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Comparison of the effectiveness and efficiency of various forms of distance learning – an experimental study

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Abstract

The aim of this paper is to compare various forms of distance learning in terms of the effectiveness and efficiency of teaching and their subjective evaluation by students. Three forms of remote teaching were analysed for the elective general university course in the winter semester of the 2020/2021 academic year: G1 – with all materials embedded on an e-learning platform for fully asynchronous learning – and with no live meetings, but specially prepared video tutorials replacing them, G2 – with materials embedded on an e-learning platform and lectures conducted synchronously through videoconferences (without video recordings), G3 – with materials embedded on an e-learning platform, synchronous lectures via video conferences and their recordings available afterwards. Final grades, a record of activity at the e-learning platform and the results of question-naires collected from all participants of the course were taken into account when carrying out the statistical analysis. The analysis proved that the most effective form of learning (the lowest number of hours devoted to learning in order to pass the subject, as well as the percentage of students who completed the course) was the one applied in group G1. According to the opinions of the students, the highest level of satisfaction from the classes was recorded for group G2.

The research brings various implications for practice or policy: for teachers interested in improving the effectiveness of their online teaching; for teachers preparing an interven-tion with the aim of improving students' remote learning engagement and its quality; supporting teachers' research engagement in the improvement of educational standards and systems; and learning planners can use these insights helpful in planning online learning projects.

Keywords: distance education, e-learning, online teaching, video lecture, student engage-ment, effectiveness, experimental study

Introduction

The digitisation of universities is a trend that has been driven by the development and ubiquitous use of ICT technology for over a decade (Kopp et al., 2019; Leszczyński et al., 2018). This applies to both the administrative and didactic area. The accelera-tor of this progress is the ease of accessing online resources through commonly used mobile devices (Cheong et al., 2021). Consequently, e-learning is growing in popular-ity as an add-on for traditional learning (as a blended/hybrid-learning) or even func-tions as its alternative, e.g. self-paced e-learning courses (Galwas, 2020). During the COVID-19 pandemic e-learning was imposed by unusual circumstances and became the only didactic form possible. This unexpected experiment, which was implemented "on the go", proved that transferring the educational process to remote education requires proper planning, preparation and designing (Adedoyin & Soykan, 2020; Turnbull et al., 2021). Its ad-hoc implementation to an online mode, but solely based on face-to-face teaching methods, sooner or later became a source of frustration for both the teach-ers and the students. This experience of failure is intensified not only by technical or

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socio-economic barriers, but also often by inadequate and unengaging forms of conveying content (Kalpokaite & Radivojevic, 2020). The key to success is the adequacy of the form of teaching in relation to the material being taught (Pacholak, 2020).

According to the survey, some students believe that e-learning contributes to their development, although it reduces the workload on the part of lecturers and increases it on the part of students (Maatuk et al., 2022). However, e-learning standards can be successfully applied for all types of modules such as supportive, blended or fully online in a learning paradigm that helps to achieve the learning outcomes of the course (Naim, 2022).

The effectiveness of e-learning has been recognised worldwide, hence the rapidly growing number of MOOCs (Massive Open Online Courses) being offered to anyone (Pallavi et al., 2022), They are run mostly in the form of self-paced courses containing on-line tutorials with no active participation of a teacher. The unflagging popularity of e-learning is described in many quantitative studies (Dahlstrom et al., 2015). However, a more in-depth analysis of the particular case study would also require qualitative research. Therefore, it would be worth conducting it for each case taking into account the specificity of the subject together with the level of digital competences within the group of students being taught. Such a comparative analysis in terms of the effectiveness of e-learning methods was carried out for the "Introduction to Excel and economic data analysis" course, offered as a general university course (elective) at the University of Warsaw in the winter semester 2020/21, attended by 105 students. Given the homogeneity of the group, the study allows for precisely assessing the efficiency of the teaching methods used, as well as their effectiveness.

Research assumptions and description

The aim of the study was to compare various forms of distance learning in terms of effectiveness and efficiency, as well as their subjective assessment of participants. A pedagogical experiment was conducted at a general university course (elective) entitled "Introduction to Excel and economic data analysis" at the University of Warsaw in the winter semester 2020/21.

For this purpose, three remote forms of course delivery have been distinguished:
- fully asynchronous, based on materials embedded on an e-learning platform with specially designed and edited videos (tutorials) instead of live lectures (G1),
- partly synchronous, including materials embedded on an e-learning platform along with synchronous lectures via live videoconferences (G2),
- partly synchronous, based on materials embedded on an e-learning platform along with synchronous lectures via live videoconferences, with their recordings available afterwards (G3).

What is important is that the above forms of education were selected intentionally. G1 can be perceived as a control group – the applied method of teaching in this group is a standard form of e-learning classes that has been practiced by lecturers for many years. The method of teaching in the G2 group results from the recommendations and guidelines of the University of Warsaw, which imposed the implementation of remote classes in the form of live meetings. Finally, the G3 group's method follows the guidelines introduced at the Faculty of Economic Sciences of the University of Warsaw, where a high percentage of foreign students located in different time zones study remotely from their countries. In order to allow them access to all course materials without having to attend live video lectures (often in the middle of the night in their time zone), it was decided that all live lessons would be recorded, and the recordings shared.

Experimental environment

The experimental study was conducted at the University of Warsaw in the academic year 2020/2021, during the winter semester at the general university (elective) course "Introduction to Excel and economic data analysis". This is a practical course and its main goal is to learn how to work with Excel. The course was conducted at the Faculty of Economics Sciences on the University of Warsaw Moodle e-learning platform (https://moodle.wne.uw.edu.pl). The course consisted of 6 modules of 5 teaching hours each. Materials for each module were provided on a regular basis within weekly intervals, including an additional break for homework. Live classes (video lectures) were held at the most convenient time for students, based on the USOS calendar (100% match of dates). Discussion forums were the main tool for asking questions during the course. This was an important component aimed at encouraging participants to cooperate and help each other, which is conducive to building social capital. In addition, students could set up an appointment with the lecturers for individual consultations conducted live via videoconference.

An assessment was based on 2 collective assignments. Additional scores could be gained by students for their activity at discussion forums. Attendance at live video-lectures was not obligatory. At the end of the course an evaluation questionnaire was circulated (Annex 1) and completed by all active participants (the rate of return was 100%).

All the information about the course, available on the course website, as well the communication elements were the same for each group. The only difference concerned the form of classes being carried out in particular groups. Below is the communication given to each group:
- Group G1: Materials for the next lesson will be published every week on Friday at 17.00 and will be available with no time limitation. You can access and use them at any time convenient for you. For each class there will be an Excel tutorial

available, including tasks (with solutions) aimed at better understanding the material being acquired. In addition, an instructional video is available for each class, where the solutions to each tasks is discussed. Questions and doubts regarding the materials can be submitted on the discussion forums dedicated for each class.

- Group G2: Video meetings for the following classes will be held weekly on Fridays from 17.00-20.00 on the MS Teams platform. Video recordings from the meetings will not be available on the platform, so you will NOT be able to watch them at a later date. For each class there will be Excel self-paced instructions given together with the tasks (including solutions) aimed at better understanding the material being acquired. Questions and doubts regarding the materials can be submitted on the discussion forums dedicated for each class.
- Group G3: Video-meetings for the following classes will be held every week on Friday from 17.00-20.00 on the MS Teams platform. Video recordings from the meetings will be embedded on the platform, so you will be able to access them at a later date. For each class there will be Excel self-paced instructions given together with the tasks (including solutions) aimed at better understanding the material being acquired. Questions and doubts regarding the materials can be submitted on the discussion forums dedicated for each class.

The number of places at the course was limited to 105, and was filled in the first round of enrollment. Students were randomly assigned to 3 equal groups – 35 people in each. The division mechanism was random and took place alphabetically in relation to students' surnames. Due to the schedule of complementary registration at the University of Warsaw, enrolled participants could resign in the meantime, giving a chance to other students to enroll. Complementary enrollment to the course finished before the first class started. All students had access to a detailed description of the different forms of the course (depending on the selected group assigned).

The participants were students from all cycles of studies at the University of Warsaw (bachelor's, master's and doctoral studies, 17 different faculties, different years and fields of study), and there was no information flow between groups. There were also no questions regarding differences in the form of course delivery.

Research hypotheses

Based on the criteria and assumptions described above, all three groups were subjected to comparative analysis, which included the following remote forms of course delivery:

- G1: a set of e-learning materials (asynchronous e-learning) + specially pre-prepared video tutorials (asynchronous e-learning),

- G2: a set of materials (asynchronous e-learning) + live video-lectures (synchronous) – University of Warsaw recommendations,
- G3: a set of materials (asynchronous e-learning) + live video-lecures (synchronous) + recordings of live classes available afterwards (asynchronous e-learning) – Faculty of Economic Sciences recommendations.

On this basis, research hypotheses were formulated that compared the analysed forms of remote education in terms of their effectiveness and efficiency (measured by the results obtained and time devoted for knowledge acquisition) and the subjective assessment of classes by students.

- H1: The highest effectiveness of teaching & learning will be obtained in group G3, and the lowest in group G1. Three criteria were taken into account: final grades, number of students who passed the course and the number of active students.
- H2: The highest teaching efficiency will be in group G3, and the lowest in group G1. The comparative criterion is the total time devoted for taking part in the course. Additionally, in groups G2 and G3, student engagement and participation in live classes will be compared.
- H3: The best evaluation of the course will be obtained in group G3 and the lowest in group G1. The key criterion for verifying this hypothesis is the overall evaluation of the course, and the secondary criterion is satisfaction from participation, enhanced knowledge and skills, substantive evaluation of the course and willingness to further study this topic.

Additionally, in order to explain any differences observed between the groups, the convenience of particular types of course materials was analysed, including, inter alia, specially tailored tutorials and recordings of live lectures.

The above hypotheses assume better effectiveness of distance learning if following the recommendation of the Faculty of Economic Sciences of the University of Warsaw during the pandemic in the winter semester 2020/21 (groups G2, G3). It is worth emphasising, however, that this form of asynchronous learning (G1) should not be discredited, as it is gaining in popularity, e.g. in business. Although the intention of the introduced recommendations is understandable, it is not a priori obvious whether the forms proposed by the Faculty will be more effective. The main purpose of the introduced guidelines was to enable students to attend live classes via videoconference. However, students from group G3, aware that the live video-lectures will be recorded, may consciously choose not to attend. The possibility of watching recordings at a more convenient time and at one's own pace (pausing and rewinding) makes this method more favourable than G2. On the other hand, video materials specially prepared and dedicated for the course, which are available on the e-learning platform (G1), should be much better for students than recordings from the live classes. This, in

turn, may lead to the conclusion that G1 will be better than G3. Therefore, the hypotheses presented above are not obvious and require verification.

The results of the experiment

Teaching effectiveness

The analysis of the effectiveness of individual forms of remote education was based on the results, which took into account three criteria: final grades, the percentage of students that had passed the subject, and the percentage of active students (Figure 1).

According to Figure 1 the percentage of students with very good and good grades does not differ significantly between the groups. A grade 'A' was obtained respectively by 34% in G1, 35% in G2 and 29% in G3 students, while 'B' by 17% in G1, 11% in G2 and 12% in G3.

However, there is a significant difference in the percentage of students who passed the subject: 77% (G1), 53% (G2) and 58% (G3). In this respect, this form of asynchronous e-learning classes proved to be the most effective, with a 24% advantage over live video-classes without the recording being shared, and a 19% advantage over live video-classes with the recording shared. This result was not affected by the higher percentage of failing grades, but it was impacted by the higher rate of dropping out from the course in the group with live video-classes. The total percentage of resignations and unclassified students (not participating in classes, who did not return any assignment) was respectively: 17% (G1), 45% (G2), 32% (G3), and including people who resigned from completing the course before the first classes had started: 0% (G1), 29% (G2) and 22% (G3).

A simple conclusion is therefore apparent: the most flexible and attractive form of conducting the course in remote mode were the asynchronous e-learning classes (G1), and the least – those conducted with the inclusion of live video-lectures without recordings (G2). It is worth emphasising that the dates of classes were not given at the time of enrolling to the course, and students found out about them after being assigned to a specific group and logging in to the course space on a platform. Nevertheless, they were selected in line with the availability calendar in the LMS system (USOS), according to which the agreed dates suited all participants. The course schedule did also not interfere with work, as the meetings began at 5.00 p.m. However, students may have had other commitments stopping them from participating. After all, the timetable is one of the most important criteria for students when enrolling in a course. Asynchronous e-learning (G1) removes the barrier of access, as all materials can be reached at any convenient time.

Thus, the H1 hypothesis, stating that the highest teaching effectiveness is in group G3 (with live and recorded video-classes), and the lowest in group G1 (with pre-recorded tutorials and without live video-classes), can be rejected.

Taking into account the final grades, the percentage of those who passed the subject and the percentage of active students at the course, group G1 proved to be the most effective form of teaching, followed by live lessons with recordings (G3), and lastly live video-classes without recordings, although the difference between G2 and G3 is relatively small.

Figure 1

The structure of final grades within each group
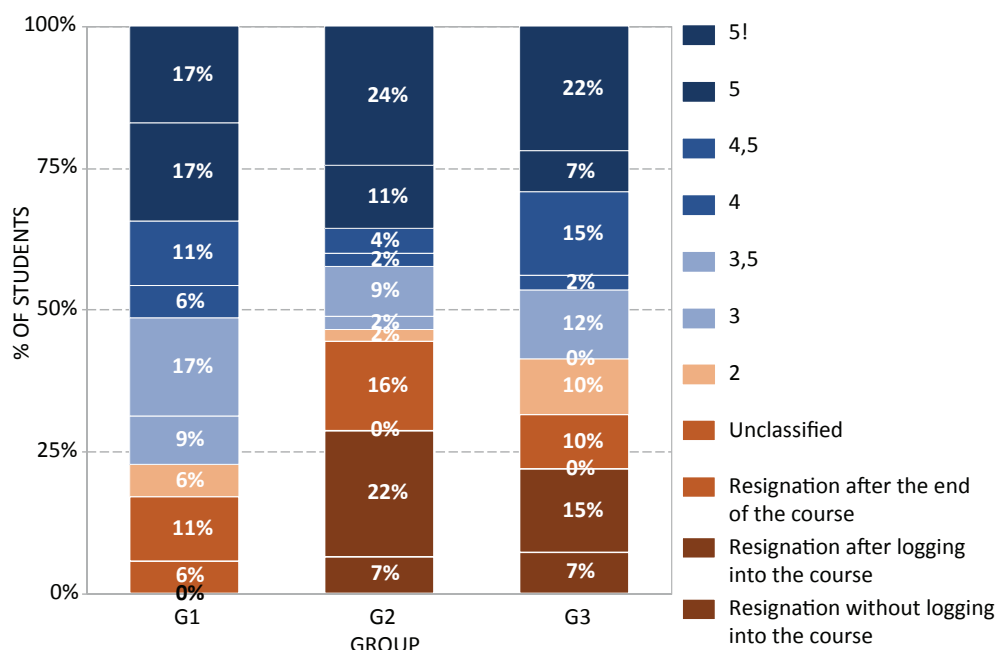
Source: authors' own work.

On the other hand, when comparing the total scores obtained by active participants (understood as those who did not resign from completing the course) during the entire course, which was the basis for the final grade, we can see that people from the group G2 performed better (mean 54.77, median 57.25, std. dev. 14.68) than groups G1 (mean 48.12, median 51.26, std. dev. 13.65) and G3 (mean 49.73, median 51.6, std. dev. 17.66) (Figure 2). The observed differences, however, are not statistically significant, which was confirmed by performed tests (Shapiro-Wilk, ANOVA, Tukey's, Kruskal-Wallis). This means that the scores directly reflecting the level of acquired skills and knowledge do not depend on the adopted form of carrying out the classes. The explanation for this fact may be as follows: students set a goal they want to achieve, and providing that the materials are properly prepared (in this case, participants were given a set of course materials, which included theoretical part, tasks, tasks' solutions that allowed for self-studying, and the live video-classes and recordings were only a supplement, aimed at easier acquisition of the material), and also the subject is interesting from their point of view, they are able to achieve it. The only question is how much time they need to devote to achieving the intended goal.

Teaching efficiency

The efficiency of teaching was measured by the declared number of hours devoted for attending a single class, single homework assignments and in total participation in the course. This data was provided in the evaluation questionnaire carried out after the end of the course and after the grades had been given (Appendix 1).

Before analysing the results, it is worth considering what the most optimal approach is. The assumption made in this paper concludes that the less time students spend on completing the course and obtaining a subjectively satisfactory final grade, the higher the effectiveness of both the learning and teaching. Better effectiveness of teaching allows teachers to provide more knowledge about the topics being lectured, and students are able to complete more subjects with limited resources of study time. According to the H2 hypothesis, the highest expected learning efficiency will be in group G3, and the lowest in group G1. In the group G3 students can participate in live video-classes, which is aimed at facilitating and improving the understanding of the topic discussed, as well as watch the recordings after class, if necessary. In group G2 there are no recordings available, so any doubts should be dealt with by way of own investigation or by questions on the discussion forum of the course. In group G1, however, there is no direct contact with the teacher. On the other hand, the video tutorials are relatively short and may be of even better substantive quality. The results, showing the time-consumption of the course in each group, are presented in Figure 3.

The lowest average number of hours devoted by students to individual classes (Figure 3, part 1) was in group G1 (mean 2.40, median 2, std. deviation 1.20), followed by group G3 (mean 3.16, median 3, std. dev. 1.66), and the highest was in group G2 (mean 4.27, median 4, std. dev. 1.66). The performed tests confirmed the statistical significance of the difference between groups G1 and G2 (the full test report is presented in Appendix 3).
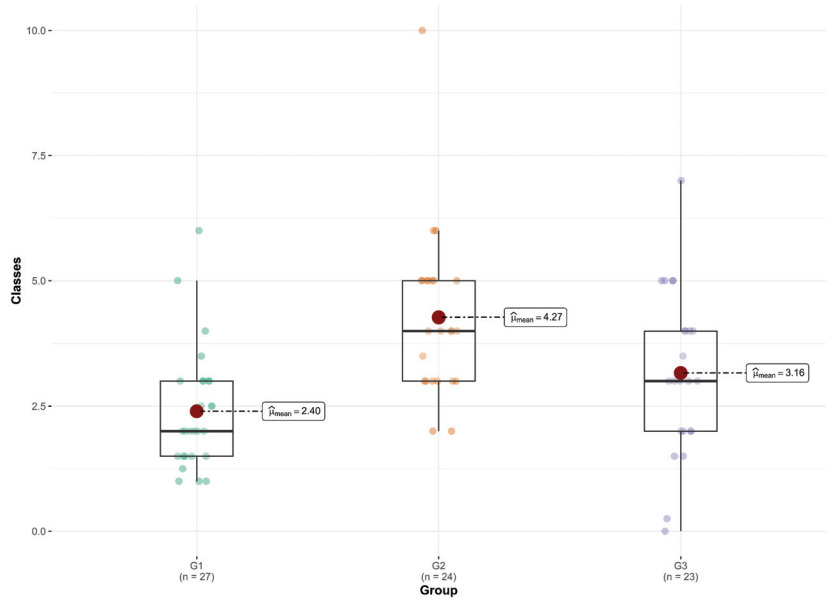
Figure 2

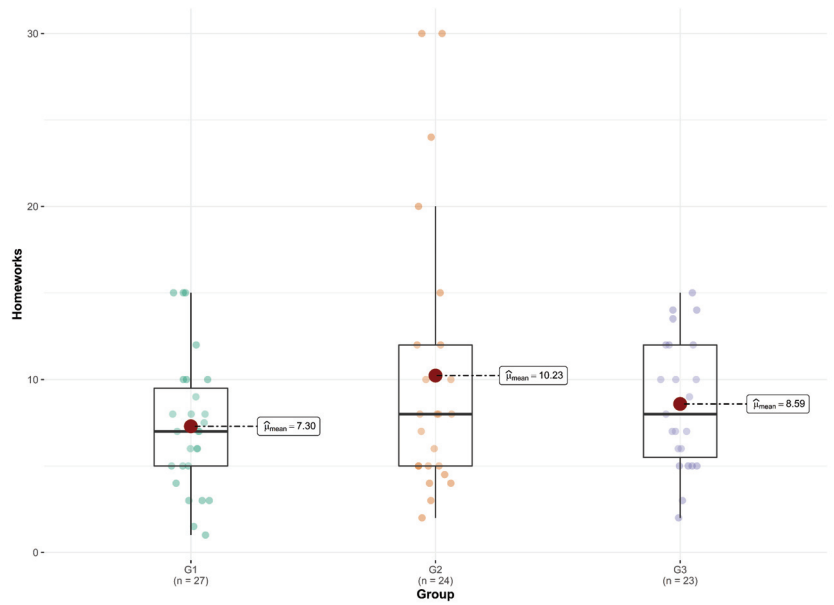*Distributions of scores among active participants within the 3 groups*
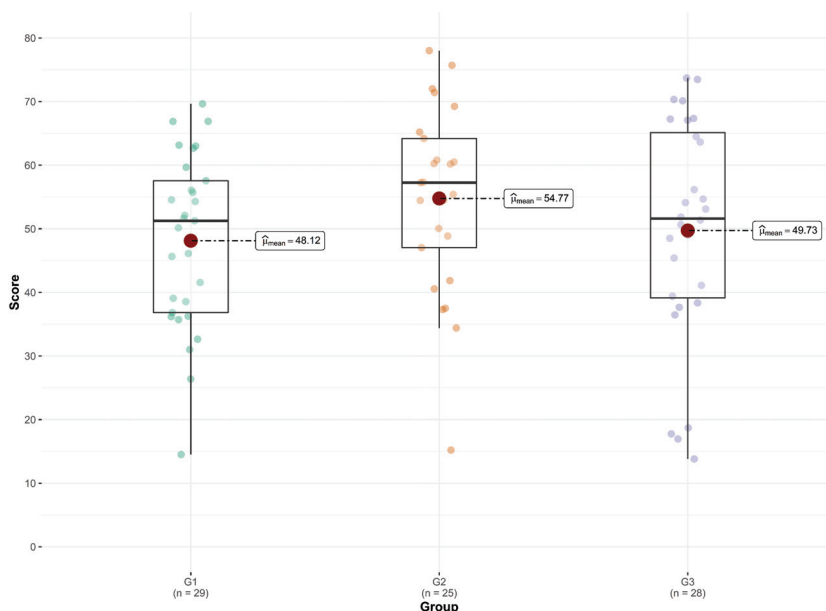
Source: authors' own work.

Figure 3
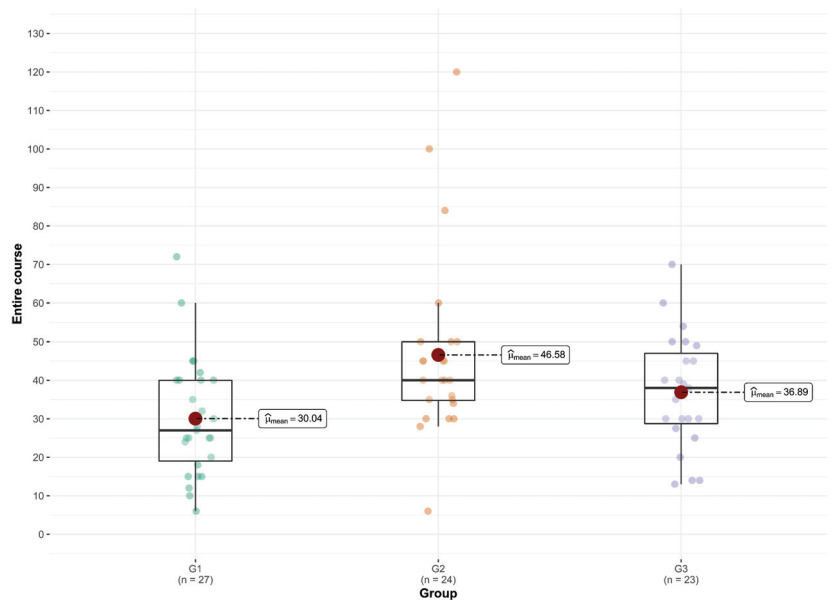*Distribution of the time-consumption of each course by groups*

Part 1. Average number of hours devoted for a single class.

Part 2. Average number of hours spent on a single homework assignment.

Part 3. Total number of hours devoted to attend the entire course.

Source: authors' own work.

This result is partially in line with expectations. In asynchronous e-learning the video materials were optimised, with the length of the video for the average block compressed to about one hour, while the live video-classes lasted four times as long.

Therefore, stydying the course materials was the least time-consuming in this case (G1). Surprisingly, however, there is a significant difference between groups G2 and G3. The explanation for this is the high percentage of students participating in live video-classes in G2 (88% of active students) in comparison to group G3 (19%).

This shows explicitly that sharing recordings from video-classes lead to students not attending the live video-lectures. Instead they watched recordings, rewinding them and pausing at their own pace.

Table 1 presents the results of the survey regarding the evaluation of various didactic methods applied in the course within each group. According to this, students from group G2, who did not participate in live video-classes, found both the recordings from the lectures and the tasks the most useful didactic materials. It is also worth noting that the students participating in live video-classes rated this form of teaching very high. In addition to that, video tutorials were also highly appreciated by group G1.

However, taking part in video-classes and/or watching video materials is not the same as mastering all the material to be processed, which is verified by homework assignments. In general, one may expect that the more systematic student's effort is put into learning, and the more time they devote to each class, the less extra time they will need to spend on completing a subject.

As for the subject „Introduction to Excel and economic data analysis", the credit was based on homework, which consisted of sets of tasks to be solved by oneself. Part 2 of Figure 3 shows, however, that students from group G1 devoted the least time to studying (mean 7.30, median 7, std. deviation 3.86), then G3 (mean 8.59, median 8, std. dev. 3.77), and the most time for studying was devoted by group G2 (mean 10.23, median 8, std. dev. 8.03). The differences

in means and medians can be considered as relatively small and statistically insignificant (Shapiro-Wilk, ANOVA, Tukey's, the full test report is presented in Appendix 4). However, there is clearly a greater differentiation of the results in group G2 (greater standard deviation and longer right tail of the distribution) in comparison with the other groups (Levene, Fligner-Killeen, details in Appendix 4).

However, the most important aspect is the total number of hours allocated to participation in the course, which is shown in Part 3 of Figure 3. As could have been expected, in this case group G1 performed the best (average 30.04, median 27, std. dev. 15.26), then G3 (mean 36.89, median 38, std. dev. 14.92), and finally G2 (mean 46.58, median 40, std. dev. 24.14). The clearest difference is between asynchronous e-learning lessons and live video-lectures without recordings. This result is statistically significant. Students from group G1 group spent statistically less time on learning than those from group G2 with the video-classes conducted live, without sharing the recordings. The latter case also had the greatest variability in the learning time during the course.

The H2 hypothesis was therefore rejected. In this part of the analysis we obtained two significant results. First of all, the didactic form with pre-prepared video tutorials replacing live classes turned out to be more effective than the classic form with live video-classes. Secondly, if we provide recordings of the video-classes, students do not participate in the live classes (attendance 19%). When recordings are missing, the presence rises to 88%. So, if for some reason, we want to maintain direct contact with participants, we should not share the recordings. It is also more fruitful to shift to an asynchronous form and provide pre-prepared and tailored video tutorials, instead of recordings from live classes.

Such a high difference in attendance to live video-classes between groups G2 and G3 is surprising, and may be down to three factors. Firstly, the low quality of teaching, which is not the case here, because according to the data in Table 1 live classes were the highest-rated didactic form. Secondly, the subject matter of

Table 1

Convenience of didactic forms used within the course in each group and participation in live video-classes (on a scale of 1–5, where: 1 – very low usefulness; 5 – very high usefulness)

Didactic form	G1	G2	G3	G2 live	G2 recorded	G3 live	G3 recorded
Self study materials	4.52	4,30	4.71	4.20	4.33	<u>4.65</u>	<u>5.00</u>
Assignments	4.48	<u>4.52</u>	<u>4.75</u>	4.60	<u>4.50</u>	<u>4.70</u>	<u>5.00</u>
Solutions for exercises	4.56	4.22	4.46	3.80	4.33	4,45	4.50
Homework	4.42	4.17	4,54	4.60	4.06	4.55	4.50
Discussion forums	3.11	3.43	3.54	2.60	3.67	3.65	3.00
Live video-classes	0,00	4.24	4.50	<u>5.00</u>	4.00	<u>4.65</u>	3.75
Video materials	<u>4.96</u>	4.43	0.00	4.20	<u>4.50</u>	0,00	0,00

Source: authors' own work.

Figure 4

Assessment of the course time-consumption in comparison with other courses taken by students so far (on a scale from 1 to 5, where: 1 – very low; 5 – very high)
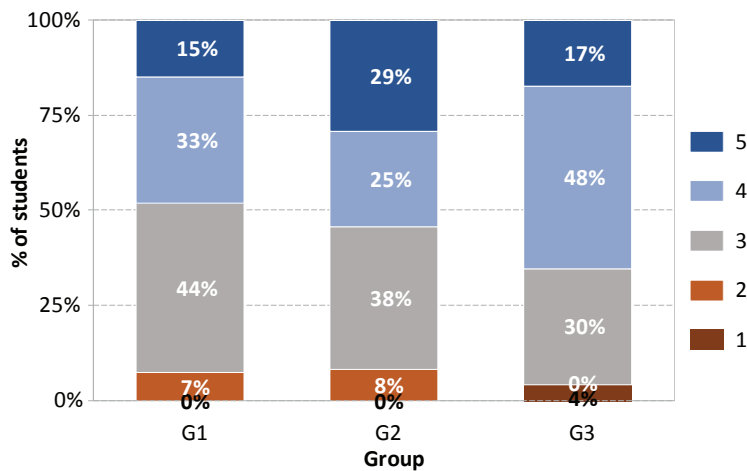
Source: authors' own work.

the lesson could be too simple, making it unnecessary to attend the live class. However, the results in Table 1 are contradictory to this thesis. Moreover, according to the students' evaluation in the survey, the course on Excel was relatively more time-consuming than other courses taken by students (Figure 4).

High and very high time-consumption was indicated in G1 – 48%, G2 – 54% and G3 – 65%, and low or very low, respectively in: G1 – 7%, G2 – 8% and G3 – 4%. It can therefore be concluded that, in the opinion of the participants, the analysed course was relatively time-consuming in relation to other academic subjects, and live classes should be an important didactic element. There is therefore a third option – students consciously and rationally made decisions about not participating in the classes, considering watching recordings from classes as a more efficient form of learning. This is confirmed by our analysis of the Spearman's rank correlation, which showed substitutability between live video-classes and class recordings.

A better evaluation of the convenience of live classes means greater time-consumption of individual classes ($R = 0.5103$) and of the entire course ($R = 0.3264$), and, at the same time, a lower rating of that of recorded videos ($R = -0.5263$).

On the other hand, the higher rating for the convenience of the videos means that individual classes ($R = -0.3721$) and the entire course ($R = -0.2431$) are less time-consuming, and therefore evaluation of the live classes (which are more time consuming) is lower ($R = -0.5263$). All these relations are statistically significant.

Evaluation of the course

The third very important criterion comparing various forms of distance learning, apart from effectiveness and efficiency, is the evaluation of the course by its participants. Table 2 presents the results of the survey (Appendix 1), in which students were asked to evaluate: satisfaction with participation in the course, enhanced knowledge and skills, the level of the course, their willingness to continue studies in this topic, and finally to provide an overall evaluation of the course.

The course was rated high in all three groups of students. Interestingly, in almost all aspects the highest score was in group G2, which was, after all, the most time-consuming form of course. The overall evaluation of the course at 4.91 (on a scale of 0 to 5) can be considered a very high score. Group G1 came second and G3 third. This comes as a surprise, as it was in group G3 that students had the opportunity to both attend video-classes live and to watch recordings from the lectures. This form could be considered as the most convenient for students. However, as this case study shows, more is not always better. Although all the students from group G3 group, who decided to participate in the live video-classes, rated the course with the maximum possible mark (5.0), they were a definite minority (only 19% of students from this group participated in the live classes). The remaining 81% of students decided to study the material on their own, using e.g. the recordings. Their satisfaction was much lower (4.56), both in relation to students participating in live video-classes and to the fully e-learning group (4.78), in which, as a matter of fact, the structure

Table 2

Evaluation of participation in the course by groups (on a scale of 0–5, where: 0 – very low grade; 5 – very high grade)

Students' evaluation of the course	G1	G2	G3	G2 live	G2 recorded	G3 live	G3 recorded
Satisfaction from taking part in the course	4.63	**4.79**	4.57	4.75	**5.00**	**4.80**	4.50
Enhanced knowledge and skills	4.56	**4.71**	4.65	**4.75**	4.50	**4.80**	4.61
Course level assessment	4.44	**4.83**	4.48	4.80	**5.00**	**4.80**	4.39
Feeling encouraged to further study this topic	**4.52**	4.48	4.09	**4.53**	4.25	4.00	**4.11**
Overall evaluation of the course	4.78	**4.91**	4.65	4.89	**5.00**	**5.00**	4.56

Source: authors' own work.

of classes was actually the same, but the videos were shorter and more essential, and thus probably better. Importantly, this form of conducting classes required more independence and self-discipline from students, which translated into greater encouragement to further study this topic than among people participating in classes conducted by a lecturer.

What may come across as surprising, however, is the higher overall evaluation of the course among students not participating in live video-classes in group G2 (5.0) in comparison with those that participated (4.89). Both results, however, are very high, and the slight difference may result from a conscious choice – after getting acquainted with the subject of the course and participating in the first classes, they decided that it would be more effective to study the materials on their own. All these students received a very good final grade, and they emphasised the very high quality of course materials (assignments in particular) in the open questionnaire, which seems to confirm this thesis.

These lead to a conclusion that also the H3 hypothesis, stating that the subjective evaluation of students regarding participation in the course will be the highest in group G3 and the lowest in group G1, has not been confirmed. Students from group G2 were the most satisfied, followed by G1, and then G3.

Summary and conclusions

The results of this research indicate that the most effective form of learning are asynchronous e-learning classes, which provides access to materials at the most convenient time for students, with no fixed hours of attending classes (G1). This group (G1) noted the highest percentage of students who passed the subject and the lowest percentage of dropouts. However, there was no difference between the groups in the number of scores obtained among students who took the test.

The most effective form of learning, understood as the lowest amount of learning hours devoted to passing the subject, was in G1. More time on learning was spent by students from the G3 (live video classes + recordings) and the most in G3 (with live video-classes without recordings). The difference between groups G1 and G3 is statistically significant.

According to the evaluation form, the course was the most appreciated by group G2, then group G1, and the lowest grades were given by group G3. In general, the higher grades were given by students participating in live video-classes in comparison to those who did not attend them.

A significant difference noted in the percentage of students participating in the live video-classes between groups G2 (88%) and G3 (19%) is an interesting observation. There is also an important conclusion: if, within the didactic process, emphasis is put on the effectiveness and efficiency of learning, then probably asynchronous e-learning, including the pre-recorded tutorials (instead of live video-lectures), should be applied. If direct contact with students is important, online synchronous live classes should be carried out,

but without sharing recordings, as this option will prevent students from participating in the live classes. This does not change the fact that, from among the various didactic online forms, video recordings, as such, are the most highly rated tools helpful in acquiring knowledge (Bubaš et al., 2019).

Therefore, general conclusions drawn from the analysis for this subject only should be made with caution. Based on other studies, other pedagogical elements and methods also influence the final results of video-based teaching, which altogether can increase the students' commitment and motivation, as well as their overall level of satisfaction with the classes (Yousef et al., 2014).

Nevertheless, the purpose of this experimental study was to compare the results obtained in groups without and with recording from online classes vs. especially designed and pre-recorded video material. In this novel context there was a negative impact of making videos available on student attendance to live video-classes (a significant drop). It also proves the great need for time flexibility for the educational process. It should be emphasised, however, that the experiment was carried out for an elective subject, to which students had freely enrolled due to self-motivation.

Consequently, it is worth checking whether a similar analysis performed for compulsory subjects or the subjects of which the main goal is, for example, the acquisition of soft skills, would bring similar results. Therefore, it would be necessary to continue research comparing different forms of remote education, depending on the topic being taught and the profile of students.

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Appendices are available in the online version of the journal.

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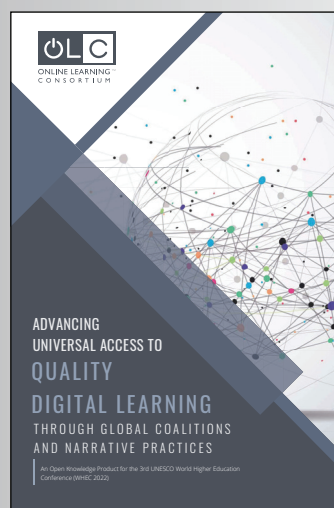
Madeline R. Shellgren, Angela Gunder
Advancing universal access to quality digital learning through global coalitions and narrative practices

The OLC report is now featured in the prominent United Nations Educational, Scientific and Cultural Organization (UNESCO) database for the 3rd UNESCO World Higher Education Conference (WHEC2022).

Published as an open knowledge product to be widely and freely accessible, this playbook helps educators document their current progress while roadmapping future initiatives. OLC's framework was designed in alignment with all 17 UN Sustainable Development Goals, including Quality Education.

"Our report serves as a concise guide to address the needs of educators seeking to ensure that online, blended, and digital learning is equitable within their own local contexts," said OLC Director of Community Strategy and Engagement Madeline Shellgren. "It provides models for professional learning, partnership, and collaboration on digital learning change work through global coalitions."

Indeed, the report's framework emphasizes collaboration with educators' local and global communities in order to create quality, equitable digital education at any scale. This includes individual digitally-mediated courses as well as those across online programs and within institutional, system-wide, and countrywide digital strategies.

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