Perception of Selected Aspects of Online Learning by Czech Higher Education Students

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Abstract—The study is based on an analysis of real educational processes in the period 2020–2021, when the most significant pandemic waves of Covid-19 were recorded in the Czech Republic. In relation to this, the study aims to identify the views of 968 students on the changed conditions of education and the perception of selected aspects of the transition to online learning by respondents from two higher education institutions in the Czech Republic, the first of which is focused on humanities and the second specializes in economics studies. The research is aimed at discovering students' attitudes towards the form of distance education forced on them by the relevant circumstances, the use of individual components of distance education to support teaching originally designed for the in-person form, the level and effectiveness of the use of information technologies in online learning and the potential of hybrid learning. For a greater degree of analyticity, a combined research model based on both quantitative and qualitative research has been chosen. Aspects of online learning that could be employed as complementary tools in the full-time conventional study mode have been identified. Students of economics can better visualize the inclusion of online learning in the full-time conventional study mode. Master level students are critical of online learning. The results have been used to design and empirically validate appropriate learning strategies with reflection on current student needs.

Keywords—online learning, distance education, economics and humanities study programmes, digital competence, higher education institution

1 Introduction

The Covid-19 pandemic brought numerous problems in connection with the forced rapid transition from in-person to distance education, which had not been prepared in systematic terms in advance. Digitalization in education and online teaching in the academic environment suddenly became a necessary reality for all teachers, all study programmes and all subjects of study, regardless of their conception, content, form and teaching methodology, instead of an often rather formal fashionable trend. User-friendly synchronous and asynchronous platforms for online learning started to be

developed, featuring didactically effective, well-arranged and user-friendly properties from the point of view of both teachers and students, the clients of education. The integration of these modern technologies into study programmes can be utilized to further develop education based on hybrid teaching and blended learning in the post-Covid era. The situation associated with dealing with the impacts of the Covid-19 pandemic required searching for and finding optimal tools and methods of online education that had impacts on preferred learning styles according to the on-going current teaching mode, modified teaching concept, modified educational content including methods of presentation of the learning content taught and feedback.

Research on the usefulness of data visualization in the context of online education of higher education students, future engineers, was conducted in 2022, particularly highlighting its desirable effects on the development of their professional competences [1]. The authors conclude that online learning provides new effective tools for higher education and presents the potential for improving the knowledge, skills and learning effectiveness of future engineers. Establishing a balance between synchronous and asynchronous teaching units can mediate the necessary interaction among students while taking advantage of all the potential benefits of blended learning [2]. Research by these authors has clearly established that those students who performed well demonstrated a minimum 44% engagement rate with the course content. This can be interpreted as meaning that a certain level of student engagement is required to succeed in a virtual asynchronous classroom. If this is achieved, the risks of disrupting traditional teaching and learning modes can be eliminated in all study programmes designed as in-person teaching process, i.e., relying on the traditional model of teacher-student interaction in frontal instruction.

The objective of the 2021 research is to determine the perception of selected aspects of online learning by students of two higher education institutions in the Czech Republic, the first of which is focused on humanities and the second specializes in economics studies. The research is aimed at discovering students' attitudes towards the form of distance education, the use of distance learning components in the full-time conventional study mode, and the use of information technologies in online lessons. The need for the research was triggered by the current unfavourable situation in education caused by the global pandemic crisis. Therefore, students expressed their attitudes towards online learning also in terms of the standard of study materials, communication and digital competences of the teacher and themselves. The survey aimed at finding out the differences in students' opinions according to the specialization of the higher education institution and level of study, and has been complemented by qualitative research results that portray the authentic views of higher education students on online learning. The results will be helpful in designing appropriate educational strategies reflecting the current needs of students.

The research objective produced the following research issues and substantive hypotheses:

> *RQ1: What are the reasons for higher education students not accepting online learning as a full-value alternative to in-person teaching?*
> *RQ2: From the perspective of students, what are the advantages of the distance education components?*

RQ3: From the perspective of students, what are the disadvantages of the distance education components?

H1: Students' attitudes towards distance learning as a full-value alternative to in-person teaching vary depending on the specialization of the university.

H2: Students' attitudes towards distance learning as a full-value alternative to in-person teaching vary depending on the level of study.

H3: Students' attitudes towards the researched aspects of online learning vary depending on the specialization of the higher education institution.

H4: Students' attitudes towards the researched aspects of online learning vary depending on the level of study.

H5: Students' attitudes towards the standard of study materials, teacher communication, teachers and students' digital competences are mutually correlated.

2 Literature review

Beginning with the 2019/2020 academic year, higher education started addressing the issues of adapting education systems to the distortions and irregularities that interfere with the orderly functioning of universities from outside in the form of extraordinary teaching conditions. The situation caused by the Covid-19 pandemic was a case in point. Higher education institutions on all continents had to urgently ensure teaching continuity for their students based on various forms of distance education. In doing so, certain issues arose regarding the different level of quality of distance education compared to in-person teaching, the use of common distance platforms to ensure a smooth learning process and the use of these tools to ensure the relevance of the assessment of students' knowledge and skills [3]. The research conducted demonstrates that respondents – engineering students – confirm satisfaction with the learning process, the use of distance tools and the level of mastery of these tools by teachers in well-organized online learning. Associated testing of learning results shows that for the same course, properly set up distance learning does not reduce the performance of engineering students. However, according to these respondents, in-person forms of teaching have undeniable and irreplaceable advantages over distance forms, mainly in the degree of socialization achieved, with practical and project work being seen as moments of sharing and exchanging information and ideas among students, as well as between students and teachers. Through socialisation, students develop their scientific and professional identity, reach maturity and prepare for the reality of practical work in their chosen field.

The second indispensable advantage of contact learning concerns the role of the teacher in practical and project work. When the teacher is in the classroom with the students, he/she is able to empathically reflect the state of mind of the students, intervening appropriately in moving towards achieving the set educational goals. Distance forms of education do not allow for such immediate feedback and the possibility of flexibly adapting teaching methods to the real time of teaching and immediate learning needs. In contrast, some studies [4] point out the relative advantage of distance forms of education in the more flexible and easier access to the desired number and specialization of courses, the technological sophistication of quality online platforms and the

ability to use the course whenever they want. In this context, another study [5] further highlights the popularity of smart devices to record, share and watch lessons at any time, it is particularly positive about the Zoom Video Conferencing app, which was effectively used by students to communicate and gain knowledge with the possibility of learning anytime, anywhere.

The degree of adaptation of higher education students to online learning is significantly dependent on their positive perceptions of self-efficacy and collaboration during the online teaching process [6]. In this sense, more than 60% of students find such learning useful. Nevertheless, approximately 50% of students also perceive some limits to such adaptation. These results suggest that students recognize the usefulness of active digital pedagogy, but at the same time they are reluctant to abandon the in-person form of teaching altogether, even if they find the online modality to be working. Students prefer to interact verbally with teachers at least once a week, which provides some clues for the development of learning management models based on blended learning. The risks of online learning are revealed by research [7], which demonstrates that the application of digital technology to education does not automatically facilitate interaction with the teacher and with other students, and that group activities through an online platform are not necessarily easier. These results are in agreement with another study [8], which revealed five critical points of online learning, i.e., the level of student interaction achieved, the number of students in online classrooms, the online test review system, the usefulness of the system and the complexity of the learning result assessment methods.

Nowadays, the virtual online platform has become an unmissable medium for teaching. Actively engaging students and encouraging them to interact with each other can lead to effective online learning [9]. Team-based learning (TBL) is a teaching strategy focused on learning in groups and in line with the study [9] it has provable potential to facilitate peer learning at the higher cognitive levels of Bloom's extended taxonomy. This finding is contradicted by several studies [10], [11], [12], which point to students' reserved attitudes towards online learning, where they lack community activities, collaboration and teamwork, brainstorming, support for critical thinking and a sense of leadership and mention higher levels of physical fatigue, relatively lower quality and quantity of knowledge gained and weaker feedback. There have been research papers that demonstrate students' positive attitudes towards open-distance learning [13], [14]. Other studies [15] point to the opportunities of distance learning, such as learning at one's own pace, anywhere, anytime and using smartphones and laptops.

Educational content and study materials influence the perception of the quality of educational design [16]. This research was conducted during the Covid-19 pandemic in Turkey based on hierarchical linear modelling with a sample of 14,962 students and 3,631 academics from 30 universities. The results showed that the variables gender, grade level, distance education experience before the pandemic and teaching methods had a significant effect on the overall student satisfaction score. On the other hand, age and faculty/higher education institution did not prove to have a statistically significant effect. The findings showed that the synchronous method in distance education positively influenced the general satisfaction score of the students. These research papers also complement the findings of another Turkish study [17], confirming the significant role of self-management in the learning process and the fact that students' motivations

for online learning were positively correlated with their self-regulation abilities for the learning competence. It has been shown that increasing students' self-regulation skills has a positive effect on their satisfaction and that satisfaction is a predictor of their study results.

Several studies [18], [19] have demonstrated the positive dependence of students' digital competences for their subsequent development of self-management skills, especially time management and developing their own personal performance and productivity. They tend to consider the tasks put in front of them more as challenges than as threats, thus being more positive and resilient to stressors. According to a Spanish study [20], a positive transfer of previous digital experiences and habits from the personal sphere (social networks, video chatting, networking) to the academic environment when studying has been demonstrated, but more advanced forms and methods of using online resources for learning, such as advanced structured searching via search engines, MOOC courses, etc. are not known. Research [21] has proven the need to strengthen teachers' digital competences. These have also been identified to be a significant limitation for the effectiveness and further development of online education. In fact, it has turned out that students evaluated the application of online learning tools during the Covid-19 pandemic negatively, because the teaching based on them was poorly handled by teachers, making it non-stimulating, often boring, oversized with a lot of homework and little feedback. Thus, the problem is also the improperly chosen online teaching strategies by teachers who are not didactically sufficiently prepared for online teaching and/or for hybrid and blended learning.

3 Methodology

3.1 Research sample

The sample was made up of students of bachelor and master study programmes focused on humanities and economics in two Czech universities. The schools and respondents were chosen by purposive sampling. The main criterion for the selection of the two universities – Prague University of Economics and Business (PUEB) and Jan Amos Komenský University, Prague (JAKUP) – was the employment of the authors in these schools as teachers. The sample was created in response to the COVID-19 pandemic crisis, when it was necessary to find out how students perceived the quality of selected aspects of online learning. The study specialization of these schools arose from the need to compare the views of students who had chosen study programmes that fell within social sciences. Therefore, this made it possible to set up a research tool in a more friendly way and thereby gain a better insight into the interpretation of the research results toward the definition of recommendations on how to make online education more effective at the level of social science education.

The research was conducted from April to June 2021 and was participated in by 968 students on a voluntary basis, with a 30% response rate from Prague University of Economics and Business, namely from the Faculty of Finance and Accounting, and with a 10% response rate from Jan Amos Komenský University, Prague. The sample consists of students of humanities and economics disciplines of bachelor and master

study levels. The structure of the sample is shown in the following table, which presents the relative frequencies of individual categories separately for each of the universities. See Table 1.

Table 1. Structure of the research sample – level of study (%)

Higher Education Institution	Level of Study		Total
	Bachelor	**Master**	
PUEB	413 (42.7%)	240 (24.8%)	653 (67.5%)
JAKUP	255 (26.3%)	60 (6.2%)	315 (32.5%)
Total	668 (69.0%)	300 (31.0%)	968 (100.0%)

3.2 Data, methods

Data collection was based on a questionnaire method within the quantitative research. The data collection took place from April to June 2021, as the Czech Republic did not allow students to attend classes in person and teaching was conducted exclusively online. A non-standardized web-based questionnaire was prepared for research purposes. The conceptual focus of the research was inspired by research that conducted factor analysis involving various concepts identified as critical success factors for online teaching [22], [23]. The questionnaire method for assessing respondents' attitudes is also frequently used in education, and has therefore been selected also in view of the quantitative nature of the research [23], [24]. The survey was conducted anonymously and remotely using school email communication with students. All sensitive data were encrypted.

The questionnaire was divided into the following topics and students expressed their attitudes towards them:

A) Higher education students' reasons for not accepting online learning as a full-value alternative to in-person teaching
B) Advantages of individual components of distance education
C) Disadvantages of individual components of distance education
D) Distance education as a full-value alternative to in-person teaching
E) Selected aspects of online learning (i.e. use of information technologies; use of distance learning components in in-person teaching, standard of study materials, teacher-student communication, level of digital competences of the teacher and students).

Table 2 shows the classification of the questions of the questionnaire under each topic and the matching of the variables expressing the respondents' answers with each question (See Table 2).

Table 2. Description of the data from the questionnaire topics A–E

Topic	Question	Variables	Classification Under Research Question/ Hypothesis
A	*What are the reasons for not accepting online learning as a full-value alternative to in-person teaching?*	respondents providing open-ended answers (nominal)	RQ1
B	*What are the advantages of individual components of distance education?*	respondents providing open-ended answers (nominal)	RQ2
C	*What are the disadvantages of individual components of distance education?*	respondents providing open-ended answers (nominal)	RQ3
D	*Do you consider distance education to be a full-value alternative to in-person teaching at higher education institutions?*	Likert Scale 4-definitely yes, 3-probably yes, 2-probably not, 1-definitely not (ordinal)	H1 H2
E	1. *In your experience, which modern technologies are most used in distance education?* 2. *How do you rate the standard of learning support materials provided by teachers during online learning?* 3. *How do you rate the level of communication with teachers during online lessons?* 4. *How do you rate the level of digital competences of the teachers who taught you?* 5. *How do you rate the level of your own digital competences?* 6. *In terms of your experience so far, which components of distance education have suited you so well that you would like them to continue to be used even in the full-time conventional study mode under standard conditions?*	1. LMS Moodle, MS Teams, Zoom, Moggis, Google Meet, E-mail, Videostream, podcast, Skype, Socrative, Kahoot, Quizizz (nominal; Multiple-choice) 2. Likert Scale 1-excellent to 5-poor 3. Likert Scale 1-excellent to 5-poor 4. Likert Scale 1-excellent to 5-poor 5. Likert Scale 1-excellent to 5-poor (ordinal) 6. lecture, tutorial, seminar, consultation, practical training, testing, webinars (nominal; Multiple-choice)	H3 H4 H5

The above questionnaire topics were structured in a manner consistent with the nature of qualitative and quantitative research. The aspects of online learning that were examined were selected according to examples of good practice and several empirical studies:

- Distance learning as a full-value alternative to in-person teaching [25];
- The most frequently used modern information technologies and elements of distance education [26];
- Study materials for online learning [27];

- Teacher-student communication during online lessons [28];
- Digital competences of teachers and students in terms of the following components: Information and media literacy; Digital communication and collaboration; Digital content creation; Responsible use of digital technologies; Problem solving through digital technologies [29], [30], [31].

Digital competences were assessed in the questionnaire by the students collectively as a whole, but the students had prior knowledge of the components of digital competences as defined by the authors in the questionnaire.

Some of the topics were supplemented with open-ended questions or the possibility of different answers from respondents, which were of the nature of qualitative research and were evaluated accordingly. These were topic A, then topic B, where students had the opportunity to fill in an open reason in case they did not perceive distance education as a full-value alternative to the in-person form of teaching. Topic C could also be supplemented with open comments from students, where they commented on the advantages and disadvantages of the online form of learning. This part of the qualitative research was evaluated by analysing the students' responses and by using the occurrence of the most frequent similar attitudes, structured according to university specialization and study level.

The last questionnaire topic E contained questions to determine the characteristics of the respondents relevant to our research. These were:

- Specialization of the universities (Prague University of Economics and Business – economics education/UJAK – humanities):
- Level of study (bachelor/master).

Neither the gender nor the age of the respondents was the object of the research, given that the aim of this study was to assess differences in students' opinions according to other aspects, namely the study specialization of the universities and the level of study.

Pre-research was carried out prior to the actual research, involving a sample of 10 students with the characteristics of the respondents from the main research, thus increasing the validity of the content. The pre-research was helpful as the non-standardized questionnaire was updated based on comments from these respondents. The comments of the respondents related mainly to the content and wording and this helped to clarify the understanding of the text. We were able to eliminate errors that would have led to the poor interpretative value of the results subsequently obtained. Reliability of the questionnaire was measured by computing Cronbach's alpha. The questionnaire was evaluated as reliable, as Cronbach's alpha was 0.704. The value is between 0 and 1 [32]. Since this test yielded a satisfactory result, we did not use different instruments to measure the validity and reliability of the research instrument.

3.3 Statistical analysis

The object of the statistical analysis was the following null hypotheses tested at 95% confidence level:

- H_{0-1}: Students' attitudes towards distance learning as a full-value alternative to in-person teaching do not vary depending on the specialization of the university.
- H_{0-2}: Students' attitudes towards distance learning as a full-value alternative to in-person education do not vary depending on the level of study.
- H_{0-3}: Students' attitudes towards the researched aspects of online learning do not vary depending on the specialization of the higher education institution.
- H_{0-4}: Students' attitudes towards the researched aspects of online learning do not vary depending on the level of study.
- H_{0-5}: Students' attitudes towards the standard of study materials, teacher communication, teachers and students' digital competences are mutually correlated.

The original data obtained from the questionnaire survey are of several types. The variables expressing the descriptive characteristics of the respondents, i.e. the specialization of the universities and the level of study are nominal variables and are used as a classification factor to perform comparative analyses. The data are described in more detail in Table 2. The data contain mostly numerical ordinal variables based on a five-point Likert scale of 1 to 5 or a four-point Likert scale. Both types are commonly treated as numerical variables. The significance is described by the arithmetic mean. As these characteristics do not meet the normality requirement (verified by the Shapiro-Wilk test), but do meet the homogeneity of variance requirement (verified by the Levene test), the Mann-Whitney U test has been selected from the two-sample tests to assess hypotheses H1 and H2. In the case of ordinal variables, the Mann-Whitney U test has also been used to verify hypotheses H3 and H4. The relationships of pairs of nominal variables in the case of hypotheses H3 and H4 have been described by means of a contingency table. These are alternative variables, so one can speak specifically about an association table, which has only two rows and two columns, and therefore contains four combinations of two variables of the two mutually assessed statistical characters.

A correlation matrix was constructed to determine the correlation relationships between the variables in the case of testing hypothesis H5. The tables presented in the Results section show only part of it. The field inside the table body always contains the value of Pearson's correlation coefficient *r*, which is typically used for this type of data. The statistical analysis was performed using the SPSS programme.

4   Results

The results are listed following the order of the research questions and hypotheses.

4.1   Results of qualitative research (RQ1–RQ3)

The results of the qualitative research are structured according to the research questions (See Tables 3–5).

Table 3. What are the reasons for students not accepting online learning as a full-value alternative to in-person teaching? (RQ1)

	Bachelor	**Master**
PUEB	In-person teaching is more effective – it is easier to hold attention, discuss, collaborate. In-person teaching is irreplaceable in personal contacts (first year students do not know teachers, classmates). Isolation – stress, depression Absence of feedback Technical problems and the stress involved.	Lack of social contacts, discussions, debating, interaction. Lower quality of lectures and seminars. Impossibility of implementing seminars, which use special software available at school, or demanding computational, accounting exercises. Being overloaded with the preparation of term papers. Technical problems on the part of both teachers and students.
JAKUP	Lack of personal contacts and communication with teachers. Teaching of some subjects replaced by self-study and term papers. Absence of practical exercises and discussion. Lack of digital competences of teachers – inability to conduct online teaching. Many of the lectures and seminars were not conducted online. In many cases, communication was performed only via email. Technical problems.	Lack of personal contacts (teachers, classmates), interaction, discussion. Teaching was reduced, some subjects were not taught online. Absence of feedback.

When comparing students' responses by university specialization, differences in opinions are particularly noticeable in the area of lessons replaced by self-study and term papers. Furthermore, the lack of personal contacts and feedback along with technical problems and overloading of students are the next key obstacles.

Table 4. From the perspective of students, what are the advantages of distance education components? (RQ2)

	Bachelor	**Master**
PUEB	Time saving, flexibility Financial savings (on transport costs, food, accommodation) Recording the lecture, possibility of revisiting the content repeatedly Calmer and stress-free environment More effective way of communicating with teachers (consultation) Access to study materials	Time flexibility, possibility of replaying seminars and lectures retroactively Time saving Easier to combine studies with work Ability to connect from anywhere
JAKUP	Saving time, finances, not having to commute Connecting from anywhere, at anytime Calm environment, comfort of home None	Time flexibility Comfortable home environment No need to commute

The most frequent opinions, regardless of the university's specialization and the level of study, include saving time and finances, a calm and comfortable home environment, more effective communication with the teacher and the possibility of combining studies with work.

Table 5. From the perspective of students, what are the disadvantages of the distance education components? (RQ3)

	Bachelor	**Master**
PUEB	Lack of social contacts (classmates, teachers, study officers) Isolation Absence of student life, school environment Lower motivation to study and ability to hold attention Problems during seminars – poor interactivity, insufficient space for questions, misunderstanding Absence of group work Difficulty of exams, not enough time – stress Stress due to possible internet failure (technical problems)	Lack of direct contacts with the teacher and classmates, interaction, communication Unavailability of paid software applications (e.g. Matlab) necessary for lessons Loss of motivation, attention Lack of teamwork, cooperation Inadequate testing and examination methods Greater emphasis on self-study Technical problems Limited access to the library
JAKUP	Lack of direct contacts (teachers, classmates), interaction, limited communication Study materials made available on various channels Inconsistency in the use of online platforms (ZOOM, MS Teams, possibly Google Classroom) Absence of feedback Lack of digital competences of the teachers Teaching of many subjects replaced by term papers and self-study Inability to concentrate at home Inadequate testing and examination methods	Lack of direct contacts (teachers, classmates), interaction, discussion, debating, limited communication Online lessons replaced by a lot of assignments and term papers Inadequate method of testing and examinations (degree of difficulty, technical competences, time – stress) Poor digital competences of the teachers and students

It can be concluded that students of both higher education institutions and levels of study perceive the disadvantages of distance education similarly. The disadvantages of distance education coincide with the reasons mentioned by students for not accepting distance education as a full-valued alternative to the in-person form of teaching.

4.2 Results of quantitative research (H1–H5)

The results of the quantitative research are structured according to the individual hypotheses. Firstly, hypotheses H1 and H2 were evaluated, i.e. students' attitudes towards distance learning as a full-value alternative to in-person teaching depending on the university specialization and the level of study. These attitudes were described by arithmetic mean and standard deviation. Statistical differences according to the classification factors were established using the Mann-Whitney U test. The results are presented in Tables 6 and 7.

Table 6. Descriptive statistics – distance learning as an alternative to in-person teaching (H1 and H2)

Classification Factor	N	Mean	Standard Deviation
University specialization (H1)			
JAKUP (humanities)	285	2.558	1.018
PUEB (economics)	607	2.728	.905
Level of study (H2)			
Bachelor	605	2.691	.950
Master	287	2.638	.936

At the level of the established averages, differences in the perception of distance learning as a full-value alternative to in-person teaching in terms of classification factors are more than evident. The students of economics (PUEB) are in favour of the distance learning alternative in the full-time conventional study mode (2.728) compared with the students of humanities (JAKUP). This alternative is also more accepted by students of bachelor study programmes (2.691) compared to those in master study courses.

Table 7. Significance of differences between students' attitudes according to classification factors (H_{0-1} and H_{0-2})

Factor	Specialization of the University p	Level of Study p
Distance learning as a full-value alternative to in-person teaching	.015	.385

Statistically significant differences at the 95% confidence level were found depending on the specialization of the university. This means that this factor is perceived differently by students of humanities and students of economics. In terms of the level of study, no statistically significant differences were found among students' attitudes towards this factor. Hypothesis H_{0-1} is rejected at the 5% significance level, while hypothesis H_{0-2} is not rejected at the 5% significance level.

Hypotheses H3 and H4 were tested with respect to nominal and ordinal variables using two statistical methods, namely the Chi-square test and Mann-Whitney U test. The results obtained by descriptive statistics methods are presented first (Tables 8 and 9). Then the results of the verification of hypotheses H3 and H4 in the case of ordinal variables are shown in Table 10.

Table 8. Descriptive statistics – Attitudes towards the researched aspects of online learning from the university perspective, ordinal variables (H3)

	University	**A**	**B**	**C**	**D**
N	JAKUP	315	315	315	315
	PUEB	653	653	653	653
Mean	JAKUP	2.517	2.073	2.210	1.984
	PUEB	2.072	2.026	2.182	1.859
Standard deviation	JAKUP	1.084	.963	.994	.733
	PUEB	.925	.983	.868	.852

Abbreviations: A – standard of study materials; B – communication with the teacher; C – digital competences of the teacher; D – digital competences of the student.

At the level of the established averages, differences in the attitudes towards the importance of online learning aspects were detected in terms of the specialization of universities. Students of humanities (JAKUP) perceived a greater importance of these aspects for online learning compared to students of economics study programmes (PUEB).

Table 9. Descriptive statistics – attitudes towards the researched aspects of online learning in terms of level of study, ordinal variables (H4)

	Level of Study	**A**	**B**	**C**	**D**
N	Bachelor	668	668	668	668
	Master	300	300	300	300
Mean	Bachelor	2.277	2.069	2.187	1.924
	Master	2.083	1.980	2.200	1.847
Standard deviation	Bachelor	1.015	.985	.919	.821
	Master	.955	.957	.892	.807

Abbreviations: A – standard of study materials; B – communication with the teacher; C – digital competences of the teacher; D – digital competences of the student.

At the level of the established averages, differences in the attitudes towards the importance of online learning aspects were detected in terms of the level of study. Students of bachelor programmes perceive a greater importance of aspects for online learning compared to master degree students in the case of the standard of study materials, communication with the teacher and digital competences of the student. In the case of the digital competences of the teacher, a greater importance of this aspect for online learning is felt by master degree students.

Table 10. Significance of differences between attitudes towards online learning aspects according to classification factors (H_{0-3} and H_{0-4}), Mann-Whitney U test

Online Learning Aspect	Specialization of the University p	Level of Study p
A – Standard of study materials	$< .001$	.005
B – Communication with the teacher	.321	.199
C – Digital competences of the teacher	.928	.797
D – Digital competences of the student	.001	.165

Tables 11 and 12 show the results of the verification of hypotheses H3 and H4 in the case of the nominal variables in terms of the classification factors for the determination of differences in students' attitudes. Only the results with significant differences are presented in the tables.

Table 11. Significance of differences between attitudes towards online learning aspects according to specialization (H_{0-3}), Chi-square test

Online Learning Aspect	Value	df	Specialization of the University p
Use of distance learning components in the full-time conventional study mode			
Lectures	7.599	1	.006
Seminars	17.265	1	$< .001$
Webinars	3.994	1	.046
Use of information technologies			
Zoom	32.645	1	$< .001$
Google Meet	14.111	1	$< .001$
Skype	6.446	1	.011
Kahoot	63.945	1	$< .001$

Table 12. Significance of differences between attitudes towards online learning aspects according to the level of study (H_{0-4}), Chi-square test

Online Learning Aspect	Value	df	Level of Study p
Use of distance learning components in the full-time conventional study mode			
Testing	5.529	1	.019
Webinars	23.972	1	$< .001$
Use of information technologies			
Moggis	12.439	1	$< .001$

Hypothesis H_{0-3} is rejected at the 5% significance level for the following aspects: the standard of study materials and digital competences of the student, use of online lectures, seminars and webinars in the full-time conventional study mode and the most

frequent use of Zoom, Google Meet, Skype and Kahoot in distance learning. Students of economics programmes perceive distance elements as more appropriate for use in in the full-time conventional study mode compared to humanities students. At the same time, more humanities students compared to students in economics study programmes indicated that Zoom, Google Meet, Skype, and Kahoot information technologies were not used in online lessons. Other aspects have not been perceived significantly differently by students.

Hypothesis H_{0-4} is rejected at the 5% significance level for the following aspects: the standard of study materials, use of online testing and webinars in the full-time conventional study mode and the most frequent use of Moggis in distance learning. Master programme students perceive distance elements more inappropriately for their use in the full-time conventional study mode compared to students of bachelor programmes. At the same time, more master degree students compared to those studying at bachelor level indicated that Moggis information technology was not used in online lessons. Other aspects are not perceived significantly differently by students.

Hypothesis H5 was tested by Person's correlation coefficient *r*, which was used to find correlations between the following variables: the standard of study materials, communication with the teacher, digital competences of the teachers and digital competences of the students. The statistical analysis was tested at the 95% confidence level. The results are shown in Table 13 in the form of a correlation matrix.

Table 13. Correlation matrix

		A	**B**	**C**	**D**
A Standard of study materials	Pearson's *r*	–			
	p	–			
B Communication with the teacher	Pearson's *r*	.508	–		
	p	<.001	–		
C Digital competences of the teacher	Pearson's *r*	.489	.471	–	
	p	<.001	<.001	–	
D Digital competences of the student	Pearson's *r*	.251	.311	.294	–
	p	<.001	<.001	<.001	–

The correlation analysis shows that the four variables researched are positively correlated with each other. The strongest positive relationships were found for the following three pairs: evaluation of the standard of study materials for online lessons (A) – communication with the teacher during online lessons (B); evaluation of the standard of study materials for online lessons (A) – evaluation of the teacher's digital competences (C); communication with the teacher during online lessons (B) – teacher's digital competences (C). A weaker positive relationship was established for the remaining pairs of variables (A – D; B – D; C – D). This may be mainly due to the fact that students' level of digital competences is not directly related to online lessons in the sense of teaching. Hypothesis H_{0-5} is rejected at the 5% significance level.

5 Discussion

The research study focused on the perception of selected aspects of online learning among Czech university students specializing in humanities and economics. Our study supported the finding that students do not accept distance education as a full-value alternative to the in-person form of teaching [6], [25]. Our qualitative research shows that students, regardless of their study specialization or level, perceive some limitations in distance or online learning, but also acknowledge its advantages. According to students, the key obstacles are the high level of self-study imposed on them by teachers, the lack of personal contact and feedback, technical problems, and overloading of students. The authors [3] also point out the limitations of the teacher's role in practical and project work. Our findings are in line with the study [33], which expands the risks with a lack of sense of belonging to the community and the loss of the opportunity to discuss new things and exchange experience directly. Other authors consider the risks of online or distance learning to be a lack of transparency in online examinations, testing and methods of assessing learning results [8] or inappropriately structured online curricula [12].

Our study confirmed previous findings concerning the benefits of distance or online learning. Regardless of differences in the study specialization or level, students most often consider the advantages of online learning to be saving time and finances, a calm and comfortable home environment, more effective communication with the teacher and combining study with work. Although online learning denies contact between teacher and student, it does allow for remote communication in synchronous or asynchronous form to be more effective. Our study thus contributed to the emerging phenomenon, which is digital pedagogy [6]. This field has the task of integrating 21st century professionals into a new educational era. The authors illustrate this in a large study on a sample of 483 students from the University of Seville, Spain, focused on assessing the autonomous role of students in relation to teachers and networking in communication and collaboration to support the shared goal of learning subjects online. Therefore, the authors recommend strengthening pedagogical communication, providing timely and complete information about changes, involving students in decision-making processes, adapting the content and teaching methods to the extent and format of the implemented online teaching and learning, making them user-friendly, strengthening synchronous forms of education, and reducing the range of online learning tools used.

Our study provides new insight into the perceived aspects of online learning from the perspective of significant differences between higher education students in terms of their specialization (i.e., humanities, economics) and study level (i.e., bachelor, master). Significant differences were found in the case of study specialization, with students differing in their opinions particularly on distance learning as a full-value alternative to the in-person form of teaching, on the standard of study materials, digital competences of the student, and on the possibility of using online lectures, exercises and webinars in the full-time conventional study mode. Differences were also evident in the use of online tools. However, the situation was better in economics study programmes, where students can more imagine the use of online learning in the full-time conventional study mode. Our findings can be compared, for example, with a study from a Turkish

university environment [16], which found a significant effect of gender, grade level, distance education experience before the pandemic and teaching methods on overall student satisfaction scores. On the other hand, age and faculty or higher education institution did not prove to have a statistically significant effect. Our study contradicts this finding, which is mainly due to the countries where the research was conducted.

Beyond empirical research [16] our study has newly revealed significant differences in perceptions of online learning in the case of study levels. Students have different opinions about the standard of study materials, the use of online testing, and the possibility of using webinars in the full-time conventional study mode. Master degree students are more critical of online learning aspects compared to students of bachelor study programmes. As to its characteristics this finding appears to be similar to research [20] on generational differences in terms of online teaching. The authors have found that Generation Z interacts more intensively online, but does not demonstrate a better understanding of technology tools to support learning than Millennials. The effectiveness of using digital technologies and online learning tools at the university level is not related to age.

Our study also showed that the standard of study materials, student-teacher communication, digital competences of the teacher and the student are positively correlated. This finding is in line with research [34], [35], which revealed a positive correlation between student-centred teaching design and the quality of distance education based on interactive communication methods and developed online communication. It can be concluded that the development of online learning applying user-friendly tools is an effective component of blended learning [35]. This is facilitated by digital infrastructure, support for student work and optimized, appropriately structured educational content in the form of study materials.

It is necessary to point out certain limitations of our study, which may explain some of the discrepancies between our study and the current empirical knowledge relevant to our research. Our research did not include the maximum possible number of variables that may influence higher education students' perceptions of online learning aspects. Another limitation is the structure of the sample, which was limited to two study specializations, namely humanities study programmes and economics study programmes taught at higher education institutions in the Czech Republic. Therefore, it will be necessary to continue this research, in which we see the potential for the future of education, and, in particular, to expand not only the sample to include other different study specializations taught at higher education institutions, but also to include variables that can be used to more validly assess the reasons for higher education students' views on distance or online education.

6 Conclusion

The existing knowledge and our empirical study show the relevance of digital pedagogy for the present time. This phenomenon obviously has its pitfalls, but there are also a number of advantages, among which one can clearly include the prospect of a certain cautious transfer of the online form of teaching into the traditional in-person form. It will be possible to make use of this transfer primarily for the practitioners and

other guests taking part in the lessons. By using various platforms that allow online transfer, the teacher can conduct office hours in this way and address students' problems in terms of overall learning in an efficient way that saves time and money on both sides. These recommendations are consistent with and clearly contribute to the new phenomenon, which is digital pedagogy. On the other hand, these recommendations will require the involvement of school management in terms of providing training for teachers in the didactics of online teaching, the application of new methods and digital learning resources in teaching. This will be challenging in terms of time, finances and also the setting of the parameters for sustainable professional development of the higher education teacher.

It can be concluded that this is a contemporary trend in education. This transition still has a long way to go, as a number of pressing issues will have to be discussed, particularly in relation to the system of control and methods of assessing learning results in the case of online examinations or testing. Therefore, our study also opens up these issues for future investigation. It will be necessary not only to ascertain the attitudes of students specializing in other fields of study in higher education, but above all to develop and pilot-test control systems of learning result assessment that will respect objectivity and offer reliability in the evaluation of results.

7   Acknowledgment

8   References

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