students achieved 92% for those prepared in groups of three, and one student got 94% for work completed independently. It seems that after the pandemic, relying on befriended fellow students regain its popularity. The students become more familiar with each other during taking on-campus classes together. Therefore, they had more confidence in each other than their predecessors during the pandemic. However, the most ambitious female student who received the highest mark preferred to work individually.

## Statements of Students on Individual and Group Work

Negative ratings resulted from various reasons. The most ambitious part-time Student A studied exclusively individually and obtained the highest marks. He chose to work independently despite being aware that failing to complete a task on time resulted in receiving negative feedback and an additional task to be completed:

> Dear Professor, thank you for reminding me about the due date. However, I won't be able to prepare the presentation on time. I have higher priority things to do – I need to work to support myself and earn money for my studies. I realize that by failing the deadline I will fail the assignment and will have to prepare an additional presentation. (Student A).

But the least ambitious students in their 1st and 2nd year and those from large groups, preferred group work and sharing the workload to disperse responsibility.

Moreover, online interactions frequently cause confusion and misunderstandings. Less ambitious students expressed negative emotions when no one from the group was willing to take responsibility for flawed or incomplete work. Thus, responsibility was scattered, especially in groups of several students. In such cases, each member of the group counted on others to produce a quality piece of work because all members of the team were to receive the same mark for the assessment.

The commitment level of the members of other groups was similar: some students were very ambitious but particular showed a lack of commitment which according to some authors (Xie et al., 2020; Saraiva, & Silva, 2021, p. 8) is characteristic of online education. In case where the group work occurred to be effective, it was repeated in the next units. Otherwise – it was terminated, as in an example below:

> ...This is totally absurd! It was me who changed this presentation and introduced many corrections and it was me who put the penultimate version. Student C did not communicate with me at all. Student C didn't bother to inform me that he was resigning from the cooperation. Only yesterday he contacted me asking for help with the presentation. I had no idea that he broke the cooperation a while ago. I was not informed. I'm just learning about this now and I'm shocked (...). More, Student C has just written to me that he obtained credit for this unit. I don't know how. We did the presentation together, and I have passed all the quizzes. I simply don't understand it all. (Student B 19.02.2022).

Unfortunately, student B did not work systematically. She did not respond to e-mails from Student C or the tutor. She arbitrarily considered the cooperation to be over.

Student C who studied systematically had a completely different view on cooperation with Student B:

> I have been contacting Student B on a regular basis in regards to corrections. Ms. Student B did not reply a long time. Therefore, I decided to introduce corrections by myself in order to receive a pass. Regards. Student C.

Student B who arbitrarily withdrew from working with Student C in the above course was unable to find a colleague to form a pair with during the next course. She failed to complete assignments on her own and dropped out. The reasons for the failure had most likely biopsychic and didactic background. Firstly, the student had difficulty concentrating and too little predisposition to cooperate. Secondly, the remote form of classes limited the teacher's control and imposed a learning environment probably not adapted to the cognitive abilities of this student (compare Słomczyński, & Sidor 2012).

Student B's statement shows that, especially after the pandemic, students ought to be practically instructed, on *how collaborative learning (CL) and teamwork skills developed through working in groups* (Haugland, Rosenberg, & Aasekjer 2022, p. 2). In student cooperation, the most important thing is that each member of the group knows what the goal of the jointly performed task is. Whereas Student B correctly believed that

> in multi-subject and multi-task activities, everyone does "only their own thing", without sufficient reflection on what they are doing and what others are doing, what they are aiming at (...) in difficult situations such activities are at risk of failure between the acting people when the ties are broken (Kojs 2021).

Mindlessly completing only "one's part" of the task is characteristic of education in authoritarian and totalitarian systems. In the analyzed courses, students were presented with exemplary tasks and evaluation criteria. Student's work was to be accompanied by self-control and self-esteem, thanks to which *people with a sense of freedom and responsibility are shaped, which in turn favors the formation and functioning of democratic systems* (Kojs 2001).

## Discussion

The students enrolled in the courses delivered at one university, in the specific realities of the COVID-19 pandemic and in post-pandemic conditions were subjects of this study. Only the assignment grades were analysed. Marks for the final exam or the tests, active participation during classes, and the fact that a student dropped out during completing a given unit were not taken into consideration for this research.

The results cannot be generalized due to the small research sample: units prepared and delivered by one lecturer, marks taken from one Institute of a particular university, from only two fields of study and achieved over two academic years. The way students worked might have also been influenced by the social context – students were uncertain if they would be able to continue their studies during the pandemic. Thus, they might have been more inclined to study more efficiently during the 2020-2022 teaching period.

Young people have an extremely high demand for peer-to-peer contact and social interaction. During the pandemic, such interactions were prohibited or at least strongly limited. Thus the time of the COVID-19 restrictions deepened interpersonal remote relationships developing the need for closeness with other people, empathy (Gurba et al., 2022, p. 3), and even caused Post-Traumatic Growth (Tedeschi 2018). This may explain why students were quite often so eager to work in pairs and groups during the pandemic. It would, therefore, be worth comparing those results with data obtained after pandemic, e.g. in the academic years 2022/2023 and 2023/2024, to see if students would be equally willingly participating in group work.

The passing criteria changed during the analysed period, because the way the assignments were completed was being adapted to the social context on an ongoing basis. During the academic year 2020/2021 due to the pandemic-related stress, students were allowed three attempts to pass the assignment. The same way they could also improve their final mark for the unit. However, during the academic year 2021/2022 the pandemic was over. Students were allowed to correct errors that led to failure of the assignment, but were no longer allowed to improve their marks. Introducing corrections attracted the lowest mark for the task. Failure to submit an assignment before the deadline meant failing it. It is not surprising then that students often were awarded the lowest passing mark (70%).

Mark for the assignment was either the final grade for the course, or in case of the courses ending with an examination – formed a part of that grade. Assignments within the *Literary Film Adaptations*, *Media in the Society*, and *Multimedia in Social Communication* units were marked, but the unit was Pass/Fail. Therefore, students were not motivated to put an effort into preparing their assignments. Then, it can be said that students studied different units with varying degrees of commitment.

In addition, the presented research offers insights into behavioural patterns of individual students. It happened that an individual task was prepared by one student in group. So, comparing such grade with the average grade achieved by the group does not present a reliable or accurate approach. Failure of a student to complete the assignments represents a similar kind of situation – the average rating for the rest of the students working in same-sized groups was lowered. Nonetheless, the findings of the research allow for applying some identified behaviour to a broader population i.e. other studied groups and the entire population of students.

## Conclusions and Recommendations

The hypothesis, *students working individually receive higher grades than those working in pairs or groups of three* was only partially confirmed. Students working individually received slightly higher grades, but it was not statistically confirmed.

The insignificantly highest marks were obtained by students preparing their assignments individually: the average grade for individual work was only 1.38% higher from those awarded for work in pairs, and only 2.17% higher from those awarded for work completed in groups of three. Thus, there is no statistically significant difference between grades obtained by students studying individually, in pairs, or in group of threes, because $p=0.2341$.

This means that distance education poses a serious research challenge for networking pedagogy or Internet pedagogy within Internet studies, and also for the fundamental findings of connectivism. E-learning is not about a one-way transfer of knowledge or individual effort. It requires students to communicate, cooperate, make conscious decisions, and defend their identity. However, for passive students, the media power proposes an *"un-educational" scenario of the new society affecting people's growth and development* (De Martino, 2022, p. 143). That is why post-pandemic students need instructions, on how to work in small groups. Students who are least motivated to work in groups also need the teacher's admonitions (Stoyanova, & Krämer, 2020, p. 109).

## Future Research

The findings of the study are universal to humanities. A comparative research among science students is recommended. Additionally, further research on organization and effects of individual and group work during distance education students

is highly recommended. It would be worth studying student's attitudes to group work and individual work in subsequent post-pandemic years. Further studies ought to incorporate qualitative approach into exploring students' decisions on modes of studying (individually or in groups) because students have very different motives when making this choice.

What effects did the cooperation bring? Future research may also focus on investigating the impact of social media on the communication skills of students, their contribution to acquisition of knowledge, and the relationship between contemporary education and the logic of the market: the transformation of the educational content into profit, political strategies, and turbo-capitalist culture (Luttwak, 2000). Digital communication tools, intentionally or unconsciously used in e-learning, may develop or weaken team spirit, individual and social identity, even democratizing or weakening citizenship and the values of civil society (De Martino, 2022, p. 146).

The author hopes that this partial research will encourage other researchers to conduct recommended research and use results presented here.

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Anna Ślósarz

## Razem czy nie?
## Efekty samodzielnej pracy i współpracy
## studentów Wydziału Filologicznego podczas e-learningu

S t r e s z c z e n i e

Założono, że zdalna współpraca rozwija kompetencje społeczne studentów, pozytywnie wpływa na osiąganie poznawczych celów kształcenia i rozwijanie umiejętności. Badaniu poddano 655 studentów stacjonarnych i niestacjonarnych, uczestniczących w 22 kursach zdalnych i w formacie blended learning, prowadzonych na dwu kierunkach, na studiach I i II stopnia, stacjonarnych i niestacjonarnych, podczas pandemii COVID-19 i po niej, czyli w latach akademickich 2020/2021

i 2021/2022. Przeprowadzono instrumentalne studium przypadku: porównano oceny, uzyskane przez studentów za prace indywidualne oraz wykonane w parach i trójkach. Statystyczne różnice nie ujawniły się, jednak nieco wyższe oceny (83.81%) studenci uzyskali, pracując indywidualnie, a niższe (81,64%) w parach. Najzdolniejsi studenci nie ryzykowali współpracy i nie chcieli tracić czasu na zdalne komunikowanie się z mniej ambitnymi rówieśnikami, a najmniej zaangażowani liczyli na zmniejszenie wysiłku, wsparcie grupy i rozproszenie odpowiedzialności. Najwyższe oceny uzyskali studenci ostatnich roczników, którzy najlepiej rozumieli kryteria oceniania i stosowali się do nich, ponieważ chcieli zaliczyć zadanie w pierwszym podejściu, aby mieć czas na pisanie i obronę pracy. Niechętnie podejmowali współpracę studenci zagraniczni, którym zależało na dobrych ocenach i terminowym zaliczeniu z uwagi na krótki okres pobytu w Polsce i napięcie, spowodowane wojną na Ukrainie. Najniższe oceny (70% punktów) uzyskali studenci pierwszych roczników, którzy nie znali się wzajemnie, nie zyskali jeszcze wprawy w stosowaniu się do kryteriów oceny i mieli problemy z komunikowaniem się, spowodowane izolacją podczas pandemii. Najefektywniej współpracowali studenci zaprzyjaźnieni. W najliczniejszych grupach zwykle najlepiej wypadały prace w parach, lecz z uwagi na tendencję najzdolniejszych do pracy samodzielnej najwyższe statystycznie oceny uzyskano właśnie za prace indywidualne.

S ł o w a  k l u c z o w e: zadanie, ocena, MOODLE, ryzyko, koledzy

Анна Слосарь

## Вместе или нет?
## Эффекты самостоятельной работы и сотрудничества студентов филологического факультета при дистанционном обучении

Р е з ю м е

Предполагалось, что дистанционное сотрудничество развивает у студентов социальные компетенции, а также положительно влияет на достижение познавательных целей обучения и развитие умений и навыков. В исследовании приняли участие 655 студентов очной и заочной формы обучения, принявших участие в 22 курсах дистанционного и смешанного обучения, проводимых по двум направлениям обучения, на первой и второй ступенях, очной и заочной, во время и после COVID-19. пандемии, то есть в 2020/2021 и 2021/2022 учебных годах. Был проведен инструментальный кейс-стади: сравнивались оценки, полученные студентами за индивидуальную работу и выполненную в парах и тройках. Статистических различий не было, но несколько более высокие оценки (83,81%) были получены у студентов, работавших индивидуально, и более низкие оценки (81,64%) в парах. Наиболее талантливые студенты не рисковали сотрудничеством и не желали тратить время на дистанционное общение с менее амбициозными сверстниками, а наименее вовлеченные рассчитывали на снижение усилий, групповую поддержку и распыление ответственности. Самые высокие оценки получили студенты последних курсов, которые лучше всего поняли критерии оценивания и придерживались их, так как хотели сдать диссертацию с первой попытки, чтобы успеть написать и защитить диссертацию. Иностранные студенты, которые хотели хороших оценок и своевременного завершения курсов, не желали сотрудничать из-за короткого периода пребывания в Польше и напряженности, вызванной войной на Украине. Самые низкие оценки (70%) получили первокурсники, которые не знали друг друга, еще не набрались практики в соблюдении критериев оценки и имели проблемы с общением из-за изоляции во время пандемии. Студенты, которые ранее были друзьями, работали наиболее эффективно. В самых больших группах

обычно лучше всего удавалась работа в парах, но из-за склонности наиболее способных к самостоятельной работе самые высокие статистически высокие оценки были получены за индивидуальную работу.

К л ю ч е в ы е  с л о в а: задача, оценка, MOODLE, риск, друзья

Anna Ślósarz

## ¿Juntos o no?
## Efectos del trabajo independiente y la cooperación de los estudiantes de la Facultad de Filologia durante el e-learning

S u m a r i o

La cooperación a distancia pretende desarrollar las competencias sociales de los estudiantes, así como incidir positivamente en la consecución de los objetivos cognitivos de la educación y el desarrollo de habilidades. El estudio abarcó a 655 estudiantes de tiempo completo y medio tiempo que participaron en 22 cursos de aprendizaje a distancia y combinados, realizados en dos campos de estudio, en estudios de primer y segundo grado, a tiempo completo y medio tiempo, durante y después del COVID-19 pandemia, es decir, en los cursos académicos 2020/2021 y 2021/2022. Se realizó un estudio de caso instrumental. Se compararon las calificaciones obtenidas por los alumnos para trabajos elaborados individualmente, en parejas o en grupos de tres. No hubo diferencias estadísticas, pero los estudiantes obtuvieron notas ligeramente más altas (83,81%) trabajando individualmente, y notas más bajas (81,64%) en parejas. Los estudiantes más talentosos no se arriesgaron a cooperar y no querían perder el tiempo en la comunicación a distancia con compañeros menos ambiciosos, y los menos comprometidos apostaron por reducir el esfuerzo, el apoyo grupal y la dispersión de la responsabilidad. Las calificaciones más altas las obtuvieron los estudiantes de los últimos años que mejor entendieron los criterios de evaluacióny los cumplieron, porque querían aprobar la tesis en el primer intento para tener tiempo para escribir y defender la tesis. Los estudiantes extranjeros que querían notas y créditos a tiempo se mostraron reacios a cooperar debido a una corta estancia en Polonia y la tensión provocada por la guerra en Ucrania. Las notas más bajas (70% puntos) las obtuvieron los alumnos de primer año que no se conocían, aún no habían adquirido práctica en el cumplimiento de los criterios de evaluación y tenían problemas de comunicación por el aislamiento durante la pandemia. Los estudiantes que eran amigos trabajaron con mayor eficacia. En grupos más grandes, trabajar en parejas a menudo trajo mejores resultados. Sin embargo, debido a la tendencia de los estudiantes ambiciosos a trabajar de forma independiente, estadísticamente las calificaciones más altas se obtuvieron para trabajos individuales.

P a l a b r a s  c l a v e: tarea, evaluación, MOODLE, riesgo, amigos

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# Challenges Related to the Postulates of Students Towards Education in Post-Pandemic Times

## Abstract

The Covid19 pandemic has changed the day-to-day behaviour of society in many aspects, including education. The mode of operation of schools has changed from traditional to remote. The changes affected various school types, also universities. Remote teaching as a binding educational practice forced both students and teachers to adapt to a dynamically changing reality. Experience gained during the pandemic had an impact on the educational and professional prospects of students. The aim of the research was to learn about the expectations of students towards their own development and education, as well as to determine what their postulates are regarding formal education in post-pandemic times. Extensive empirical material was obtained from 100 people (women) studying at the Pedagogical University of Krakow. The objectification of the results was possible after a thorough analysis of the narrative texts (prospective). Formal and content categories were distinguished, which were arranged in four areas, taking into account the postulates of the surveyed students related to: (1) organisation and course of education, (2) use of information and communication technology (ICT) in education, (3) fulfilment of students' needs, (4) personal and professional

development. The selected areas form a complementary whole in which students' expectations relate to important spheres of functioning of an individual, that is intellectual, psychosocial and physical. The students participating in the survey expect that after the pandemic they will still be able to use experience and skills gained during the remote learning, they want the university to provide a secure physical and social space. They also want to receive emotional support which would help get rid of negative feelings and also receive instrumental support to allow correct behaviour and effective participation in post-pandemic education. The described categories were expanded to include examples of students' narratives.

K e y w o r d s: challenges, postulates, students, remote learning, post-pandemic education

## Introduction

Going to college is an important stage in the life of any young man. New, sometimes difficult situations with which the students have to cope affect their functioning in various aspects of life. New challenges that appear at the university are often related to the organization of everyday life and learning which is very different to what they knew previously, now they find themselves in a different place, far from a close family. A fast track into adulthood is often full of anxiety, uncertainty and expectations related to independent life, fulfilment of one's own interests and passions and to the studying. Plans and hopes of one million two hundred thousand students starting education in October 2020 had to be verified in connection with the COVID-19 pandemic spreading all over the world. Restrictions in interpersonal contacts caused changes in education at universities. Seemingly an instant, face-to-face teaching was no longer the dominant and the most convenient form of delivering knowledge (Bonk, 2020, p. 589).

## Advantages and disadvantages of E-Learning

Remote teaching, introduced almost at the beginning of academic year, earlier considered a supplement to traditional education, suddenly became a practice, basis of systemic education. When education changed, students and university teachers had to adapt to the new reality. For most of 2020, many educators were hesitant and nervous to move into online environments, while praising synchronous

tools such as Zoom as saviours of their professional lives. At the same time, other instructors acknowledged that they were in survival mode and were struggling with the array of online learning technology tools and features" (Bonk, 2020, p. 589). The rapid development of digital technology in the 21st century has influenced learning and teaching. It enables learning anywhere, anytime and with anyone. New technologies offering various opportunities, as well as new challenges that emerged with the pandemic, required both teachers and learners to be proficient and efficient in using applications, as well as technical skills in using devices. The transition to distance learning due to the virus has become necessary to continue to provide education for students. Various distance learning paradigms have been implemented to support distance learning. (Kharma et al., 2021, p. 499).

The new situation forced the universities to ensure high level of classes and prevent abuse. While online learning is generally considered as an option, an alternative to traditional learning, during the coronavirus pandemic it has become an essential element to keep schools and colleges operating (Coman et al., 2020). Good educational practices were being popularized. However, despite actions being taken, academic teachers encountered difficulties in preparing and conducting classes, which resulted inter alia from absence of IT competence which some teachers admitted (Marek, Chew & Wu, 2021; Şentürk, 2021; Lapada, Miguel, Robledo and Zeba Alam, 2020).

The availability of ICT alone has not solved the human factor problem, e.g. problems with the motivation of learners to learn, a decrease in the quality of the translation process by teachers, the credibility of checking the knowledge of learners and emerging difficulties related to technological and IT limitations – problems with equipment and the Internet (Kruszewska, Nazaruk and Szewczyk, 2022; Calderón, Scanlon, MacPhail and Moody, 2021) and, above all, no direct contact with others. Particular attention was paid to the need to take care of peer relationships by (Darling-Hammond and Hyler, 2020; Pyżalski, 2020) indicating that the lack of social interaction is one of the biggest disadvantages of remote learning.

Nadia Yusuf and Nisreen Al-Banawi (2013, p. 176) stat "when you use e-learning platforms, there are some elements that can be considered as obstacles to student learning, such as reduced motivation in students, delayed feedback or assistance due to the fact that teachers are not always available when students may need help during learning, or a sense of isolation due to the lack of physical presence of classmates". Research findings on social isolation have shown a negative impact on the mental health and well-being of children and adolescents (Guangul, Suhail, Khalit and Khidhir, 2020). Social isolation, defined as the lack of social contact (De Jong van Tilburg, Dykstra 2006), can often lead to feelings of loneliness, defined as the discrepancy between desired and perceived relationships (Perlman, Peplau, 1981). Loneliness is a significant problem because humans are evolutionarily "wired" to belong to stable and secure social relationships (Baumeister, Leary, 1995; Farrell, Vitoroulis, Eriksson, and Vaillancourt, 2023).

It has been shown that stressors are important, i.e. fear of infection, prolonged isolation, boredom, lack of contact with other people, lack of personal space at home, fear of the financial stability of the family. Long-term remote learning results in loosening relationships and deterioration of well-being of all subjects of education and is likely to contribute to disruptions in the emotional, social and intercultural development of students (Pyżalski, 2020; Kumar, Saxena and Baber, 2021; Peters et al., 2020; Rasheed, Kamsin and Abdullah, 2020).

As Marek Kaczmarzyk (2020) points out, the technology itself and its impact on the central nervous system can be an additional source of stress that negatively affects the results in remote education – the ability to remember or analyse information decreases.

The analysis of students' opinions indicates that remote education has both positive and negative aspects. The results of studies to date indicate that advantages mentioned by students include organization of time (time reduction), method of performing the education process (easy access to all sources, easy supervision, streamlined training), and comfort of remote work, cost reduction (no travel or accommodation costs). The disadvantages included: absence of direct contact with the university community (teachers, fellow students, problems with motivation, attention, high learning workload and time-consuming writing of papers, technical problems. Students also enumerated problems related to the abuse of technology, which is manifested by fatigue, information overload, reluctance to use the computer and the Internet and irritability, as well as reduced efficiency (Kharma et al., 2021; Vidal, 2020).

A dynamic course of pandemic and new situation for educational process forces the need to change the way of thinking about education and to ponder on not only its current form but also on what the education will look like and what its conditions will be when the crisis is over. New experience, often gained in untypical or difficult situations, should not only be used in the future, but also should support current actions aiming at creation of optimal conditions for educational process that take into consideration of postulates of main subjects of academic education. New challenges which were faced by online students who did not have a previous experience in remote learning could be very difficult for them. But new opportunities appeared at the same time, encouraging university students and teachers alike to develop competences necessary to face current and future requirements of the changing education.

Referring to the latest report of Educause Horizon, Rhea Keelly (2021) indicates that future trends, technologies and teaching and learning practices have been identified which are the result of the COVID-19 pandemic. The most important technological trends mentioned in the report include:

1. General acceptance of hybrid learning. It was noticed in the report that acceptance of blended (hybrid) models year had sped up considerably during the last year. Both teachers and students discovered new ways of interacting

and accepted them. It was emphasized that in case of future crises flexibility of using remote and direct education will help institutions ensure continuity of education.

2. Increased use of technology in the learning process. The pandemic required that both new and existing educational tool be introduced to the mainstream. The report indicates that institutions and instructors have started to rely on tools such as videoconferences, team platforms and virtual classrooms, although they were previously reluctant to use them (Pelletier et al., 2021, p. 8). An even wider use of these tools can be expected in the future.
3. Development of online departments. Acceptance of new technologies entails the need to motivate, train and support the teaching staff. The effectiveness of new online learning solutions and remote courses will depend on conditional on the personal views of teachers.

## Methodological assumptions of the research project

Remote learning has become an integral part of education at a university, and becomes important to define the desired functioning of students at a university in post-pandemic times. The aim of the project was to learn the students' expectations relating to their own development, education and also expectations towards formal teaching at universities after the pandemic. Taking into account the aim of the study, a qualitative strategy was chosen, which makes it possible to learn "a picture of the individual experiences of the subjects and the phenomena (…) occurring in a specific place and context" (Rubacha 2016, p. 21). In accordance with one of the important principles of grounded theory, where the need to limit pre-conceptualisation before working in the chosen field is emphasised, the main problem was formulated: what is the imagined educational future of pedagogy students in the post-pandemic era? and specific problems:

1. What are students' expectations of education in the post-pandemic era?
2. What expectations of formal education at the university do the surveyed students form?
3. What are the students' perceptions of their personal and professional development in the post-pandemic era?

Adequate to the adopted research strategy and guided by the so-called principle of openness, the formulation of hypotheses was dispensed with; instead, in addition to outlining the research problems, a method of data collection and interpretation was established. This approach assumes a kind of independence in learning about the nature of the phenomenon in question, "suspending" the researcher's beliefs and judgements for the duration of the study so that they do not limit the horizon

of vision of the phenomenon under investigation. In qualitative researches, the aim is to present the perspectives of the persons acting as comprehensively, faithfully and authentically as possible (Krüger, Pfaff, 2006). We were interested in 'how participants construct their views and perspectives and how these are located in their positions' (Charmaz, 2009, p. 27).

Qualitative methods (narrative) were used in order to obtain an abundant and detailed research material. Norman K. Denzing, a propagator of qualitative methods in social science, indicates that narrative refers to biography and "(…) presents experience and definitions of a given person, group or organization as this person, group or organization interprets it" (Helling, 1990, p. 14). Collecting information on a person's life from that person is based on their retrospective or prospective verbalizations. According to Bogna Bartosz (2002), a characteristic feature of biographical studies is that they account for the historical and temporal variability; three time perspectives can be used in such studies: retrospective, current and prospective.

The students participating in the study prepared written narratives about the future, so it can be said that prospective narrative was used. The students themselves defined the method and scope for a given issue, guided by the instruction given by the researcher. The selection of the sample to the surveyed group was intentional. The group consisted of full-time students of Pedagogical University in Krakow with major in pre-school and early-school pedagogy. These were 1st year students (only women are in the 1st year of this course). They started the studies during the pandemic, for the first weeks they participated in hybrid with classes traditionally at the university, and remote lectures. The research was conducted in March 2021.

When additional restrictions were announced, all classes and lectures were conducted in the form of e-learning. 100 written narratives were collected and then analysed. The purposeful selection of narratives has been justified by referring to the principle of saturation of research areas and the principle of searching for thematic diversity in respondents' answers. Multiple reading of the texts allowed for distinguishing formal and content-wise categories for a certain objectivization of collected data. According to Creswell's steps (2013, pp. 201–204), (1) empirical material was selected and the data were prepared for analysis by sorting them. After that, (2) a review of all the data was conducted to obtain a general orientation and make sense of the overall information, with notes made on the margins that drew attention to the most important content. The next step (3) was a detailed analysis, during which coding was carried out, i.e. dividing the material into significant segments and giving them names (in vivo). The codes that emerged during the data analysis were a combination of those that were established in advance (questions related to the detailed problem) and those that appeared during the study. Qualitative information was manually coded and sorting schemes were used. In the next step (4), coding was used to identify 4 categories that reflected different expectations of the respondents and were supported by quotes. After

that, (5) visualization was conducted, i.e. a graphic model of the interrelationships between the categories was developed. The final step (6) was the interpretation of the results obtained, using A. Maslow's theory of motivation and needs.

## Results

In the research material, two types of current and future narratives were distinguished, although the narratives were supposed to concern the future and related expectations.

Although it was not the main subject of the paper, it is worth emphasizing that in the part concerning the present time the participants described their current difficulties, expressed their desire to return to the normal life characterized their emotional state, ways of implementation of educational tasks, and evaluated the current education. The time perspective referred to here and now. The categories will be presented in a separate paper.

The categories distinguished in the narratives were arranged in three groups: postulates concerning the organisation and course of education, postulates related to meeting the needs of students, and postulates concerning personal development and work.

The quality of the teaching-learning process depends mainly on the personal resources of educational entities and on the organisation of education. Correctly conducted remote classes, adapted to the needs of participants, allow for a differentiation of teaching and involving the participants participants in differentiated tasks and in different ways. Such classes are not only interesting, but also effective and allow the education goals to be achieved. The narratives of students participating in the survey included the issues related to the stationary (brick-and-mortar), remote and blended learning.

The analyses indicated that expectations of our students are diverse, some want to "go back to normal", that is stationary brick-and-mortar and some suggest blended (hybrid) mode.

The postulates of students related to the organisation and course of full-time education concern the willingness to return to full-time education at the university which, according to the respondents, will allow them to get to know life at the university, gain new experiences and deepen their knowledge. Here are examples of the respondents' statements:

- *I would love to go back to studying full-time, because it is definitely better and more pleasant for me to study at the university. I want to experience student life in the real, not the virtual world.*

- *I hope that the situation will improve significantly soon and it will soon be possible to return to the university. I can't wait for full-time classes and meetings at the university.*
- *I want to gain new experiences, deepen my knowledge, experience real student life, full-time study and all things related to it.*
- *I would like to return to the walls of the university, take face-to-face classes and take advantage of everything the university can offer, I want to use the library, reading room.*
- *Learning in the face-to-face mode is more effective for me than remote learning, I am more motivated and focused on the content of lectures. It is easier to mobilise to learn. Few things distract me.*
- *If I could go back to the university, I would like the form of classes to be the same as before the pandemic.*
- *Face-to-face classes give you the opportunity to have direct contact with reality.*
- *I would like to go back to traditional teaching, lively discussion, meeting people I liked.*

*I believe that return to stationary classes would allow many people to leave the virtual world. I also wish that traineeship which now is only in remote mode was conducted exclusively in the stationary mode.*

*In spite of all, stationary classes force bigger concentration, preparation and bring (which I think is the most important) the atmosphere of mutual discussion, understanding and interest.*

The proponents of the brick-and-mortar mode indicate the need for a real playing of student's part, yearning to feel the atmosphere of the university, experience the advantages of direct contact with teachers, that is meeting the authority, being better motivated to study, committed to classes and focused on the most important matters, and consequently better educational effectiveness. Some students also expressed the desire to use the university infrastructure, that is the library and cultural offer. The students would also cherish direct relations with classmates. It can be said that such students crave for being immersed in the scientific, emotional, social and material space of the university. The students therefore see the advantages of the stationary mode, which in their opinion is more effective than remote learning.

The students also spoke about hybrid education, which can be a very good and alternative solution:

- *Hybrid learning would be the best solution. The subjects that do not require a direct contact with a teacher can continue online. Only practical subjects, various classes should be stationary at the university, but in smaller groups. Consultations should be take place individually, by appointment.*
- *Hybrid learning as it was in early 2020 could be a good solution. Classes in small groups should take place at the university, and lectures or classes*

*in larger groups should be remote. The hybrid learning should be like it was before, two days at the university, 3 days remote.*

- *Hybrid learning could be a good solution. It would be possible to allocate some days in the schedule for face-to-face exercises, and lectures to be held remotely outside the university.*
- *Hybrid learning could be a good idea. For example, schedule should be that on some days there are only classes and students and teachers would come to the university, and on other days there are only lectures which could be remote.*
- *When the pandemic is over the model will be: we will study in the hybrid mode because we have seen that some classes do not need to be live, but they can be planned so that anyone can open them and make them at the time and place most suitable for them.*
- *When universities have fully online courses in their offer, in addition to full-time and external courses, it would give an opportunity to study to people from abroad, from distant parts of the country who for various reasons cannot leave their place of residence, and for instance pregnant women or mums with young kids would not have to worry about who to leave the kids with.*

Among the advantages of hybrid education, the students mentioned the possibility of direct contact with the lecturer and other students, better organisation of work and time not only at the university, but also in a place convenient for them, while maintaining safety rules, which definitely favours gaining new experiences and motivation to absorb and enrich knowledge:

- *The advantage of hybrid learning is that everybody can work at their own pace. Everyone assimilates knowledge in their own way, and look for more information if they are in doubt. A student can always go back to the materials sent from classes and at the same time can contact the teacher directly, so if there is a problem it can be explained during classes at the university. It seems to me that such teaching is effective because everyone has their own way of assimilating knowledge. In addition, this mode includes not only working with the teacher, but also independent work which helps in assimilating knowledge, looking for more information on such issues and you can develop your skills better that way.*
- *Hybrid learning was a good idea. It allowed us to attend the classes in person, meet people, get to know teachers and at the same time provided some security. In addition, we could plan returns home, work or minimize the risk of meeting in a large group (e.g. lectures).*
- *Hybrid learning could combine remote learning and standard learning. The best solution would be two days brick-and-mortar, that is all classes. This would allow interactions between students, making acquaintances or even friendships. Contact with teachers would also be easier, or getting to know the university and its employees for freshmen.*

- *Thanks to hybrid teaching, I can gain more time to learn and prepare for classes, I do not waste it on commuting, because only part of the classes takes place at the university.*

Proponents of the hybrid learning, on the other hand, want some classes to be held in a brick-and-mortar way and some remote. They suggest that stationary classes are held three days a week and two remaining days are used for online lectures. It was also indicated repeatedly that lectures should be recorded and made available to students to replay at the time convenient for them. This means de facto opting for a partially asynchronous remote learning. There were also suggestions that students could choose the form of learning, e.g. hybrid, full online or full stationary.

It can be said that the organization of learning expected by a large number of participants in the research has been propagated for a dozen years by pedagogues who support e-learning. It is dubbed blended learning, which can be explained as learning involving the use of complementary techniques of independent work on an educational platform and asynchronous communication with teachers (classes, laboratories) in the traditional face-to-face form (or remote synchronous).

Preferring the hybrid learning, the surveyed students indicated a number of its advantages such as possibility of personalization of teaching, releasing more independence, flexibility, comprehensiveness, possibility of gaining knowledge from various sources, that is Internet (materials published on the platform as text, presentations, recordings, e-textbooks) and during traditional meetings with teachers, as well as time saving (fewer commutes, possibility of studying at convenient time and place). Also important is the reduction of costs (lower commuting expenses, lower costs of accommodation). The students believe that the blended mode is safer, traditional meetings – classes, traineeship – are held in smaller groups where all safety measures can be taken, and the lectures are in the form of videoconferences or recordings. The participant students see also the need to use the electronic sources in the future.

The analyses indicate that many students appreciated and would like to continue using modern educational technologies, that is communication platforms and tools, both synchronously and asynchronously, i.e. Moodle and Microsoft Teams. In the opinion of surveyed students, these technologies allow returning multiple times to various materials, conducting fully remote courses, and in addition Microsoft Teams favours synchronous communication of educational entities. It allows a teacher to control the meeting and it allows students to participate in classes actively and to dissipate any doubts. The surveyed students favourably assessed the materials and electronic books offered by the university and teachers and declare that they would like to use such materials also after the pandemic. Many students emphasized that during the remote learning they improved their digital competences (ability to use media messages, create digital content, communicate and cooperate online) and would expect that such tools are further used in education.

Below are examples of students' narratives concerning the use of teaching technologies and electronic educational materials. The respondents point to the possibility and need to use the recording of lectures, which could be played back at a convenient time and many times, or to make them available in the form of presentations or Word files, and also point to the possibility of using the Moodle platform to present lectures in the form of courses ending with tests:

- *Recording the lectures would be a very good solution, particularly for students who work, because you can play the lecture any time, you don't have to be present at the university at a specific time. In addition, if you have misheard something, all you need is to rewind and play again.*
- *The remaining days would be for online lectures. Just like now, they would be on Microsoft Teams (...). An alternative could be making the materials available in the form of, for instance, Word files or presentations. Lectures on Moodle in the form of courses finished with short tests are also an interesting solution.*
- *In my opinion, lectures should be recorded, which students could play back at a convenient time and place if they could not attend them directly. Lecturers could also share various materials on a regular basis to focus, not take notes. Such materials can be used in preparation for exams..*
- *The post-pandemic time can be organized to combine new skills which we have learned from remote teaching and use more multimedia materials during stationary classes or combine these two worlds, these two realities in which we functioned.*

The pandemic crisis undoubtedly contributed to deprivation of social and security-related needs. In connection with SARS, the participants of educational process experienced negative states, such as anxiety, fear, exhaustion, burnout, longing for contact with others.

When describing their expectations related to the fulfilment of needs, the surveyed students mostly focused on such categories as support, interpersonal relations, particularly with peers and teachers.

In their narratives, the students admit that they often feel insecure and they believe that insecurity will accompany them after they return physically to the university. The surveyed students expect that the university create a secure environment for them. The sense of security has become a value with more importance. Supposing that the source of danger which coronavirus is will not disappear altogether, the surveyed students indicate the need for disinfectants, teaching in small groups, ventilating rooms, etc. They also anticipate difficulties in getting accustomed to the stationary learning. It can even be said that they are afraid of transitioning from remote to traditional learning. Consequently, they expect multifaceted support from the university and teachers in teaching-related issues, organizational issues and psychical issues. They expect empathy, understanding, patience, building of a favourable emotional climate, and assistance in correct functioning in post-pandemic education. They hope that the university will create

optimal conditions for the development of their personal potential and they indicate the willingness for multidimensional involvement. Many narratives indicate the need for psychological support, and even directly state that the group support given to date is insufficient and the students need individual support. They expect team-building classes, trips, meetings, workshops, implementation of group projects. They want to enjoy the university life.

Here are examples of students' statements in the support category:

- *I think that even after the end of the pandemic, it will be very difficult for us to get used to the new situation and we will be accompanied by anxiety. That is why support is so important, which should be provided not only by the university authorities, but also by lecturers. It will be a long process of getting used to the new reality.*
- *The difficult time of the pandemic has shown how important support is. We are all stressed about the situation in Poland and in the world, we are worried about the health and life of our loved ones and our own. We live in constant stress. That is why it is so important not to feel any additional fears after returning to the university, so that the classes are dominated by a nice, safe atmosphere, which is very much needed by all students and lecturers.*
- *The university authorities should organise support circles, meetings with psychologists, and meet expectations. In my opinion, today a lot of young people need psychological help, but they do not want to admit it.*
- *I hope that teachers will still be understanding and help us get accustomed to the system of work which normally is used at the university and which we do not know. They should consider the fact that we started to study during the pandemic, and the amount of all materials which occurs in normal circumstances, can be overwhelming for us.*

The surveyed students value direct interpersonal communication and express their desire to build relations, declare the willingness to get to know their colleagues and teachers better, look forward to being among classmates and using the experience and professional achievements of teachers. Many of them expect that after a real meeting with others they will assume the attitude of openness to take advantage of all the university can offer:

*I can't wait to meet my friends directly after returning to the university, not via the Internet and we will be able to talk face to face, interpersonal contacts are very important for healthy and efficient functioning.* The surveyed students also paid attention to relations with lecturers. In this category, they indicated how important it was for them to ensure an atmosphere of safety and understanding:

- *I hope that classes and lectures will go smoothly, in nice atmosphere full of mutual respect, exchange of knowledge and views. I believe that present times and conditions of living, working, learning are quite a challenge for everybody, and that's why I appreciate any help, understating and efforts of teacher.*

- *I think that after returning to the university, cooperation between lecturers and students will be necessary, and that is why support and mutual understanding will be so important to go smoothly through the current situation.*

In terms of personal development, the surveyed students declare the willingness to develop their interests, participate in science clubs, develop musical talents (for example joining a choir), develop their physical skills, e.g. team sports, going to the swimming pool and taking advantage of cultural events:

- *I want to participate in various activity clubs or groups (...) I wanted to join a choir very much.*
- *I would like to join a scientific circle that will help me in my professional development and enable me to actively participate in various types of events.*

Even before the pandemic, combining studies and work was becoming increasingly popular for financial reasons and in order to gain experience. When planning the post-pandemic future some students dream of integrating work and the full-time studies at the university. They indicate that while entering adulthood they wish to relieve their parents from the burden of supporting them. In their opinion, the university should make an effort to meet their expectations, mainly in terms of the schedule of classes to make it possible to reconcile the full-time studies with work. They often indicate that hybrid teaching would create favourable conditions for them. Here are examples of respondents' statements in terms of categories – work:

- *The students could work and have income to support themselves.*
- *Find a solution to reconcile work with studying at university.*
- *When the pandemic is over, I hope to be able and have a possibility to work and study at the same time.*

The narratives indicate the students' readiness for multitasking, however sometimes it is not clearly expressed how they are intending to reconcile two time-consuming activities such as studies and work.

## Discussion

The analysis made it possible to select the categories of students' postulates regarding their own education and formal education at the university in post-pandemic times. Four areas were distinguished, taking into account the postulates regarding the organisation and course of education, the use of information and communication technologies (ICT) in education, meeting the needs of students and creating conditions for personal and professional development (Figure 1. Graphic model of the relationship between categories).

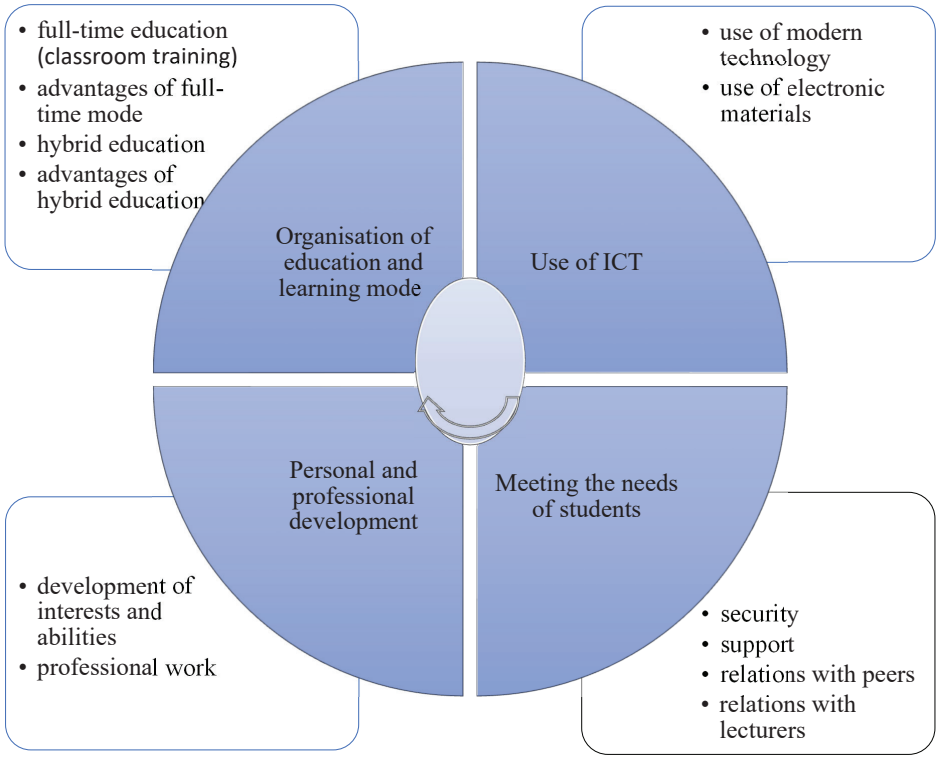


*Figure 1:* Graphic model of the relationship between categories

The illustrative material is our authorship.

Suggestions concerning the organisation and course of education: female students expect in the future a hybrid education, classes conducted both on-site (exercises and internships) and remote classes (lectures). Such suggestions were also made by surveyed students at universities in Poland and other countries (Poplawska, 2022; Widla, 2022; Almalki, 2022; Eringfeld, 2021). The respondents appreciate such advantages of distance learning as the possibility to individualise education, autonomous action of students, high flexibility, versatility, possibility to use varied materials and sources at any time, time saving, cost reduction. Taking into account students' suggestions, higher education institutions will have to develop a blended approach to education that combines virtual and face-to-face learning in a thoughtful and flexible way to take into account the diverse needs of students while maintaining a sense of subjectivity and community (Eringfeld, 2021; Rapanta, Botturi, Goodyear et al., 2021).

Postulated use of ICT: female students surveyed felt satisfied and still want to use ICT, notice its usefulness and tangible benefits, and indicate that these technologies provide valuable support in meeting the demands of studying. Higher education institutions will be forced to redesign existing educational programmes or

construct new ones so that technology would be used and students also wouldgain the necessary technological competences (Rapanta, Botturi, Goodyear et al., 2021). An interesting future solution in this regard is described by (Wieser, Bangerl, Karatas, 2022) characterising different scenarios for post-pandemic education, among others the digital (digitised) face-to-face/classroom university i.e. a future model in which digital technologies would be integrated into face-to-face (direct) learning (in the classroom/classroom). Here, digital technologies would be used in different models such as hybrid learning or the 'flipped classroom'.

Postulates regarding the personal and professional development: female students declared in the post-pandemic future that they would like to develop their individual interests as well as their subject interests related to the circles and courses implemented at the university. Developed individual interests can help to overcome difficulties and motivate to increased cognitive activity and high academic performance (Hidi, 2006; Wild, 2022).

Needs satisfaction postulates were mainly concerned with meeting the need for security, getting support in didactic and organizational issues, but also psychological and social issues. In view of the above, it becomes important to build a culture of support that ensures the safety of wellbeing for all members of the academic community. This may include supporting the development of all actors and building positive relationships between people.

The distinguished areas form a complementary whole, in which the postulates refer to important spheres of human functioning, i.e. intellectual, psychosocial and physical. In post-pandemic times, the surveyed students will strive to use the experience and skills gained during remote learning.

The implementation of the presented postulates is a kind of challenge facing universities. While it while it is not difficult to maintain mixed education (remote and face-to-face) with the provision of appropriate digital infrastructure, it must be remembered that this is not the answer to all education problems in post-pandemic times. It will be necessary to modernise education standards, which will help formulate guidelines for e-learning conducted at the university. It will be necessary not only to prepare teachers for work, but also to develop their skills, especially digital and social competences, thanks to which they will be able to provide the necessary support to students.

Following observed trends, it is possible that e-learning will become a conventional form of education in the coming years (Yusuf and Abdul-Aziz, 2013, p. 178). E-learning indicates a shift from classroom-based learning under instructor control to a mixture of approaches that include instructor control when appropriate (Dagiene and Kurilovas, 2010).

One of the limitations of the study was that the research sample consisted of first-year students of full-time studies at the Pedagogical University of Krakow in the field of pre-school and early school pedagogy. They were selected due to the fact that 99.9% of students of pedagogy faculties are women. The study was

conducted at the end of the second semester (May–June), when classes were held remotely. Students have already had the experience of full-time learning in the first semester, as distance learning at the university was introduced on 22 March, 2020.

## Conclusions

In the light of the unique needs of female students in terms of their own development, education, as well as expectations regarding formal education at the university after the pandemic subsides, it can be seen that the respondents' opinions are divided. Proponents of the hybrid approach believe that it is attractive and offers the opportunity to individualise education, gives a sense of greater independence, self-reliance, flexibility and versatility. It can therefore become an alternative to traditional education, as it enables wider and easier access to education for everyone, including people living abroad or young mothers who divide their time between child care and education. It also provides the opportunity to acquire knowledge from various sources, i.e. via the Internet at any time and place, which is particularly important for the respondents who study and work at the same time. Diversifying teaching and engaging participants in diverse tasks and in different ways can bring real benefits. Such classes are not only interesting, but also more effective and allow one to achieve a variety of educational goals. Teaching in hybrid mode allows one to combine studies with work, which became very popular among students even before the pandemic. It is also appreciated for saving time and money. This is an important aspect mentioned by the respondents due to the possibility of integrating work and study, as well as due to the willingness and sometimes the need to relieve the financial burden of the parents and to achieve greater financial independence by the respondents. Therefore, universities should meet the expectations of female students, e.g. in terms of timetables, so that it is possible to combine studies with work.

Proponents of full-time education benefit from the university environment, point to the need to truly play the role of a student who wants to feel the atmosphere of the university, experience the advantages of direct contact with lecturers and peers, and want to use the university's infrastructure and cultural offer in an unlimited way. Their expectations in terms of needs focus on such categories as: multifaceted support (including psychological, organisational, didactic), a sense of security and interpersonal relations. These are very important needs from the perspective of one's own development. Satisfying social contacts are conducive to mental and physical health, as they protect us from loneliness and stress, give us a sense of competence and belonging, and bring joy, which promotes self-efficacy and a sense of agency. Therefore, they should be taken care of at every stage of life and

education. As such, it can be seen that students want to immerse themselves in the scientific, emotional, social and material space of the university and take as many benefits as possible in terms of acquiring knowledge, skills, and establishing relationships in a direct way. It is also understandable that we develop comprehensively, and our brain uses its potential much better in direct contact with others.

It should be emphasised that the pandemic crisis has undoubtedly contributed to the deprivation of social and security needs. In connection with SARS, the participants of the educational process experienced negative states, such as anxiety, fear, exhaustion, burnout and longing for contact with others.

The pandemic has highlighted the adaptability of both lecturers and students to continue learning remotely and their appreciation for modern information technologies, which is a key aspect of a successful education model that demonstrates rapid response and adaptation to changing living conditions. Distance learning has both clear advantages and disadvantages, which have been mentioned above. The study identified difficult challenges faced by universities, lecturers and university authorities, i.e. providing students with comfort, a sense of security and creating optimal conditions for the development of personal potential, which was clearly articulated in the respondents' narratives. This is not an easy task in the era of fluid reality and requires many treatments in various spheres of education and functioning in changing conditions. The pandemic and its effects have shown how important it is to develop both systemic and university-level solutions conducive to effective, safe and multilateral education.

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## Wyzwania związane z postulatami studentów wobec edukacji w czasach post-pandemicznych

S t r e s z c z e n i e

Pandemia Covid19 zmieniła codzienne funkcjonowanie społeczeństwa w wielu aspektach, w tym także w zakresie edukacji. Zmianie uległ model działania szkół z tradycyjnego – stacjonarnego na model zdalny. Zakres zmian objął różne typy szkół, w tym szkoły wyższe. Uczynienie nauczania na odległość obowiązującą praktyką edukacyjną wymusiło dostosowanie się zarówno studentów, jak i nauczycieli akademickich do dynamicznie zmieniającej się rzeczywistości. Koniecznością stało się rozwijanie i korzystanie z kompetencji cyfrowych. Nabyte podczas pandemii doświadczenia wywarły wpływ na perspektywy edukacyjno-zawodowe studiujących. Celem podjętych badań było poznanie oczekiwań studentów wobec własnego rozwoju, edukacji, a także określenie, jakie są ich postulaty względem formalnego kształcenia czasach post-pandemicznych. W podjętych badaniach jakościowych wykorzystano metodę narracji i uzyskano bogaty materiał empiryczny pochodzący od 100 osób studiujących na Uniwersytecie Pedagogicznym w Krakowie. Zobiektywizowanie wyników. było możliwe po wnikliwej analizie tekstów narracji (prospektywnej). Wyróżniono formalne i treściowe kategorie, które uporządkowano w czterech obszarach, biorąc pod uwagę postulaty badanych studentek związanych z: (1) organizacją i przebiegiem kształcenia, (2) wykorzystaniem technologii informacyjno-komunikacyjnej (TIK) w edukacji, (3) zaspokojeniem potrzeb studentów, (4) rozwojem osobistym i zawodowym. Wyróżnione obszary stanowią komplementarną całość, w której postulaty studiujących dotyczą istotnych sfer funkcjonowania jednostki tj. sfery intelektualnej, psycho - społecznej i fizycznej. Badane studentki oczekują, że po ustąpieniu pandemii będą mogły nadal wykorzystywać nabyte w trakcie nauki zdalnej doświadczenia i umiejętności, pragną zapewnienia przez uczelnię bezpiecznej przestrzeni fizycznej i społecznej. Chcą również uzyskać wsparcie emocjonalne, które będzie sprzyjało uwolnieniu się od negatywnych uczuć, a także otrzymać wsparcie instrumentalne, które umożliwi właściwe sposoby zachowania się i efektywne uczestnictwo w postpandemicznej edukacji. W artykule opisane kategorie zostały wzbogacone przykładowymi wypowiedziami badanych.

S ł o w a  k l u c z o w e: wyzwania postulaty, studenci, kształcenie zdalne, edukacja postpandemiczna

Challenges Related to the Postulates of Students Towards Education in Post-Pandemic Times

Агата Поплавская, Елена Бочарова, Беата Суфа

## Вызовы образованию после пандемии в оценках студентов

Р е з ю м е

Пандемия COVID-19 серьезнейшим образом нарушила традиционно привычное функционирование общества во многих сферах, включая образование. Сложившаяся обстановка сделала невозможным продолжение образовательного процесса в традиционной – стационарной форме в школах и высших учебных заведениях. Дистанционное обучение заставило студентов и преподавателей адаптироваться к динамично изменяющейся реальности. Использование цифровых компетенций в образовании стало необходимостью, а опыт, полученный во время обучения online повлиял на профессиональные перспективы студентов.

Цель данного исследования – узнать как студенты оценяют уровень своего развития и знаний, полученных во время пандемии, а также определить, требования студентов к формальному образованию в постпандемический период. В статье представлены результаты качественного исследования, проведенного среди с студентов Педагогического университета им. Комиссии народного образования в Кракове. Использование нарративного метода дало возможность собрать богатый эмпирический материал. Тщательный анализ ответов респондентов помог представить картину объективных результатов исследования. Вопросы задаваемые участникам касались четырех главных тем, а именно: (1) организации процесса обучения, (2) использования информационных и коммуникационных технологий в образовании, (3) удовлетворения потребностей студентов, (4) личностного и профессионального развития.

На основе результатов исследования сделан вывод о том, что ожидания студентов касаются в первую очередь, сферы функционирования, т.е. интеллектуальной, психосоциальной и физической. Опрошенные студенты были уверены в дальнейшем использовании опыта и навыков, приобретенных во время дистанционного обучения. Университет является безопасным местом, где они могут получить эмоциональную и психологическую поддержку, которая позволит им эффективно продолжить обучение по закончению пандемии. В статье приведены примеры ответов респондентов.

К л ю ч е в ы е  с л о в а: вызовы, студенты, дистанционное обучение, постпандемическое образование

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## Retos educativos pospandémicos en las valoraciones de los estudiantes

R e s u m e n

La pandemia del COVID-19 vulneró seriamente el funcionamiento tradicional de muchas esferas sociales, incluyendo la educación. La situación de pandemia impidió seguir con el proceso educativo en los colegios y universidades de manera tradicional. La educación a distancia hizo que los estudiantes y docentes se adaptasen a la nueva realidad. El uso de recursos tecnológicos en el ámbito educativo se hizo realidad y la experiencia obtenida durante los cursos a distancia influyó en las perspectivas profesionales de los estudiantes.

El objetivo de la investigación en cuestión – averiguar el grado de estimación de los estudiantes de su nivel de conocimientos recibidos durante el período de pandemia así como los requisitos de los estudiantes para educación en el período pospandémico. En este artículo se aprecian los resultados de la investigación cualitativa realizada entre cien estudiantes de la Universidad Pedagógica de la Comisión de la educación popular de Cracovia. El uso del método narrativo dio la posibilidad de obtener mucho material empírico. Objetivación de los resultados de la investigación se hizo posible después de análisis riguroso de las respuestas de los entrevistados. Las preguntas que han hecho a los entrevistados eran de cuatro temas principales: 1) organización y el proceso del aprendizaje. 2) el uso de tecnologías de información y comunicación en el ámbito educativo 3) satisfacción de las necesidades de los estudiantes 4) el desarrollo personal y profesional. Basándose en los resultados de la investigación, se ha llegado a la conclusión que las expectativas de los estudiantes están relacionadas en el primer turno con el tema del funcionamiento, es decir, condiciones emocionales, psicosociales y físicas. Los estudiantes encuestados estaban seguros de que usarían en el futuro su experiencia y habilidades adquiridas durante el período de educación a distancia. La universidad es un lugar seguro donde ellos pueden obtener el apoyo emocional y psicológico que les permitirá seguir con sus estudios después de la pandemia. En el artículo se presentan los ejemplos de las respuestas de los encuestados.

P a l a b r a s  c l a v e: retos, estudiantes, educación a distancia, educación pospandemia

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# A Practical Test of Distance Learning During the COVID-19 Lockdown

## Abstract

The article describes the authors' experience of distance learning at Rzeszow University of Technology during COVID-19 lockdown. The problems associated with the didactics in the pandemic period were discussed. They concerned hardware, software, and teaching rooms. Technical and organisational issues were discussed. The aspect of student involvement in the distance learning process and the learning outcomes achieved by the students was also addressed. Finally, the conclusions that emerged from this stage of work with students were presented, as well as suggestions related to the improvement of the distance learning process for the future.

K e y w o r d s: e-learning, distance learning, COVID-19, lockdown

# 1. Introduction

## 1.1. General information

The transition of education in Poland, and thereby universities, into a distance learning mode was forced by a government decision. The period began in April 2020 and lasted until June 2021. Thus, the lockdown comprised three semesters of study for universities. In this article, the authors focused on distance learning carried out at the Faculty of Chemistry in Rzeszow University of Technology (RUT), which is a medium-sized technical university in the country, located in the southeastern region of Poland. The university includes 7 faculties: *The Faculty of Chemistry, The Faculty of Civil and Environmental Engineering and Architecture, The Faculty of Electrical and Computer Engineering, The Faculty of Management, The Faculty of Mathematics and Applied Physics, The Faculty of Mechanical Engineering and Aeronautics, and The Faculty of Mechanics and Technology*.

The education of students at the Faculty of Chemistry is carried out in a two-degree mode: the first degree – engineering and the second degree – master's. Four courses were available to students in the undergraduate program: biotechnology, chemical technology, chemical and process engineering, and pharmaceutical engineering. Second-degree studies are provided in two courses: biotechnology and chemical technology. Our students participate in activities such as lectures, exercises, laboratories, and projects. Lectures and exercises are conducted in classrooms equipped with screen projectors, visualizers and traditional blackboards. For core subjects such as mathematics, physics, statistics, and general chemistry, where lecture group sizes are large (>70 people), lectures are held in lecture classrooms, while laboratory exercises (10–15 people) in subjects such as general chemistry, organic chemistry, biology, et al. are conducted in typical chemical or biological laboratories. In addition to these, there are laboratory classes and projects that are conducted in computer labs (e.g.: computer science, statistics, technical mechanics and mechanical engineering, etc.).

During the COVID-19 lockdown in the Department of Chemistry, we educated students in all the courses mentioned. The university authorities followed the decision of the country's authorities and, at the time of the lockdown, announced that all didactics would be conducted online. This meant the complete introduction of e-learning throughout the university for all types of classes. Academics had the choice of teaching from the university's rooms or from home. The students, on the other hand, were to be in their homes. Computers, of course, became necessary for the communication and transmission of teaching content to students. These computers were to be equipped with the appropriate software. This applied to both the computers of university teachers and the computers of students.

The two-year lockdown allowed both academics and university authorities to gain practical experience regarding distance learning. However, the question arises, "Has remote teaching worked well as a form of teaching at the university during the blockade?" This problem is complex. Obtaining an answer requires analysis from several different points of view. In order to carry it out, the authors decided to divide the problem into simpler components. They singled out the following questions:

Q1: Do universities have the facilities required for distance learning?
Q2: Do universities have the equipment needed to conduct distance learning classes?
Q3: Do universities have the software necessary to conduct distance learning classes?
Q4: Are teachers comfortable with operating distance learning equipment?
Q5: Are teachers comfortable with distance learning software?
Q6: Are students more likely to participate in distance learning activities?
Q7: Are students more active during distance learning?
Q8: Are students more comfortable in acquiring knowledge during distance learning?
Q9: Do students perform better during the remote learning process than they do with face-to-face teaching?

In the following content of the article, the authors analyze the various issues contained in the questions and try to find answers to these questions.

### 1.2. Phases of distance learning

During the lockdown, two phases of distance learning could be clearly distinguished:

- 1st phase – summer semester of the academic year 2019/2020,
- 2nd phase – academic year 2020/2021.

The first phase could be called a „period of storm and stress" or a „temporary transient state". It was caused by the sudden movement to full-scale distance learning for which the universities in Poland were not fully prepared. There was a shortage of equipment, software, and classrooms. As a result, most of the universities experienced some difficulties and turmoil, but they were managed fairly quickly. This sudden and unexpected situation unleashed a lot of creativity among academics. They introduced elements of distance learning without having guidelines, so it was quite diverse: from conducting live classes and broadcasting on the channel of a streaming platform, through instant messaging for synchronous communication such as Teams, Zoom, or asynchronous communication on various chat rooms or social networks, and finally exchanging emails with students. Undoubtedly, the form of these classes largely depended on the ability to use

modern information technology in education, in other words, on the knowledge of e-learning techniques. And here, the e-learning training courses organized for employees in 2014–2018 (developed and conducted by prof. Barbara Dębska and the authors of this publication) proved to be an unquestionable asset.

The second phase was a period of relatively stable teaching but with limited effectiveness for the Faculty of Chemistry. This stage was stable because the preceding summer holiday period gave universities time to equip themselves with hardware and software and improve their teaching organization. In addition, university authorities and academics already had some experience from the first phase. So, they had already roughly figured out what needed to be improved in distance learning. Unfortunately, despite the stability of the online teaching process, its efficiency was definitely worse than before the lockdown period. However, it should be emphasized that this was due to reasons beyond the control of university staff. In the range of classes taught in the university's departments, a significant share is taken by practical classes, conducted in studios and laboratories. Such activities cannot be effectively carried out in the distance mode. At the time of the university's transition to the distance learning mode (i.e., at the very beginning of the first phase), it was decided that laboratory classes would be conducted in a limited way, with the help of materials prepared by academic teachers and assisted by technical staff. These details are described in later sections of this article.

## 2. Premises used during activities

### 2.1. Rooms used by teachers

At the beginning of the lockdown at the Faculty of Chemistry in RUT, i.e., in the 1st phase, classes were mostly implemented asynchronously, i.e., in the e-learning service, teachers uploaded materials in the form of PDF files, presentations, videos, etc. Students were obliged to download them and study their content. Tests and exams were held remotely. However, some teachers conducted classes (lectures and exercises) in a synchronic manner, using publicly available communication media (social networks, chat rooms, etc.).

In the 2nd phase, four classrooms were prepared and equipped with newly purchased equipment and software for distance learning for teachers. The equipment in the aforementioned rooms was periodically checked by designated persons for proper operation (some of the authors of publication included). Some teachers conducted distance lectures in the prepared rooms, while others conducted them from their staff rooms in the university buildings. However, a significant number

of teachers conducted distance learning from home. At the beginning of this phase, among the group of teachers who declared that they would be conducting classes in the teaching room of the university building, there were voices for support persons to assist during their classes. Specifically, this would involve the lecturer conducting the class traditionally on the blackboard and the attendant filming the lecturer live, keeping an eye on the quality of the video and the sound system. These requests were dismissed as unrealistic as the technical staff of the classrooms were only two people who also taught their classes. On the other hand, technical staff of faculty are not trained in the use of multimedia equipment to handle this task.

### 2.2. Rooms used by students

Unfortunately, the authors are not aware of detailed data on the rooms used by students during online learning, since no one recorded such information during both phases. Nevertheless, at the time of the introduction of the lockdown at the Faculty of Chemistry in RUT:

- in the first month of distance learning, some students declared that they were attending classes while living in dormitories and lodgings,
- after the first month (owing to decisions made by the country's authorities), students declared that they attended classes from home.

Quantitative data are not available; the authors only have feedback from online conversations with students. It was very common for teachers to hear noises transmitted from student computers when students joined remote classes (e.g., sounds of hushed conversations, cries of small children, noises coming from the kitchen, barking dogs, and even sounds of renovations). Given the restrictions imposed by the country's authorities (lockdown), it can be assumed that the vast majority of students attended classes in their own homes.

## 3. Equipment used for distance learning

### 3.1. Equipment of dedicated teaching rooms

After the experience of the first phase, teachers and faculty authorities came to the conclusion that conducting classes such as lectures and classes in subjects that require the presentation of graphic content on the fly, for example, such as biochemistry or organic chemistry, where the teacher presents certain content on the blackboard (chemical structures, mechanisms of chemical reactions, etc.), cannot be done using an ordinary computer. To make the classes useful to the

students, the teacher has to use an additional peripheral device, as it is impossible to draw effectively and efficiently with a computer mouse. That is why the faculty authorities decided to purchase two graphic tablets with a screen. Also, some of the homeroom teachers have purchased such devices.

The first two rooms prepared at the Faculty of Chemistry in RUT for distance learning were equipped with the following equipment:

- laptop: 3.5 GHz processor frequency, 16 GB RAM, USB 3.0 ports, USB C ports,
- monitor: 21", HDMI,
- graphics tablet: 16" (LCD screen, wireless pen, USB, HDMI),
- mouse: wireless
- media HUB: 4 x USB 3.0, 2 x HDMI, 1 x LAN,
- HD digital camera with built-in microphone (USB),
- headphones communicating via USB and Bluetooth (equipped with a switch),
- visualizer – digital camera mounted on a movable arm (USB).

The rooms listed were prepared for teachers who needed a graphics tablet for their classes but did not have a suitable room and tablet at home. In addition, the prepared rooms took the burden of hardware and software configuration off their shoulders. Each teacher brought only his or her own files and notes with him or her, and launched the ready-made set, and began classes. The equipment was periodically checked to make sure that it was ready for use.

The graphics tablets purchased were models with built-in LCD screens. Each such tablet required two signal cables to be connected to the computer for proper operation: USB, which transmitted the position of the tablet pen, and HDMI, which transmitted the image from the computer to the tablet. The models used were characterized by very low drawing delays, that is, from the moment the pen docks the tablet surface until the virtual ink mark appears on the tablet screen (< 500 ms). In fact, the delays were imperceptible to the user, which is especially important for live drawing.

The other two rooms prepared at the Faculty of Chemistry in RUT for distance learning were equipped with the following equipment:

- desktop: 3.0 GHz processor frequency, 8 GB RAM, USB 3.0 ports,
- monitor: 21", HDMI,
- mouse: wire, USB
- HD digital camera with built-in microphone (USB),
- visualizer – digital camera mounted on a movable arm (USB).

These rooms were prepared for those teachers who did not need graphic tablets for their classes and preferred to use a visualizer instead. Visualizers were prepared as could be shared online: printed materials (books) or notes, written or drawn on paper on the fly, or show small objects (such as small laboratory equipment).

### 3.2. Equipment used by teachers in office rooms

Teachers used both: desktop and laptop computers in their staff rooms. In addition, managers of some departments purchased video cameras from the funds allocated for didactics. These were HD webcams, which also come standard with a microphone. The cameras were purchased for those employees who intended to use desktop computers (laptops are now equipped with a camera and microphone as standard). As mentioned earlier, a small number of academics purchased graphics tablets from funds allocated for didactics. Some of these purchased tablets were models without a screen (cheaper than those with a screen).

### 3.3. Equipment used by teachers at home

Academic teachers conducting remote classes from home overwhelmingly used their own private equipment. Again, this included desktop computers as well as laptops. A small number of teachers purchased computer equipment (computer, monitor, graphics tablet, camera, microphone) with private funds. Unfortunately, the authors do not have figures on the share of each category of equipment. Graphics tablets equipped with an LCD screen were very popular. This made it immeasurably easier for teachers, who had to convey complex sign content (e.g., symbols) and graphics (chemical structures, etc.) during lectures and classes.

### 3.4. Equipment used by students

In this case, the authors do not have detailed data on the equipment used by the students. However, the following picture emerges from the fragmentary feedback that is reaching academics (including the authors):

- the majority of students used laptops, which are standard equipped with a digital camera and microphone (they are placed in the flap that constitutes the screen),
- students using desktop computers equipped themselves with digital cameras on their own or using cell phones (smartphones) as cameras,
- a small percentage of students also used cell phones (smartphones) in place of a computer,
- lack of any feedback that students used graphics tablets.

# 4. Software used by teachers

## 4.1. Software used in lectures and classes

Teachers used Windows-based computers to conduct remote classes. These were versions: 7, 8 (including 8.1) and 10. There were some people who used computers running MacOS X or Linux. Communication between teachers and students took place both synchronously (live) and asynchronously. The Zoom program was used for synchronous communication (audio and video transmission) between teachers and students at the beginning of Phase I. The Teams program was also available as part of the MS Office 365 software, for which the RUT has a license. However, at the beginning of Phase I, not all employees were familiar with it. Lecture and class content was made available through these programs.

The content of the lectures was mostly prepared in the form of presentations. PowerPoint was used mainly to prepare the presentations. Few teachers used Impress from the LibreOffice suite. Individuals presented the content prepared in Word or Acrobat Reader (content exported to PDF). The presentations included graphic objects such as chemical structures, spectra (spectroscopy), chromatograms, charts, graphs, diagrams, technical drawings, and photographs. Chemical structures were prepared in AccelrysDraw or ChemSketch. Diagrams came from Excel, Origin, or Calc (from the LibreOffice suite). Diagrams and schematics were prepared using PowerPoint tools or embedded as objects prepared in Visio or Draw (from LibreOffice suite).

Teachers used PowerPoint and Whiteboard mainly, for activities requiring drawing (e.g., chemical structures and reactions) or writing mathematical expressions. The whiteboard built into the Teams program was used less frequently. The popularity of PowerPoint or Whiteboard is due to the fact that they allow easy and quite convenient use of a graphics tablet and more intuitive operation. This is much more convenient than the whiteboard built into the Teams program. The authors received feedback from teachers in the Faculty of Chemistry, who declared that these programs were much more convenient than the whiteboard built into the *Teams* program.

Laboratory activities were limited to video recording of laboratory experiments. Some videos were supplemented with voiceover commentary.

The classes held in computer labs were conducted remotely. Some of the software used in such classes was open source or freeware. However, a good portion was commercial software.

### 4.2. Software used during computer lab classes

Laboratory classes using computers were implemented to a limited extent due to the lack of student access to these specialized programs requiring a domain-supervised installation and running, which was impossible on student private computers. This was due to the license granted to the university by the manufacturer of such software. Examples include Microcal Origin or the MS Office suite (Excel, PowerPoint, Word). Commercial software, usually used in computer labs, available to students at home, are, for example: Matlab, Statistica, AccelrysDraw, ChemSketch, and Visual Studio. So, these programs have been used in remote teaching. On the other hand, some commercial programs were able to be replaced by open source programs. Details are given in Table 1.

Table 1
*Summary of sample subjects and software used by the authors in distance learning (computer labs)*

| No. | Course | Software | License |
|---|---|---|---|
| 1 | packages of application software | LibreOffice Calc | open source |
| | | Matlab | commercial |
| 2 | experimental methodology | Statistica | commercial |
| 3 | statistical processes control | | |
| 4 | statistics and results elaboration | | |
| 5 | computer science | LibreOffice Draw | open source |
| | | LibreOffice Impress | open source |
| | | AccelrysDraw | commercial (free version) |
| | | ChemSketch | commercial (free version) |
| | | NetBeans | open source |
| | | GIMP | open source |
| | | SharpDevelop | open source |
| | | Visual Studio | commercial (CE[1] version) |
| 6 | fundaments of programming | CodeBlocks | open source |
| | | Visual Studio | commercial (CE version) |

For the implementation of distance learning classes on the subject of packages of application software, an initial attempt was made to use Excel in a version that runs in a web browser (MS Office 365). However, due to the fact that it is a very

[1] CE = Community Edition – software available free of charge to schoolchildren, students and hobbyists.

poor version, it was quickly abandoned (after first lesson) and replaced with Calc from the LibreOffice suite.

### 4.3. E-learning platform and communicators

During distance learning, coordination between teachers and students and mutual communication became a necessity. On this purpose, the Moodle learning management system, already running on the RUT servers, the Teams program (within MS Office 365), the USOS, system and (to a limited extent) traditional email were used.

The origins of e-learning at the Rzeszow University of Technology can be traced back to 2004, when the Faculty of Chemistry obtained Center of Excellence status (Dębska, Dobrowolski, Jaromin, & Hęclik, 2020). Then, the Center for Distance Education (CDE) began to operate on the faculty. The establishment of CDE was closely connected with the COMODEC project (Fifth Framework Program of the European Union). It was initiated by prof. Barbara Dębska. CDE became one of the tasks carried out by the staff of the Department of Computer Chemistry under WORK PACKAGE 3: Computer-aided Information Retrieval from Chemical Databases. From the funds earmarked for this project, an IBM Lotus LMS educational platform was purchased, on the basis of which a teaching portal was built, subsequently made available to students through a (now defunct) website: www.e-chemia.pl. With the funds available from the COMODEC project, it was also possible to purchase equipment and build a computer lab suitable for remote learning. The portal pages included online teaching materials, which took the form of:

- lecture handouts that can be used by students when they need them, such as preparing for an exercise, test, or exam,
- interactive calculation exercises designed in such a way that the student can change the data, and the computer supervises each step in the calculation and explains the mistakes made by the student,
- instructions for laboratories containing a description of the exercise, a simulation of its course, a description of how to process the results and a test to verify the student's preparation for the test, and
- lessons that expand the scope of the material taught with additional content, allowing personalized learning pathways for different groups of students.

Through the portal pages, teaching materials were made available to support education in both chemistry and chemical informatics. The database of the portal was constantly expanded, both in terms of the number of courses (bioinformatics, methodology of the experimental work) and their content. Among others, applications were developed: modelling the operation of measuring devices (e.g. spectrometers (Dębska, Guzowska-Świder, & Hęclik K, 2013)), simulating the

course of laboratory exercises, following and supervising the interactive way in which students solve computational tasks in the field of chemometrics, explaining the work of complex computer tools (a tutorial of the Statistica program, or a tutorial of the CLC Sequence Viewer program for analyzing, comparing and presenting genetic sequences), as well as teaching student-chemists the basics of programming in Pascal and C/C++ and using the acquired skills to solve, for example, chemical engineering tasks. According to the draft structure of the portal www.e-chemia.pl, its development was achieved not only by expanding the database of teaching materials but also by the fact that some of the portal's teaching material resources were created on the Moodle platform. Although IBM Lotus LMS was a commercial platform, Moodle is made available under an open source license. In addition, not only is it used in the process of self-learning, but it is also possible to conduct research on the teaching process carried out remotely using it. Throughout the years of CDE operation, professor Barbara Dębska has led and actively participated in the development of the www.e-chemia.pl portal.

In 2013, a strategy for the computerization of the RUT was developed and continued until 2020. The implementation elements of e-learning into the university's didactics was one of the tasks planned but it required the construction of a virtual campus. This was achieved thanks to the efforts of prof. B. Dębska. The e-Learning Center was established. The launch of the RUT's learning platform took place in 2014, and since then prof. B. Dębska has served as the rector's representative for e-learning. The staff of The Department of Computer Chemistry began transferring teaching materials from the www.e-chemia.pl portal to the new e-learning portal. In that year, a training program on e-learning was prepared for university teaching staff. It was developed by Prof. B. Dębska and the authors of this publication. Between 2014 and 2018, 25 training courses were implemented with a total of 185 participants (22% of all university teachers). Since 2014, the Moodle platform has been used all the time by university teachers and students.

During the COVID-19 lockdown, the e-learning platform was primarily used to make teaching content available to students by university teachers and also to notify students of course details. The content available on the platform is arranged hierarchically. Each faculty has a separate section, which is divided into degree programs (1$^{st}$ – BSc, 2$^{nd}$ – MSc) and, subsequently, into courses. During the lockdown, the Faculty of Chemistry educated the following students:

- 1$^{st}$ degree in the courses: biotechnology, chemical technology, chemical and process engineering, and pharmaceutical engineering
- 2$^{nd}$ degree in the courses: biotechnology, chemical technology, chemical and process engineering.

Each course contains a range of courses that correspond to the taught subjects (modules). The course is managed by a coordinator. He/she is responsible for creating and configuring the course. He/she can provide materials for didactics, or he/she can delegate this to the subject teachers assigned to the course.

During the period of remote teaching, the following were placed in the course: lecture presentations, files with assignments, instructions for classes, and videos of laboratory classes. In addition, tests and quizzes were created in the course to verify the knowledge of the students, acting as remote tests and exams. A small number of teachers used Zoom and also the Forms module, available on the Teams platform, to conduct tests and exams.

### 4.4. Training in the use of hardware and software

A training course on how to use the e-learning portal was already organized for academics in the first phase of distance learning. It included: registration, logging in, setting up and configuring the course, posting content in various formats, and creating tests and quizzes. It was conducted by one of the authors. In the course of conducting it, it turned out to be very necessary, as many people had never used the platform or did so rarely[2]. In particular, the most difficult part was the preparation of tests and quizzes to replace test and exams (at least in some subjects). Several such training sessions were held.

In addition, instructions for creating tests and quizzes containing screenshots with explanations were prepared by one of the authors. These were in the form of PDF files which were placed on the main page of the portal so that they would be visible as soon as any teacher logged in.

### 4.5. Evaluation of work with hardware and software

The Moodle e-learning platform, installed on the RUT server and administered by the university staff, performed very well, operating practically without malfunction and allowing for quick and convenient content sharing and communication with students, as well as conducting colloquia and exams. Similarly, the USOS and Zoom software also worked smoothly.

The Teams application was evaluated very differently by teachers: better or worse. In the initial period, some important functionality for the university was not available, such as downloading student attendance lists during lessons. Another problem was the cases of faulty uploading of the view of the shared program window. This manifested itself as a view of a black or grey rectangle where

[2] Details of the training courses conducted among the staff of Rzeszow University of Technology (including the Faculty of Chemistry) were published at the conference: *Dębska B., Dobrowolski L., Hęclik K., Jaromin M., Organization of training for academic teachers by the e-Learning Center of the Rzeszów University of Technology, XVIII Virtual University conference 2018 (Knowledge and teaching in the face of the idea of transhumanism), Warszawa 20–21 June 2018*.

the shared program window should be visible. These problems were originally reported by students to the teachers. This problem arose when working with ChemSketch, which was used extensively by chemists. Another inconvenience was that the number of simultaneously visible images of people connected in a single session was limited to 9 (later increased to 12). Originally, the *Teams* program was created to implement meetings of small groups of employees in large corporations. The requirements of corporate employees are different from those of education. It might be necessary to conduct a detailed study of the ergonomics of this program among students and teachers[3]. However, this issue is beyond the subject of this article. The authors have received signals from university teachers that it is inadequately adapted for university teaching. In comparison, the authors rate the *Zoom* program as better designed, more responsive and ergonomic.

The ergonomics and functionality of the *Forms* module (a module of the *Teams* application) was evaluated differently by teachers. Unfortunately, due to the difficulties of the lockdown as well as its low usage rate, no research was conducted on the ergonomics of this module. Nevertheless, it is important to remember that, as with *Teams*, the capabilities of the *Forms* module are due to its purpose – it is a module for corporations and not education.

However, the biggest disadvantage of solutions such as *Teams* and *Forms* is that these are services hosted on the server of a private entity, additionally located in the jurisdiction of a foreign country. The university (authorities, teachers, technical staff) does not have full access to this service and the data stored there. In addition, these data may be accessed by people who perhaps should not have them. It is important to remember that corporations very often disregard the provisions of the General Data Protection Regulation (GDPR). Many times in the past, due to poor server security, carelessness of corporate employees, or their dishonesty, data has been leaked. The problem is compounded by the fact that not only the university does not have lever age over the corporation, but also the Polish government. EU bodies have also had difficulties in the past enforcing compliance by foreign (non-European) corporations.

The software used during the computerized laboratory classes, listed in Table 1, worked flawlessly. This is hardly surprising in view of the fact that it has been tested many times. Students have also used it in the past on their computers at home. Difficulties occasionally occurred. Generally, this was due to poor knowledge of some students of how to use the program. These problems were solved continuously by the teachers teaching the classes.

[3] This topic is quite broad and would involve research at the intersection of software ergonomics and software development methodology.

# 5. Work with students

## 5.1. Conducting the lectures

In the 1st phase, in most cases, the lectures were prepared as PDF files (less often PowerPoint or Word) and uploaded to the university's e-learning platform.

In the 2nd phase, the situation was already stabilized and academics had developed some ways to deal with distance learning. Before the start of the academic year, courses were prepared on the e-learning portal. Gradually, the content of the lectures was to be uploaded to them, after each meeting was completed. According to university authorities' guidelines, lectures were conducted online. The presenters either used only presentations or lectured in a mixed manner, i.e. presentation interspersed with content drawn or written on the screen and explained on the fly. For example, lectures in the spectroscopic methods of analysis course were conducted using presentations, as it is difficult to draw on the screen (or blackboard) the spectra that were created by the apparatus. On the other hand, lectures in organic chemistry were conducted in a mixed way, i.e. the lecturer presented the content from the presentation, then went into detail using a tablet and drawing program. During lectures, students were not allowed to share content. However, they could make comments using microphones or via chat. However, not all lecturers allowed the use of microphones. Nevertheless, the backchannel sometimes proved necessary, such as when there were momentary lapses in video and audio transmission or when there were questions from students. During lectures, only some lecturers turned on the cameras. Unfortunately, the authors do not have detailed statistical data on this issue. On the other hand, students generally had their cameras turned off during lectures and often turned off their microphones as well. In such a situation, it was difficult for the teacher to determine how many students were actually attending the lecture and how many only had their computer equipment on but were absent.

## 5.2. Conducting the classes

In 1st phase, classes were conducted similarly to lectures. However, in 2nd phase, the exercises were already conducted online. Teachers conducting the following classes:

- displayed files with pre-prepared content of exercises and tasks,
- conveyed information by writing or drawing (chemistry, math, etc.) using:
  - a graphics tablet – in PowerPoint or Whiteborad,
  - a visualizer – on paper,
- "drew" structures in ChemSketch or AccelrysDraw,
- "drew" diagrams in PowerPoint, Draw, or Visio.

During the exercises, students were required to turn on their cameras and microphones. Students were also allowed to share the content of their screens and were occasionally asked to respond. In such cases, the student was required to share the program window in which he/she presented his/her solution to the task. In the case of chemical structures (and reaction mechanisms, in particular), students had a more difficult situation than the teacher because of the lack of a tablet. Nevertheless, they were slower but very good at writing down chemical structures or calculations with the mouse.

### 5.3. Conducting the laboratory classes

Laboratory classes at the Faculty of Chemistry take two forms. The first type is the classic classes in a chemical or biological laboratory, which depends on the field of study (chemical technology or biotechnology). The second type is classes in the computer lab. In this case, students work with software. In the case of classic laboratory classes, academics recorded a video of an experiment on a given topic if technically feasible. Sometimes, technical staff (lab technicians) were called in to help perform the experiment or record the experiment. During or after the recording, the teacher described in voice the activities performed. The recording was copied to a computer and then uploaded to an e-learning platform for the relevant course.

The computer-based classes were held in a slightly different format. Before class, students familiarized themselves with the topic of the meeting by reviewing the instructions posted in the corresponding course on the e-learning platform, just as previous classes had done during full-time study. If necessary, as described in the instructions, the students downloaded the relevant software from the university server (commercial software) or from an open source server. The installation method was described in a separate manual. In some classes, students also downloaded data files to their computers, which they then worked on during the course. After establishing a connection through an instant messenger (Teams or Zoom), students ran the software provided for work during a particular meeting. During these activities, they were also required to turn on their cameras and microphones. They also had the opportunity to share the content of their screens. The instructor explained on an ongoing basis how to perform specific operations, operate the program or obtain certain results. During the class, students were called on to respond. The students were required to share the program window in which they presented their results or demonstrated how to perform certain operations. In addition, recordings (screen sessions) showing the operation of programs and solving specific tasks were prepared for some subjects. An example is the recordings for the subject of application software packages prepared by one of the authors, concerning the operation of a spreadsheet (Excel, LibreOffice Calc) and Matlab. The recordings were accompanied by data files with solutions.

### 5.4. Execution of tests and exams

Tests and exams were implemented in two ways. The first was similar to those conducted during classroom instruction. The students solved the assignments by writing on pieces of paper. During the writing process, they were required to turn on cameras and microphones and position them in such a way that the lecturer could monitor them. The time for writing the colloquium was predetermined by the teacher. Students were informed about the technical details in the classes before verifying their knowledge. Additionally, the information was communicated to them by a university e-mail. Before the established time, the recorded solutions were photographed (smartphone) or scanned (scanner) by them and sent via university email to the teacher's email inbox. Alternatively, a variant was also used, whereby photographs or scans of the course were uploaded to an e-learning portal, where each student has their own account.

The second way to verify student learning results was through the use of tests and quizzes posted on the e-learning portal. The teacher prepared the relevant quiz in the course in advance. He/she configured it, i.e. the start and end date and time, the way the answers were given, etc. Then he/she included a set of questions in text (or graphic) form. The questions could be single or multiple choice. As in the first case, students were notified in advance about the colloquium or exam and its mode, via USOS or university email. If, during the course of the test or quiz, the student exceeded the allowed time, the server automatically interrupted the quiz, scoring the student, those answers that were given by the student. Immediately after the quiz was over, each participant could check the result of the quiz and review their answers and see which, if any, were incorrect.

The first way of verifying learning outcomes (i.e., photographing the solution sheet) has the disadvantage of being prone to potential abuse by students. Unfortunately, for some subjects, it is not technically feasible to perform them with a test or quiz. Organic chemistry is an example. It is not possible to prepare a reliable colloquium or exam on this subject using a quiz. Such verification requires drawing chemical structures or reaction mechanisms. Even if such software existed, the student would first have to learn how to use it at least in a good degree to be able to write (or rather draw?) the solutions in time.

Unfortunately, the second way of verification is also prone to abuse by students. The reason is that the student is sitting in front of the computer at home. Thus, the teacher has no way of verifying that the student is not using a third party acting as a prompoter. However, this method has the advantage that the student does not have to photograph or scan his/her work and send it as a file (attachment) by email or post it on the portal. The results are already there. The second advantage is that as soon as it is completed, the results are automatically graded by the software, so the student knows their grade right away. Another plus is that there is no question that the evaluation is subjective. Unfortunately, automation has the

disadvantage that the student does not answer the question him/herself but chooses an answer within a certain pool. So to some extent, some students may guess the answer without actually having knowledge.

Attention should be paid to abuses on the part of teachers who, unable to fully control students during the verification of learning outcomes, shortened the duration of a test or exam time absurdly. By shortening the duration, they wanted to force the students to prepare as well as possible and prevent them from using their notes. Unfortunately, excessive shortening of the duration of revision resulted in enormous stress among students, which often demotivated them. Because they thought, why bother trying and rushing if they still will not physically manage to write everything despite being well prepared.

Another burden was the automatic end time of the test or quiz and the unreliability of electronic equipment, the Internet connection. Students were burdened with a great deal of stress as to whether everything would work properly and whether they would be able to scan and upload their work in time, whether the Internet connection would be stable, and whether they would be able to be logged into the relevant portal throughout the verification period, which was a prerequisite for participation.

### 5.5. Coordination of the distance learning process

As mentioned earlier, the teaching process was coordinated using an e-learning platform, among other things. In the case of the work of academic teachers on the platform, some negative habits and routines have become apparent. A considerable number of subjects are taught by several people. For example, for half a semester a lecture is given by Professor A, and then, by Professor B, or a lecture is given by Professor A, classes by Doctor B, and laboratory classes by Doctors D and E. In the expected case, one course should be created with a name like the subject being taught. However, in many cases, not a single course taught cooperatively was created, but several different courses, often having additional phrases in their names. Examples of such course names are:

- "Basics of something XX/YY–ZZ>BasOfSth, Winter Term 2021/22, Laboratory, group no. 1",
- "Some materials. Laboratory exercises led by Prof. A… B… for group no. 2–5",
- "Subject with a long name IVCX – lecture FINAL TEST".

The problem was acute, as about half of all courses created within the department were called this way. This creates some confusion in the portal and can make it difficult for students to use it.

### 5.6. Students' preparation for classes

During the lockdown, the requirements for students' preparation for the courses changed slightly. In the 2nd phase, these requirements were openly stated in the courses posted on the e-learning portal. The first difference was that students did not have to come to lab classes equipped with personal protective equipment (lab coat, goggles, gloves). However, they should still be prepared to practice the lecture content. The second difference was in the classes conducted with software, i.e. those that were conducted in the computer lab before the lockdown. Students were required to pre-install software on their home computers (this applied to the software described in Section 4.2. Software used during computer lab classes). The access to this software and how to install it was given in advance in the instructions posted on the e-learning platform. In addition, they should: (a) be in a separate room and (b) have a personal computer running. In most cases, students were prepared correctly. Nevertheless, sometimes there were single cases when:

- the student did not install the software in advance, despite the fact that the others in the group had done so (the instructions for the class were posted in advance in the corresponding course on the e-learning portal), thereby causing delay for the others in the group,
- the student wanted to participate in a computer lab class using a smartphone and being on the go (bus), where the class was about a program running on a personal computer,
- a student reported a problem with the installation of the software, in a situation where he/she had a laptop computer with an incompatible operating system, which he/she did not notify the teacher in advance,
- students disconnected from the current instant messaging session, with most cases generally reconnecting quickly (up to 5 minutes), reporting internet connection problems in the chat (which was very often true, though not always).

## 6. Summary

*Answers concerning Q1, Q2:*

Summarizing the distance learning period, it should be noted than in the case of dedicated rooms and staff rooms, the university did well. Also as for the equipment used by teachers, there were no difficulties in the second stage of the blockade. Occasional problems with hardware and software at the Faculty, were resolved on an ongoing basis by the authors (there were fewer than 10 such problems during the entire lockdown).

*Answers concerning Q3:*

As for the analysis of the hypothesis that universities are well-equipped with software for remote classes, this issue should be divided into four groups, according to the types of software:

(a) basic, i.e. operating system,
(b) synchronous communication (online messaging),
(c) content exchange (e-learning platforms),
(d) daily work (editors of various types, engineering calculations, etc.).

Ad. (a) The first group of software is the system for desktop computers. The vast majority of this is Windows (ok. 98%). It completely meets the needs of both teachers and students. The only caveat is the system's automatic updates, which can sometimes cause chaos and disorganization, as they cannot be easily blocked. In the case of the other systems, i.e. Linux and MacOS X, it is worse. The former is not suitable for everyday desktop work. The authors have been following the development of this system for many years (i.e. since 1999). The obstacle is its architecture and the habits and design decisions of the programmers who decide on its development. The main emphasis while working with this system is on the command line (called also: terminal, console)[4]. MacOS X, on the other hand, is much more expensive than a typical personal computer, including Windows in the price of the computer. However, the most acute thing is that both of these systems mostly lack the appropriate versions of the software used by students at our faculty.

Ad. (b) The second group is online communicators, capable of transmitting video and audio simultaneously. What is there is basically enough (e.g., Zoom) or is of lower[5] quality (MS Teams). This is particularly acute on computer equipment that has been used for several years (it is difficult to require a student to purchase very powerful, expensive equipment). Another acute problem is that these programs are not tailored to the needs of universities. The first is a general-purpose communicator, basically for home users. The second is designed for corporate users. Both of these groups have very different needs from students and teachers (Wea, Dua Kuki, 2021). Moreover, in both cases the communication is

[4] This way of working is not suitable for desktop systems. Instead, it is suitable for servers administered remotely.

[5] Software quality is related to features such as ergonomics (e.g., poor features, unintuitive GUI), responsiveness (e.g., slow response to user actions), crashworthiness (e.g., hangs), system resource requirements (e.g., high CPU load, high RAM usage), installation difficulty (e.g., need to install various virtual machines, interpreters, third-party libraries). The problem of low-quality software is related, among other things, to the tools used to produce the software, the knowledge and experience of the programmers developing the software, design assumptions, etc. The production of software by a large company does not automatically imply its high quality. Very often corporations buy beta-phase software projects from start-ups and under-invest in their development. In addition, software developed using scripting languages has higher CPU power requirements and consumes more RAM than programs compiled into machine code. This is unfortunately the case with the *MS Teams* program.

supervised by corporations – they are the ones who own and administer the servers. These problems are noticed, analyzed and discussed in the academic community (Ślósarz, 2020). In the case of the Teams program, there is another issue of the technology used. A conglomeration of HTML, CSS and JavaScript solutions is sufficient for web development but not for server and desktop applications[6] (Pereira, Couto, Ribeiro, Rua, Cunha, Fernandes, Saraiva, 2017). In addition, the communication server[7] should run on the university's computers (servers). Unfortunately, despite the passage of several years, it is clear that corporations will not create a communicator that meets the needs of universities, because they have no profit in it. On the other hand, the open source movement is incapable of creating ergonomic, intuitive-to-use and well-equipped software (negative examples include: Linux desktop version (Tashkinov, 2023), GIMP, Inscape, CMake, Python, R). Developing such software requires a large effort from a team of programmers who expect to be paid lavishly (rightly so), a determined project manager who will ensure that the software being developed is user-friendly and the user manual is comprehensive. Many open source projects show a chronic lack of: documentation, decent manuals and years of technical support. One should not be surprised, it costs a lot of effort finally. Another well-known affliction of many open source projects is that their developers stop being interested in the project after 2–5 years. Bored, they start a new project, shinier and promising more fame. As you can see, we will still have to wait for good communication software for universities.

Ad. (c) The portal used by our university should be evaluated positively, even though it is open source software, too. Admittedly, Moodle is not very user-friendly for those who install and administer it (IT specialists) but it is useful enough (ergonomic) for students and teachers. From the point of view the lockdown period, it should be evaluated positively.

Ad. (d) As for programs for daily work here is basically fine. Either you can use open source (LibreOffice) or freeware applications (ChemSketch, AccelrysDraw) or commercial ones available for students (Statistica, Matlab).

Summarizing points a–d, it should be said that our department is not badly equipped with software, and the weak point is synchronous communication. However, this is not our university fault. Improving this situation is beyond the reach of the universities.

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[6] Developing software using node.js technology and the Electron library is quite fashionable nowadays and, moreover, allows corporations to slightly reduce the cost of producing such software. However, the end-user loses out, as the quality of such software is inferior compared to programs developed with classic tools. Most of the client (desktop) software was and still is developed using languages compiled to machine code (e.g. C++) and using extensive libraries (e.g. Boost, Qt, VCL). Unfortunately, this approach requires higher financial resources and an incomparably better educated and professionally experienced staff (programmers).

[7] Server has two meanings: (I) program and (II) – computer. The authors mean both, i.e. software as a service, running on computers in the university's server room.

*Answers concerning Q4:*

In most cases, teachers coped well with operating the equipment (computer, camera, microphone, graphics tablet). The few who had difficulty understanding the use of multimedia computer peripherals were trained and coped with the requirements of distance learning at a later stage. It can be unequivocally stated that teachers have managed quite well in this case. It should also be borne in mind that the percentage of technology laggards will decrease significantly in the years to come as multimedia peripherals are becoming more widely available, just because only because their prices are lowering.

*Answers concerning Q5:*

Again, most teachers have done well with the software. Those few, as in the case of hardware, were trained either in groups or individually (rarer situations) (Forde, Obrien, 2022). A much bigger problem turned out to be the cooperation of teachers using the e-learning platform, as described in Section 5.5. Teachers using such practices forgot that the e-learning portal exists primarily for the benefit of students. An overabundance of fragmented courses with strange names causes students to feel lost, which detracts them from the effectiveness of teaching. Meanwhile, the platform is supposed to help them. Perhaps the remedy for such practices would be to encourage students to report such irregularities/deficiencies to the person in charge (the dean's attorney/rector) could intervene with the teacher who introduced the chaos. Currently, the problem of portal clutter has diminished and only about 1/3 of the faculty's courses are disjointed. Nevertheless, the problem still exists and needs to be solved. So from the point of view of handling the software, the teachers did well. On the other hand, their work on the e-learning platform needs to be corrected.

*Answers concerning Q6:*

During distance learning, attendance was verified by a list of student accounts visible in the communicator (e.g. Teams), i.e. connections. It could be saved to a file. In the case of lectures, it is difficult to determine whether the students actually attended, or whether only their computer logged into the communicator. For example, a lecture group on the course statistics and results elaboration led by one of the authors had about 110 people. In the case of exercises and computer labs, this was easier to verify because the groups were smaller, students were required to turn on cameras and microphones, and were debriefed. Verification of actual student participation is also difficult to solve because the teacher should be focused on teaching the class. Communication programs usually transmit a limited number of images of participants' faces (e.g., 9 or 12). So the teacher would have to take breaks during the course of teaching to switch the view of these people in the thumbnail list. The more people a group has, the more cumbersome this is. Even if the program could display a large number of thumbnails (e.g., 100), the

teacher would still be distracted (reviewing the participants). The question "should the teacher play the role of a controller?" remains an open one. In addition, with a very large number of thumbnails, there is a technical problem of transmitting a large number of video streams to the meeting participants (even if they have limited video resolution). Thus, remote teaching makes it difficult to reliably verify students' attendance in classes, but attendance was slightly higher than during full-time study (i.e., before the lockdown).

*Answers concerning Q7:*

The activity of the student (engagement) in class can only be assessed for exercise and computer laboratory classes in the same way as for attendance, i.e. by questioning individuals in the group. The authors observed during the classes that most of the students were interested in the classes. If an issue (task, program) caused a problem, they reported it to the teacher. The teacher's involvement in explaining or solving a problem (including a technical software-related one) made the students more willing to cooperate during the class. It should also be mentioned that students during the lockdown were slightly more likely to participate in consultations than their predecessors during full-time study. The consultations were arranged individually by the teacher. Online consultations have the advantage that the student does not lose time getting to the university. On the other hand, the teacher can use his/her free time for consultations beyond those hours that result from his/her work schedule. In particular, if the consultations were held in the evening, the teacher also would not have to spend time commuting to the university. Therefore, the authors notice some increase in student activity during remote classes.

*Answers concerning Q8:*

The period of distance learning was undoubtedly easier for students. This ease manifests itself in two aspects: time and finances. It goes without saying that these involve getting to the university and back home. This issue also applies to students living in dormitories and hostels. Except that these two cases differ in the proportion of time and financial costs incurred. Distance learning reduces the time it takes commuting students to get to the university and back home. On the other hand, students who live in dormitories or lodgings do not have to bear the costs associated with leasing the premises. With distance learning, both groups can live in their hometowns without wasting commuting time or money to stay near a scholar. Instead, they have to bear the cost of purchasing a computer and software. However, computers become commonplace and are used in households, these costs can theoretically be ignored. The situation becomes more complicated when there are more people in the family (e.g. teenagers) engaged in distance learning. Then parents need to purchase additional computers and software if their children's classes are held at the same time. In such a situation, two cost estimates

would have to be made: (a) for hardware and software, and (b) for travel and fees for premises and food during the blockade period. For this purpose, a large number of such cases would have to be analyzed. Collecting such financial data would be quite a technical challenge. However, a cursory analysis of (a) the prices of computers and basic software[8], and (b) adding up the prices of transportation tickets (bus, train) for commuting between 5 and 20 km of the university, as well as the prices of dormitory and lodging fees over a period of 3 semesters, would likely come out in favor of distance learning. Thus, remote learning makes it easier for students to complete their studies (Ciano et al., 2022), but not everywhere. There are still countries where the infrastructure is not sufficiently developed to take full advantage of the possibilities of e-learning (Adzovie et al., 2022), as well as those where young people do not have sufficient skills in the use of hardware and software (Sohil et al., 2022).

*Answers concerning Q9:*

The last issue, which seems to be the most important of those presented so far, is the effectiveness of the learning process slowed down during the COVID-19 lockdown. However, it is difficult to assess it objectively in the case of the 1st phase, since the teachers (including the authors) were not able to get enough feedback, other than tests conducted through tests and quizzes. Nonetheless, colloquia from this phase generally performed at least as well or slightly better than during classroom learning. The better results may have been due to the limited control opportunities of the students, which some of them probably eagerly took advantage of. There was much more of this feedback in the 2nd phase. However, the grades were similar to those of the 1st phase. The reason may have been the same but in addition, students, like teachers, gained some experience during 1st phase. On the one hand, there may have been abuse during the writing of colloquia or exams, but on the other hand, there may also have been a low-effort learning effect ("there is lower control, so I don't have to make an effort"). In the end, these two opposing effects may have balanced each other out, producing a result similar to those of in-person classes. Unfortunately, these are only speculations. There is no way to verify it because it would require reconducting colloquia and exams in stationary form on the same group of students, right after conducting them in an e-learning form, and then comparing them. Perhaps in the future someone will conduct such studies. It would be very interesting from a sociological and didactic point of view. Thus, the last hypothesis remains unresolved for reasons of constraints: time, financial and technical. Some universities are trying to assess the impact of blockade on the teaching process (Boulos, 2022). There are reports in which measurable losses in the teaching process are found (Patrinos, 2022) as well as those that present

[8] The hardware and software for remote learning can be used for several years without having to replace it with a new one.

opposite conclusions (Abunamous et al., 2022). The discrepancy may be due to the different areas of teaching in each school, which affects the specifics of the classes taught.

In summary, the currently available IT infrastructure (hardware, software) has enabled distance learning for at least a dozen years. There are still problems with slow connections or periodic short breaks in connectivity, but mainly in small localities, significantly distant from large urban centers. Nevertheless, these are increasingly rare cases. Therefore, during the blockade period, it was possible to switch to remote learning mode without major perturbations, albeit not without effort (Cárdenas-Cruz et al., 2022). Unfortunately, the authors conclude that this mode of teaching is less effective and prone to various pathologies in the teaching process. In particular, it is inappropriate for universities training students in natural sciences and technical subjects, where the mastery of laboratory work is important (Dębska, Guzowska-Świder, & Hęclik, 2016). For such universities, the optimal solution seems to be the blended learning method, where lectures, classes, classes in the computer lab, and consultations are held remotely, while laboratory classes and exams are conducted stationary. Moreover, the following also seems important:

- the continuous process of retrofitting the university with appropriate hardware and software,
- continuous training of academic teachers in the use of the same, so that they can effectively and efficiently conduct classes remotely and also,
- convincing university authorities and a large part of academic teachers themselves of the advantages of such a form of teaching.

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Karol Hęclik, Lucjan Dobrowolski, Marcin Jaromin, Iwona Zarzyka

## Test praktyczny zdalnego nauczania w trakcie lockdown'u COVID-19

Streszczenie

W artykule opisano doświadczenia autorów z okresu prowadzenia zajęć zdalnych na Wydziale Chemicznym Politechniki Rzeszowskiej w trakcie pandemii COVID-19. W artykule poruszone zostały problemy związane z dydaktyką tego okresu. Dotyczyły one sprzętu, oprogramowania i pomieszczeń dydaktycznych. Omówiono kwestie techniczne oraz organizacyjne. Poruszony został także

aspekt zaangażowania studentów w proces nauczania zdalnego oraz osiągniętych przez nich efektów nauczania. Na koniec przedstawiono wnioski, jakie się nasuwają z tego etapu pracy ze studentami, a także propozycje związane z poprawą procesu zdalnego nauczania na przyszłość.

S ł o w a k l u c z o w e: e-learning, zdalne nauczanie, COVID-19, lockdown

Кароль Хенцлик, Люциан Добровольски, Мартин Яромин, Ивона Зажыка

## Практический тест дистанционного обучения во время карантина COVID-19

А н н о т а ц и я

В статье описывается опыт авторов в периоде проведения дистанционных занятий на химическом факультете Жешувского Политехнического Института во время карантина, введённого из-за пандемии коронавируса COVID-19. В статье рассматриваются проблемы, связанные с преподаванием в период пандемии. Это касалось оборудования, программного обеспечения и учебных аудиторий. Обсуждаются технические и организационные вопросы. Также обсуждается аспект вовлечения студентов в процесс дистанционного обучения и результаты обучения, которых они достигли. В конце представлены выводы, сделанные по данному этапу работы со студентами, а также предложения, связанные с усовершенствованием процесса дистанционного обучения на перспективу.

К л ю ч е в ы е с л о в а: электронное обучение, дистанционное обучение, COVID-19, изоляция

Karol Hęclik, Lucjan Dobrowolski, Marcin Jaromin, Iwona Zarzyka

## Prueba práctica del aprendizaje a distancia durante el confinamiento por COVID-19

R e s u m e n

El artículo describe la experiencia de los autores en el aprendizaje a distancia en la Universidad Politécnica de Rzeszów durante el confinamiento por COVID-19. Se discutieron los problemas asociados a la didáctica sobre el periodo pandémico. Se referían al hardware, el software y las aulas de enseñanza. Se debatieron cuestiones técnicas y organizativas. También se abordó el aspecto de la participación de los alumnos en el proceso de aprendizaje a distancia y los resultados alcanzados por éstos. Por último, se presentaron las conclusiones que surgieron de esta etapa de trabajo con los estudiantes, así como propuestas relacionadas con la mejora del proceso de aprendizaje a distancia para el futuro.

P a l a b r a s c l a v e: e-aprendizaje, aprendizaje a distancia, COVID-19, cierre

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# Teacher Training and Learners with Special Needs in the U.S. and Poland – the COVID-19 Experience

## Abstract

The 2021 transition to teaching online and to virtual environment due to COVID-19 was challenging for many educationalists, teachers, students and pupils all over the world. However, it was particularly difficult for teachers of learners with special educational needs, school therapists and counsellors. They had to provide highly individualized teaching and service without (or with limited) face-to-face contact. This article looks at teacher qualifications necessary to provide ICT based education for learners, particularly for learners with special needs (from the American and Polish viewpoint). The Authors analyze the context of preservice teacher training in the COVID-19 conditioned environment with the particular focus of teachers of English as a Foreign Language (who wish to obtain teacher qualifications to teach in Polish public schools).

K e y w o r d s: teacher qualifications, preservice teacher education, special needs learners, e-learning, online learning

# Introduction

The COVID-19 pandemic has restricted and transformed all spheres of life all over the world, including education at all levels in an unprecedented manner. University training programs, administrators, educators, students, parents, and school personnel were forced to adapt to virtual classrooms, new channels and forms of communication, new strategies and techniques of teaching and learning. School buildings, like many other institutions, closed for many months (including the USA and Poland) and physically separated millions of students who receive special services (in the U.S. and Poland) from their tutors, counsellors, peers, etc. The circumstances imposed working under pressure, dealing with everyday stress and the rising levels of anxiety, loneliness and doubts. It was particularly difficult for educators to:

> [honor] students' Individualized Educational Programs (IEPs) and [offer] therapies in a remote setting. Both general education and special education teachers, regardless of previous experience with online instruction, were expected to provide high-quality instruction to all students during the mandatory school closures that resulted from the COVID-19 pandemic. Typical practices in special education and teacher preparation include strategies for direct instruction, inclusive practices, behavior management, and social emotional development that lead to increased inclusion for students with disabilities (Brownell et al., 2005: p. 11).

While some educational institutions had been using e-learning based courses or course components and had well trained personnel, there had been many which still lacked skills, equipment and technical support. There had been institutions with ready to transfer content to Moodle, Google, Teams, Zoom, etc. based classrooms, but there had been institutions which had to develop whole programs, train teachers, learners, buy equipment, software, etc. All institutions had to adapt to governmental restrictions, meet the expectations of all participants of the educational process and not only to survive, but be flexible, open to new experience, creative and professional. Designing quality online content takes time, requires competences and experience. It also involves cooperation, investment in both hardware and software, adaptation and training. Years of teacher training programs in Poland/Europe (for example, such as: E-Academy of the Future, or e-Twinning), for example, certainly proved effective; however, the needs were immense and circumstances changing. In the U.S., for example, at the beginning of the pandemic "Instructors were not ready for this sudden change that required the use of a new platform and the design of alternate activities and delivery methods. Some users faced technical

and unforeseen difficulties while using the new platform including internet access issues and Zoom bombings" (Serhan, 2020: p. 340).

When the COVID-19 pandemic started to spread and education institutions in Poland shut down (March 2019), SWPS University transferred to the online mode within two weeks. It was possible due to the efforts of the authorities, educators and administration but also because the University had been using distant learning tools for many years before. The tutors had been trained in using and designing their own materials and were well prepared for the transition, knowing a lot about the medium. English Studies program in the University of Social Sciences and Humanities (SWPS University), both at graduate and postgraduate level offers preservice teacher of English as a Foreign Language Certification program. The curriculum contained ICT based competences long before the pandemic; therefore, it was a smooth transition to the online mode. What students mastered during the online classes, in many cases, had an immediate application in practice as many combine work with studies. In addition, students continued their obligatory internships in public institutions, which were also online at that time.

## Problem of Research

This paper examines the responses to the crisis in the U.S. and in Poland from the perspective of academics and practitioners involved in teacher training programs. The objectives of this study were to: (1) examine students' competences and teacher's perspectives during a Pedagogical Diagnosis course and (2) examine the same students' skills during a *Computer Assisted Language Teaching course*, addressed at fellow teacher trainees or teachers of EFL at SWPS University in Warsaw, and (3) investigate the impact of COVID-19 restriction on the use of technology in real-life teaching context- The British School in Warsaw Perspective.

Government decisions during the COVID-19 pandemic have resulted in the closure of many schools across the US as well as in Poland. This has made it necessary for teachers and teacher training programs to work online where they face the prospect of designing lessons, homework, assignments and assessment suitable for online learning. Such a change is usually done in small steps, testing what works and what does not, however the speed of response to the COVID-19 pandemic has not allowed many schools and teacher training programs for a slow and steady approach. In effect, almost overnight the nature of work shifted into unchartered territory where there are no guidelines and where much of what works in person may not work online.

## Background of Research- the US perspective

In the U.S., teacher certification criteria are determined at the state level. Authorities of each state define the content and requirements of the certification programs. In most states, traditional [1]teacher certification requires: a bachelor's degree or higher, completing a state-approved teacher preparation program, completing teaching internships (at least one semester long), taking state-required exams for educators (Better Teachers, 2022).

> The cost of teacher certification varies from state to state but typically costs between $40 and $200. In addition to receiving a passing score on the required assessments for your state, you will also need to pass a fingerprint and background check proving that you have no criminal history. The first certificate earned is usually valid for between one and five years and will need to be renewed every few years. Renewal usually requires continuing education coursework and/or the completion of graduate-level courses. Some states require specific courses to be taken for renewal, while others require general education or subject area coursework (Better Teachers, 2022).

Teacher preparation programs are designed to prepare teachers for everything they should encounter during their first years as a teacher. Requirements for teacher preparation programs to become accredited became stricter when the Council for Accreditation of Educator Preparation (CAEP) implemented new standards (2022). These standards included categories such as: ensuring to prepare teachers with content knowledge and appropriate pedagogical tools, requirements to partner with districts to ensure quality feedback and practice during student-teacher partnerships and demonstrating that teacher graduates are successful in improving academic achievement in students, preschool-12th grade (Sawchuk, 2013). Holding teacher-candidates to higher standards would potentially lead to better teachers and better outcomes for students (Boyd et al., 2008).

Teacher preparation programs for special education teacher candidates often incorporate the seven standards for initial special education teachers established by the Council for Exceptional Children (CEC) into their program (CEC, 2022, Gremp et al., 2020). However, despite these efforts, nothing could have prepared future teachers and current educators for the new demands they faced during the transition to online learning during the COVID-19 pandemic. At the beginning of the pandemic, a majority of teachers, for example, in Arizona began using

[1] Each state also provides guidelines and requirements how to obtain alternative or volunteer teacher qualifications.

Zoom, an online video-conferencing platform, Microsoft classrooms, to meet with and provide e-lessons and other learning management systems (i.e. blackboard, Microsoft Team Suite, Desire2Learn, Moodle and Pearson Learning Solutions) if not all, for their students (Young & Donovan, 2020; Turner et al., 2020), and some used paper packets or worksheets for students who had difficulties accessing online lessons (Tremmel et al., 2020). Special education teachers especially, had unique challenges as they were still required to maintain their students' individual education plans (IEPs) and monitor the progress on their students' IEPs virtually, now with the help of individualized packets and feedback from students' parents or caregivers (Expect More Arizona, 2020).

Remote learning experience has brought significant changes in the way we understand, plan and conduct teacher training programs, virtual classroom based strategies and techniques. It has also revealed the benefits and drawbacks of both traditional and online learning. In the U.S "[s]ome [special education] personnel appeared to adjust their thinking about how special education services could be delivered and modified their approach to a family-centered coaching process; others struggled to change from a child-focused special education service delivery model" (Steed et al; 2022, p. 128). Research both in America and Poland provides valuable findings with regard to the quality of educational services trained and delivered, findings that will help improve teacher qualification programs in the future.

The reality resulting from the COVID-19 thus raises questions about the nature of teaching and ways of supporting the learning of student teachers and educators servicing individuals with special needs. It further challenges teacher education and educators to (re)think ways for scenarios that are unpredictable and unknown and more collaborative in nature, but which raises questions related to equity and social justice.

Linda Darling Hammond, Charles E. Ducommun Professor of Education Emeritus at Stanford University and Maria E. Hyler, the Deputy Director of the Learning Policy Institute's (LPI) Washington, D.C. claimed in 2019:

> With the advent of COVID-19 pandemic, even greater efforts are needed to address students' academic and social emotional needs, all the while making up for learning loss and preparing for the unpredictable combinations of distance learning, blended learning, and in-classroom learning. These expectations, along with the need for greater emphasis on equity-focused teaching and learning have raised the bar for educators and for educator preparation (Darling Hammond et al., 2019).

The following case studies prove that both teachers and teacher trainees took up the gauntlet.

## Background of Research- the Polish perspective

Qualifications to teach foreign languages in the Polish public education system can be obtained at the tertiary level of education (M.A. required) and are governed by the Polish Ministry of Education and Science and described in terms of the program content, ETS, number of hours, internships, etc. in the "Regulation of the Minister of Science and Higher Education of 25 July 2019 on the Standard of Initial Teacher Education" (*Journal of Laws* of 2012, item 1450). The document specifies concrete learning objectives in four areas: Pedagogy (B2)[2], Psychology (B1), Subject Didactics (D 1) Basics of Didactics, and Voice Emission (C).

If we take a closer look at the IT based competencies described in the three spheres of the learning outcomes (knowledge, skills and social competences), their role is mentioned directly in the following fragments:

> In the area of knowledge: the graduate knows and understands
>
> D.1/W4. Substantive, didactic and educational competences, including the need for professional development, also with the use of Information and Communication Technology (ICT) and the need to adjust/adapt means of communication to the learners' level of development and stimulate the cognitive activity of learners, including the creation of didactic situations
> D.1/W8. Ways of organizing the classroom, including rules of universal planning: didactic means (coursebooks and educational packages), didactic aids- choice and selection of educational resources, including electronic, foreign, educational application of media and Information and Communication Technology (ICT)
> D.1/W9. Didactic methods used in the taught subject or course and the importance of shaping the competence of responsible and critical used of digital media and respect for copyrights.
>
> In the area of skills: the graduate can
>
> D.1/U7. select the methods and didactic means, including ICT based techniques and activities, engaging learners and taking into consideration their different educational needs
>
> In the area of social competences: the graduate is ready to
>
> D.1/K4. promote a responsible and critical application of digital media and respect copyrights

[2] The symbol refers to the concrete section of the document.

> D1/K8 build the habit of systematic studying and using different sources of knowledge, including the Internet ("Regulation of the Minister of Science and Higher Education of 25 July 2019 on the Standard of Initial Teacher Education" p. 20)[3]

However, indirectly IT based competencies are not only applicable but rather inevitable in many other learning outcomes, just to give a few more examples from the section on social competences:

> The graduate is ready to D.1/K5. shape the ability to cooperate among students, including group problem solving; D.1/K6. build the system of values and to develop ethical and shape communication competences and cultural habits; D.1/K7. develop learners' curiosity, activity and independence in cognition and logical and critical thinking skills; D.1/K9. stimulate/encourage learners' life-long learning skills and autonomy. ("Regulation of the Minister of Science and Higher Education of 25 July 2019 on the Standard of Initial Teacher Education" p. 20).

One cannot imagine developing not only the above mentioned skills but also others in terms of knowledge and skills nowadays without the use of ICT; therefore, it is very important that the process of program/course development should incorporate practical application of ICT in education with the focus on "learning by doing" approach.

## Research Focus

The research focused on examining the effectiveness of the online teaching process during COVID-19 at the tertiary level of education with the learning aims addressed at the qualifications to teach and support learners (of EFL) with special needs, and at the primary level of education where the virtual environment teaching was confronted with real life challenges.

[3] The Authors' own translation; W stands for Knowledge, U stands for Skills.

## Methodology of Research

The research aimed at collecting data from three case studies conducted in Poland: two at the SWPS University and one in the primary school in Warsaw. It was based mainly on lesson observations and follow-up discussions and evaluation. The research involved both theoretical and practical stages with the in-between mock teaching (students' micro-teaching sessions). The research shows how the context of preservice teacher training in the COVID-19 conditioned environment was shaped by not only technological challenges but also by the needs the and expectations of learners.

## IT Based EFL Teaching and Teacher Training at SWPS University in Warsaw, Poland- Case Study 1

The case study concerns a semester long course run at SWPS University in Warsaw in the academic year 2020–2021 as a part of the graduate program for students / EFL teacher trainees, aiming at obtaining qualifications to teach in the Polish system of education. The course was titled *Computer Assisted Language Teaching* and was conducted on the Moodle platform and Google Classroom/Meet. Originally planned for the blended mode, because of the pandemic, it was managed via Google meet option 100% online. The seven participants of the course were 2nd year M.A. day studies students.

The students' aim was to design on the Moodle platform a module addressed to EFL teachers on the chosen aspect of TEFL: i. e. different challenges and problems of a modern digital teacher of English (technical problems, special needs learners, language anxiety, individual needs, mixed ability groups, lack of motivation/ creativity, etc.) The course operated on two levels: individual and global as students worked individually on the modules (topics/ "chapters") and cooperated (forming a community of practice) to produce a coherent and interactive online course content for teachers and teacher trainees (on the e-learning platform), content that included a variety of practical solutions for a modern teacher of EFL (working in different modalities of the language classroom) ("Course description").

The course syllabus included, among others, the following learning objectives and assessment tasks (Table 1):

Table 1
*Computer Assisted Language Teaching course learning objectives and assessment tasks*

| Symbols of learning outcomes for subject domain[4] | Program learning outcomes | Assessment task |
|---|---|---|
| W1, W2 | Students have up-to-date knowledge of relevant tools and methodology for TEFL with IT, on-going research in using IT in TEFL, and limitations in using IT in TEFL. | Microteaching |
| U3 | Students can design activities, search, incorporate, and document information and arguments from different sources, including reliable online sources. They can also use Internet technologies, including the e-learning platform, digital coursebooks, libraries, databases and dictionaries, and IWBs. | Preparing and conducting micro/peer-teaching activities/lesson sequences, Google Classroom/ Moodle design, class/ home assignments |
| U4 | Students can independently plan and carry out projects typical of the profession of a teacher, such as collaboration, field-study, and observation. | Moodle based module/ syllabus/activity design and implementation, home assignment |
| U6 | Students possess basic knowledge in the area of assessment of services associated with educational activity, including the ability to evaluate the efficiency of teaching aids and technology in ELT. | Class/home assignment, discussion |

S o u r c e: *Computer Assisted Language Teaching* SWPS University course syllabus.

The course organization was based on four main stages: 1. Lead in to the course (with reference to students' previous knowledge and skills obtained during: *IT in Education 1,2 and 3* courses, *Psychological Aspects of Language Teaching, Pedagogical Diagnosis, Success and Failure of Language Learning*), *Language Teaching Methods and Techniques, Language Education in Europe),* 2. Online workshops: designing own modules on the e-learning platform, 3. Preparation to micro/peer teaching sessions (including reflection on and anticipation of possible problems), 4. Micro/peer teaching sessions, 5. Course summary and evaluation.

Before starting the design process, students were asked to brainstorm to come up with the selection of topics and identify the relations between the chosen topics. Because the course was 100% online during the COVID-19 pandemic, the activity was conducted with the use of Jamboard tool (Figure 1):

[4] Learning outcomes for the subject dom*ain are specified in the Polish* Qualifications Framework.

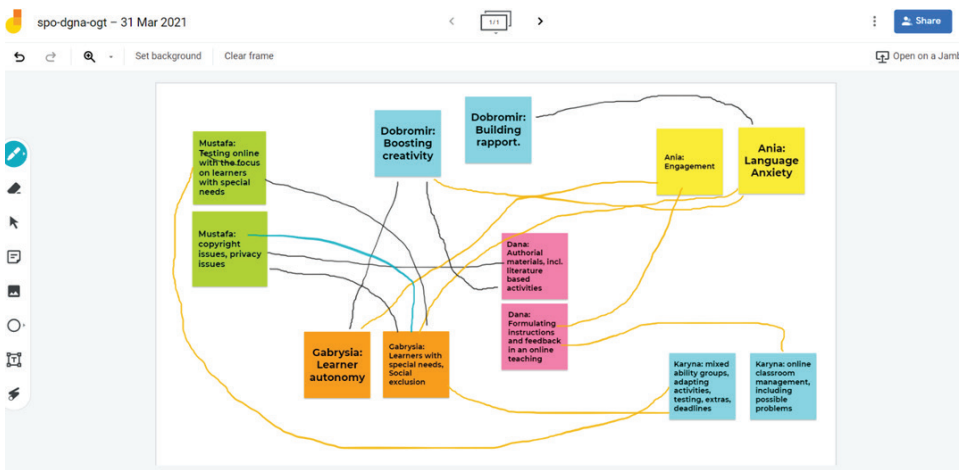


*Figure 1.* Stage 1 activity: Brainstorming for the selection of topics.

S o u r c e: Class materials https://classroom.google.com/ (access date 31 March 2021).

The main focus/aim of course was to organize and supervise students' time, space, content and interaction in the process of designing modules (ca. 60 minute long lessons on the Moodle platform) devoted to the selected problems and challenges and addressed at fellow teacher trainees and teachers of EFL. Teacher trainees were given the status of "Teachers" for the course duration, so they could edit the content. The distribution of content was governed by students' own preferences, experience and needs to foster engagement in Dornyei's (2017: min. 7:41) understanding of the term, meaning motivation plus implementation) and creativity. As a result, the course consisted of 12 topics (modules), providing interactive content adjusted to both teacher and pupil perspective (source: Learn Online at https://learnonline.swps.edu.pl/course/view.php?id=2097)

1. Building rapport, closeness, emotional contact, communication online, feedback from learners to teachers
2. Boosting creativity of learners
3. How to deal with language anxiety factor?
4. Engagement in online teaching
5. Authorial materials, including literature based activities
6. Formulating instructions and feedback in online teaching
7. Usefulness of traditional materials in the online classroom, copyrights issues & privacy issues
8. Testing online with the focus on learners with special needs
9. Online classroom management
10. Mixed abilities groups
11. Learners with special needs, e.g. dyslexia, low self-esteem, social exclusion
12. Building learners autonomy and self-study skills

For the purpose of this study, we will take a closer look at Module 11 designed by the student Gabriela (Figure 2):

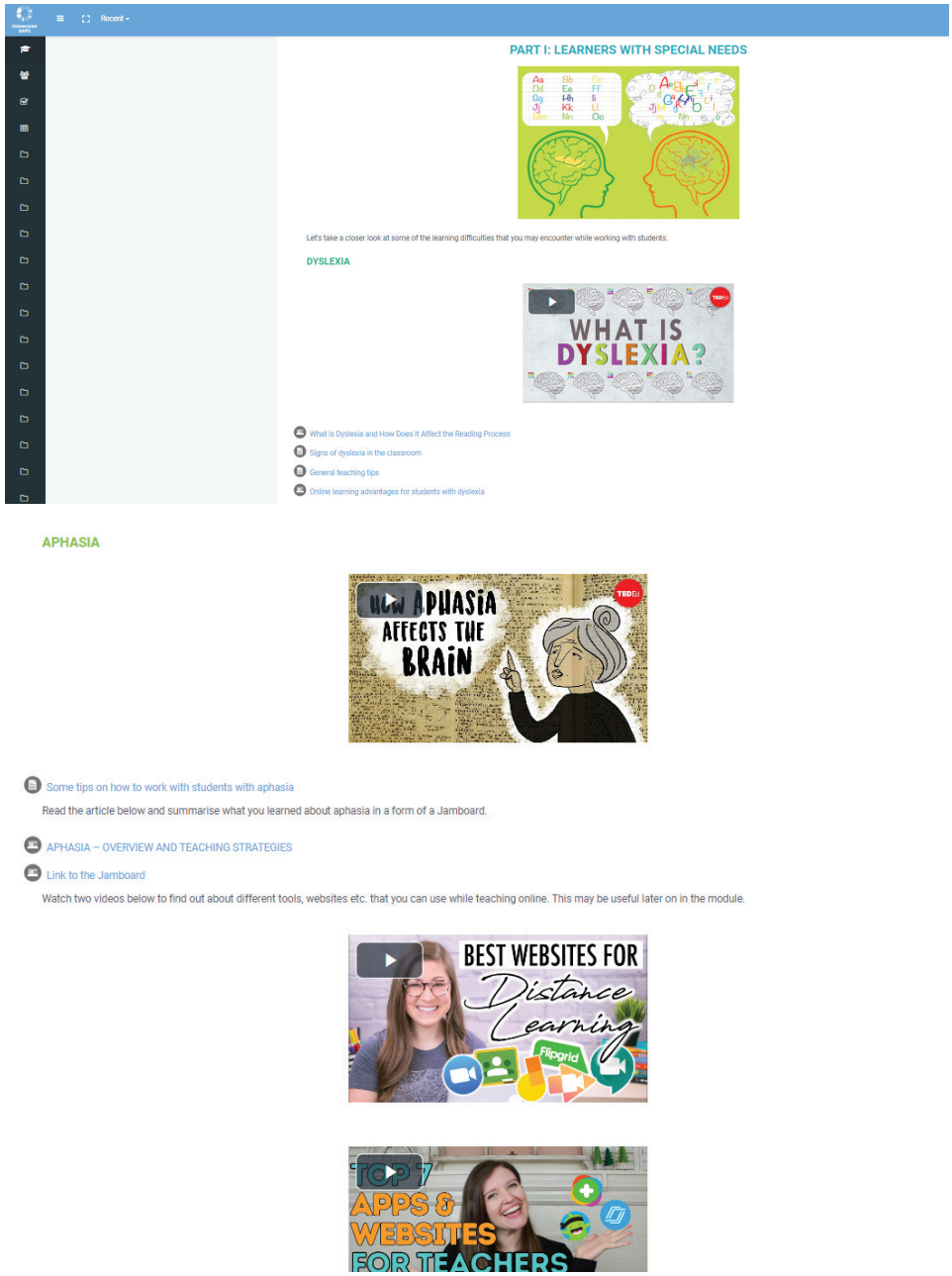


*Figure 2.* Module 11Topic: Learners with Special Needs

S o u r c e: Course materials, https://learnonline.swps.edu.pl/course/view.php?id=2097.

In her module, the teacher trainee focuses on designing authorial materials for techniques of individualizing teaching of learners of English with special needs, such as: dyslexia, aphasia, low self-esteem or suffering from social exclusion. Methods and techniques of working with specials needs learners, pedagogical diagnosis- these topics are obviously present in the ministerial recommendations and requirements (compare section: B.2.W6.). The novelty is to train teachers of English to design their own and use available IT based materials for teaching so that they match the individual aims of their courses, needs of the pupils. Moreover, it is necessary to provide guidance in the application of these materials. The author of the module provides a variety of IT based resources (online files, handouts, links to webinars, videos, articles) and stimulates critical thinking (discussions in the form of forums, comparing and note taking, brainstorming with the Google tool Jamboard, reflection based written and oral activities) to provide general teaching tips and recommendations when teaching online. In this section, she particularly focuses on practicing and improving reading skills of learners with special needs.

The second section of the module deals with social exclusion, in particular with reference to the EFL classroom, school achievement, and the role of ICT (Figure 3):

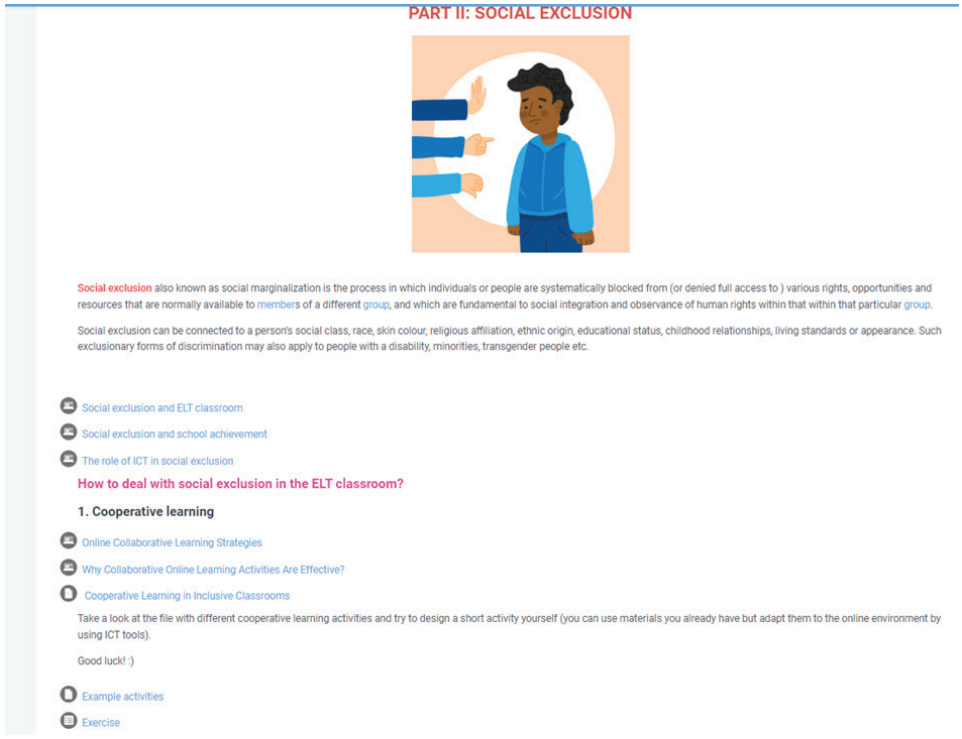


*Figure 3.* Module 11 Part 2

S o u r c e: Course materials, https://learnonline.swps.edu.pl/course/view.php?id=2097.

It is important to notice at this point that the whole course can be delivered in the following modes, depending on the current teaching context: 100% self-study, 100% online (Moodle plus Meet with the teacher present), blended (traditional classroom + Moodle obligatory or optional). The course can be recycled each semester or year after necessary updates. The three scenarios of the module delivery were practiced by students in the last but one stage of the course *Computer Assisted Language Teaching* in the task peer/micro-teaching. Due to COVID-19 restrictions, since teaching at SWPS University was 100% online at that time; students performed via Google meet and screen sharing option with all participants being logged into the Moodle platform. Additionally, the class was observed by another teacher who provided valuable feedback in the last part, i.e. course, module evaluation (Figure 4):

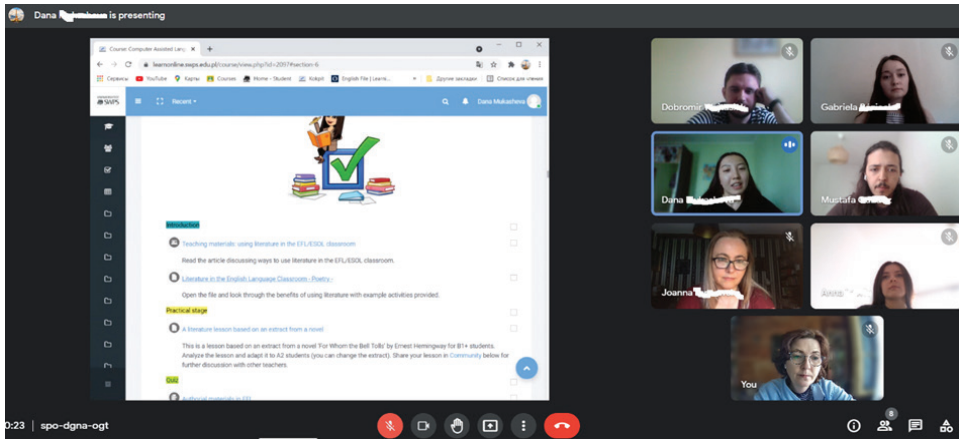


*Figure 4.* Screenshot of Google classroom based meet: Peer teaching sessions

S o u r c e: https://classroom.google.com/.

## Basic Knowledge on Specific Learning Difficulties and Co-Occurring Neurodevelopmental Disorders: *Pedagogical Diagnosis* Course- Case Study 2

To become a fully equipped professional who has the necessary knowledge and the tools to teach foreign languages, teacher trainees must be aware of the specific learning difficulties they may encounter when working with the young learners. Therefore, the 20 hours long course on *Pedagogical Diagnosis* has been incorporated into the study program for the SWPS University students. The main

aim of the course was to introduce students with various issues related to diagnosing, supporting and educating children with different kinds of learning difficulties.

The major learning outcomes of the course have been included in the course syllabus and described in detail with regard to the three areas: knowledge, skills and social competences.

> In the area of knowledge, the graduate should:
>
> W6. have structured knowledge of different types of learning difficulties in primary and secondary school childrenW5. gain elementary knowledge of individual emotional and social difficulties exhibited by children with learning difficulties
> W6. have basic knowledge of various diagnostic methods applied in special education in the Polish and British educational system.
>
> In terms of skills, the graduate should:
>
> U6. be able to apply and integrate theoretical knowledge from the realm of special education and related sciences in order to analyze complex problems of SEN children and to diagnose their developmental problems
> U6/U7. know how to read and use psychological opinions in order to design adequate educational interventions
> U6. be able to prepare an IEP (Individual Educational Plan) for a child with learning difficulties based on their knowledge of elementary theories, terminology and resources in the field of special education.
>
> In the area of social competences, the graduate should:
>
> K4. be capable of communicating via various channels and techniques with other specialists (teachers, methodologists, school psychologists) both in Polish and in the foreign language.
> K1. understand the need for life-long learning and constant self-development as a Learning Support teacher (*Pedagogical Diagnosis* course syllabus SWPS University).

At the end of the course, students were asked to prepare an IEP (Individual Educational Plan) based on a profile of a student with specific learning difficulties and on their knowledge of different types of learning difficulties. They had to present it during a short oral test at the end of the course justifying their choice of targets in the IEP.

The course was primarily intended to be conducted in-person in order to provide the EFL teacher trainees with some strategies and possible resources that they could personally experiment with. However, due to the COVID-related restrictions, it was shifted to the virtual reality and it was run via Google Classroom/Meet.

Evaluation of the course was required at the end of it. It showed that the course had been highly perceived by the students. As they all had already had some experience with working with the special needs students, they found the course informative and useful. Selected materials presented during the classes were used by some of the students in their modules addressed to EFL teachers. During oral evaluation, students reported that they had learnt a lot during the classes and that such a course is not only interesting and practical but the necessary part of the study program. However, they believed that it should be extended as 20 hours does not seem sufficient to cover all the areas of special needs.

The areas covered within the course were as follows: specific learning difficulties and co-occurring neurodevelopmental disorders such as: dyslexia, dyscalculia, Attention Deficit Hyperactivity Disorder (ADHD) and Attention Deficit Disorder (ADD), Autistic Spectrum Disorder (ASD), developmental co-ordination disorder (dyspraxia), different forms of speech impairment (e.g. aphasia, apraxia, stuttering), Sensory Processing Disorder (SPD), and social and emotional difficulties.

## Prevalence of SLD and Co-Morbid Neurodevelopmental Disorders

The aforementioned specific learning difficulties and co-occurring neurodevelopmental disorders seem very common nowadays when the awareness of their existence has increased significantly in society (Zingoni et al. 2021). According to the American Psychiatric Association (APA, DSM-V), the prevalence of Specific Learning Disorders is around 5–15% among the school-age children across different languages and cultures (Khodeir et al., 2020). The World Health Organization (WHO) defines them as "a neurodevelopmental learning disorder characterized by significant and persistent difficulties in learning academic skills, which may include reading, writing, or arithmetic" (ICD-11, 6A03). Those difficulties do not stem from a disorder in intellectual development, sensory impairment, neurological or motor impairments, socio-cultural opportunity or limited access to education, and they may affect child's overall performance in a negative way (ICD-11, 6A03) .

The most common form of SLDs is dyslexia and it constitutes around 80% of all the cases of SLDs (Kohli et al., 2018). Data obtained from the Connecticut Longitudinal Study have shown that dyslexia affects around 17.5% of the population (Shaywitz et al., 1998, Shaywitz et al., 1999). The International Dyslexia Association defines dyslexia as a

> specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge (IDA).

Among the psychiatric co-morbidity with Specific Learning Difficulties, ADHD came to the first position (Khodeir et al., 2020). According to WHO, "attention deficit hyperactivity disorder is characterized by a persistent pattern (at least 6 months) of inattention and/or hyperactivity-impulsivity that has a direct negative impact on academic, occupational, or social functioning" (ICD-11, 6A05). Regular reviews prepared by the researchers show that the ADHD "prevalence globally is between 2% and 7%, with an average of around 5%." However, it is estimated that at least a further 5% of the school-aged children display significant difficulties with physical hyperactivity, inattention, and impulsivity that are very close to meeting the full diagnostic criteria for ADHD (Sayal et al., 2018).

Autism Spectrum Disorder (ASD) is also a very common neurodevelopmental disorder. Jinan Zeidan claims that approximately 1/100 children are diagnosed with autism spectrum disorder around the world (Zeidan, et al., 2022). ASD is defined as a disorder "characterized by persistent deficits in the ability to initiate and to sustain reciprocal social interaction and social communication, and by a range of restricted, repetitive, and inflexible patterns of [behavior], interests or activities that are clearly atypical or excessive for the individual's age and sociocultural context" (ICD-11, 6A02).

To conclude, all the data mentioned above show that Specific Learning Difficulties and co-occurring neurodevelopmental disorders are very common worldwide among the school-aged children. Therefore, the teachers working in the mainstream education are very likely to encounter such problems during their professional journey and they should be well-prepared to deal with them in a professional and efficient manner. Consequently, the program of study should be designed in a way to equip graduates with the necessary knowledge and tools.

## The Effect of COVID-19 Pandemic on Teaching Pupils with Special Needs-The British School in Warsaw Perspective- Case Study 3

Chaos that followed the closure of schools due to the COVID-19 pandemic particularly affected special needs / learning support teachers who, in those exceptional circumstances, were still required to provide high-quality services; remotely monitor the progress of their pupils, and ensure the implementation of the targets contained in the IEP. If the authorities required school buildings to close down, it was not possible to provide the SEN student with in-person learning and a one-on-one aide, even if their Individual Educational Program (IEP) recommended it. It also revealed the necessity of the close and regular cooperation with the parents who were often expected to support pupils in their lessons and give regular feedback to the teachers, in this way becoming more responsible for their child's educational process.

One of the greatest challenges of pandemic times was cooperation with 1:1 assistants (shadow teachers) who could not stay in close contact with pupils under their care. The lack of physical contact very often prevented those students from fully participating in the lessons. As a result, many pupils with special needs were unable to meet the requirements of the curriculum and the gap between them and their peers was getting wider. One of the authors of the article is a practitioner working in The British School, Warsaw. As an active Learning Support teacher and the Head of the Learning Support department, she had a chance to witness the struggle of her pupils with special needs. The British School (TBS) in Warsaw is a very specific example of an educational establishment in Poland. It provides education in English following the British National Curriculum. It also provides support for students with various learning difficulties making sure that they can participate in the mainstream education. Pupils with diagnosed special needs receive additional learning support either individually, in a small group setting or in-class.

The majority of students with dyslexia experienced significant problems when working online. They reported difficulties with following the pace of the lessons; however, they felt uncomfortable asking for help publicly. They also felt embarrassed to post any writing tasks in a chat box for fear of being ridiculed by their peers who would notice their spelling mistakes. Consequently, they tried their best to conceal that they were underachieving. As a result, many of them decided to either miss the lessons they were finding challenging or to switch the cameras off and do not participate actively in them. Many of them struggled also with using technology, e.g. joining break-out rooms on a Teams Platform or adding homework to the system.

One of the groups that was most affected by the pandemic was that of students with Attention Deficit Hyperactivity Disorder (ADHD). Some research conducted after the first lockdowns show that school closures and other COVID-19 related restrictions resulted in worsening of symptoms among children with ADHD and they also affected interaction patterns within family in a negative way (Shah et al., 2021). Various difficulties were expressed by TBS students with diagnosed ADHD. They reported they had found it challenging to sit still in a lesson and focus on given tasks. They were often unable to complete the tasks and upload them on a system. They felt tempted to switch to doing other things during the lessons such as playing computer games, visiting different websites (not always appropriate), and watching YouTube videos. They tended to join the lessons with their cameras switched off; they often missed important information and were unable to work individually or in a group.

The greatest challenge reported by the learning support teachers in TBS was working with pupils with Autistic Spectrum Disorder. Problems with verbal communication significantly disturbed their learning process as well as the limited ability to follow the rules of working in a virtual reality. Disruptive behaviors prevented those pupils from participating in many group activities. Moreover, the lack of physical contact with the class teacher or a shadow teacher had a great and negative impact on their concentration and ability to complete given tasks. As the COVID-19 situation and moving to virtual learning was sudden and unexpected, there were no procedures regarding virtual lessons that teachers could follow. TBS teachers were expected to ensure that the lessons were led in as much professional manner as possible. Those exceptional circumstances required unique solutions: the IEP meetings were held online, parents had to be more involved and additional lessons were offered to the students with greatest difficulties. Nevertheless, due to the increasing difficulties of students with special needs, after several months of the lockdown, many of them were allowed to return to school whilst adhering to the safety protocols put in place in the school due to COVID-19.

All the above-mentioned observations from the virtual learning experience were presented to the SWPS University students to during the course on *Pedagogical Diagnosis* in order to raise their awareness of various difficulties and challenges associated with working virtually with the SEN pupils. The main aim was to prepare teacher trainees for the reality of working in a living classroom environment in which pupils' needs would be recognized and addressed adequately. The major idea is that graduates become more sensitive to potential problems and more creative in terms of developing a plan of action tailored to the needs of theirs pupils. Teacher competence encompasses the ability to see each student in a wider perspective, understand their struggle and the need for individualized approach.

## Conclusions

COVID- 19 teaching context (years: 2020-2021) has convinced the unconvinced that technology in the hands of pupils/students/teachers/teacher trainees is a must that, in fact, can bring many beneficial changes also in the post-pandemic context, such as: "from teaching push, to [learning pull], [f]rom [t]eacher [a]uthority to [learner autonomy], [f]rom [c]ontent creation, to [content curation] (O'Driscoll, 2020: min. 41:55).

Teachers at SWPS University had been trained and used Moodle platform and other IT based tools for many years before 2019, and had worked out the best methods and techniques to provide effective teaching and equip students with the necessary and up to date competences. In fact, nowadays we cannot imagine effective communication whether inside or outside classroom without these tools and only with pen and paper based options. However, we must realize that our students, digital natives (Prensky) can also teach us teachers a lot, so giving them the authority of teachers in such courses as the one described above, can result in long-lasting community of practice with a platform of vast and useful resources and networks.

The paper emerged from the comparison of the Polish and American academic perspectives on the educational inclusion strategies developed and put into practice during COVID-19 and based on the data collected during transitioning of the content to online environments. Teaching students with learning difficulties has been a challenge for many educators as it requires not only adequate qualifications but also creativity in preparing entertaining lessons adjusted to their individual needs. COVID-19 pandemic presented the teachers with new and even greater challenges that they had to face virtually and overcome using technology. Online teaching turned out to be the only available solution; therefore, it had to develop to include every student in the education system and cater for their needs.

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## Kształcenie nauczycieli a sytuacja uczniów ze specjalnymi potrzebami edukacyjnymi – doświadczenia z okresu pandemii COVID-19 w USA i Polsce

S t r e s z c z e n i e

W 2021 roku z powodu COVID-19 wielu pedagogów, nauczycieli, studentów i uczniów na całym świecie zmierzyło się z wyzwaniem nauczania/uczenia się online i wymaganiami a także ograniczeniami środowiska wirtualnego. Było to jednak szczególnie trudne dla nauczycieli uczniów ze specjalnymi potrzebami edukacyjnymi, terapeutów i pedagogów szkolnych. Musieli oni zapewnić wysoce zindywidualizowane nauczanie i wsparcie bez kontaktu bezpośredniego (lub z jego ograniczoną formą) kontaktem bezpośrednim. Artykuł dotyczy podnoszenia umiejętności oraz zdobywania kwalifikacji przez nauczycieli, niezbędnych do prowadzenia edukacji opartej na TiK skierowanej w szczególności do uczniów ze specjalnymi potrzebami edukacyjnymi. Autorzy analizują (z perspektywy polskiej i amerykańskiej) kontekst edukacyjny, przygotowanie nauczycieli do pracy w środowisku uwarunkowanym COVID-19, ze szczególnym uwzględnieniem nauczycieli języka angielskiego jako języka obcego (którzy chcą zdobyć kwalifikacje nauczycielskie do nauczania w polskich szkołach publicznych).

S ł o w a  k l u c z o w e: kwalifikacje nauczycielskie, przygotowanie do zawodu nauczyciela, uczniowie ze specjalnymi potrzebami edukacyjnymi, e-learning, nauka online

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## Подготовка педагогов и положение учащихся с особыми образовательными потребностями: опыт пандемии COVID-19 в США и Польше

А н н о т а ц и я

Переход в 2021 году к преподаванию онлайн и к виртуальной среде в связи с COVID-19 был сложным для многих работников образования, учителей, студентов и учеников во всем мире. Однако особенно трудно пришлось учителям учающихся с особыми образовательными потребностями, школьным терапевтам и консультантам. Им приходилось обеспечивать высоко-индивидуализированное обучение, обслуживание с ограниченным контактом или же вовсе бесконтактное. В данной статье рассматривается квалификация преподавателей необходимая для обеспечения образования обучающихся на основе ИКТ, особенно учащихся с особыми

потребностями (с американской и польской точек зрения). Авторы анализируют контекст предварительной подготовке преподавателей в условиях COVID-19, уделяя особое внимание учителям английского языка как иностранного, которые хотят получить специализированную квалификацию для преподавания в польских государственных школах.

К л ю ч е в ы е  с л о в а: педагогическая квалификация, подготовка к профессии учителя, учащиеся с особыми образовательными потребностями, электронное обучение, онлайн-обучение

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## Capacitación de docentes y estudiantes con necesidades especiales en los Estados Unidos y Polonia: la experiencia de COVID-19

R e s u m e n

En 2021, la transición a la enseñanza en línea y el entorno virtual debido a la pandemia del COVID-19 fue un desafío para muchos educadores, maestros, estudiantes y alumnos por todo el mundo. No obstante, tal fenómeno fue especialmente difícil para los profesores de alumnos con necesidades educativas especiales y los terapeutas y consejeros escolares, quienes tenían que proporcionar una enseñanza y un servicio altamente individualizados sin contacto cara a cara, o con un contacto muy limitado. Desde la perspectiva de los Estados Unidos y Polonia, este artículo analiza las cualificaciones docentes necesarias para proporcionar una educación basada en las TIC, en particular a los alumnos con necesidades. Los autores analizan el contexto de la formación inicial de docentes en un entorno condicionado por la COVID-19, con especial atención a docentes de inglés como lengua extranjera que desean obtener calificaciones docentes para enseñar en las escuelas públicas polacas.

P a l a b r a s  c l a v e: calificación docente, formación inicial de docentes, estudiantes con necesidades especiales, e-learning, aprendizaje en línea

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# E-Tutor Tandems in a COIL Course – Design, Implementation and Evaluation

## Abstract

Research on digital collaboration scenarios in Higher Education (HE) is characterized by various approaches that often define the acquisition and development of global skills as learning goals. Virtual Collaborative Learning (VCL) in HE represents one approach to facilitating students' global skills. Depending on the use case, these learning arrangements can include case study-based group learning under e-tutorial supervision. This paper focuses on the perspective of e-tutors – specially qualified student assistants – and their competence development during the summer semester of 2022. Based on previous research findings, a tandem setting was chosen for their competence development. This paper mainly compares expectations and experiences regarding the competence improvement of e-tutors in a multinational tandem. These expectations and experiences were queried through two quantitative questionnaires utilizing 5-point Likert scales and one short follow-up questionnaire after the finalization of VCL. In general, the positive expectations of the e-tutors were fulfilled, but not to a similar extent for each competence category. Especially the development of social and pedagogical competencies was positive, whereas the development of intercultural competencies was challenging. Several recommendations for action were derived, which impact further e-tutor training.

K e y w o r d s: Global Skills, Virtual Exchange, Tandem, Virtual Collaborative Learning, Competence Development

Current research shows that various teaching and learning approaches have enriched the higher education (HE) landscape. Most approaches aim at students' competence-oriented and practical education (Clauss et al., 2019; Murillo-Zamorano et al., 2019). The need for training and development of global skills has attracted significant attention of HE to keep pace with the demands of the working world (Bourn, 2018). Especially the development of such global skills like knowledge work, teamwork and the use of technology has become increasingly essential for the modern workforce.

Also, the requirements of the 21st-century workplace and the goals of the EU's Bologna reform (European Commission, 2018) bring international virtual exchange and mobility projects into focus in HE teaching (O'Dowd, 2018). These requirements can be met with collaborative online international learning (COIL) approaches (Rubin & Guth, 2015), including Virtual Collaborative Learning (VCL) (Herrera-Pavo, 2021).

Through virtual collaboration and exchange, students from different HE institutions and cultural backgrounds develop a joint solution to a realistic case study within a set timeframe (Jödicke et al., 2014). E-tutors ensure a smooth process and close support of the student groups during their work phases (Jödicke & Teich, 2015). The trained learning facilitators are the first point of contact for the students and fulfill various tasks, e.g., motivation, feedback, and conflict resolution.

The qualification of e-tutors takes place either within a one-semester module or through a set of online workshops over a few weeks. Since e-tutors do not receive any further offers for competence development, additional instruments should be developed and implemented to address the improvement of competencies among e-tutors, thereby fulfilling the competence-oriented university mission. Competence-oriented learning opportunities are essential to "keep education aligned to the current job market, because we want to bridge the gap between study and career" (Chim & Dijk, 2022, p. 28).

Therefore, in the context of the multinational VCL in the summer semester of 2022 between a German University of Excellence, seven Albanian universities, and one Slovenian university, e-tutor tandems were introduced and evaluated. The concept of tandem learning was chosen as it is an established mutual learning method (Calvert, 2015).

A tandem approach can be a helpful tool to support and consequently learn from each other (Vassallo & Telles, 2006). Moreover, the e-tutors were obliged to fill out a tandem contract to establish their working basis. The main objective of the approach was to improve the competencies of the e-tutors. Thus, we pose the following research questions (RQs):

RQ 1: What do e-tutors expect of a tandem regarding competence improvement?
RQ 2: What do e-tutors expect of a tandem contract?
RQ 3: What are the e-tutors' experiences in tandems regarding competence improvement?

RQ 4: What are the e-tutors' experiences with the tandem contract?
RQ 5: How do the e-tutors rate the tandem in general?

To answer these RQs, comprehensive surveys with a Likert scale were presented to the e-tutors before and after the VCL. Additionally, a short follow-up questionnaire was handed out to the e-tutors a few weeks after the conclusion of the VCL.

# 1. Theoretical Background

This chapter lays the theoretical foundations concerning the concept of VCL, e-tutorial support, tandem setting and contract, and competencies. These explanations serve as a basis for comprehending the results and recommendations for action.

## 1.1. Virtual Collaborative Learning

The virtual exchange course, accompanied by the e-tutors in the summer semester of 2022, was called "Collaboration in the Virtual Classroom" and based on the VCL framework by Bukvova et al. (2006). Within this framework, the groups generally range from four to six people to encourage active collaboration among the participants. It is a formal educational setting that awards 5 ECTS points for performance. The average effort per individual is 150 hours, and the module's accreditation depends on regional examination rules. Four design dimensions comprise the VCL framework, guaranteeing the setting's quality (Schoop et al., 2019). They are explained in the following.

*Realistic Task Design:* The case study setup is patterned with a real-world scenario in which participants collaborate for several weeks in small groups to tackle challenging issues (Altmann & Clauss, 2020). The case study is didactically prepared and enriched with elements from a real-world business context. In the summer semester of 2022, the case study was focused on the participants creating a start-up that deals with ecotourism and is based in Albania. The goal was to convince a jury at the end of the project period with a professional pitch of the business idea and to win fictitious start-up capital.

*Technical Platform:* The module takes place via Microsoft Teams, which supports synchronous and asynchronous communication. Students can choose various collaboration and communication tools to enhance their working experiences. The platform provides options for group collaboration on documents and central group storage. Furthermore, appointment scheduling can be done intuitively with integrated tools (Clauss et al., 2019a).

*Professionalized Pedagogical Support:* Teams working in virtual groups are assisted by qualified e-tutors, who receive special training, e.g., in providing organizational, social, and technological support (Jödicke & Teich, 2015). They have technical platform proficiency, conflict resolution, and computer-mediated communication skills. To ensure student support, the e-tutors work closely with the module supervisor (Schoop et al., 2019). The novelty in the summer semester of 2022 was the introduction of e-tutor tandems. Typically, groups are supervised by one e-tutor, but this time a group was assisted by a tandem of two to four e-tutors.

*Learning Analytics:* The framework is enhanced by learning analytics and information visualization about students' learning behavior and interaction patterns on the collaboration platform. Students are fully informed beforehand about how and why their data is processed (Clauss et al., 2019a).

The primary objective of the VCL is to develop and improve communicative, digital, professional, personal, and student-centered competencies (Clauss et al., 2019b). Working on the case study allows students to gain professional competencies. The organization of individual and group learning processes enhances self-competence. Collaboration on a technical platform ensures the development of social and digital skills. Working with people of different ethnicities improves intercultural competencies (Clauss et al., 2019a).

Groups are evaluated formatively and summatively to maximize learning outcomes on an individual and group level. For this evaluation, continuous observation by e-tutors is necessary to get insight into learning processes and respond quickly when issues arise (Tawileh, 2017). Thus, this setting focuses on developing global skills through a modern learning arrangement in HE.

### 1.2. E-Tutors

The term "e-tutor" is used in several different settings and has many synonyms, making it challenging to define distinctly. Online tutors, instructors for distance learning, or e-moderators are other names for e-tutors (Bawane & Spector, 2009; Vegliante & Sannicandro, 2020). de Metz & Bezuidenhout (2018) explain the term extensively and define an e-tutor as "the person most intimately involved in the assistance of distance students" (p. 29). Jödicke & Teich (2015) provide a more precise definition of e-tutors for our research setting. They define e-tutors as those who support students in achieving learning goals in modern e-learning environments.

This understanding of e-tutorial activities fits the extent of their support in a VCL. In this context, they observe, assist, and direct the learning processes rather than disseminating knowledge, as defined, for example, by Bawane & Spector (2009). E-tutors provide support with technological, organizational, content-related, and interpersonal challenges and operate as students' first points of contact

(Jödicke & Teich, 2015). Thus, this publication's working definition of e-tutors is that *e-tutors are student learning facilitators of virtual learning processes in a modern HE setting*.

### 1.3. Tandem Setting and Tandem Contract

Tandem learning originated in language teaching in the 1960s and is still often used as a medium for bilateral language learning, e.g., in e-tandem projects (Guanoluisa & Viera, 2021) or even in language teacher training (Aguilar et al., 2019). It is seen as an approach to facilitate autonomous or self-learning (Calvert, 2015). The two main principles of tandem learning are reciprocity and autonomy (Little & Brammerts, 1996). Reciprocity refers to the principle of mutual interdependence, stating that the partners must support each other and exchange information and skills for their mutual (but not necessarily equal) benefit. Autonomy means that both partners are responsible for their learning and choose what they want, when they want to learn, and how much assistance they need. Thus, neither learner is expected to be a teacher (Little & Brammerts, 1996).

However, these two principles can be applied to more settings than language teaching. In recent years, tandem learning has also become the focus of, e.g., knowledge management to transfer organizational knowledge between generations. An example of tandem work outside of language teaching can be found at Deutsche Bank (Fischer, 2007). The "know-how tandem" has been used since 2001 and pursues, among other things, the goals of increasing the quality of support, ensuring the transfer of knowledge, and creating a corporate culture (Fischer, 2007). In this example, tandem learning focuses on the transfer of tacit knowledge (Rimser, 2017).

Generally, tandems concentrate on the transfer of know-to-do-knowledge rather than know-what-knowledge (Hulme, 2014). A tandem can be implemented in many ways and used for different applications. This flexibility is a great advantage of the method (Vassallo & Telles, 2006). In the present case, one could also speak of e-tandems since the tandem work was done virtually by the e-tutors (Soledad et al., 2021).

A tandem contract was introduced to support the "forming" phase of the tandem (Tuckman, 1965). In a recent study, such group contracts were profitable for group collaboration (Brannen et al., 2021). According to Brannen et al. (2021), a contract helps to structure group dynamics and has a positive influence, e.g.,

- on the establishment of working relationships between group members,
- on students' perceptions and approaches towards communication,
- on students with academic anxiety.

The tandem setting in the VCL course was designed as follows:

A brief introduction to the tandem concept was given to create a shared understanding of tandems. Before the start of the supervision phase, tandems were

formed, usually consisting of two e-tutors from different countries, to stimulate intercultural exchange and, thus, the acquisition of intercultural competencies. After the beginning of the VCL, few student groups were dissolved or redistributed; therefore, few tandems consisted of more than two e-tutors.

For a common working basis, a template of the tandem contract was provided to the e-tutors and filled out jointly before the start of the supervision phase. The template was inspired by several authors (Centre for Teaching Excellence University of Waterloo, 2021; George Brown College, n.d.; Griffin Tate Template, 2002; Hesterman, 2016; Sutherland, 2021; University of Washington, n.d.; Warren, n.d.). Since most of the e-tutors met at a participating university before the start of the VCL as part of an ERASMUS+ project, the tandem contracts were discussed and filled out on-site.

### 1.4. Competencies

The concept of competencies has many connotations (Bergsmann et al., 2015). In this work, competencies are understood as an activity-based cluster of connected knowledge, attitudes, and abilities correlated with performance that may be improved by educational actions (Lowry & Flohr, 2005; Sisson & Adams, 2013). Like many other jobs, being an e-tutor requires special competencies. These requirements were extensively derived and evaluated in Langesee (2022). Ultimately, nine competence dimensions can be identified that e-tutors should cover. Although a primary qualification of e-tutors aims at an understanding of the tasks to be accomplished and a basic grounding in the required competencies, there is potential for improvement. The approach of tandem learning addresses this opportunity for competence development (Almazova et al., 2020).

While the language learning tandem is the best-known form of a tandem at universities, the benefits of the setting can also be transferred to other contexts. Through the intensive exchange in a tandem, which is the basis for a positive collaboration, the improvement of social, communicative, professional and, depending on the setting, intercultural competencies are targeted (Calvert, 2015; Chun, 2015; Pomino & Gil-Salom, 2016; Tardieu & Horgues, 2019). This is especially relevant in the context of emerging global skills that are critical for lifelong learning and success. Global skills' relevance is tied to global economic competition, technological breakthroughs, and increased diversity and mobility resulting from a connected world (Bourn, 2018; King et al., 2017).

Moreover, it is commonly acknowledged that global skills are required for people to prosper in HE, companies, and society. According to Oxford University Press (n.d.), global skills are classified into five major categories:

- communication and collaboration,
- creativity and critical thinking,

- intercultural competence and citizenship,
- emotional self-regulation and well-being,
- and digital literacy.

Especially communication and collaboration, intercultural competence, and digital literacy can be identified in the competence requirements for e-tutors (Langesee, 2022).

## 2. Methodology

The study was quantitative and included web-based questionnaires for data collection. Online surveys were chosen to ensure the anonymity and confidentiality of the respondents and therefore increase candidates' willingness to provide authentic answers (Evans & Mathur, 2018). For this study, the items for two of the three developed online questionnaires were based on research by Langesee (2022), in which nine competence areas for e-tutors in COIL settings were identified. They were assessed through statements related to a specific competence. For example, a statement from the first questionnaire (Q1) that referred to communication competence was: *I expect to improve my communication moderation skills through an e-tutor tandem*.

The surveys were conducted with the help of Microsoft Forms, and responses were collected in three stages. The first stage was conducted before the start of the VCL, the second one after the VCL, and the third one four weeks after the previous one to allow some time for reflection.

The first two questionnaires were divided into one section, gathering socio-demographic data, and two thematic sections. In Q1, the thematic sections referred to the expectations (RQ 1 & RQ 2) of e-tutor competence development and the impact of an e-tutor tandem contract within the upcoming VCL. The same thematic sections in the second survey (Q2) focused on the e-tutor experiences (RQ 3 & RQ 4) gathered during the VCL.

Each questionnaire took approximately 15 minutes to complete. Most items were self-rated on a 5-point categorical Likert scale, which represents an ordinal psychometric measurement of attitudes, beliefs, and opinions. The response options ranged from total rejection ("strongly disagree") to total compliance ("strongly agree"), with a neutral option in the middle, presenting a symmetric Likert scale (Joshi et al., 2015). A few reversed items were constructed to prevent straight-line answering and reduce acquiescence bias (Pasek & Krosnick, 2010). A comment section for open questions was included in Q1 and Q2.

The third questionnaire (Q3) included a short section with socio-demographic data and one follow-up question referring to the overall impact of e-tutor tandems

on the competence development of e-tutors in a tandem (RQ 5). All three questionnaires (OA1-3) are available in the online appendix (OA)[1]. The survey intervals and numbers of participants (N=) are shown in Figure 1.

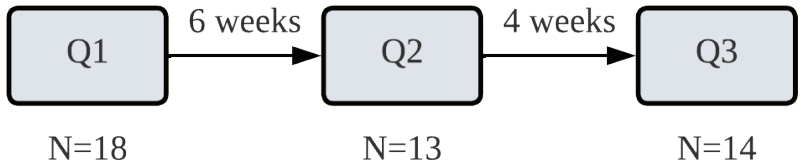


*Figure 1.* Timeframe of the Questionnaires and Number of Participants per Questionnaire

The surveys' validity and reliability were ensured during their design, and a pre-test was performed with experienced researchers (Taherdoost, 2016). The questionnaires were then analyzed descriptively using the integrated analysis functions of Microsoft Forms. There, the percentage share to the respective number of returns was calculated. The group of e-tutors was homogeneous in age, which is why they were considered and evaluated as one group.

## 3. Results

In the following section, the results for both questionnaires, Q1 (*expectations*) and Q2 (*experiences*), will be described jointly and nuanced to evaluate the contrasts. Then, the answers to the open-ended questions of both questionnaires will be presented. Additionally, the follow-up questionnaire (Q3) will be evaluated briefly.

### 3.1. Socio-Demographic Data and Background Information

Q1 was answered by 18, Q2 by 13, and Q3 by 14 e-tutors. The withdrawal of a few e-tutors can explain the discrepancy in the number of participants. The workload and high involvement exceeded the expectations initially set by their supervising university. The age distribution of the participants for Q1-Q3 is depicted in Figure 2.

[1] https://bit.ly/3P3ugs2

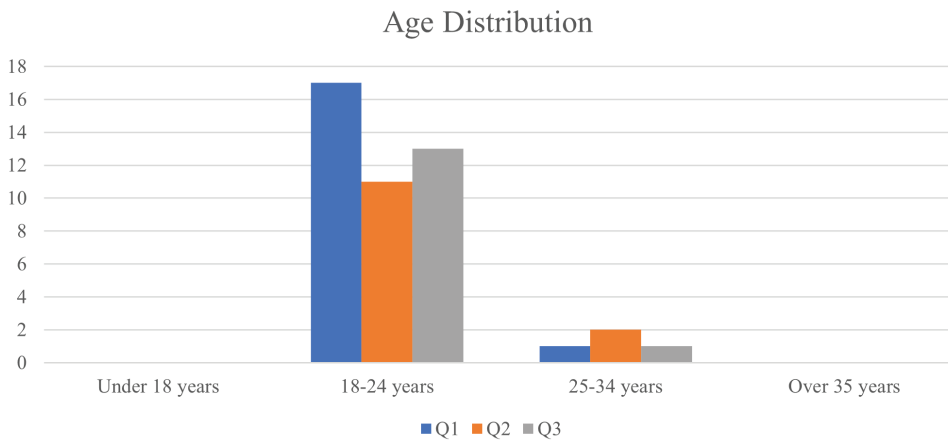


*Figure 2.* Age Distribution of Participants for Q1-Q3

The e-tutors belonged to the collaborating universities. The exact distribution of e-tutors is not discussed in detail here, as it is not the focus of the descriptive analysis. In Q1, the e-tutors were then asked how long they had been an e-tutor at the time of the survey. As depicted in Figure 3, six e-tutors had been e-tutors for less than six months, four for between six and eleven months, and eight for between one and two years.

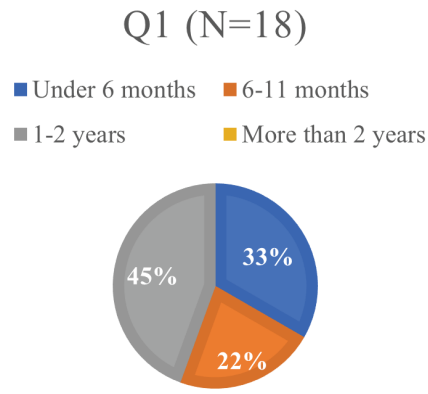


*Figure 3.* Duration of Employment as an E-Tutor

### 3.2. Comparison of Expectations and Experiences in Tandem Work

The questions in Q1 were formulated with a view to the future. A statement about the expectation of the development of social competence can serve as an example. It read*: I expect that an e-tutor tandem will improve my ability to interact socially.* In Q2, the participants' experiences were queried with the same

statement: *The e-tutor tandem improved my ability to interact socially.* Thus, the two questionnaires differed only in the tense of the statements. In the following, the results of the questionnaires concerning the competencies (*social, pedagogical, communication, media, organizational, individual, professional, evaluation*, and *intercultural*) are summed up and discussed.

Now, the most conspicuous results relevant to answering RQs 1-4 are discussed in the text and are tabulated in Table 1. To maintain clarity, the other statements from Q1 and Q2 are deposited as OA4. Generally, the percentage results of Q1 and Q2 and their differences are presented.

The statements (S) in the second column summarize the core content of the relevant statements from Q1 and Q2 and are clustered to their respective competence by the first column. The exact wording can be taken from the original questionnaires (OA1-2). The difference between Q1 and Q2 is shown in brackets and color-coded (*red* for a decrease, *green* for an increase). The numbers are derived from the results of each respective questionnaire. The percentage calculation was performed directly in Microsoft Forms, while the calculation of the differences was done manually. Afterward, the competencies are presented successively to guide through the evaluation.

Table 1
*E- Tutor Tandem - Comparison Between Q1 and Q2*

| Competence | Statement (S) | Expectation → Experience (Difference) in % | | | | |
|---|---|---|---|---|---|---|
| | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Social | S2: Building social relationships | – | – | 0.0 → 23.1 (23.1) | 77.8 → 30.8 (47.0) | 22.2 → 46.2 (24.0) |
| | S3: Building and maintaining a good relationship with the tandem partner | – | – | 5.6 → 23.1 (17.5) | 77.8 → 23.1 (54.7) | 16.7 → 53.8 (37.1) |
| | S5: Identification of student problems | – | – | 22.2 → 7.7 (14.5) | 55.6 → 53.8 (1.8) | 22.2 → 38.5 (16.3) |
| | S6: Resolving student problems | – | – | 22.2 → 7.7 (14.5) | 50.0 → 46.2 (3.8) | 28.0 → 46.2 (18.2) |
| | S7: Learning from partner's social skills | – | – | 11.1 → 23.1 (12.0) | 72.2 → 38.5 (33.7) | 16.7 → 38.5 (21.8) |
| | S8: Building a more personal relationship with the partner | – | – | 38.9 → 30.8 (8.1) | 55.6 → 30.8 (24.8) | 5.6 → 38.5 (32.9) |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Pedagogical | S10: Teaching/ Pedagogical skills | – | – | 5.6 → 7.7 (2.1) | 77.8 → 46.2 (31.6) | 16.7 → 46.2 (29.5) |
| | S12: Feedback skills | – | – | 0.0 → 7.7 (7.7) | 77.8 → 46.2 (31.6) | 22.2 → 46.2 (24.0) |
| | S13: Learning from partner's pedagogical skills | – | – | 5.6 → 0.0 (5.6) | 72.2 → 46.2 (26.0) | 22.2 → 53.8 (31.6) |
| Communi-cation | S14: Communication skills | – | 0.0 → 7.7 (7.7) | 5.6 → 0.0 (5.6) | 61.1 → 46.2 (14.9) | 33.3 → 46.2 (12.9) |
| | S16: Communication moderation skills | – | 0.0 → 7.7 (7.7) | 0.0 → 0.0 (0.0) | 83.3 → 46.2 (37.1) | 16.7 → 46.2 (29.5) |
| | S18: Foreign language skills | – | 0.0 → 7.7 (7.7) | 11.1 → 0.0 (11.1) | 44.4 → 61.5 (17.1) | 44.4 → 30.8 (13.6) |
| | S19: Learning from partner's communication skills | – | – | 0.0 → 15.4 (15.4) | 72.2 → 53.8 (18.4) | 27.8 → 30.8 (3.0) |
| Media | S21: Repertoire of collaboration tools | – | – | 16.7 → 15.4 (1.3) | 66.7 → 61.5 (5.2) | 16.7 → 23.1 (6.4) |
| | S22: Learning from partner's media skills | – | 5.6 → 0.0 (5.6) | 5.6 → 30.8 (25.2) | 66.7 → 46.2 (20.5) | 22.2 → 46.2 (24.0) |
| Organiza-tional | S23: Organizational and planning skills | – | – | – | 72.2 → 61.5 (10.7) | 27.8 → 38.5 (10.7) |
| | S24: Knowledge of group management | – | – | 5.6 → 0.0 (5.6) | 61.1 → 69.2 (8.1) | 33.3 → 30.8 (2.5) |
| | S25: Learning from partner's organizational skills | – | – | 5.6 → 15.4 (9.8) | 66.7 → 61.5 (5.2) | 27.8 → 23.1 (4.7) |
| Individual | S26: Creativity | – | – | 5.6 → 15.4 (9.8) | 66.7 → 38.5 (28.2) | 27.8 → 46.2 (18.4) |
| | S28: Empathy | – | 0.0 → 7.7 (7.7) | 22.2 → 15.4 (6.8) | 72.2 → 53.8 (18.4) | 5.6 → 23.1 (17.5) |
| | S29: Tolerance | – | 0.0 → 7.7 (7.7) | 11.1 → 30.8 (19.7) | 55.6 → 46.2 (9.4) | 33.3 → 15.4 (17.9) |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Individual | S31: Learning from partner's individual traits and character | – | – | 0.0 → 15.4 (15.4) | 77.8 → 61.5 (16.3) | 22.2 → 23.1 (0.9) |
| Professional | S34: Learning from partner's professional skills | – | – | 5.6 → 7.7 (2.1) | 55.6 → 69.2 (13.6) | 38.9 → 23.1 (15.8) |
| | S35: Interdisciplinary collaboration skills | – | – | 5.6 → 0.0 (5.6) | 66.7 → 76.9 (10.2) | 27.8 → 23.1 (4.7) |
| | S36: Reduction of workload and maintaining of high-quality work | – | – | 16.7 → 0.0 (16.7) | 55.6 → 84.6 (29.0) | 27.8 → 15.4 (12.4) |
| Evaluation | S37: Assessment skills | – | – | 0.0 → 7.7 (7.7) | 88.9 → 69.2 (19.7) | 11.1 → 23.1 (12.0) |
| | S38: Data analysis and interpretation skills | – | – | 5.6 → 0.0 (5.6) | 77.8 → 76.9 (0.9) | 16.7 → 23.1 (6.4) |
| | S39: Learning from partner's evaluation / assessment skills | – | – | 0.0 → 15.4 (15.4) | 77.8 → 61.5 (16.3) | 22.2 → 23.1 (0.9) |
| Intercultural | S40: Intercultural skills | – | – | 0.0 → 30.8 (30.8) | 44.4 → 38.5 (5.9) | 55.6 → 30.8 (24.8) |
| | S44: Enrichment of worldview | 0.0 → 7.7 (7.7) | 0.0 → 7.7 (7.7) | 0.0 → 7.7 (7.7) | 72.2 → 46.2 (26.0) | 27.8 → 30.8 (3.0) |
| | S45: Learning from partner's intercultural skills | – | 0.0 → 7.7 (7.7) | 0.0 → 7.7 (7.7) | 66.7 → 46.2 (20.5) | 33.3 → 38.5 (5.2) |

***Social Competence (S2-8)***

Forming and maintaining a social relationship with the tandem partner exceeded the expectations of the e-tutors. Both statements (S2/3) showed a significant increase in Q2. The relationship with the tandem partner is essential to build trust, which is a foundation of a beneficial partnership (Choi & Cho, 2019). The statement that an e-tutor tandem helps to establish a more personal relationship with the tandem partner (S8) also received a significant increase in agreement in Q2. Identifying supervised students' problems (S5) exceeded the expectations from Q1. This development concurs with S6, which deals with resolving supervised students' problems. This experience was also perceived positively by the e-tutors. Additionally, the tandem supported the e-tutors in learning from the social skills of the tandem partner (S7).

***Pedagogical Competence (S10-13)***

The successful experience regarding S10 and S13 can be combined, as the positive development of one's pedagogical skills (S10) goes along with learning from the pedagogical skills of the tandem partner (S13). Increasing one's feedback skills (S12) improved significantly from Q1 to Q2. Especially the ability to provide helpful feedback to the tutored student group is essential for an e-tutor in a VCL-like setting.

***Communication Competence (S14-19)***

Communication skills displayed a mixed picture. Although the experience of improving communication skills (S14) developed positively for some e-tutors, a few felt the opposite. A similar, though more positive picture emerged in S16. The ability to manage or moderate communication improved significantly, and only some indicated the contrary. As described in chapter 2, the origins of tandem learning lie in language teaching. In some cases, foreign language skills (S18) could be improved in the tandem. Generally, the e-tutors learned from the communication skills of the tandem partner (S19), though not to a huge extent.

***Media Competence (S21-22)***

The tandem positively influenced the repertoire of collaboration tools known to the e-tutors (S21). Largely, the e-tutors learned from the media skills of the tandem partner (S22). Since this statement has a similar increase in the neutral position and strong agreement, this suggests that a tandem partner benefited more from the partner's existing media skills than the other way around.

***Organizational Competence (S23-25)***

The development of the organizational and planning skills (S23) of the e-tutors exceeded their expectations from Q1. Knowledge of group management (S24) could also record a slightly positive trend. However, learning from the organizational skills of the tandem partner (S25) was less helpful than anticipated.

***Individual Competence (S26-31)***

Creativity (S26) improved significantly. Empathy (S28) also advanced considerably for some e-tutors, although a small percentage disagreed with this development. Surprisingly, tolerance development (S29) was expected to be more positive than displayed in the results. This result may be due to various reasons, including inadequate communication within the tandem. Generally, a weak positive tendency to learn from the individual traits and characteristics of the tandem partner (S31) could be observed.

***Professional Competence (S34-36)***

A slightly positive development could be identified in interdisciplinary collaboration skills (S35). A reduced workload and the resulting maintenance of a high level of quality in work (S36) could also be noticed. Learning from the tandem partner's professional skills (S34) was generally positive.

***Evaluation/Assessment Competence (S37-39)***

The development of the e-tutors' assessment skills (S37) vastly exceeded their expectations. This could coincide with the positive development of feedback skills (S12). Data analysis and interpretation skills (S38) also increased. The trend in S39, learning from the evaluation skills of the tandem partner, was largely neutral but also slightly positive.

***Intercultural Competence (S40-45)***

The comparison between expectations and experiences of improving intercultural skills (S40) was surprisingly less positive. Although there are no negative assessments of S40, the positive assessments decrease in favor of the neutral position. Especially the enrichment of the worldview (S44) has strongly differing trends. While there is an increase in Q2's strong agreement with the statement, the disapproval ratings of the statement also increase. In general, the e-tutors stated that they had learned from the tandem partner's intercultural skills (S45), though partly opposing developments can be observed.

### 3.3. Tandem Contract

As Table 2 illustrates, the tandem contract proved to be a meaningful basis for cooperation (S48) and was able to meet the majority's expectations (s. OA5). Complying with the content of the tandem contract (S49) was also considered positive. This is also expressed in the adherence to learning goals and sticking to them (S51). Here, negative expectations could be transformed into neutral or strongly positive experiences. In Q1, the e-tutors were also asked whether they considered a tandem contract necessary (S52). The majority answered affirmatively.

Table 2
*E-Tutor Contract - Comparison Between Q1 and Q2*

| Statement (S) | Expectation → Experience (Difference) in % | | | | |
|---|---|---|---|---|---|
| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
| S48: Meaningful basis for collaboration | – | – | 22.2 → 7.7 (14.5) | 61.1 → 76.9 (15.8) | 16.7 → 15.4 (1.3) |
| S49: Complying with the contract's content | – | – | 16.7 → 15.4 (1.3) | 77.8 → 76.9 (0.9) | 5.6 → 7.7 (2.1) |
| S51: Recording learning goals and sticking to them | – | 5.6 → 0.0 (5.6) | 11.1 → 15.4 (4.3) | 66.7 → 53.8 (12.9) | 16.7 → 30.8 (14.1) |
| S52: No contract necessary | 11.1 | 33.3 | 38.9 | 16.7 | – |

### 3.4. General Questions and Comments

In Q1, the e-tutors also had the opportunity to specify the content they wanted a tandem contract to cover. Most frequently mentioned was that the tandem contract should include the expectations of the tandem. The e-tutors also rated the commitments of each tandem member, the inclusion of individual agreements, and participation rules as vital. Rules for communication and decision-making are also considered necessary. General guidelines for working methods and conflict resolution rules are also expected in a tandem contract. Although these requests could not be considered in the tandem contract provided in this VCL, they overlapped with its contents to a great extent. However, this information will help to cover essential aspects of a tandem contract in future iterations.

In Q2, e-tutors could answer open-ended questions. When asked why they would like to work in an e-tutor tandem again, nine e-tutors left a response. For example, one e-tutor wrote that collaborating and consulting about problems was helpful. Another comment mentioned competence improvements and the opportunity for intercultural exchange as motivational factors. The general work in a team was also perceived as positive. When questioned about what they would change about the tandem setup, one response suggested that dealing with the inactivity of the tandem partner should be considered.

One e-tutor stated that the work and activity of e-tutors should be better regulated to avoid an uneven distribution of workload and thus to improve the tandem setting for future e-tutors. In addition, e-tutors need more guidelines about relevant procedures in a tandem setting. Information about frequently occurring problems in tandems should also be provided in advance to prepare the e-tutors. When asked how they would rate their experience with the e-tutor tandem, seven e-tutors answered with “very positive”, and six e-tutors responded with “positive”. In addition, eleven e-tutors stated that they would work in an e-tutor tandem again, one person was unsure, and one answered negatively.

Now, to answer RQ1, it can be stated that the e-tutors expected the tandem setting to improve their competencies but to different extents. The experiences often exceeded expectations and were largely positive regarding competence improvement, which answers RQ3. Regarding Q2, it can be observed that the e-tutors expected the tandem contract to be helpful. Like in RQ3, their experience with the tandem contract positively surpassed their expectations, which answers RQ4.

### 3.5. Follow-Up Questionnaire (Q3)

Q3 was distributed to the e-tutors four weeks after concluding the VCL as a follow-up (OA3). Thereby, the e-tutors had ample time to reflect on the tandem. Q3 included one main question concerning the fit of the tandem setting for

competence improvement. Fourteen e-tutors answered it. Thirteen respondents indicated that e-tutor tandems helped develop further e-tutor and, thus, work competencies, whereas one e-tutor remained neutral (s. Figure 4). Thus, RQ 5 can be answered affirmatively.

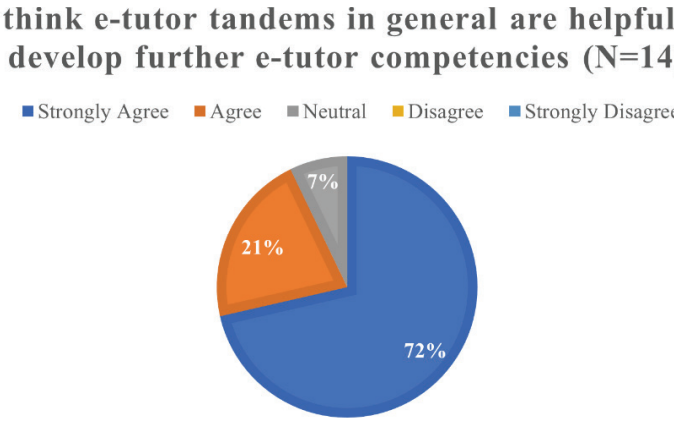


*Figure 4.* Benefit of Tandem for Competence Development

## 4. Discussion

Overall, the e-tutors had high expectations of competence improvement through tandem work before the VCL. These expectations were met or even exceeded in many competence areas. This includes, for example, social competence, which could be increased more through the tandem than initially expected by the e-tutors. Pedagogical competence was also developed more than expected. The evaluation competence exceeded expectations and might be related to the highly positive development of pedagogical competence.

In contrast, intercultural competence was developed less than expected. This may be due to an insufficient engagement with the different cultural backgrounds of the e-tutors. Professional competence also failed to meet the expectations. The expectations toward developing individual competence were higher than the experiences. These competencies include skills that are usually time-intensive to develop. Nonetheless, there were also successes, e.g., in increasing creativity and empathy.

However, the tandem is suitable for addressing and developing numerous competencies. This finding is also supported by the result from Q3, in which 72% of the e-tutors rated the tandem as helpful for competence development. The covered competencies also contain global skills that can be improved and

sustainably benefit the student e-tutors. Adjustments to the tandem setting are required to address the competence areas that did not meet expectations.

### 4.1. Recommendations for Action

In this part, we list design recommendations that we could derive from monitoring the VCL and evaluating the questionnaires. These suggestions are intended to support other module supervisors in avoiding potential obstacles when taking advantage of the opportunities offered by e-tutor tandems.

- *Initial Information About Tandem*

Although the e-tutors received a short introduction to tandem work before the start of the VCL, this needed to be more comprehensive for some e-tutors. Therefore, informing the e-tutors about basic principles, opportunities, and challenges is recommended before working in tandem. This additional knowledge transfer should provide an equal understanding of tandem work.

- *Implementing Intercultural Guidelines*

The development of intercultural competencies could be realized partly. To further support the intercultural exchange between the tandem partners, the e-tutors should include guidelines in their contract, enabling them to learn about the other culture. They could create a short presentation or quiz about their cultural background.

- *Reflection on One's Progress*

To document their learning progress, e-tutors can create learning diaries. Additionally, e-tutors should meet regularly to reflect on their learning progress and discuss challenges to support each other adequately. Firstly, the intention is to become aware of one's competencies. Secondly, the e-tutors should come to terms with their learning and development goals and reflect on achieving these objectives.

- *Goal Setting and Tracking*

Educators can provide tips and assistance to facilitate the formulation of personal goals. E-tutors should then understand how to set goals, such as improved social competence, and then follow through and track them.

- *Head of E-tutors*

To reduce the hurdle of asking supervisors for support in tracking competence development, the role of the "Head of E-tutors" can be introduced. An experienced e-tutor should fill this role. They should see it as their task to support and guide other e-tutors in their competence development. Through experience in e-tutoring, the Head of E-tutors knows where the potential for competence development exists. This e-tutor can also offer support in reflecting on the learning processes. They can intensively accompany the goal-setting process and the reflection before, during and after the VCL.

- *Tandem Contract*

To counteract time problems when filling out the tandem contract, the e-tutors should send them to the module supervisors in advance. Thereupon, e-tutors can be assigned to tandems based on their self-identified strengths and weaknesses to maximize learning potential. To further simplify tracking the set guidelines and goals, the tandem contract can be divided into three phases (before, during, and after the VCL).

- *Self-Evaluation Tool*

The identification of the competence levels can be realized, e.g., with the help of a self-evaluation tool. Such a web-based tool can allow e-tutors to get information about their competence levels before and after a VCL and thus provide an additional way to monitor their learning progress.

- *Common Understanding*

In general, the tandem work should enable e-tutors to further develop their competencies in different areas. However, before the e-tutors set their goals, a concise understanding of competencies should be created. For this, a detailed description of competencies regarding the e-tutors' activities in Langesee (2023) can be provided to e-tutors to facilitate goal formulation and tracking. It should be ensured that the competence descriptions are consistent with the explanations in the self-evaluation tool.

- *Transparency of Cooperation Partners*

There must be an equal understanding of the tandem between the e-tutors, supervising university staff, and cooperating universities. These institutions lay the foundation for collaboration. This includes, e.g., the crediting of the e-tutors' activities at the respective university and precise information for the e-tutors about the time resources required for this activity.

## 5. Conclusion

This research aimed to investigate the fit of tandem work in a VCL environment to enhance and develop competencies. The study subjects were e-tutors who virtually mentored student groups in tandems for several weeks. To evaluate the tandem work, three questionnaires were distributed to the e-tutors before, during, and after the VCL.

Their expectations and experiences within the e-tutor tandem, contract, and perceived competence development were recorded. Based on these results, recommendations for action for interested educators were derived, which impact further training strategies for e-tutors. Although the study subjects were e-tutors in

a VCL, the recommendations are transferable to similar educational environments with tutors, virtual language tandems or even company-internal training.

First, it can be noted that the e-tutors had positive expectations towards the tandem work and contract. For most participants, these expectations were exceeded by the experiences made. However, apparent differences between the nine competence areas could also be identified. For example, the positive development in intercultural competencies was lower than expected.

In contrast, the pedagogical and social competencies benefited most from the tandems. The tandem contract was also perceived as beneficial. A third survey, which took place several weeks after the VCL, underlined the positive experiences. Most e-tutors would also want to participate in a tandem in the future. This evaluation shows that global skills, integrated into different competence areas, can be improved through tandems within a virtual collaboration.

The limitations of the present research refer mainly to the small number of e-tutors. Due to the dropouts of e-tutors, the sample size was considerably reduced. Nevertheless, several tandems could be formed and researched, which allowed numerous conclusions to be drawn. Besides, in Table 1, rounding errors of 0.1% occurred in a few cases, which was not relevant to the trend but is still mentioned for completeness. Lastly, qualitative data should supplement Likert-scale questionnaires to overcome numerical data's inherent limitations. This was done in the present case with free-text questions and comment options. A mixed methods approach may be suitable for future studies.

In the future, the recommendations will be evaluated in other e-tutor tandems. A self-evaluation tool is also planned to make it easier for the e-tutors to compare their competence levels before and after a VCL. Additionally, such a tool can support them in tracking their learning goals.

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Lisa-Marie Langesee, Nelli Ukhova

## Tandemy e-tutorów w kursie COIL – projekt, wdrożenie i ocena

S t r e s z c z e n i e

Badania nad scenariuszami współpracy cyfrowej w szkolnictwie wyższym (HE) charakteryzują się różnymi podejściami, które jako cele nauczania często wskazują nabycie i rozwój umiejętności globalnych. Wirtualne uczenie się przez współpracę (VCL) w szkolnictwie wyższym jest jednym z podejść ułatwiającym studentom nabywanie globalnych umiejętności. W zależności od sytuacji te rozwiązania edukacyjne mogą obejmować grupowe uczenie się oparte na studiach przypadków pod nadzorem e-tutorów. Niniejszy artykuł koncentruje się na perspektywie e-tutorów – specjalnie wykwalifikowanych asystentów studentów – i ich rozwoju kompetencji podczas letniego semestru w 2022 roku. Uwzględniając wyniki poprzednich badań, celem pracy w tandemie tutorskim był rozwój kompetencji. W artykule porównano przede wszystkim oczekiwania i doświadczenia dotyczące rozwoju kompetencji e-tutorów w międzynarodowym tandemie. Oczekiwania i doświadczenia, o których mowa, zostały zbadane za pomocą dwóch kwestionariuszy ilościowych wykorzystujących 5-punktowe skale Likerta. Zastosowano także jeden krótki kwestionariusz kontrolny po zakończeniu VCL. W rezultacie badań stwierdzono, że oczekiwania e-tutorów potwierdziły się, jednak w różnym stopniu dla każdej z badanych kompetencji. Zaobserwowano wyjątkowo pozytywny rozwój kompetencji społecznych i pedagogicznych, podczas gdy rozwój kompetencji międzykulturowych stanowił wyzwanie. Opracowano kilka zaleceń dotyczących działań, które mogą wpłynąć na doskonalenie pracy e-tutorów.

S ł o w a  k l u c z o w e: umiejętności globalne, wymiana wirtualna, tandem/zespół, wirtualne uczenie się przez współpracę, rozwój kompetencji

Лиза-Мари Лангези, Нелли Ухова

## Тандемы преподавателей в электронном курсе COIL – разработка, внедрение и оценка Аннотация

Аннотация

Исследования сценариев цифрового сотрудничества в высшем образовании (ВО) характеризуются различными подходами, которые часто определяют приобретение и развитие глобальных навыков в качестве целей обучения. Виртуальное совместное обучение (VCL) в ВУЗе представляет собой один из подходов к развитию глобальных навыков студентов. В зависимости от конкретного случая, такие формы обучения могут включать групповое обучение на основе конкретных примеров под руководством преподавателей в электронной среде. Данная статья посвящена перспективам преподавания в электронном курсе (е-тьюторам). Студенты-ассистенты прошли специальное обучение с целью развития их компетенций в течение летнего семестра 2022 года. Основываясь на результатах предыдущих исследований, для развития компетенций была выбрана тандемная форма обучения. В данной работе в основном сравниваются ожидания и опыт в отношении повышения компетентности е-тьюторов в многонациональном тандеме. Эти ожидания и опыт были исследованы с помощью двух количественных анкет, использующих пятибалльную шкалу Лайкерта, и одной короткой анкеты после завершения VCL. В целом, позитивные ожидания преподавателей оправдались, но не в одинаковой степени для каждой категории компетенций. Особенно позитивным было развитие социальных и педагогических компетенций, в то время как развитие межкультурных компетенций было проблематичным. Было выработано несколько рекомендаций для действий, которые влияют на дальнейшее обучение е-тьюторов.

Ключевые слова: глобальные навыки, виртуальный обмен, тандем, виртуальное коллаборативное обучение, развитие компетенций

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## Tándems E-Tutor en un curso COIL – Diseño, implementación y evaluación

Resumen

La investigación sobre escenarios de colaboración digital en la Educación Superior (ES) se caracteriza por diversos enfoques que a menudo definen la adquisición y el desarrollo de competencias globales como objetivos de aprendizaje. El Aprendizaje Colaborativo Virtual (ACV) en la ES representa un enfoque para facilitar las competencias globales de los estudiantes. Dependiendo del caso de uso, estos acuerdos de aprendizaje pueden incluir el aprendizaje en grupo basado en el estudio de casos bajo la supervisión de un e-tutor. Este artículo se centra en la perspectiva de los e-tutores (estudiantes ayudantes especialmente cualificados) y en el desarrollo de sus competencias durante el semestre de verano de 2022. Sobre la base de los resultados de investigaciones anteriores, se eligió un entorno en tándem para el desarrollo de sus competencias. Este artículo compara principalmente las expectativas y experiencias relativas a la mejora de las competencias de los e-tutores en un tándem multinacional. Estas expectativas y experiencias se consultaron mediante dos cuestionarios cuantitativos que utilizaban escalas Likert de 5 puntos y un breve cuestionario de seguimiento tras

la finalización del VCL. En general, las expectativas positivas de los e-tutores se cumplieron, pero no en la misma medida para cada categoría de competencia. Especialmente el desarrollo de las competencias sociales y pedagógicas fue positivo, mientras que el desarrollo de las competencias interculturales supuso un reto. Se derivaron varias recomendaciones para la acción, que repercuten en la futura formación de e-tutores.

P a l a b r a s  c l a v e: Habilidades globales, intercambio virtual, tándem, aprendizaje colaborativo virtual, desarrollo de competencias

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# Adaptive and Intelligent MOOCs: How They Contribute to the Improvement of the MOOCs' Effectiveness

## Abstract

Several traditional MOOCs have been developed utilizing particular traditional approaches for distance learning. The main objective of this article is to examine numerous studies and research about the provision of adaptive and intelligent MOOCs to address issues, such as dropout rate, for improving their efficiency compared to conventional MOOCs. Important issues that have been the essential study interests of MOOC scholars in recent years, including dropout rate, completion rate, loneliness, and other topics, were studied. Finally, the research questions posed on the effectiveness of Adaptive and Intelligent MOOCs, the learner's characteristics used for adaptation, the adaptive and intelligent methods and techniques used, and the improvements they bring to traditional MOOCs as a compass for designing Adaptive and Intelligent MOOCs in the coming years, are discussed.

K e y w o r d s: distance education, adaptive and intelligent MOOCs, personalized learning, MOOC challenges

# 1. Introduction

The aim of this paper is to highlight the progress made in enhancing the effectiveness of traditional MOOCs by researchers using Adaptive and Intelligent MOOCs to address critical issues like dropout, loneliness, engagement, user collaboration, and the validity of methods for assessing learners' knowledge, among others.

Kentnor (2013) asserts that technology facilitates the educational process. The advancement of online assistive technologies and the opportunities they present allow us to improve on the conventional methods of instruction and learning. Massive Open Online Courses (MOOCs) have been used to implement this capability in the domain of traditional distance learning (MOOCs).

A new and potent method of gaining access to knowledge and education, MOOCs, is characterized by the integration of traditional digital teaching tools (videos, sounds, graphics, or slides), personalized tools for knowledge acquisition and validation, and the appropriate use of private social networks (Dillenbourg, Fox, Kirchner, Mitchell, and Wirsing, 2014).

Ardchir, Talhaoui, and Azzouazi (2017) assert that MOOCs are associated with the idea of openness in learning and that their main characteristics include having an infinite number of participants with free Internet access, delivering instruction via the Internet, and basing their courses on a set of goals in a particular field of study. The target audience for MOOCs is an unspecified number of participants with a very diverse profile, a range of learning preferences and methods, and a variety of online learning environments.

Widespread acceptance of distance learning has increased as a result of MOOC evolution. Due to their abundance of free, open online courses that are available to everyone and that also have interactive user forums to foster community connections between students and educators, MOOCs are very appealing and have excellent accessibility.

The effectiveness of MOOCs as teaching resources is a crucial concern for scholars. According to Sonwalkar (2012), a significant reason for concern about the long-term success, effect, and sustainability of MOOCs is the high dropout rate of participants who initially enroll in a MOOC (about 90%). In addition, the lack of participant collaboration outside of peer review raises concerns about their efficacy (Blanco, García-Peñalvo, and Sein-Echaluce, 2013). The diversity of the students and the necessity to individualize the content and delivery method is a big concern with MOOCs. One size no fits all is the idea based on personalized learning. Learning styles, knowledge levels, interests, learning rates, and other variables vary among learners (Qaffas, Kaabi, Shadiev, and Essalmi, 2020).

The conclusion made by Daniel, Cano, and Cervera (2015) was that "*Implementing adaptive learning techniques to make MOOC courses more individualized*

*is a potential, albeit currently underdeveloped, solution that will probably be accessible shortly.*" Additionally, according to Shpolianskaya, and Seredkina (2020), using intelligent technology in MOOCs enables us to create tailored learning pathways for every student, each with their techniques, forms, and rates of his learning.

The first stage is to develop the learning content into finely-grained and clearly labeled knowledge units to enable future MOOC students to personalize their learning routes (Yu, Miao, Leung, and White, 2017).

There are numerous sorts of MOOCs. Connectivist MOOCs (cMOOCs) and xMOOCs are two of the most significant MOOCs categories (eXtended MOOCs). Incorporating the de-schooling concept of Illich (1971) and the connectivism pedagogical principles put forward by Siemens (2005), cMOOCs are among the most accessible platforms for promoting self-directed learning. With a highly planned, content-driven course created for several students working primarily on their own, quiz-like examination procedures, and lectures, xMOOCs use a remarkably linear approach with well-defined outcomes.

The hybrid MOOC paradigm (hMOOC) lowers the dropout rate and encourages collaborative learning by combining aspects from cMOOCs and xMOOCs (Anders, 2015).

Instead of everyone following the same course, personalized learning is encouraged by adaptive learning. In terms of developing Web-based educational courseware, adaptive and intelligent Web-based educational systems (AIWBES) offer an alternative to the conventional "just-put-it-on-the-Web" method (Brusilovsky & Miller, 2001 as cited in Brusilovsky & Peylo, 2003). By creating a model of each student's goals, preferences, knowledge, learning styles, etc., and using this model during the engagement with the student, AIWBES aims to be more adaptable (Brusilovsky & Peylo, 2003). These include Adaptive and Intelligent MOOCs.

To provide tailored learning experiences based on dynamic assessment and data collecting for the course, adaptive MOOCs (aMOOCs) employ adaptive methodologies. They are prerequisite-based and cater to students' various, personalized pathways through the material (Ardchir et al., 2017). Additionally, MOOCs and Intelligent Tutoring Systems typically use complementary instructional strategies, although combining the two is uncommon (Aleven et al., 2016). Thus, in recent years, Intelligent or Smart MOOCs have been established.

According to Gynther (2016), adaptive learning systems, such as adaptive MOOCs, should include the following design criteria when creating adaptive learning plans in general:

- The learner should be modeled using reported outcomes.
- The development of an adaptive learning system should follow a preemptive rule that advises against using tired methods for modeling the learner.
- Modeling should take into account the learner's professional abilities, as well as their knowledge and ability to retain information in a MOOC format.

- A specialized framework's non-transparent algorithm-based adaptation cannot function by itself.
- A learner and a teacher must negotiate using one or more created data sets.
- The adaptation process ought to be prescribed and straightforward and beneath the learner's control.
- The learner ought to control his learning model.

The challenges of conventional MOOCs have led to the development of adaptive and intelligent MOOCs, which are the subjects of this article.

The remaining part of the article is structured as follows. The second section covers the methodology of the research. The third section covers relevant research on the benefits and uses of Adaptive and Intelligent MOOCs and the improvement of the efficiency they offer over conventional MOOCs, the learner characteristics they use for adaptation, and the applications that have been used to date. In the fourth section, the results of the research are presented, and in the fifth section, a discussion about the results takes place. Finally, conclusions about the effectiveness of Adaptive and Intelligent MOOCs are formed.

## 2. Methodology of Research

This work supplies a thorough review of the literature on adaptive and intelligent MOOCs to guide researchers, designers, and developers in planning future Adaptive and Intelligent MOOCs to achieve significant efficacy over traditional MOOCs. Thus, MOOC designers or developers might use the findings of this research for their MOOC design to avoid or minimize shortcomings, manage the challenges systematically, and form valid research questions for their study on related topics. Moreover, they might use the corresponding report for general information on innovations of MOOCs on the Adaptive and Intelligent MOOCs. They may also be used for educational purposes.

To find the methods and techniques used by the Adaptive and Intelligent MOOCs that increase their efficiency over traditional MOOCs, a thorough literature review regarding this case was conducted. For the quality of research studied sixty-eight bibliographic sources and papers that reported empirical evidence concerning the developed Adaptive and Intelligent MOOCs, and how they affect student performance, engagement, dropout rate, and other factors.

The fundamental factors adopted for deciding which research methodology will be used are the factors of the Adaptive and Intelligent MOOCs that contribute to the enhancement of efficiency of traditional MOOCs, the learner traits they used, and the adaptive and intelligent methods and techniques that have been used for the improvement of the efficacy of conventional MOOCs.

Consequently, the critical keys that have been used for the research questions are Adaptive MOOCs, Intelligent MOOCs, Personalized MOOCs, effectiveness, performance, engagement, dropout rate, completion rate, loneliness, learning styles, course material or content, competence, learning experience, satisfaction, isolation, motivation, learning outcome, Adaptive and Intelligent MOOC techniques.

Taking into consideration the referred above, the following research questions (RQ) were posed:

RQ1: What improvements have been made to the Adaptive and Intelligent MOOCs to overcome the low effectiveness of conventional MOOCs?

RQ2: Which learner traits have Adaptive and Intelligent MOOCs used so far to adapt to the many roles they provide?

RQ3: What adaptive and intelligent methods and techniques have been used so far to improve the effectiveness of conventional MOOCs?

The systematic literature review methodology was used to investigate traditional MOOCs' challenges and shortcomings and find solutions from research on Adaptive and Intelligent MOOCs by searching the bibliography to answer the research questions. Furthermore, as much research as possible was conducted to reduce inaccuracy, increase efficiency and reliability, and eliminate biases and errors. Prerequisites for the study include the selection of a bibliography and studies that meet the following inclusion and exclusion criteria:

Inclusion criteria: Peer-reviewed high-quality scientific journals and conferences articles and books about Adaptive and Intelligent MOOCs with a significant number of citations from 2011 to 2022; methodology/technology/procedure/findings that address challenges or shortcomings of MOOCs, fewer and shorter primary studies are considered to avoid population restrictions when considering the practical implications of the systematic review.

Exclusion criteria: Articles should be limited to English-language articles from 2011 to 2022, articles in the non-MOOC context, articles that do not meet the inclusion criteria.

The papers were collected from Scopus and Google Scholar databases according to critical keys and taking into account the inclusion and exclusion criteria.

## 3. Literature Review on Adaptive and Intelligent MOOCs

### 3.1. The efficiency of Adaptive and Intelligent MOOCs

As was indicated before, Siemens (2005) suggests connectivism as a learning theory for the digital age. The principles of chaos, network, complexity, and self-organization theories, which were influential in the early creation of cMOOCs,

are incorporated into connectivism. Similar to Carneiro (2013), who proposed the generativism theory, which lays the groundwork for a new philosophy of lifelong learning, seeks to describe collaborative learning using digital technologies and open educational resources.

Adaptive MOOCs are based on notions of brain-based learning. Examining brain cells is necessary to comprehend brain-based learning. The brain's central energy is a sort of structure called a neuron. Neurons are connected among them. The creation of new connections between neurons is called neuroplasticity and the production of new neurons is called neurogenesis. Also, neuroplasticity allows for changes in neuronal structure and pathways within the brain, as well as its physical shape. The connections between the neurons also form and break, and the brain occasionally loses and gains neurons. The average brain has 100 billion neurons, along with a vast number of connections.

When two neurons communicate, learning happens. The dendrites expand as the neuron gathers information. Dendrites are pursuing out constantly new information or stimuli because the brain is trying continuously to learn, and the brain is searching for significance in that information or stimulation. When data is conveyed to the brain, a synapse is a gap between cells that enables the communication between neurons. A neural network is created when neurons communicate with each other continually (Sprenger, 2010).

Slavkin (2002) defines brain-based learning as any instructional strategy or technique that uses knowledge about the human brain to set up lessons in such a way that promotes learning by how the brain learns.

There are notable suggestions for incorporating brain-based learning into the classroom that also applies to online courses. Based on the results of neuroscience research, Braidic (2011) suggested online faculty which uses brain-based learning techniques should provide a safe, comfortable, flexible, interactive, and supportive asynchronous learning environment by engaging students in activities and collaborative learning groups, offering flexibility, making resources available, providing feedback, and so on.

Boromo (2017) asserts that the principles that maximize information acquisition and retention are at the core of brain-based learning theory. Techniques for distance learning may be utilized to decrease interruptions and improve focus. Students' interest in online courses will grow from the discussion. Materials and teaching must be learner-centered and presented in a fun, relevant, and personally enriching way in brain-based learning settings (Lucas, 2010). It has been theorized and demonstrated through related studies that interaction is paramount for adequate online courses (Roblyer & Wiencke, 2003).

Research by Boulton, Hughes, Kent, et al. (2019) indicated a positive interaction between engagement and happiness, with an unexpected negative relationship between engagement and academic outcomes.

Conventional MOOCs face many difficulties, including learner dropout, loneliness, engagement, low completion rates, user collaboration, low satisfaction, diversity of learners, and trustworthy techniques for assessing students' knowledge. As other variables impacting MOOC dropouts, Chiappe and Castillo (2020) emphasize the importance of collaboration, community, and the necessity for certification and standardization.

To develop new approaches meant to lower dropout rates and other shortcomings of conventional MOOCs, understanding what makes MOOCs successful has emerged as a critical research challenge. The participation of the students in the course activities and the reported outcomes are used to define successful MOOCs (Niman, 2014).

According to Sonwalkar (2012), a significant reason for concern over any long-term viability, impact, and sustainability of MOOCs is the high dropout rate of individuals who enroll initially in them. Itani, Brisson, and Garlatti (2018) discovered through their research that the high dropout rate is caused by the lack of time, family obligations, lack of online abilities, lack of prior experience, the course's structure and complexity, the poor quality of the lessons, and the pedagogical approaches that have been used. According to a study by Hew and Cheung (2014), looking at the difficulties professors and students have in typical MOOCs, the plurality of students lacks orientation and motivation, and lack of communication and connection with peers and/or teachers causes dropout rates.

Sonwalkar (2012) asserts that conventional MOOC courses rely heavily on video lectures and discussion forums and are predicated on the principle that "one size fits all." A MOOC course that uses an adaptive system based on inductive, deductive, and exploratory pedagogy, when adapted to each learner's preferred learning style may have a substantially better completion rate. Completion rates can be significantly increased with adaptive MOOCs, which offer information with diverse learning methodologies and timely, intelligent feedback.

According to Miloud, Soukaina, Salma, and El Hassan (2020), a MOOC's design should be centered on an adaptive online learning system that boosts course completion rates. This will ensure that the suggested course corresponds to the most effective manner for the learner to finish the learning process.

Many classic MOOCs are created as a collection of texts and videos utilizing typical distance learning concepts, but they do not support adaptive and personalized learning. The diverse educational levels, educational objectives, learning styles, interests, and preferences of learners influenced the development of adaptive MOOCs for individualized learning. Personalisation has a significant impact on how successful MOOCs are.

MOOCs must, among other things, employ various pedagogical approaches and offer some category of accreditation or certification if they are to support personalized learning. If we look at MOOCs from five angles–the teaching model, monetization, certificate, adaptive learning, and MOOCs for underdeveloped

nations–the future will be theirs. The primary problems in the upcoming years must be these dimensions and the standard of the educational process (Daniel, Cano, and Cervera (2015).

According to Sein-Echaluce, Fidalgo-Blanco, and García-Peñalvo (2017), adaptive MOOCs should provide participants with learning methodologies that cover their learning objectives and profiles, learning preferences, etc.

Rosen, Rushkin, Federicks, Tingley, and Blink (2017) assert that engagement, adaptability to learning outcomes, and lower dropout rates result in more effective learning as students move through the course more quickly and encounter fewer issues since they are dealt with in a targeted manner. There is a definite need for research-based educational approaches that foster the best conditions for students with various backgrounds, aptitudes, and goals to thrive in MOOCs.

Gynther (2016) found that learners who want to keep their professional skills current and to collaborate with peers who have already taken a formal exam on a topic covered by the MOOC would wish to have access to the MOOC after their exams. Colleagues who also want access to the most recent information in a field and ongoing professional growth the MOOC might provide through regular updates.

### 3.2. Applications of the Adaptive and Intelligent MOOCs

Personalized learning systems have been developed using a variety of adaptive and intelligent techniques, such as artificial intelligence educational systems (from the 1970s) based on artificial intelligence languages, knowledge simulation, and modeling, adaptive control systems (from 1980 to 2010) based on artificial intelligence languages, object-oriented languages, and multimedia and adaptive cloud-based systems (from 2010 and later) that use server virtualization hardware and a cloud computing platform (Semantic Web, intelligent network agents, robots, etc.).

The first adaptive MOOC platform was created by Synaptic Global Learning and offers a personalized learning environment within a MOOC learning environment while emphasizing an educational foundation.

Birari (2014) used ITS approaches in MOOCs to create suggestions and modify the material and learning routes. Additionally, Lafifi, Y., Boudria, Lafifi, A., and Cheraitia (2020) offer a fresh perspective on how an intelligent tutoring process might be applied in human learning systems in general and MOOCs, in particular, to prevent learner dropout, isolation, and motivation loss based on learner behaviors and competencies.

Instead of using sequential modules, Blanco et al. (2013) built an adaptable MOOC utilizing a variety of functions. The design for the proposed adaptive MOOC is based on non-sequential modules, but on the different MOOC thematic sections,

when each module is applied. The modules act as a spiral along the development of the course and include gathering and analyzing data, working together, and managing resources. The modification takes place as follows:

- For each profile, the knowledge management system selects the best learning resources. Every learner in the community receives a unique program thanks to the adaption mechanism.
- During the formative assessment, the results of interactions and activities are taken into account.
- New knowledge is produced by the learning community, as a result of collaborative efforts. The newly created knowledge is assessed regularly and incorporated into the system (social knowledge produced by the educational community).

Ewais and Samara (2020) provided a system that facilitates learning by modifying the learning content through the adaptive MOOC utilizing the Nave Bayesian classification algorithm, allowing the student to attain many learning outcomes. The learner can take an automatically generated course based on anticipated learning outcomes and pedagogical relationships.

Lin et al. (2021) took into account the fact that the current techniques for course suggestions in MOOCs typically presuppose that users' choices are unchanging. They disregard the user's changing interests in consecutive learning practices. To increase the adaptability of the recommendation model, they suggest a new lesson recommendation framework called Dynamic Attention and Hierarchical Reinforcement Learning (DARL). In every contact between a profile reviewer and a referral model, DARL automatically records user preferences, enhancing the efficacy of the suggestion. According to experimental findings, the DARL performs much better than more sophisticated methods of course recommendation on important assessment parameters.

Open edX (Sanchez-Gordon & Luján-Mora, 2015) was created to increase the accessibility of course materials for individuals with disabilities. By tailoring the course material to the requirements, preferences, abilities, and students' circumstances, the edX extension aims to increase the accessibility of MOOCs. The user should update their profile with their preferred methods of access. Based on the adaptive engine controls, the Open edX plugin automatically applies all necessary settings and feeds the presentation layer with the user-optimized material.

Aleven et al. (2016) integrated the Cognitive Tutor Authoring Tools (CTAT) and the Generalized Intelligent Framework for Tutoring (GIFT) into the edX MOOC platform. For adaptive training, GIFT offers a framework and authoring tools (Goldberg, Hoffman, and Tarr, 2015). According to Aleven et al. (2016), the combination of GIFT and CTAT enhances the adaptability of edX to learner characteristics and enables the extension of learning-by-doing activities. In this situation, GIFT and CTAT each have unique responsibilities to perform, but both increase the adaptability of MOOCs.

Conversational pedagogical agents can be utilized to successfully promote and enhance student collaboration in MOOCs (Tomar, Sankaranarayanan, Wang, and Rosé, 2017), boost student engagement, lower dropout rates, increase the availability of peer assistance resources (Ferschke, Yang, Tomar, and Rosé, 2015), and increase students' collaboration (Caballé and Conesa, 2018).

Tegos, Mavridis, and Demetriadis (2021) described the design of a prototype system named PeerTalk that uses a conversational agent service designed to support students' online collaboration and provide helpful guidance. It might be organized by course instructors, scaled with faculty support, and incorporated simply into MOOC platforms, resulting in more sophisticated opportunities for authentic social engagement between students.

González-Castro, Muñoz-Merino, Alario-Hoyos, and Delgado-Kloos (2021) introduced a conversational agent for the adaptive learning module for JavaPAL that enhances a MOOC for learning Java programming by altering how students audit important topics offered by the MOOC. Item Response Theory (IRT) is used in this module to adjust the questions' difficulty based on the student's prior knowledge and provides suggestions for videos taken from the MOOC when students are unskillful to answer questions.

Pang et al. (2018) suggested an adaptive recommendation for the MOOCs (ARM) method to deal with learners' low satisfaction (a dropout cause) and feelings of isolation. ARM provides adjustable features following the needs for user happiness. Collaborative filtering enables collaborative learning to decrease loneliness by supplying information about matching learners. Additionally, ARM cleverly blends time scheduling with collaborative filtering to increase the accuracy of proposals. Experiments using data from the actual world show how well ARM can offer recommendations for reducing dropout rates.

An adaptive hybrid MOOC (ahMOOC) paradigm that combines hMOOC and aMOOC was presented by Sein-Echaluce et al. (2017). When corresponding to conventional MOOCs, the ahMOOCs model has the lowest dropout rate (much like hMOOCs). The model's qualitative analysis demonstrated the ability of its diversely profiled participants to jointly produce knowledge that will improve the course material and then apply it to their specific work environments. The study also seemed to show that the participants were conscious of how an ahMOOC may tailor the learning experience to their profiles and interests.

More trustworthy techniques are needed for evaluating learner knowledge in MOOCs. Rossano, Pesare, and Roselli (2017) experimented with an adaptive computer-based test that permits the test's energy content to be adjusted depending on the user's skill. Additionally, this keeps the user from losing interest because a question is too challenging for their profile. To gain experience creating an algorithm for assigning grades, a prototype of the CAT was integrated into an adaptive MOOC that used a quiz game.

The learner's progress toward precisely stated objectives is consistently evaluated in tailored adaptive systems. When the student is ready to exhibit their abilities, the assessment takes place so that the reinforced content can be customized to their needs. Rosen et al. (2017) utilized the functionality for adaptive learning available in edX in the ALOSI (Adaptive Learning Open Source Initiative) platform. They investigated the effects of two different approaches on developing knowledge and expertise for adaptive problems and concluded that ALOSI's adaptive assessment, with a focus on recovery, is associated with a notable increase in learning gains while having no significant effect on dropout.

Hasmaini, Salam, Nurul, and Syafiatun (2018) focused on using appropriate adaptive self-assessment tasks in MOOC-based learning. The results of this study have two main implications: (1) the dimension of learner characteristics (learning style and cognitive style) to enhance learner performance in learning through MOOCs; and (2) appropriate self-assessment activities, which consider learners' prerequisites or adapt to the characteristics of their prerequisites, to enhance learner performance in the MOOC. Based on the adaptation's findings, visual, active, reflective, and intuitive learners outperformed all others.

Teixeira, Garcia-Cabot, García-Lopéz, Mota, and de-Marcos (2016) described the so-called iMOOC (intelligent MOOC) platform, which customizes the course material based on the participant's existing knowledge and the device they use to access it.

Shpolianskaya and Seredkina (2020) used a MOOC framework and described how to select online resources and incorporate them into students' learning paths. The system was developed as a collection of personal agents and services that effectively update user characteristics in the knowledge base, enhancing the potency of suggestions.

To enable adaptation in real-time in MOOCs that use logged interaction information to remember which user behavioral or activity patterns ought to trigger and provide support, Lall'e and Conati (2021) suggested the Framework for User Modeling and Adaptation (FUMA). The association rules will shed light on which behavioral patterns can forecast poor learning performance, allowing for the communication of adaptation to challenging such habits.

Sun, Guo, and Zhao (2020) developed a theoretical framework based on adaptive structuration theory that recognizes three contextualized characteristics, namely collaborative spirit, task interdependence, and social interaction links, as prototypes for appropriation consensus. According to the results of their study, collaborative nature, task interdependence, and social interaction linkages are all positively connected with the comprehension of appropriation, which can promote commitment and learner engagement in MOOCs.

Nicholas and Francis (2017) suggested the Adaptive MOOC Design Framework (AMDF), which exemplifies how a MOOC should be put together to satisfy the plurality of personalisation requirements. Additionally, they offered Felder

and Silverman's learning style model to attain the required level of adaptivity and personalisation because learning style is one of the crucial personalisation characteristics.

Sun et al. (2015) offered a system that tries to deliver personalized micro-learning materials while bearing into account the specific needs, learning preferences, and context of story learners.

Pham and Wang (2016) suggested the Attentive Review innovation for mobile MOOC learning, which determines a learner's perceived difficulty levels of the relevant learning materials and recommends personalized review sessions through a user-independent model. This innovation makes it possible to improve mobile MOOC learning by suggesting review materials.

Using a deep neural network for question and confusion classifiers and a content-based recommender to provide answers to the learner's question, Trirat, Noree, and Yi (2020) proposed IntelliMOOC, a system for MOOCs that makes use of learners' online behaviors in addition to content information to respond to student questions.

Sun, Cui, Yong, Shen, and Chen (2018) described an intelligent micro-learning environment, namely MLaaS (Micro-Learning as a Service), using educational data mining (EDM) methods that seek to adjust micro-learning content and learning path identifications fit for each student. They created a dynamic learner model to account for the internal and external aspects that may affect learning experiences and outcomes to personalize the micro-learning necessities.

Li and Zhou (2018) described a hybrid Neural Network (NN) model that has been coupled to anticipate learners' learning methods and educate them with information about their behavior. The potential of the MOOC platform is substantially increased when a learner's preferred learning style is identified, enabling students to raise their course productivity and quality successfully.

Amarasinghe, Hernández-Leo, Manathunga, and Jonsson (2018) suggested an intelligent agent classify MOOC participants based on their actions in a structured collaborative learning environment that promotes the development of ongoing, essential collaboration learning flows.

Assaf, Ramírez-Hernández, and Glasserman (2018) developed a model based on the ROI economic model of terminal effectiveness for estimating the effective completion rate to assess MOOC completion rates.

Recently, on the idea of making systems like MOOCs more intelligent, Yilmaz et al. (2022) offered a conceptual and systematic framework for the development of an adaptive, dynamic, and intelligent tutoring system (SMIT) supported by learning analytics, which is a product of the project that attempts to merge LMS and ITS.

El Emrani, Merzouqi, and Khaldi (2021) created the intelligent adaptive cMOOC known as "IACM" to increase learner engagement while bearing into account individual preferences and learning styles.

To address the problem of high dropout rates in MOOC platforms, El Emrani, Palomo-Duarte, Mota, and Dodero (2022) suggested an adaptive cMOOC based on the ideas of adaptation, connectivism, and social constructivism. The system can also enhance learning performance and student engagement by reducing restrictions and inspiring learners.

By simultaneously developing the following elements: adaptive and personalized content, the ideal educational path, an intelligent selection system, and recommendations for interested students, Parfenov and Zaporozhko (2018) created a multifaceted, holistic, self-organizing cloud environment SMART based on MOOCs that will enable learners to maximize their potential.

By taking into account the diversity of learner profiles and providing each learner with a path customized to their needs through the exploitation of their interactions with the learning environment, Smaili, Khoudda, Sraidi, Azzouzi, and Charaf (2022) aimed to personalize the MOOC content for each learner to advance their academic performance and to enhance the effectiveness of the online platform.

Hamal and El Faddouli (2022) present an intelligent system built on cutting-edge developments in artificial intelligence, mainly deep learning applications, that may assist the learner by responding to all of his/her queries on the topics covered in the MOOC in the area of Natural Language Processing (NLP).

Using big data and artificial intelligence (AI) technologies, Tzeng, Lee, Huang, Huang, and Lai (2022) designed a MOOC assessment system that can accurately predict student satisfaction even in case of low questionnaire response rates. As a result, instructors might use a more satisfactory approach to estimate student satisfaction during and after the course.

The EduEdge project seeks to develop and launch a cloud-based Intelligent Adaptive e-Learning MOOC Platform that uses 4S Technologies to customize the learning experience for each learner. This individualized instruction will help students learn more quickly and retain it. Boosting the efficiency of the learning process and engagement also raises the quality of the learning outcomes.

## 4. Results of Research

The analysis of the research ends up with a conclusion that the researchers contribute with alternative solutions for enhancing the effectiveness of conventional MOOCs in response to the high dropout rate of students, which is one of the biggest challenges, as well as diverse educational levels, completion rates, interests and preferences, educational goals, and other learner characteristics. For individualized learning, two of them are Adaptive and Intelligent MOOCs.

This article's analysis of adaptive and intelligent MOOCs brings to light the most critical problems they addressed. Both innovations boost the effectiveness of conventional MOOCs by addressing some of their shortcomings or difficulties and outlining them below.

The response to the first research question (RQ1) posed for the improvements the Adaptive and Intelligent MOOCs provide to the effectiveness of MOOCs are as follows: lowering the dropout rate and improving the quality of MOOCs; boosting learning gains; lessening loneliness; utilizing different learning styles for better academic performance; tailoring the course material to the student's needs, preferences, skills, and circumstances; creating learning itinerary recommendations tailored to each participant's competence profile; adjusting different learning strategies to distinct learning goals; adjusting content according to prior knowledge and the device they utilize to access the course, maximizing their potential, customizing the learning experience for each learner, gauging student satisfaction during and after the course, preventing isolation, and motivation loss; and choosing the intended learning outcome. The study also showed that reducing dropout rates boosts learning effectiveness.

The response to the second research question (RQ2) is that the following learner characteristics have been used by adaptive and intelligent MOOCs to date for adaptation to a variety of functions as follows: learning styles (primarily the learning style model developed by Felder and Silverman); participants' prior knowledge and the device they use to access the course; specific requests; preferences; knowledge level; learner circumstances; engagement and ability; needs; and heterogeneity of learners' profiles.

The response to the third research question (RQ3) is that the following adaptive and intelligent methods and techniques have been used by adaptive and intelligent MOOCs to date for adaptation to a variety of functions: educational data mining (EDM) methods; hybrid Neural Network (NN) model; intelligent agent to classify MOOC participants; ROI economic model of terminal effectiveness; methodical framework for the development of an adaptive, dynamic, intelligent tutoring system; multifaceted, holistic, self-organizing cloud environment; personal agents and services that effectively update user characteristics in the knowledge base; adaptive assessment; algorithm for assigning grades; adaptive recommendation for reducing dropout rates; conversational agent service; conversational pedagogical agents to successfully promote and enhance student collaboration; adaptation of the course material to the requirements, preferences, abilities, and circumstances of the students; Nave Bayesian classification algorithm for attaining learning outcomes; personalized learning environment.

## 5. Discussion

This paper aims to highlight the progress made in enhancing the effectiveness of conventional MOOCs by researchers using Adaptive and Intelligent MOOCs to address critical issues such as dropout, loneliness, engagement, user collaboration, and the validity of methods for assessing learner knowledge, and others.

To meet this goal, appropriate research questions were posed, the relevant research method was chosen to increase the credibility and quality of the article, and the inclusion and exclusion criteria were set to select the most relevant articles from journals, conferences, and books. From the study of the most relevant articles, the above results emerged that prove the improvement of the effectiveness of the Adaptive and Intelligent MOOCs as well as the highlighting of the new technologies used by them.

Let us hope that it will help for further study and research by MOOC platform designers regarding Adaptive and Intelligent MOOCs to solve their problems and address challenges. Several important issues were analyzed to answer the research questions, and notable information emerged about the effectiveness of the Adaptive and Intelligent MOOCs using various learner characteristics and what adaptive methods and techniques have been used.

## Conclusions

The above information was collected through in-depth literature research up to date. According to the research, an improvement in the effectiveness of conventional MOOCs by the Adaptive and Intelligent MOOCs in several of their challenges and shortcomings was encountered. Various characteristics of learners have been used so far for adapting to different functions of MOOCs using several diverse adaptive and intelligent methods and techniques of Adaptive and Intelligent MOOCs. All of them are important for the additional development of Adaptive and Intelligent MOOCs by coming designers.

The main challenges in the evolution of Adaptive and Intelligent MOOCs in the upcoming years should be the adaptability to the unique characteristics of the learner, along with the quality of the education or training provided, the pedagogical effectiveness, and the effective treatment of challenges of conventional MOOCs.

The examination and application of several strategies and techniques used in online adaptive educational hypermedia systems, which have made significant contributions to learning through contemporary learning theories, is one avenue that this work suggests for increasing the effectiveness of MOOCs in the future.

These methods will significantly benefit MOOCs concerning their efficacy and capacity to handle the challenges and shortcomings of conventional MOOCs.

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Alexandros Papadimitriou

## Adaptacyjne i inteligentne kursy MOOC: jak przyczyniają się do poprawy skuteczności kursów MOOC

S t r e s z c z e n i e

Opracowano kilka tradycyjnych kursów MOOC, wykorzystując określone podejścia do nauczania na odległość. Głównym celem tego artykułu jest przeanalizowanie licznych badań dotyczących zapewniania adaptacyjnych i inteligentnych kursów MOOC w celu rozwiązania problemów, takich jak wskaźnik rezygnacji w celu poprawy ich efektywności w porównaniu z konwencjonalnymi kursami MOOC. Zbadano kwestie, które stanowiły główne zainteresowanie badaczy MOOC w ostatnich latach, w tym wskaźnik rezygnacji, wskaźnik ukończenia studiów, samotność. Dyskutowane pytania badawcze dotyczą: skuteczności adaptacyjnych i inteligentnych kursów MOOC, cech ucznia stosowanych w adaptacji, adaptacyjnych i inteligentnych metod i technik nauczania oraz ulepszeń, jakie wnoszą do tradycyjnych kursów MOOC jako podstawy do projektowania adaptacyjnych i inteligentnych kursów MOOC w najbliższych latach.

S ł o w a  k l u c z o w e: kształcenie na odległość, adaptacyjne i inteligentne MOOC, spersonalizowane nauczanie, wyzwania MOOC

Александрос Пападимитриу

## Адаптивные и интеллектуальные МООК: как они способствуют повышению эффективности МООК

А н н о т а ц и я

Несколько традиционных МООК были разработаны с использованием конкретных традиционных подходов к дистанционному обучению. Основная цель этой статьи — изучить многочисленные исследования и исследования, посвященные предоставлению адаптивных и интеллектуальных МООК для решения таких проблем, как процент отсева, для повышения их эффективности по сравнению с обычными МООК. Были изучены важные вопросы, которые были основными исследовательскими интересами ученых МООК в последние годы, включая процент отсева, процент завершения, одиночество и другие темы. Наконец, исследовательские вопросы, касающиеся эффективности адаптивных и интеллектуальных МООК, характеристик учащихся, которые они используют для адаптации, адаптивных и интеллектуальных методов и техник, которые они используют, и улучшений, которые они привносят в традиционные МООК в качестве компаса для разработки адаптивных и интеллектуальных МООК в ближайшие годы, обсуждаются.

К л ю ч е в ы е  с л о в а: дистанционное образование, адаптивные и интеллектуальные МООК, персонализированное обучение, вызовы МООК

## MOOC adaptativos e inteligentes: cómo contribuyen a mejorar la eficacia de los MOOC

R e s u m e n

Se han desarrollado varios MOOC tradicionales utilizando enfoques tradicionales particulares para el aprendizaje a distancia. El objetivo principal de este artículo es examinar numerosos estudios e investigaciones sobre la provisión de MOOC adaptativos e inteligentes para abordar problemas, como la tasa de abandono, para mejorar su eficiencia en comparación con los MOOC convencionales. Se estudiaron temas importantes que han sido los intereses de estudio esenciales de los académicos de MOOC en los últimos años, incluida la tasa de deserción, la tasa de finalización, la soledad y otros temas. Finalmente, las preguntas de investigación planteadas sobre la efectividad de los MOOC adaptativos e inteligentes, las características del alumno que utilizan para la adaptación, los métodos y técnicas adaptativos e inteligentes que utilizan, y las mejoras que aportan a los MOOC tradicionales como brújula para el diseño de MOOC adaptativos e inteligentes en los próximos años, se discuten.

P a l a b r a s  c l a v e: educación a distancia, MOOC adaptativos e inteligentes, aprendizaje personalizado, desafíos MOOC

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# The Appeal of Gamification for Master's Students of Science and Technology

## Abstract

Universities can offer their master's students who want to improve their language skills different learning environments. They can range from traditional classes to online programmes equivalent to an on-campus experience or reaching beyond it. Learning technical English through a curriculum that is inspiring and stimulating due to authentic materials used in a gamified setting can result in positive learning outcomes and increased satisfaction levels among lecturers and students. The former can find new challenges helping prevent burnout, the latter have the chance to develop hard and soft skills, including analytical, reflective and critical thinking, through context-specific language. Interactions structured around online activities which involve searching for information in authentic resources and completing activities that allow for progress to the next level can effectively prepare students for challenges they will encounter in their professional life. They can also capture imagination and unlock the creative potential of the educators involved in their development and of participants bored with school routine and textbooks. Thus, a gamified language course for specific purposes can become a highly motivating environment, in which young people develop their creativity, language proficiency

and knowledge of technological advances not only in the fields of their interest; they are also exposed to new learning practices due to the application of game-design elements. The ideas presented above will be supported by students' opinions and attitudes expressed during a pilot Moodle course in a gamified format conducted at Gdansk University of Technology in the summer semester of 2021/2022.

K e y w o r d s: gamification, ESP, technical English, cognitivism, soft skills

## Introduction

Designing an e-learning English course for master's students of science and technology who possess advanced language skills poses numerous challenges. First of all, developers must analyse the ways adults acquire knowledge, understand their preferences, and examine their learning styles to create course content which promotes and facilitates self-directed learning. Then, they should choose tools, and design engaging resources and activities that enable improvement in areas of need related to students' specialisation, and contextualised language. Finally, they need appropriate strategies evaluating progress and learning outcomes.

The delivery of online classes in academic institutions after the COVID-19 pandemic often raises the question of the quality of the education process. Even if the level of discomfort associated with new technologies, innovative teaching methods and active learning strategies may be decreasing as both academics and students have gained substantial experience over the last years, some scepticism remains. The amount of time involved with development and delivery can be an issue. A lack of interaction with the lecturer in person and insufficient engagement in an online class can also be part of the problem. Moreover, achieving learning outcomes to the required standard is viewed by some as difficult. Regardless of doubts and concerns, e-learning is here to stay. Technology can enhance learning experience if used to create a student-centred classroom, promoted by constructivist thought, which can yield a deeper level of knowledge development.

The paper aims to show how a gamified Moodle environment can help educators to engage master's students of science and technology in learning to improve language skills and soft competencies. The challenges of instructional design and course delivery will be presented through the analysis of a pilot course that was offered by the Language Centre at Gdansk University of Technology (GUT) in the summer semester of the academic year 2021/2022. The ideas shared in the paper will be supported by qualitative and quantitative research findings.

## Games and Gamification in Education

The difficulty to understand a category like *game* is acknowledged to have been noticed by Wittgenstein (1953: 36), who noticed that there is no collection of properties that all games share, instead they are in the same category via resemblances they bear to one another. The concept of *family resemblances* of games was further investigated by various cognitive linguists (Lakoff, 1987:16, 18, 21, 42, 62, 65; Kalisz & Kubiński, 1996; Kövecses, 2005). The members of this category resemble one another in various ways, but some do not share any relevant attributes. Some require, for example, competition and skills whereas others involve amusement or luck or both; some are played on boards or on paper or on a computer screen, whereas others require specialised equipment; some entail role-playing, others strategic thinking. According to cognitive linguists, they form a natural category of senses that includes more and less prototypical elements, with the latter bearing no resemblance to the former if they are not directly linked family members.

Research has shown that games may have a substantial impact on education (Squire & Jenkins, 2003). Their potential can be used in different educational settings, ranging from a traditional classroom to an online synchronous or asynchronous one (Cardinot & Fairfield, 2022; Hainey et al., 2013; Miller, 2008; Squire, 2003). They can benefit both less and more advanced students learning online (Gros, 2007). The application of digital games in university teaching seems to be more confined to courses in technology and engineering, as there is often preference for simulation, drill and practice in this educational setting (Udeozor, 2022; Pan, Ke, & Xu, 2022). As far as language classes are concerned, there is an increasing interest in online games which raise learner awareness of the second language, especially if they provide a highly engaging context through competition and relaxed atmosphere (Peterson et al., 2022).

Empirical evidence suggests that the use of game design elements in non-game context, i.e. gamification, results in increased student engagement, higher motivation due to e.g. a system of rewards (Rincon-Flores, & Santos-Guevara, 2021; Connolly et al., 2012), and better learning outcomes visible in a rise in the passing rate (Chans & Portuguez Castro, 2021). However, the nature of benefits derived from gamification requires further research to find more rigorous evidence of the effectiveness of such instructional design as only small longitudinal studies have been conducted and they show mixed results (Saxena & Mishra, 2021; Dehghanzadeh et al., 2021; Kalogiannakis, Papadakis, & Zourmpakis, 2021).

Taking into consideration the concept of a natural category as delineated by cognitive linguists, the members of the game family, having no necessary and sufficient features, can have a different effect on instructional design. This leads to courses utilising a variety of features resulting from a variety of games and their

attributes, which makes research on using game elements in a non-game context even more difficult and affects the analysis of evidence.

## Authentic Material in a Constructivist Classroom

Although active learning predominantly involves co-operative and collaborative activities (Donelan, Kear & Ramage, 2010), it can also be triggered by a gamified educational setting with no interaction among participants. Firstly, depending on games it draws on, gamification can entail problem-solving tasks and decision-making strategies – both are thought to make students actively engaged in learning. Secondly, student-friendly design, accommodating different learning styles, can be addressed by varied resources and activities as well as non-linear paths, allowing for greater autonomy and freedom of choice for students who decide what they want to study to maximise their achievements. Thirdly, the nature of educational content, its quality, authenticity, relevance to contemporary and future challenges, is what helps to self-direct learning and keep engaged throughout the whole online course.

A constructivist classroom (Mokwa-Tarnowska, 2017: 18–29), which is action oriented (Reinfried, 2000), is a very good environment in which students of science and technology who are upper-intermediate or advanced users of English can learn specialist vocabulary, improve their grammar skills, and increase the knowledge of the subject matter (Mokwa-Tarnowska, 2017: 18–29). If they use authentic materials, they can learn a variety of skills ranging from meaningful reading to using new concepts in context (Kołodziejczak, Mokwa-Tarnowska & Roszak, 2017). Written discourse shows how to produce correct sentences; it instructs how to develop a paragraph using coherence and cohesion; and it also exemplifies how to create a text within a genre. Not only is writing itself of educational value. Pictures, videos and online animations provide visual stimuli, which help students understand the linked material and acquire new knowledge. Authentic resources can allow them to build their own conceptual systems similar to those of native speakers.

Constructivism stresses learner individualisation and autonomy, hence it is learner-centred. Students in a gamified constructivist course are usually allowed to choose the educational paths they want to follow. Not always do all learning activities in an educational programme satisfy the needs' of every learner, so exercising certain freedom of choice stimulates engagement. Those students whose language competence is more advanced should be advised to build up their knowledge and skills on different resources and tasks than those meant for the less knowledgeable. Rarely is a group of students totally homogeneous, especially when participants of an ESP course are taken into consideration. That is why, tailoring the course content is important, and it can be obtained through gamification.

Another significant constructivist principle is process-related awareness. Students become more conscious of the educational processes itself, which results in them acquiring skills necessary in lifelong learning. They better understand the nature of the English language, with its patterns, image schemata and conceptual metaphors. They develop intercultural awareness, which helps them understand and adopt the conceptual systems native speakers have created over a long time.

Whether or not students can produce linguistically correct specialist texts, written within genre constraints and describing the phenomena about which they learnt during their online classes, can be checked in follow-up activities assigned for the traditional part of a blended course. In an e-learning setting, they can be offered contextualised self-assessment questions such as multiple-choice, matching and gap filling, but in a face-to-face one, they can be encouraged to participate in problem-solving activities involving analytical and critical thinking as well as production tasks requiring writing a passage or a whole text on one of the topics covered. Their inclusion makes students more interested in the resources.

Second degree students often find learning programmes structured around general English coursebooks boring and repetitive – a mere revision of what they did in previous schools, devoid of new or innovative elements they could benefit from. A gamified course with authentic resources and activities based on them provides a variety of opportunities to build mental models, thus it can better satisfy the needs of more experienced learners.

The constructivist approach to teaching and learning English in a natural environment can be more motivating for adult students. Working with authentic texts under the supervision and guidance of the tutor, participating in collaborative projects, developing new knowledge through discussions, course participants will be more adequately prepared for writing technical texts and participating in professional communication. Assessment based on problem-solving tasks in the form of open-ended questions is more beneficiary both for students and tutors, as it shows how well learners can create new knowledge in their written works and spoken discourse.

## GUT's Students' Gamified Experience

In the summer semester of the academic year 2021/2022, the Language Centre at Gdansk University of Technology (GUT) offered a test version of a gamified course in professional English to its 2nd degree students. As many as 117 volunteers agreed to test it. They had either already started a traditional two-semester course in the previous semester or had to start a half-year course in February. Some of them were returning students who had initiated re-entry to the university, and

English was the only compulsory subject they had to complete to be allowed to submit their master's thesis. Therefore, studying online was an interesting option, especially for those who were also in employment of some kind. The volunteers came from different faculties: Faculty of Architecture (4 students), Faculty of Civil and Environmental Engineering (10), Faculty of Electrical and Control Engineering (44), Faculty of Electronics, Telecommunications and Informatics (42), Faculty of Mechanical Engineering and Ship Technology (15), Faculty of Applied Physics and Mathematics (1), Faculty of Chemistry (1). The difference in the number of participants from each GUT's faculty reflects differences in faculty enrolment numbers to some extent, especially in the case of the Faculty of Chemistry (one of the smallest faculties as far as enrolment is concerned) and the Faculty of Electronics, Telecommunications and Informatics (the biggest enrolment of students at GUT).

*Moodle* has not been designed to be used as software for gamification. However, it is flexible enough to allow for some elements typical of board games to be used in the instructional design of a course in English for specific purposes (ESP). Moreover, being the main GUT's learning management system (LMS), it is well protected against data security breaches. Finally, it is easy to use for our students and lecturers as it has supported the educational process at GUT for many years – particularly intensively since the outbreak of the COVID-19 pandemic (Mokwa-Tarnowska & Tarnowska, 2022).

The course called *My Interstellar Colony Mission* (MyICM) is divided into 14 stages within 5 levels, corresponding to 14 week-workload mirroring a traditional course, and each stage has three thematically related paths, two for self-paced study plus a third one which focuses on additional activities including some for face-to-face meetings (Figure 1). To proceed to the next stage, the participants are required to achieve a score of at least 60% in one of two *Test Yourself* quizzes. They can also attempt two additional quizzes *Challenge Yourself* to accumulate more points for course activities. The horizontal movements – within a stage – and the vertical ones – from stage to stage – resemble tracks on a board game, as does moving up a career ladder, from being an applicant to becoming the governor of the colony. The colour scheme of each stage varies according to the employee's seniority in employment – the higher the position is, the darker it becomes (Figure 2). Like in many games, the participants collect trophies, i.e. badges, which look like medals and cups. The storyline with all the instructions is consistent with the narrative of building a colony on a far-away planet. The resources and activities as well as the language of the instructions aim to teach contextualised professional and formal English. The quizzes are meant to encourage the participants to read and watch the educational material, testing their developed knowledge is of secondary importance. The students can improve their total score by participating in additional activities that require analytical and critical thinking, and written discourse. To make the game more visually appealing, the default icons were hidden for the participants, and clickable pictures directed them to another subpage.

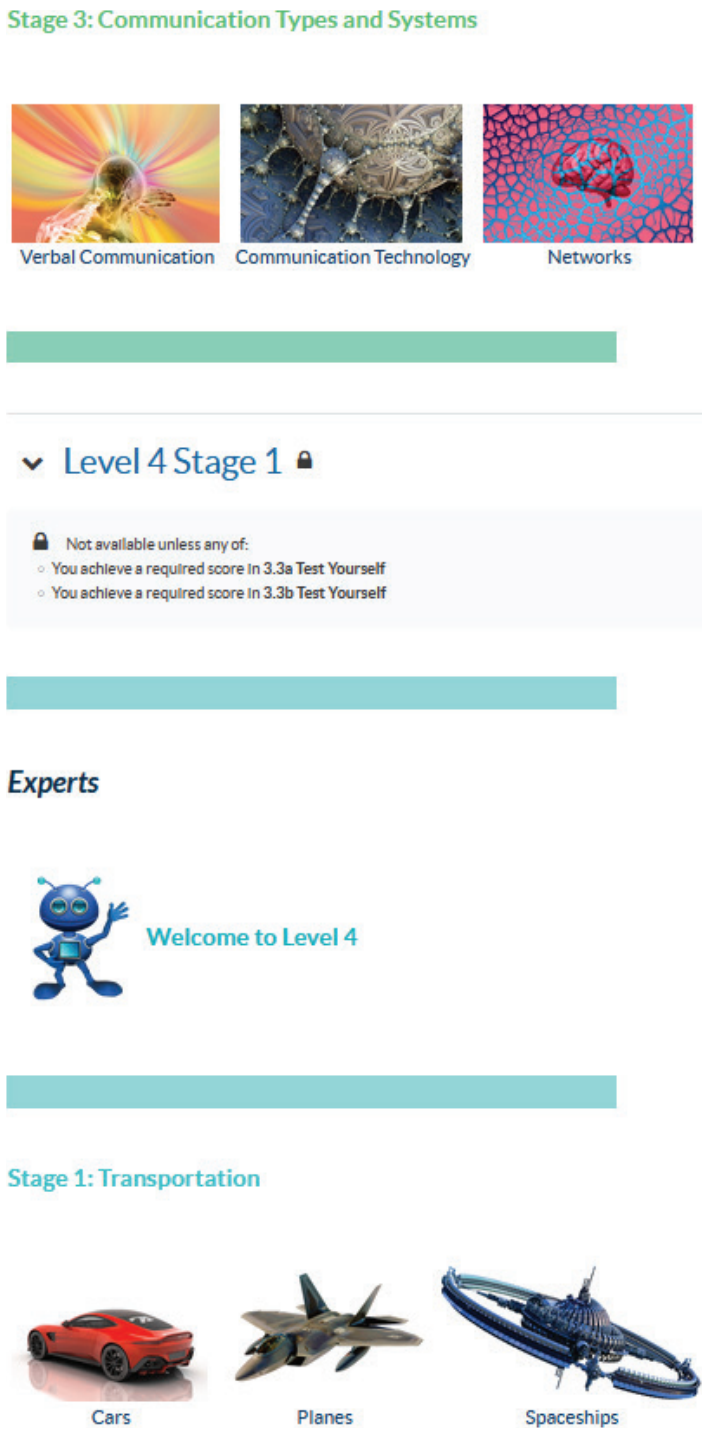


*Figure 1.* Horizontal and vertical paths in MyICM


*Figure 2.* End of the game showing the highest position in the organizational hierarchy

## Research Aims, Questions and Methods

The qualitative and quantitative research presented in this paper aimed to investigate the nature of the learning experience the participants had during the e-learning gamified language course *MyICM* – mainly the level of student satisfaction with the adopted learning approach, the level of their engagement, and the impact of the environment on an increase in students' active knowledge of

professional English. The students' opinions and needs enumerated in the comment sections of the questionnaire and sent directly to me have helped to improve the educational setting, which will be offered as an optional programme to master's students. Two basic tools were used to produce a qualitative analysis: a text-based online interview and a questionnaire (Cohen, Manion & Morrison, 2018: 538–539). The quantitative research involved an online survey. The research questions were as follows:

- What are students' attitudes towards a gamified Moodle course?
- How effective can online learning in a gamified environment be from the students' point of view?
- How engaging is a course structured around materials that address topics from many different disciplines for master's students specialising in one discipline?
- To what extent does an atypical e-learning ESP course satisfy the expectations of master's students of engineering and technology?

Data were collected through an online questionnaire available on the Moodle course's website at the end of the game and email communication. The questionnaire included eight questions with answers on a five-point Likert-type scale, and all of them finished with a request to provide a comment and justify the chosen answer. The questionnaire was not authorised to collect sociodemographic information. It is considered reliable and valid – it included standardized questions that are frequently asked to evaluate online education and language courses; it produced generalizable results, which was seen across the whole sample. All the participants were given the same questions and were tested under the same conditions. The activity was available only for those who had reached the end of the gamified course content.

Quantitative data are presented as absolute numbers and/or percentages, as appropriate. Ordinal data are expressed also as median, interquartile range and minimum and maximum values, and are represented in a box plot. The comparisons of more than two groups were performed using the Kruskal-Wallis test. Statistical analyses were performed with STATISTICA 13.0 (StatSoft Inc.).

The qualitative data were analysed via inductive coding, which helped to conceptualise the attitudes of the participants towards the gamified course and their understanding of their needs and preferences, as well as assess the suitability of the educational environment to provide quality learning. This approach resulted in defying possibly erroneous preconceptions imposed by deductive data analysis, and allowed dominant and significant themes inherent in raw data to emerge. It also aimed to establish clear, transparent and justifiable links between the aims of the study and the findings. Initial categories were created from actual words and phrases used in specific answers. Categories with similar meanings were later combined under a superordinate category. Thus, codes were developed inductively from the data downloaded from Moodle and comments sent via email (Saldaña, 2021).

## Research Design and Implementation

As many as 92 students completed the survey – the response rate was 78.6% (the total number of testers was 117). It can be assumed that the composition of the study group was homogeneous with respect to many factors: age, intellectual capacity, interest in science, technology and engineering, and B2–C1 level of English according to the Common European Framework of Reference for Languages as well as experience in using Moodle.

The analysis of the answers to selected questions is presented in this study. It is supported by findings collected in text-based online interviews with the participants. The responses were not analysed according to language competence because this research phase did not target the assessment of an increase in specific language skills. All the participants took a placement test but there was no end-of-course exam. The final score reported by Moodle was not English competence level dependent. Some of the participants whose initial level was in the lower area of the B2-C1 continuum, achieved a total score above 80%, which was also typical of the higher level students. The quizzes focused primarily on contextualised language from the resources and to a lesser extent on the general knowledge of grammar and lexis.

## Qualitative and Quantitative Research – Results and Discussion

The students appreciated the format of the course – grade 5 from 24.09% of the respondents and grade 4 from 50% (Figure 3). None of them had participated in a similar online programme on Moodle before. They had used numerous online materials and done many activities developed in the LMS since the outbreak of the pandemic prior to joining the course. However, all of them had had a considerably simpler structure and a linear arrangement; they had been built using the topics format and typical Moodle icons. Some students mentioned in the survey that they were surprised to see clickable pictures and an atypical layout compared with other university Moodle courses.

The students were also satisfied with the game elements that had been incorporated into the instructional design and the whole outcome (Figure 4). To show slight differences across the members of the biggest cohorts, answers given by 85 respondents from the Faculty of Electrical and Control Engineering (FECE), the Faculty of Civil and Environmental Engineering (FCEE), the Faculty of Mechanical Engineering and Ship Technology (FMEST) and the Faculty of Electronics, Telecommunications and Informatics (FETI) are presented in Figure 4.

The substantial majority (77 students out of 92, and 70 out of 85) showed a positive attitude towards the gamified course they had attended (altogether: very satisfied – 24%, satisfied – 59%, undecided – 11%, dissatisfied – 2.2%, very dissatisfied – 2.3%). Seven students from three other faculties, whose answers are not included in the data in Figure 4, were very satisfied with the course. Those who did not like it stated that there were too few materials related directly to their specialisation, that is to automation control systems. Having heard about this gamified course, one student expected it to be like a typical game, but it was not, and they did not like it; they, however, did not explain what the term 'game' meant for them. Much of the appreciation resulted from the course:

- being fun,
- having a wide selection of interesting materials,
- having a substantial number of quizzes,
- having a well-organised structure.

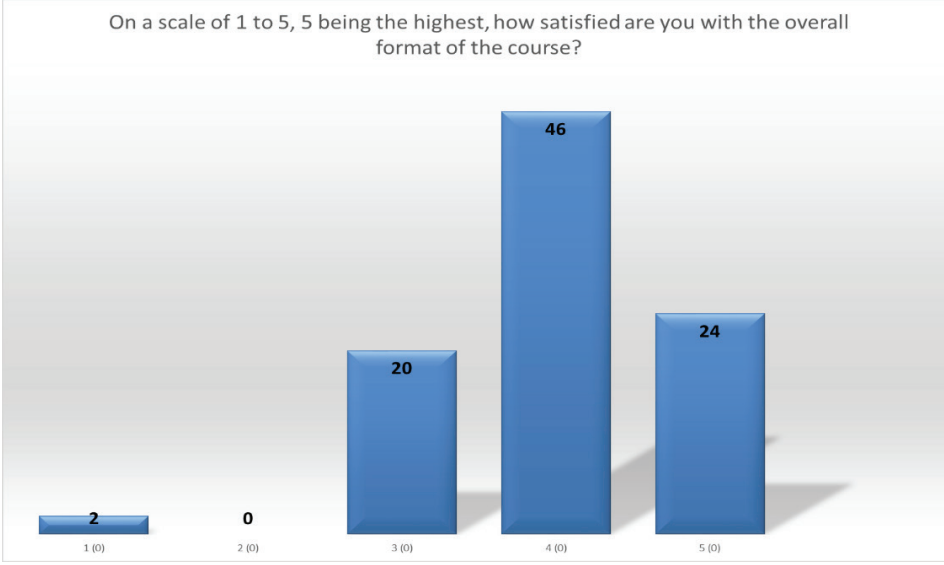


*Figure 3.* Participants' satisfaction with the course (in numbers)

Some respondents added that they had learnt more intensively and, in their understanding, their progress had been faster than in a traditional language classroom.

The Kruskal-Wallis test confirmed that the multiple comparisons between the results of rate gamification experience (ordinal scale 1–5) were non-significant across four faculties ($p = 0.613$, $p > 0.05$) (Figure 5). They, however, gave a significant insight into online learning. The findings indicate that all the students, irrespective of the faculty they study in, enjoyed the gamified format of the course.

What is more, they particularly appreciated the content, i.e. the authentic resources and the quizzes showing contextualised specialist language.


| | Very dissatisfied | Dissatisfied | Undecided | Satisfied | Very satisfied | Missing |
|---|---|---|---|---|---|---|
| FECE | 2.8 | 0 | 11.1 | 58.3 | 25 | 2.8 |
| FCEE | 0 | 0 | 11.1 | 55.6 | 33.3 | 0 |
| FMEST | 0 | 0 | 9.1 | 81.8 | 9.1 | 0 |
| FETI | 3.5 | 3.5 | 13.8 | 58.6 | 17.2 | 3.5 |

*Figure 4.* Gamification experience (in percentage)

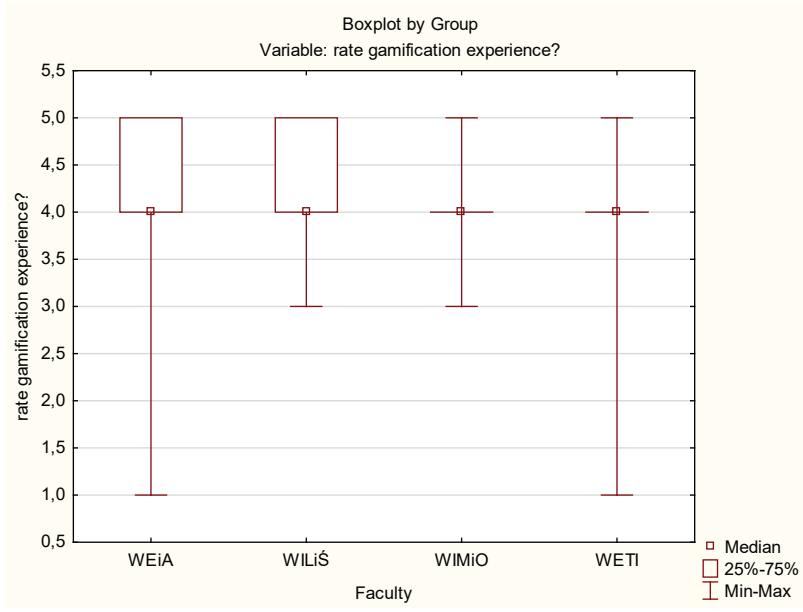


*Figure 5.* Comparison of gamification experience across four groups

Master's students, who are already long-life learners of English, are difficult to reach and motivate because their needs vary depending on the level of their language skills, learning experiences, attitude towards group classes and attending English language courses at university. A new gamified educational setting was positively assessed by the respondents and the commitment of the developer to quality was acknowledged – the course was highly rated in terms of quality learning (Figure 6). The students were actively and purposefully engaged in studying to improve their competence. As many as 82.6% of the participants agreed that this new format with its authentic materials and matching activities met their expectations regarding the quality of university education.

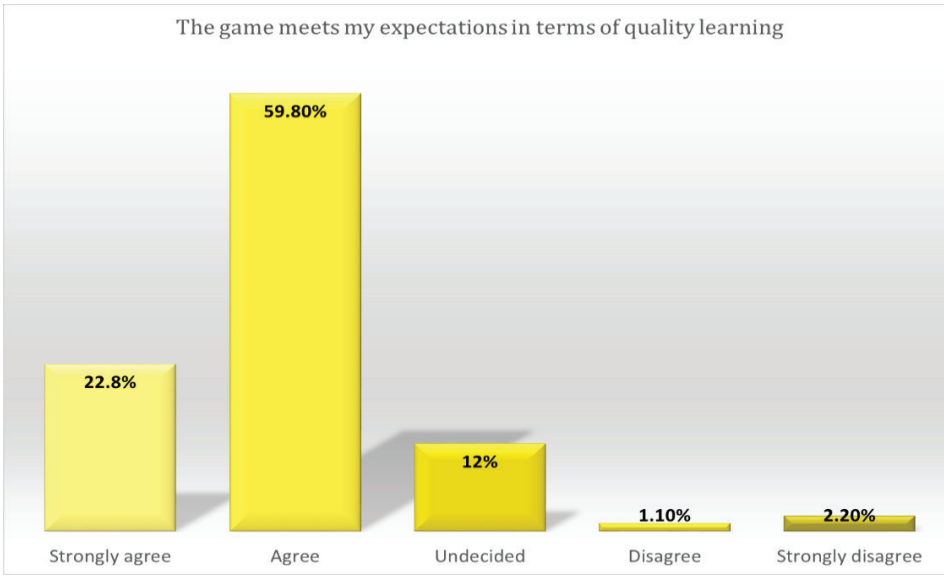


*Figure 6.* Expectations and quality learning (in percentage)

The answers to the question about whether or not the course is worth recommending are consistent with those about quality learning. The vast majority of the respondents would recommend the course to their peers – with positive responses reaching 91.4% (Figure 7). The codes in the qualitative research included "innovation", "novelty" and "challenge", and the findings are consistent with the quantitative results. Only two students are not willing to recommend it and another five had no opinion. It could be hypothesised that this course format was not up to their liking – the negative comments were that it was boring, monotonous, and that there were too many resources and too difficult quizzes. Some students were surprised that it was so demanding.

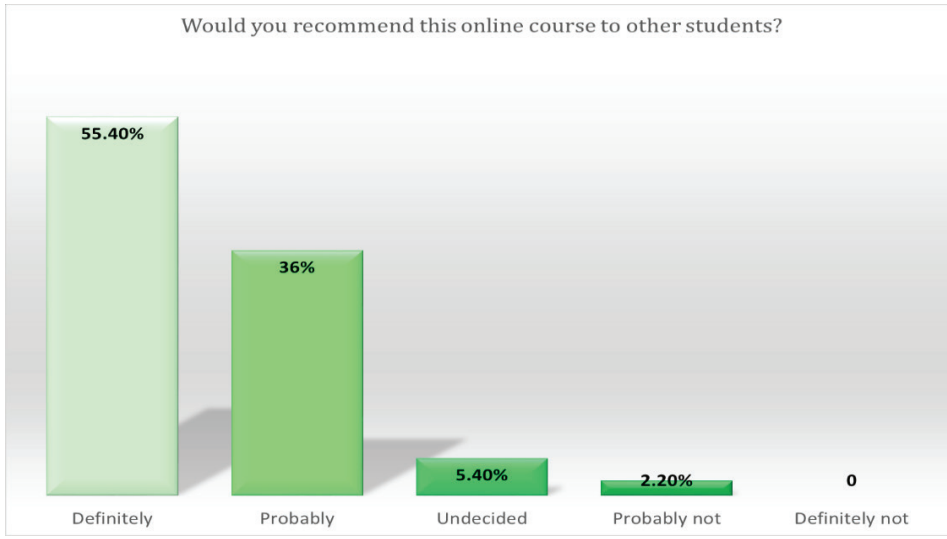


*Figure 7.* Suitability for Other Students (in percentage)

## Conclusion

The new course in professional English for master's students, developed in a gamified e-learning environment, aimed to:

- create a more engaging educational setting than a traditional classroom, which would stimulate students to more intensive learning;
- encourage students to learn contextualised language actively and increase their knowledge of correct structures;
- personalise learning experiences;
- enable students and tutors to gain new experiences by using engaging methods and techniques. The research results show that all the aims have been fulfilled. The lecturers to whom the course was presented were willing to offer it to their students, and were interested in becoming tutors on it.

Due to non-linear paths that allowed for personalisation, the students were able to choose learning strategies and plan their goals. This was a move towards introducing a more student-centred approach than in typical GUT's online programmes. The gamified classroom developed for master's students of science and technology concentrated on improving both hard and soft skills (Mokwa-Tarnowska, 2018). The former included the knowledge of vocabulary items and phrases in specific technical and formal contexts that might be useful to them in

their future jobs. The latter targeted analytical, critical and reflective thinking, time management, creativity, adaptability, work ethic and attention to detail.

The course was perceived to be attractive and engaging partly due to its gamified format, but predominantly because its resources were authentic materials that focused on modern technological advances, interesting and provocative ideas, future trends and probable developments. The storyline and the board game-like structure encouraged the students to study areas unrelated to their specialism that they would otherwise not even think about considering, which was a substantial benefit of gamification. The emphasis in the course was more on education than entertainment. However, the slightly out of this world context, a bit of fun inherent in intertextual elements, and the career incentive of reaching the top of a social hierarchy seem to have enhanced the students' learning experience.

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The Appeal of Gamification for Master's Students of Science and Technology

Iwona Mokwa-Tarnowska, Viviana Tarnowska, Magdalena Roszak

## Atrakcyjność grywalizacji dla studentów II stopnia nauk technicznych

S t r e s z c z e n i e

Uniwersytety oferują studentom studiów magisterskich, którzy chcą poprawić swoje umiejętności językowe, różne środowiska uczenia się – od tradycyjnych zajęć po rozbudowane programy e-learningowe. Program nauczania technicznego języka angielskiego, który jest inspirujący i stymulujący dzięki autentycznym materiałom wykorzystywanym w środowisku zgrywalizowanym, może skutkować pozytywnymi efektami uczenia się i zwiększonym poziomem satysfakcji wykładowców i studentów. Ci pierwsi znajdą nowe wyzwania pomagające zapobiegać wypaleniu zawodowemu, a drudzy mają szansę rozwinąć umiejętności zarówno twarde poprzez kontakt ze skontekstualizowanym, profesjonalnym językiem angielskim, jak i miękkie, w tym myślenie analityczne, refleksyjne i krytyczne. Zróżnicowane interakcje online, polegające na wyszukiwaniu informacji w autentycznych zasobach i wykonywaniu zadań umożliwiających przejście na wyższy poziom gry, mogą skutecznie przygotować uczniów na wyzwania, jakie napotkają w życiu zawodowym. Mogą też pobudzić wyobraźnię i uwolnić twórczy potencjał edukatorów zaangażowanych w tworzenie tego typu kursów oraz uczestników znudzonych szkolną rutyną i podręcznikami. Zgrywalizowany kurs języka specjalistycznego może stać się wysoce motywującym środowiskiem, w którym młodzi ludzie rozwiną swoją kreatywność, biegłość językową i zdobędą wiedzę techniczną nie tylko w dziedzinach, które ich interesują. Przedstawione powyżej idee zostaną poparte opiniami studentów wyrażonymi podczas pilotażowego kursu zgrywalizowanego udostępnionego na platformie Moodle, prowadzonego na Politechnice Gdańskiej w semestrze letnim 2021/2022.

S ł o w a  k l u c z o w e: Grywalizacja, specjalistyczny język angielski, kognitywizm, umiejętności miękkie

Ивона Моква-Тарновска, Вивиана Тарновска, Магдалена Рошак

## Привлекательность геймификации для студентов второго цикла технических наук

А н н о т а ц и я

Университеты могут предложить своим магистрантам, желающим улучшить свои языковые навыки, различные условия обучения. Они могут варьироваться от традиционных занятий до онлайн-программ, эквивалентных обучению в кампусе или выходящих за его пределы. Изучение технического английского языка по учебной программе, которая вдохновляет и стимулирует благодаря когнитивистскому подходу, используемому в игровой среде, может привести к положительным результатам обучения и повышению уровня удовлетворенности как преподавателей, так и студентов. Первые могут найти новые задачи, помогающие предотвратить выгорание, вторые имеют возможность развивать твердые и социальные навыки, включая аналитическое, рефлексивное и критическое мышление, с помощью контекстно-зависимого языка. Взаимодействия, построенные вокруг онлайн-мероприятий, которые включают поиск информации в ресурсах на основе аутентичных материалов и выполнение действий, которые позволяют перейти на следующий уровень, могут эффективно подготовить студентов

к проблемам, с которыми они столкнутся в своей профессиональной жизни. Они также могут поразить воображение и раскрыть творческий потенциал педагогов, занимающихся их развитием, и участников, уставших от школьной рутины и учебников. Таким образом, игровой языковой курс для конкретных целей может стать высоко мотивирующей средой, в которой молодые люди развивают свои творческие способности, владение языком и знание технологических достижений не только в интересующих их областях; они также знакомятся с новыми методами обучения благодаря применению элементов игрового дизайна. Представленные выше идеи будут подкреплены мнениями и установками студентов, высказанными в ходе опроса и во время пилотного курса Moodle в игровом формате, проведенного в Гданьском технологическом университете в летнем семестре 2021/2022.

Ключевые слова: геймификация, ESP, технический английский, когнитивизм, мягкие навыки

Iwona Mokwa-Tarnowska, Viviana Tarnowska, Magdalena Roszak

## El Atractivo de la Gamificación para Estudiantes de Maestría en Ciencias y Tecnología

Resumen

Las universidades pueden ofrecer a sus estudiantes de maestría que desean mejorar sus habilidades lingüísticas diferentes entornos de aprendizaje. Pueden ir desde clases tradicionales hasta programas en línea equivalentes a una experiencia en el campus o incluso más allá. Aprender inglés técnico a través de un currículum que es inspirador y estimulante debido al enfoque cognitivista utilizado en un entorno gamificado puede resultar en resultados positivos de aprendizaje y niveles aumentados de satisfacción tanto para los profesores como para los estudiantes. Los primeros pueden encontrar nuevos desafíos para prevenir el agotamiento, mientras que los últimos tienen la oportunidad de desarrollar habilidades técnicas y blandas, incluyendo pensamiento analítico, reflexivo y crítico, a través del lenguaje específico del contexto. Las interacciones estructuradas alrededor de actividades en línea que involucran la búsqueda de información en recursos basados en materiales auténticos y la compleción de actividades que permiten el progreso al siguiente nivel pueden preparar efectivamente a los estudiantes para los desafíos que enfrentarán en su vida profesional. También pueden capturar la imaginación y liberar el potencial creativo de los educadores involucrados en su desarrollo y de los participantes aburridos con la rutina escolar y los libros de texto. De esta manera, un curso de lenguaje gamificado para propósitos específicos puede convertirse en un entorno altamente motivador, en el que los jóvenes desarrollan su creatividad, competencia lingüística y conocimiento de los avances tecnológicos no solo en los campos de su interés; también están expuestos a nuevas prácticas de aprendizaje debido a la aplicación de elementos de diseño de juegos. Las ideas presentadas arriba serán apoyadas por las opiniones y actitudes de los estudiantes expresadas en una encuesta y durante un curso piloto Moodle en formato gamificado llevado a cabo en la Universidad Tecnológica de Gdansk en el semestre de verano de 2021/2022.

Palabras clave: gamificación, ESP, inglés técnico, cognitivismo, habilidades blandas

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