Student assessment of remote learning as an alternative to on-campus learning at technical universities during a pandemic

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ABSTRACT: In this article, the authors present the findings of a survey on students' ratings of remote learning in comparison to traditional, on-campus learning. The survey was conducted among students of selected technical universities in the context of the COVID-19 pandemic, which has forced universities, including technical and artistic universities, to almost immediately switch to remote learning. In many cases, this was the first attempt at introducing remote learning to the teaching of design studio and artistic classes. The main goal of the survey was to test the assumption that teaching design or drawing cannot be executed remotely or it is less effective in that mode. This survey was administered to students at two institutions in different countries upon the completion of a study semester. The responses varied across and within the surveyed institutions, including general ratings, preferences, effectiveness, and the weighting of each element, phenomenon and effect. The study results can be used to inform the improvement of on-line education, especially at technical and artistic universities.

INTRODUCTION

The teaching process at technical universities is typically based on lectures, design assignments, exercises, laboratory classes, seminars and elective modules. Recently, some of these classes have been switched to remote learning. This assumes teaching exercise classes and lectures on-line, using platforms like Microsoft Teams, Zoom, etc.

The effectiveness of knowledge transfer via pre-recorded lectures that can be re-watched was discussed by Hertzog [1]. In his opinion, this form of knowledge transfer is accepted by both students and teachers. It enables repeating the lecture multiple times and asking the lecturer questions during its recording. While it might be difficult at this stage to point to other effects of applying remote learning, it is possible to collect information about its assessment by students.

The objective of this article is to present the outcomes of this assessment and, as a consequence, formulate conclusions that can prove useful in the quality improvement of education while using remote learning. Apart from the academic value, the findings can be applied in the practice of teaching design studio modules.

Teaching design is a complex process that should account for the individual cognitive style of each student. Preferences in cognition and information processing in architecture students were discussed by, among others, Roberts [2]. He described Riding's cognitive styles and the level of learning abilities in working on design assignments at each stage of architectural education. As noted by Roberts, everyone has a preferred style of learning, which can be recognised by personality typification. Moreover, he pointed out how learning styles were used by landscape architecture students at the University of Guelph to determine effective education methods. He listed three types of how students work: wholist, intermediate and analytic [2].

The authors of this article are aware of the necessity of an individual approach to teaching each student as based on Roberts' observations, similarly to others; for example, Vozárová and Šimkovič discussed the impact of psychological traits on architectural design [3].

The authors of this article also used the protocol and scenario method to support their analysis [4]. This method is based on the research achievements of psychologists regarding the work effectiveness of architects at different stages [5][6].

According to the authors, the protocol and scenario method allows students to develop all three abilities (intuition, affinity and analytical thinking), as well as creative thinking about architecture and space. Detailed studies on students' design thinking and the related above-average creativity were presented by Kamrowska-Załuska and Parteka [7]. Creative thinking was also discussed by Białkiewicz [8], and Pusca and Northwood [9]. Creative thinking can be

developed via design studio classes when assignments are properly formulated. According to the authors, design assignments for students should be formulated so as not to limit student creativity and enable them to utilise digital tools already during early work stages. Digital technologies have a significant impact on architectural design, architectural education and design practice [10].

Remote classes should account for the teaching methods specified, as well as enable the practicing of an individualised approach to each student. In this article, the authors present the outcome of an assessment of remote learning by students from two universities - Cracow University of Technology (CUT), Kraków, Poland, and the National Aviation University (NAU) in Kyiv, Ukraine. The results of the study enabled a comparison of the assessment of remote and traditional learning in general, as well as comparing them for the two universities.

METHOD

The study was performed using a survey. It was carried out using questionnaires that were sent to students via e-mail. This formula enabled carrying out the study without directly contacting the respondents.

The survey was undertaken in 2020. It was performed on a sample that consisted of 22 students of the Faculty of Architecture at Cracow University of Technology (FA-CUT) and 12 students from the National Aviation University in Kyiv. The responses to the survey questions were collected via e-mail in different periods of time. The method was justified as the authors wanted to gauge student opinions as to the assessment, including effectiveness, of on-line teaching. It should be noted that, by law, students are part of the curriculum and teaching review process. They participate in it after the conclusion of each semester.

The survey questionnaire, apart from general questions (about age, gender and year of study), also included questions about the students' general assessment of remote learning and traditional learning (in class, on-campus), their perceived effectiveness of remote learning, and preferences as to the form of learning if given the choice between the two.

Afterwards, the participants moved on to the second part of the questionnaire, wherein they assessed the weight of each element, phenomenon and effect accompanying remote and in-class learning. The elements under assessment included: the time devoted to individual critiques, time for group discussion, effectiveness of knowledge transfer by the teacher, effectiveness of knowledge assimilation by the student, teacher involvement in the class, student engagement, student focus on the information transferred during class, organisation of study time, understanding of the subject of classes, ease of mastering the material, effectiveness of teacher aid in understanding the subject matter taught, communication between students, effectiveness of student-teacher communication.

The respondents used ratings based on a scale of 0 - 5 points, which allowed half-point ratings (0.5, 1.5, 2.5, 3.5 and 4.5). The mean values of this rating demonstrated differences at the two universities. This applied both to the different weight of each element that was significant, and to remote and in-class learning quality.

To process the survey results, the authors used mathematical statistics that accounted for the mean rating value *m*, standard deviation *s* and coefficient of variation *n*. Based on the authors' earlier study, the method and sample size used this time appear sufficient to consider the current findings as objective, in terms of *m*, *s* and *n* [4].

RESULTS AND ANALYSIS

The results of the first part of the survey were similar for both universities. The greatest differences were observed for Question 1, which concerned the assessment of remote learning, and Question 4, about the preferred form of learning (assuming a choice is given).

The question: *How would you rate remote learning on a scale of 0 - 5?* Eight students from the FA-CUT (the most numerous group) gave this form of teaching a rating of three points - 36%. The same rating was given by 50% (the most numerous group) of the respondents from the NAU in Kyiv.

Traditional learning was rated slightly higher. The most frequent rating to this form of learning at the CUT was five points (32% of respondents) and four points (33%) at the NAU in Kyiv.

The effectiveness of remote learning was rated very similarly at both universities, with the most frequent rating being 3.5 points (32% of respondents gave this rating).

Concerning answers to the question: *If given the choice of learning method, which form would you choose?* Eight respondents from the CUT chose the traditional form (36%), seven a hybrid method and six remote learning. The differences in responses concerning selection were not significant. Among respondents from the NAU, there was a clear preference for the traditional method (75%).

The results from the second part of the survey indicated that the first six factors that accompany traditional learning were rated the highest: 1) time devoted to individual critiques - 54%; 2) time devoted to group discussions - 68%; 3) effectiveness of knowledge transfer by the teacher - 50%; 4) effectiveness of knowledge assimilation by the student - 41%; 5) teacher involvement in classes - 64%; and 6) student engagement in classes - 50%. Similarly, the highest rating was given to in-class teaching: 10) ease of mastering material - 45%; 11) effectiveness of teacher aid in understanding the subject matter - 40%; and 12) communication between students - 73%.

Among the ratings given to individual elements that accompanied remote learning, the highest weight was assigned to on-line education effects, including: 2) time devoted to group discussions - 27%; and 12) communication between students - 27%. The lowest ratings, three points - were given to: 9) understanding subject matter taught; 10) ease of mastering material; and 13) effectiveness of student-teacher communication.

The results of respondents from the NAU in Kyiv indicated that none of the elements associated with in-class teaching were given the highest rating - five points. The element rated the lowest was: 8) study time organisation - this factor was given 0 and 2 points by the largest group of respondents - 8%. A rating of 3 points was given to elements: 4) effectiveness of knowledge assimilation by the student; 6) student engagement in classes; 11) effectiveness of teacher aid in understanding the subject matter; 12) communication between students; and 13) effectiveness of student-teacher communication.

The responses from the CUT are presented in Figure 1 and Figure 2.

Figure 1 presents the results of an analysis of mean value *m*, standard deviation *s* and coefficient of variation *n* for each element of traditional learning. The analysis concerned responses from Cracow University of Technology. The results show significant differences concerning the coefficient of variation. Mean values were at a similar level, similarly to standard deviations.

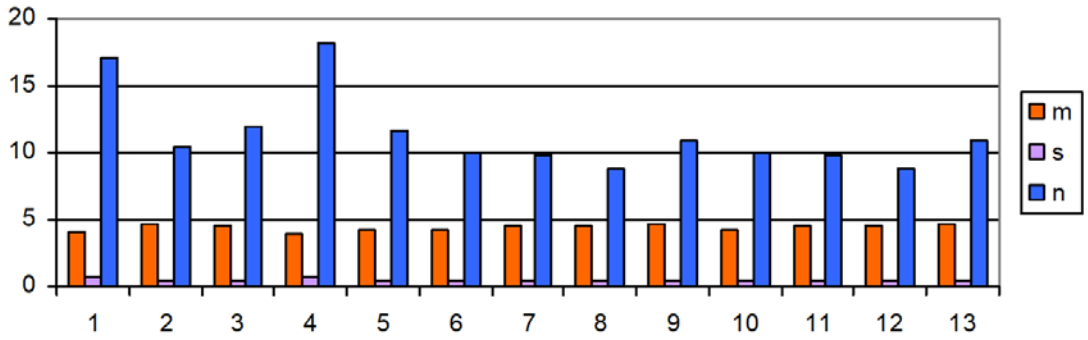

Figure 1: Analysis results of mean values of ratings for each element of traditional learning *m*, standard deviation *s* and coefficient of variation *n* - for respondents from the CUT.

Figure 2 illustrates the results of the same analysis concerning remote learning at the CUT.

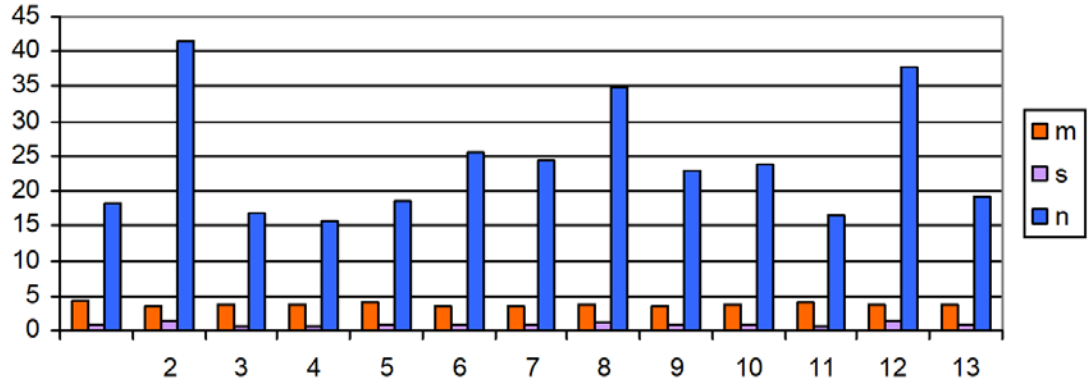

Figure 2: Analysis results of mean values of ratings for each element of remote learning *m*, standard deviation *s* and coefficient of variation *n* - for respondents from the CUT.

The analysis results concerning the distribution of the number of individual ratings given by respondents to the elements of traditional and remote learning showed differences in relation to both the individual elements and teaching methods.

Based on the results of statistical analysis, it can also be stated that a good variety of ratings was achieved. This applies especially to ratings given by respondents from the FA-CUT. Here, it should be noted that the numbers listed in

the statistical analysis were not the results of measurements of a specific physical quantity, but an expression of subjective assessment.

CONCLUSIONS

Remote learning, which is currently the standard, requires exploration and improvement. The unforeseen situation associated with the pandemic threat resulted in the urgent and sudden necessity of introducing on-line classes at every level of education. Although it is difficult to currently identify the effects of remote learning, it is possible to analyse its strengths and weakness, and problems with its application. A more complete diagnosis of the subject matter explored in this article could contribute to the quality improvement of education and its outcomes.

The element of remote learning that was appreciated the most by respondents from Cracow University of Technology (among those subjected to assessment) was the possibility of effectively hosting group discussions. Effective communication between students was also highly rated.

Remote learning was reported to hinder the understanding of the subject matter being taught, effective mastery of material and effective teacher-student communication.

Students from the National Aviation University in Kyiv gave high ratings to the ease of understanding the subject matter being taught and the ease of mastering the material. They identified the greatest inconveniences as: the low level of teacher aid effectiveness in understanding the subject matter being taught, communication between students and student-teacher communication.

The responses were extremely diverse. The elements rated the highest by CUT students were those that NAU students rated the lowest.

However, the element that was rated similarly by both respondent groups was difficult student-teacher communication. This communication is critical and also difficult while teaching first-year students, who see the integration within their peer group as particularly important. It appears that group discussions and joint initiatives aimed at solving problems discussed during classes can be of aid in this matter.

The results of the analyses have been presented using column diagrams in Figure 1 and Figure 2. Similarities and differences in ratings of the analysed elements of traditional and remote learning at two universities (Cracow University of Technology and the National Aviation University in Kyiv) are also indicated. The results of the study, apart from the academic value, also have an additional application potential - they can aid in improving remote learning, which is currently the fundamental and sole possible method of teaching.

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