

# Evaluation of remote learning at technical universities during a pandemic – the perspectives for the future

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**Abstract:** This article is a summary of a research conducted in the conditions of remote teaching of undergraduate and postgraduate students at technical university. The research referred to the effectiveness and perspectives of web-based education (under the conditions of lockdown) during the COVID-19 pandemic. The aim of the research was to assess the quality of courses and involvement of students in the learning process. One year after the introduction of this form of learning at universities, certain phenomena can be observed, which allow us to draw the first conclusions. In the final part of the study, the author discusses the possibility to continue and use this form of education once the pandemic has passed. The familiarisation and adaptation of students to this specific character of courses in the conditions of a pandemic was a stimulus to interpret this state as a long-term form of education that can change future ways and forms of teaching at universities, including technical universities.

**Keywords:** remote learning, technical universities, pandemic Covid 19, LUT

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## Introduction

None of us realised how much effort this new situation would require from both the lecturers and the students when it came to implementing remote education. The development of appropriate means and methods of communication was to provide a solid work environment in the relationship between a lecturer – a communication tool (usually a computer, but also a smartphone, tablet, etc.) – a student. It was mainly about creating a specific code of communication. Although remote learning is not a new method of transferring knowledge, it was the first time that it was used (under conditions of higher necessity) on a mass scale in contacts with a large group of recipients [1].

Until now, the use of this way of communication has mostly been limited to a video conference in business, or occasional contacts and teaching in small groups. The breakthrough for remote learning came in March 2020. We all realised that this situation may last longer (due to sanitary hazards) and it is necessary to develop working methods adequate to the complexity of educational methods of work.

It was also necessary to create a solid basis for the continuation of work and study. Education had an additional purpose in this respect by occupying young people and limiting their mobility. Probably for the first time since the so-called “Spanish flu” pandemic in 1918–1920, humanity faced a general threat to health and life, which additionally caused disturbing psychological and psychological behaviour in some people [2].

*Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community. [3]*

Not being able to gather and leave the place of residence (only if justified by medical reasons), may have triggered fear and even a sense of anxiety.

## Characteristics of remote learning for university students

The initial lack of official regulations defining the methodology of teaching caused many lecturers to work on the basis of various computer applications and programs they were familiar with, such as: Classroom, Big Blue Button, Moodle or providing content for individual learning (e-learning). It soon became apparent that the obligations imposed (primarily) on the lecturers also applied to the students and required their greater involvement in educational processes. This involved the establishment and acceptance by the students of a work discipline through:

- preparing for subsequent tasks on a regular basis;
- systematically following the instructions of a lecturer;
- spending a longer time to develop an adequate form of tasks – instructions;
- working in stressful conditions (under sanitary or technical restrictions);
- regularly attending classes (with strict control of the time spent in class).

The gravity of the situation and the lack of other learning perspectives prompted many students to get organised in order to attend university classes. The meaning of the term “remote learning” meant something completely different than e-learning, by having the lecturer present during the classes and monitoring the educational process. Scientists emphasizing the importance of learning with the use of electronic tools define the meeting of a lecturer and a student in this form of education as creating a new educational environment, outside the university [4].

Being aware of the fact that this is a new phenomenon, not researched or described in comparable conditions, it was important to use this situation to monitor certain responses in the educational and social space. A distinctive feature of classes at technical universities is the fact that some of them are conducted in the form of workshops and laboratory classes, which by necessity had to be rescheduled and carried out in the traditional form during periods when the lockdown restrictions were lifted with additional sanitary restrictions. The different forms of classes with the use of electronic tools were also defined: hybrid, remote and traditional classes [5].

Individual factors influencing the emotional reception of the content in a computer-mediated relationship, which were significant in the case of longer contacts, also had to be taken into account. The most frequent factors determining the effectiveness of distance learning were:

- the individual qualities of a lecturer giving a class;
- the quality of the teaching system or application;
- the readability and usability of the content provided;
- the student’s involvement and activity in a class.

## Characteristics of remote classes at faculty of civil engineering and architecture of Lublin University of Technology – summary of observations

Students were able to adapt quickly to these conditions, finding the positive aspects of the situation. The lack of definite time frames for lifting sanitary restrictions would have disorganised the education process in the longer term. The holiday period was therefore a time of relaxed discipline regarding social contacts in many countries. The new academic year proved to be a time of hard work for all participants involved in the process. A unified curriculum based on the TEAMS application approved by the university authorities was introduced. The learning process became more structured and disciplined, bringing the expected results in the form of greater involvement of students.

While most of the classes involve only direct access to a computer, some of them require additional space or even rearranging of the interior. This is the case with freehand drawing classes, which require the creation of a suitable spatial distance in order to achieve the necessary ergonomics and freedom of work [6].

Giving remote lectures was a significant challenge for lecturers. Direct contact of a lecturer with a student in a lecture hall provides a work comfort which could not be replicated in the conditions of remote teaching. In order to motivate a large group of listeners, it was necessary to change both the way of transferring knowledge and methods of presenting content. Unfortunately, in this case, contact with 100 or more students proved impossible. Other problems were lack of eye contact or reaction to behaviour of some students, the atmosphere of the room or even its acoustics [7]. All this meant that a lecturer stayed vis a vis a computer screen and they had to speak to it.

Another unique group of classes, which most could not be completed remotely, were laboratory classes. The characteristics of these classes involve mostly performing research on the basis of available equipment and research instruments. Unfortunately, most of them had to be postponed to a time when the many pandemic restrictions were lifted, e.g. during holidays.

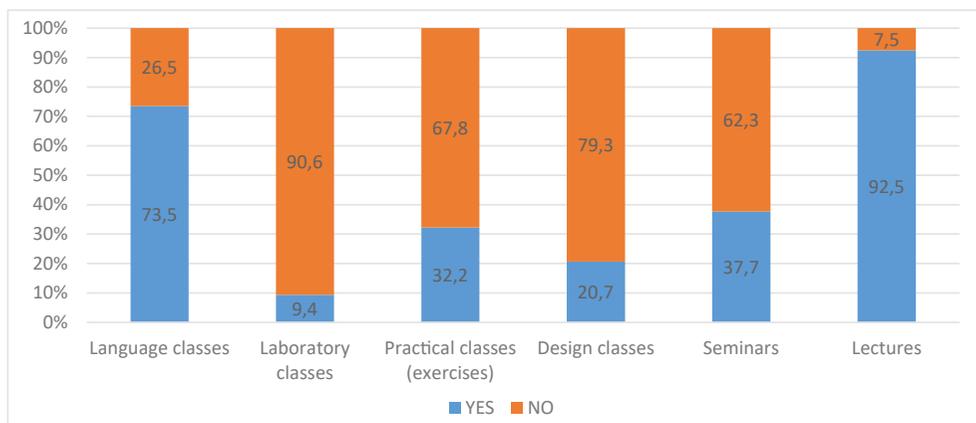
Design courses with the use of computer were not particularly difficult for students. Opportunities offered by computer-based design and its presentation through screen sharing were very helpful. But an e-learning platform and teaching aids are not sufficient to realise the full potential of students in classes [8]. However, students were found to be reluctant to make sketches as the pre-design and conceptual stage. Another negative example of difficulty to enforce the instructor's requirements was the reluctance to work with a mockup. Students explained it by the limited space for work, and the lack of access to appropriate materials and tools. Therefore, the level of approval of this form of classes was not high.

Other courses in the form of practical classes, depending on their character, were or weren't accepted. The most accepted forms of remote learning were language classes, seminars and naturally lectures.

There was no difference between the students' academic performance for the semester, compared to the performance in traditional classes. Student papers were completed diligently, with commitment, the only major difference was in timeliness of work submission. However, students required constant stimulation in order to achieve a creative approach to solving problems and a certain flexibility in executing their knowledge at such particular times.

According to Białkiewicz:

*...education has been undergoing changes resulting from the need to adapt teaching to evolving needs and possibilities, but this is also due to the development of architecture in the availability of new materials and changing fashion. [9]*



**Fig. 1.** Once the restrictions on the functioning of universities are over, can some classes still be delivered remotely (based on students' answers)?

## Method

In order to obtain the research material for the interpretation of the results, it was decided to make a form of a survey available to interested students. Being aware that students do not appreciate extended forms of research questionnaires, it was finally decided to create a set of closed questions. The idea was to provide clear conclusive answers to the issues raised. Interpretation of such results may offer limited possibilities, but it precisely defines the decision and purpose of the respondent's answer. The primary purpose of the survey was to obtain firm answers to a set of questions that would be used to develop interpretations and draw final conclusions. In effect, the aim was to formulate a qualitative evaluation of the effectiveness of remote teaching in order to analyse the possibility of continuing this form of work in the future, in a traditional teaching environment. The research included students of Faculty of Civil Engineering & Architecture at Lublin University of Technology (FCEA-LUT).

The faculty research in the form of a survey was limited to a small group of 67 FCEA students evaluating remote teaching at this particular university. The teaching period under evaluation was April 2020 to March 2021. The time frame over which the remote teaching was conducted was long enough to obtain reliable responses to interpret the observed phenomena. The results of the faculty research were compared with the results of a multi-stage extended questionnaire developed for all faculties of Lublin University of Technology (by the university authorities), addressed to both the students and lecturers. However, only the results of the students' evaluation [10] were used for comparison. Therefore, it may be valuable to juxtapose their results in the context of the whole technical university with the answers to the questionnaire.

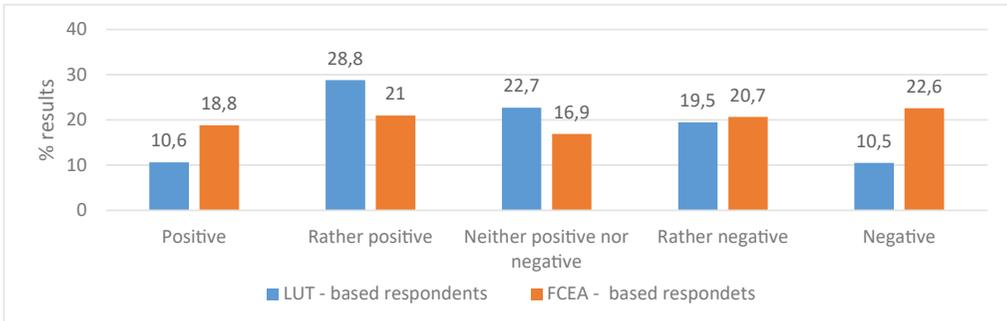
What was important in the final evaluation of the annual remote classes was to summarise the observations from teaching the classes. This concerned the specifics of learning at a technical university and the classes taken. Along with a determination of acceptance for particular forms of teaching, the possibility of continuing remote courses when returning to traditional teaching was indicated. The final summary of these courses was made in the form of a table with the specification of threats and perspectives regarding the possibility of their continuation.

## Results and analysis

There were no problems reported in the interviews with students resulting from a lack of access to a computer as a tool for communicating with a lecturer, or a lack of other tools helpful for studying process such as a scanner, printer or appropriate software. A recurring impediment to access to various forms of contact was overloading of the Internet network and interruptions in signal transmission during peak periods.

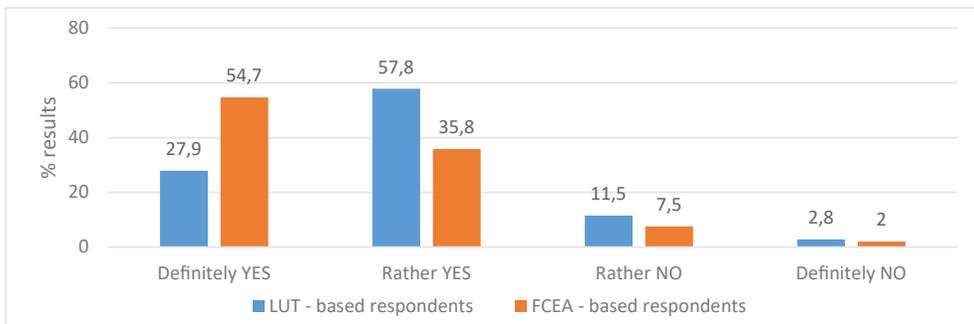
The work with a use of a computer gave the students freedom that most often consisted in: independence from rigid time frames in performing tasks and individual work, flexibility of working hours in relation to the conditions of family life and the possibility of performing additional activities at the same time. The initial lack of discipline on the part of young people could have developed into a permanent loss of personal contact with individual students. This is where the additional role of a lecturer had to appear in order to mobilise and unite the student group to carry out activities in semi-normal conditions [11].

The first question concerning the evaluation of the remote education during the pandemic was to determine to what extent this format proved successful in an emergency situation. It may be stated that positive evaluations (rather positive and positive) prevail at 39.4%, similarly as in the case of the questionnaire evaluation of the students of FCEA, where positive notes constitute 39.8%. It was evident that the group which positively responded to this period of change in the approach to knowledge transfer were the postgraduate students. This may be due to their greater independence and familiarity with individual work and at the same time the development of appropriate techniques and ways of studying at the university.



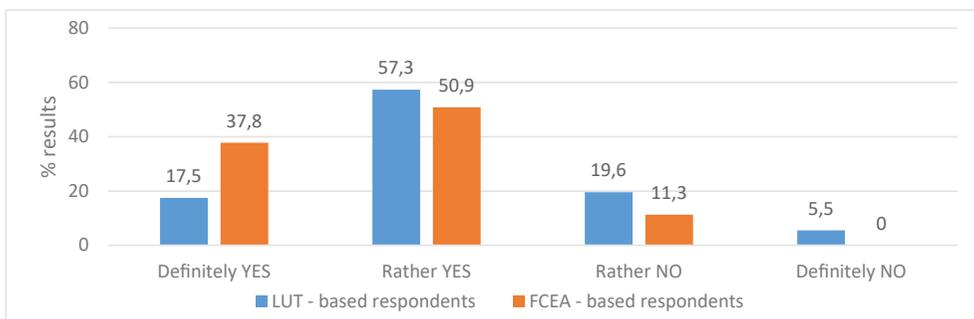
**Fig. 2.** Evaluation of remote learning delivered during the pandemic in Lublin University of Technology

The second question of the survey was to assess the usefulness of materials provided by lecturers to students for remote classes. In this case it also turned out that it was an adequate form of education in relation to the content of the material provided and the possibility of further independent work of students. The negative marks (no and rather not) constitute in this case 14.3% in the university survey and 9.5% of the faculty survey. There were no major differences in the evaluation of undergraduate and postgraduate students.



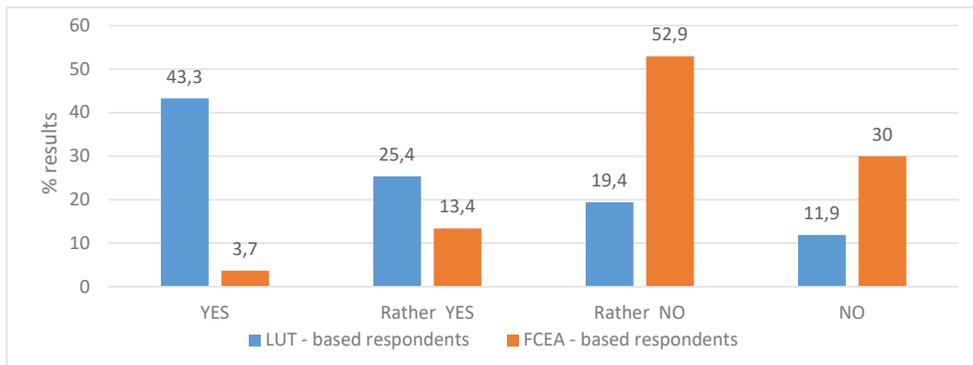
**Fig. 3.** Evaluation of usefulness of teaching materials provided by lecturers for remote classes

The next question concerned the adequacy of the form of the classes to the content provided. The evaluation of students was again positive both for the LUT 74.8% and FCEA questionnaire 88.7%. The approval for the adaptation of the form of the classes to their content may indicate that the materials presented have been developed in such a way as to make them attractive to the recipients. It is known that remote teaching requires more work on the part of a lecturer. Creating an attractive form acceptable to so many students may be a proof of that. Analysing the essence of the answers, one can get the impression that the level of satisfaction varied from 17.5% to 57.3%, but still positive opinions had a huge advantage over the negative ones from 5.5% to 19.6%.



**Fig. 4.** Adaptation of the format of remote classes to the content delivered

The last question was the possibility to continue this form of work with students after the lifting of restrictions imposed on the functioning of the universities. When analysing the answers to this question, it is important to note the structure of the results. Despite the acceptance of remote teaching, we cannot speak of a decisive advantage in the LUT results obtained. There is a split in the results between supporters (68.7 %) and opponents of remote teaching (82.9 %). When talking to students about the assumptions and objectives of the survey, it was very often emphasised that they will always associate the period of remote learning with the need to stay at home. The time of the COVID-19 pandemic will remain a period of restriction of their personal freedom and they cannot accept it as a conscious voluntary form of acquiring knowledge when restrictions are lifted.



**Fig. 5.** Should part of the courses continue to be taught remotely after the lifting of the restrictions on the functioning of universities?

## Conclusions

On the basis of the conducted research and analyses after a year of remote teaching, it cannot be fully concluded that in the difficult times of the COVID-19 pandemic, remote education as a form of academic teaching at a technical university has proved to be positive. The evidence is the acceptance of such teaching by a significant percentage of LUT students (68.7%) and at the same time lack of acceptance by FCEA students (82.9%). Only a part of students have appreciated this form of classes, learned discipline and cooperation with the teacher.

When applying different teaching techniques, it is important to use different forms of classes, e.g. group discussions and individual critiques [12]. The materials and content provided by lecturers were found useful and were used in further individual studying by students. Nevertheless, it is necessary to remember about developing the forms of transmitting didactic material and adjusting it appropriately through various and adequate ways of teaching. In the future, these forms of teaching should be improved in order to adapt to work with larger groups (not only during lectures), while at the same time increasing the level of control and verification of the acquired knowledge. Moreover, (as very often emphasised by younger students in the questionnaire) contact with the lecturer without the use of a computer remains important.

The research that concerns the assessment of remote teaching should be continued when the students return to university without the burden of an extreme situation, that is currently being heard in response to the questions asked.

**Table 1.** Possibilities of using remote learning in traditional teaching at a technical university – perspectives and threats.

Perspectives	Threats
<ul style="list-style-type: none"> <li>• Creating new forms of studying (apart from traditional – stationary and non-stationary).</li> <li>• Stimulating the development of technology and IT facilities at universities.</li> <li>• Creating new specialisations and fields of study.</li> <li>• Better organisation of the didactic process as a result of savings in premises and equipment.</li> <li>• Easier access to studies and the possibility of educating more students.</li> </ul>	<ul style="list-style-type: none"> <li>• Lowering of quality standards, requirements, and ultimately the level of education.</li> <li>• Decrease of the discipline and monitoring of the process of acquiring knowledge.</li> <li>• Lack of adaptation of study programmes and increasing attractiveness of the remote forms of conducting classes.</li> <li>• Dependence on technical and technological solutions at universities.</li> <li>• Limitation or deprivation of opportunities for direct contact with lecturers.</li> </ul>

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