e-mentor

DWUMIESIĘCZNIK SZKOŁY GŁÓWNEJ HANDLOWEJ W WARSZAWIE
WSPÓŁWYDAWCA: FUNDACJA PROMOCJI I AKREDYTACJ KIERUNKÓW EKONOMICZNYCH

2024, nr 2 (104)

Krzyżak, J., & Walas-Trębacz, J. (2024).Challenges in remote education: analysis of social interaction, motivation and engagement. *e-mentor, 2*(104), 44–53. https://doi.org/10.15219/em104.1654

Joanna Krzyżak

Jolanta Walas-Trębacz

Challenges in remote education: analysis of social interaction, motivation and engagement

Abstract

This article analyses selected challenges of remote education, focusing on the impact of the COVID-19 pandemic. It is divided into a theoretical part, synthetically explaining the key challenges related to remote education: social interactions, students' motivation and engagement, and an empirical part, presenting the results of a survey conducted on 1828 students at the Cracow University of Economics. The empirical research enabled analysis of the impact of selected distance education factors on the level of perceived learning outcomes by students, with a particular focus on social interactions (both between teachers and students, and among students), student motivation, and engagement in remote learning environments. The data was collected through a survey distributed in 2020 and 2022, using the Computer Assisted Web Interviewing (CAWI) technique via Google Forms. The results indicate moderate improvements in social interaction and motivation over time, with a slight decrease in the perceived effectiveness of remote learning. The literature review and empirical study reveal changes in the quality, motivation, and engagement of interaction, emphasising the need to adjust teaching strategies in the areas considered to increase the effectiveness of remote education. This study enriches the current literature by addressing gaps and providing suggestions for directions of future research, additionally providing practical recommendations for teachers and educational institutions to improve the efficacy of remote learning.

Keywords: remote education, social interaction, motivation, engagement, challenges in remote education

Introduction

Remote education has become an integral part of the modern educational system, with its importance significantly increasing as a result of global events such as the COVID-19 pandemic (Saliba, 2023). The higher education system has also recently undergone transformational change, accelerated by the pandemic, which elevated remote education to the dominant position of the main educational approach for a vast number of students worldwide. This rapid change has highlighted numerous challenges and opportunities that define remote learning environments, with particular emphasis on the nuances of social interaction, motivational dynamics, and the crucial importance of student engagement (Adedoyin & Soykan, 2020).

Although remote education was studied prior to the pandemic, its urgency and scale during the crisis have amplified its importance (Karakose et al., 2022; Krzyżak & Walas-Trębacz, 2021; Maini et al., 2021; Martin, 2023; Svatos et al., 2022; Tsang et al., 2021).

This article aims to provide nuanced insights into the evolving challenges of remote learning, focusing on teacher-student and student-student interactions, motivation, and engagement.

Social interactions in remote classes are often perceived as inferior to traditional settings, highlighting the need for improved communication dynamics (Abbasnejad et al., 2023; Ryan et al., 2020). Motivation and engagement are pivotal for effective learning, and their impact in remote contexts varies, influencing educational outcomes. Understanding how these challenges differ over time has practical implications for educators,

Joanna Krzyżak, Krakow University of Economics, Poland, https://orcid.org/0000-0002-8230-3552
Jolanta Walas-Trębacz, Krakow University of Economics, Poland, https://orcid.org/0000-0002-8266-8922

e-course designers, educational authorities, and university authorities. For example, gaining knowledge about achieving differentiated outcomes can help tailor pedagogical practices and teaching materials to the needs of current students (Deng, 2022).

The methodology of this study includes a survey of students at the Cracow University of Economics during two different time periods, in 2020 and 2022, strategically chosen to capture the initial adaptation to remote learning and the subsequent period of continued reliance on this mode of education. The longitudinal approach allows for an analysis of changes and trends over time, offering insights into the persistence of the phenomena observed and the evolving nature of the challenges associated with remote education.

The study contributes to academic discourse by providing empirical evidence on the impact of social interaction, motivation, and engagement on learning outcomes in remote contexts, particularly amid pandemic-induced transitions. Practical implications include recommendations for improving remote education quality, aiding in pedagogical practices, curriculum design, and policy implementation (appendix 1).

The structure of this article has been designed in a systematic way to provide an in-depth understanding of selected challenges of remote education. The article begins with an introduction discussing the topic's rationale, research context, objectives, and study scope and limitations, before proceeding to review theoretical aspects of remote education, social interaction, motivation, and engagement. The research methodology is then outlined, presenting results that address key challenges: social interaction, motivation and commitment. The discussion section interprets the obtained results, connecting them to existing literature and highlighting their theoretical and practical implications. Finally, the study concludes by summarising findings and suggesting future research directions.

Literature review

Understanding interactions in remote education

This section aims to introduce existing theoretical frameworks facilitating further analysis and interpretation of online interactions, motivation and engagement during online education.

Social interaction in online education is pivotal for its quality and effectiveness (Karakose et al., 2022; Sitnicki et al., 2023), while understanding online education interactions requires a multidimensional approach, drawing from theoretical frameworks such as social constructivism, the transactional distance theory, the social presence model, and the self-regulation theory. Within the realm of social constructivism, online interactions are central to negotiating meaning and constructing knowledge. L. S. Vygotsky's zone-of-proximal-development theory underscores the importance of interactions with more experienced individuals in skill and knowledge development (Vygotsky, 1978). In the transactional distance theory, M. G. Moore posits a "distance" between teachers and students in remote education, necessitating educational interactions to minimise this (Moore, 1993). The social presence model emphasises the need for participants to feel a sense of "presence" in the virtual environment, achieved through interactions such as dialogue and non-verbal communication (Garrison et al., 1999). The self-regulation theory views online interactions as mechanisms for students to manage their learning process, particularly crucial in asynchronous remote education models (Zimmerman, 2000). Integrating these perspectives offers a holistic understanding of social interaction mechanisms in the online environment, which is crucial for optimising educational practices in remote contexts (Tsang et al., 2021; Yan, 2021).

Effective interaction with teachers is critical for remote learning (Karakose et al., 2022), where teachers serve as mentors guiding students through programme content. However, challenges such as maintaining effective communication and resolving technological issues can hinder interaction quality (Svatos et al., 2022). Student interaction is integral to remote education, facilitated by Learning Management System (LMS) platforms and online communication tools (Pappas, 2019; Sitnicki et al., 2023; Yan, 2021). Nonetheless, limited physical presence may impact interaction quality, and creating an environment encouraging active student interaction remains a challenge (Saliba, 2023) (appendix 2).

The role of motivation in remote learning

Motivation to learn plays a crucial role in remote learning outcomes, often demanding self-discipline and organisation, which can be challenging for some students (Krzyżak & Walas-Trębacz, 2021). The shift to online learning methods has propelled remote education to the forefront of research (Martin, 2023).

One of the key models explaining aspects of motivation in education is the Self-Determination Theory developed by E. L. Deci and R. M. Ryan, in which the authors highlight that autonomy, competence, and social relationships as fundamental to intrinsic motivation in education (Deci et al., 2017; Ryan et al., 2020). The Achievement Goal Theory proposed by C. Dweck, on the other hand, is one of the better-known approaches in psychology, focused on understanding the variety of goals that learners can set for themselves in an educational context (Dweck, 1986) (appendix 3). Understanding this theory in the context of remote education can have practical implications, as appropriate support mechanisms can be used to promote mastery-oriented goals, which in turn can increase learner motivation and engagement (Martin, 2023). The Expectancy-Value Theory developed by J. Eccles and others proposes that motivation for learning is a function of expectations of success and the value attributed to the task (Eccles et al., 1983). Self-monitoring mechanisms, on the other hand, are necessary to maintain high levels of motivation in the process of self-directed learning, according to the self-regulation theory (Zimmerman, 1990). In the context of distance education, the Self-Regulation

Theory becomes particularly relevant. Remote environments require learners to be more independent and self-disciplined, which make self-regulation skills even more important, the development of which can be supported by appropriately designed learning materials, interactive platforms and continuous feedback (Krzyżak & Walas-Trębacz, 2021) (appendix 4).

Engagement during online education

Engagement in remote studies is a key factor affecting the quality and effectiveness of the teaching and learning process, both in traditional and online contexts (Thompson et al., 2023). In the context of remote education, engagement is of particular interest because of unique challenges such as social isolation, lack of face-to-face interaction with teachers and peers, and varying access to educational resources (Bergdhal, 2022). Engagement in remote education can be defined as an active and purposeful process of student participation in learning tasks that leads to understanding and assimilation of knowledge (Fredricks et al., 2004). Its three main dimensions are most often mentioned: behavioral engagement, affective engagement and cognitive engagement (Appleton et al., 2008).

In remote education, measuring engagement is particularly complicated and requires multidimensional assessment tools (Maini et al., 2021; Thompson et al., 2023). Several commonly used tools can be listed as follows: analysis of the e-learning platform, surveys and questionnaires, teacher evaluations and qualitative methods (interviews and observations) (Carmona-Halty et al., 2019). Understanding the impact of engagement on remote education effectiveness is crucial for developing effective pedagogical and technological strategies (Abbasnejad et al., 2023), emphasising the need for engaging teaching materials and activities and monitoring students' engagement (Tsang et al., 2021).

Research methodology

Remote education has become a common method for transferring knowledge, which was especially visible during the COVID-19 pandemic. However, despite its growing popularity, there are numerous challenges related to social interaction, motivation and student engagement.

To reliably investigate and analyse the main challenges of social interaction, motivation, and engagement in remote education, the study was divided into three main stages: conceptual, empirical, and deductive (Kreamer et al., 2023; Sułkowski et al., 2021), with each stage playing a key role in obtaining practically useful results.

The first stage of the research process involved conducting a review of Polish and foreign literature using four publicly available databases: EBSCO, Scopus, Web of Science, and Emerald. The literature review formed the basis for the formulation of the research problems to which answers were sought and addressed three issues (the focus of the research): interaction, motivation and engagement during remote education. This analysis made it possible to determine the types of research problems addressed so far by different authors and to identify the existing research gap in the field.

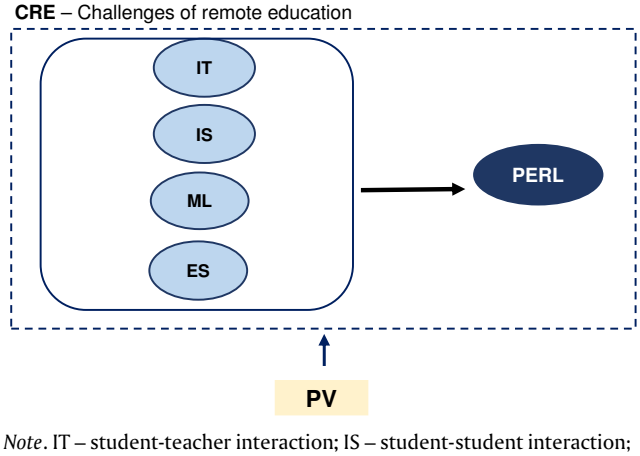
The empirical study was designed to determine how remote education affects students' perceived effectiveness, focusing on challenges associated with remote education. Aspects such as the quality of social interactions between participants in the educational process, the level of motivation to learn, and the degree of engagement in the distance learning process were considered. The study aimed to investigate longitudinal changes in interactions, motivation, engagement and effectiveness of remote learning during and after the peak of the COVID-19 pandemic.

To help understand the phenomenon under study, and also guide the research process, a research model was developed (see Figure 1).

In the conceptualisation stage, the task was to prepare the research tool, namely a survey questionnaire. The survey design aimed to collect data that directly answers the research questions posed, while ensuring ease of analysis and interpretation of the results. The survey was designed to elicit detailed information about students' experiences of remote learning, taking into account both positive and negative aspects. The questions were formulated in such a way as to obtain data on the quality of student-teacher interaction, student-student interaction, students' level of motivation to learn, and their level of involvement in the educational process.

The questionnaire was divided into two main sections: the first section relied on six demographic questions, and the second section contained 17 specific questions. The questions were closed-ended, and respondents answered each question using a scale of

Figure 1
CRE-PERL research model



Note. IT – student-teacher interaction; IS – student-student interaction; ML – motivation for remote learning; ES – engagement in remote study; PERL – the perceived effectiveness of remote learning; PV – temporal context (year 2020 and year 2022).

Source: authors' own work.

1–5 (where 1 meant very poor, 2 – poor, 3 – average, 4 – good, 5 – very good). This article focuses on the analysis of five selected questions from an extensive research project.

The questionnaire sheet was reviewed using a diagnostic survey for its accuracy and understanding of the questions by three experts in the field under study. After gathering the opinions of the experts and making minor adjustments to the questionnaire form, a target group (the size of the research sample) was established, paying attention to representativeness (Flick, 2020). The improved version of the questionnaire was used in the framework of proper research, which was quantitative in nature.

In the next stage, research was conducted among deliberately selected respondents in two periods: in the summer semester of 2020 (648 students) and in the winter semester of 2022 (1,180 students). To achieve the research goal, a purposeful sampling method was implemented, characterised by a conscious selection of study participants. The purposive sampling was justified by its specificity, as well as by constraints, such as the time available. The selection criteria were closely related to the research assumptions and were of key importance for achieving the intended research goal. The survey targeted students from various institutes of the Cracow University of Economics, who took part by responding to a questionnaire. The survey was conducted exclusively online, using a platform known for its security and ease of use to ensure maximum participation and an accurate representation of the university population. Participation in the study was voluntary and anonymous, and all respondents agreed to share their opinions on the challenges and expectations in the context of remote education during the pandemic. The Computer Assisted Web Interviewing (CAWI) technique and Google Forms were chosen to conduct the survey, due to several key advantages of these methods in the context of this study, namely: a high level of accessibility, assurance of anonymity, and efficiency and ease of analysis (Sułkowski et al., 2021).

Once the data was collected, data processing and statistical analysis was undertaken using the Statistica PL 13.3 package (George et al., 2016).

The final (deductive) stage undertook the formulation of practical recommendations and conclusions (Sułkowski et al., 2021), which can be of relevance to teachers, e-course designers, and educational authorities.

Characteristics of the research sample

The survey was conducted twice among 1,828 students at Cracow University of Economics, representing different forms of study, majors, and years of study.

The structure of the participants is shown in Table 1, which includes the six key criteria according to which the respondents were divided (appendix 5).

Table 1

Characteristics of the surveyed respondents according to different breakdown criteria

Parameter		2020		2022	
		N	%	*N*	%
Gender	Women	394	60.80	825	69.92
	Men	254	39.20	355	30.08
Age	18–19 years old	216	33.33	309	26.19
	20–22 years old	229	35.34	609	51.61
	23–24 years old	148	22.84	169	14.32
	Over 24 years old	55	8.49	93	7.88
Year of study	Little study experience (1st year of studies)	216	33.33	551	46.70
	Medium level of study experience (2nd year of studies)	193	29.78	371	31.44
	Extensive study experience (3rd and 4th year of studies)	239	36.89	258	21.86
Forms of study	Full-time studies	355	54.78	790	66.95
	Part-time studies	293	45.22	390	33.05
Attendance at remote classes during the last semester	Attendance up to 25%	1	0.15	4	0.34
	Attendance 25–50%	11	1.70	18	1.53
	Attendance 51–75%	59	9,10	87	7.37
	Attendance above 75%	577	89.05	1071	90.76
Remote learning equipment	Exclusive equipment	613	94.60	1117	94.66
	Equipment shared with others	35	5.40	63	5.34

Source: authors' own work.

Research results

The presentation of results includes descriptive statistics and correlation analysis. The study was conducted over two separate periods – 2020 and 2022 – to identify changes in students' perceptions of remote education and assess how the challenges of remote learning have evolved.

The results on the CRE-PERL model variables (see Figure 1) are presented in Tables 2 and 3, which expose the most important changes observed between the two research periods.

In Round II of the study (2022), some interesting trends can be observed compared to the data from Round I (2020). The mean value of student-teacher interaction during remote classes in Round II ($M = 2.40$; 95% CI [2.34, 2.45]) was slightly higher than in Round I, where it was 2.34. Moreover, the standard deviation in Round II ($SD = 1.01$) indicates slightly less variation in the responses compared to Round I ($SD = 1.11$). Similarly, the mean value of student interaction in Round II ($M = 2.12$; 95% CI [2.06, 2.18]) was also higher compared to Round I, where it was 2.00. The variation in responses remained similar, with a standard deviation of 1.04 in Round II and 1.10 in Round I. Regarding the motivation to study remotely, the mean value in Round II ($M = 2.72$; 95% CI [2.66, 2.78]) was higher than in Round I, where it was 2.60. The standard deviation in Round II ($SD = 1.09$) was also slightly lower than that in Round I of the study ($SD = 1.16$). A similar trend can also be observed in the category of involvement in remote studies, where the mean value in Round II ($M = 2.71$; 95% CI [2.65, 2.77]) is slightly higher than in Round I, where it was 2.70, while the standard deviation ($SD = 1.07$) is similar to Round I ($SD = 1.14$). Regarding the remote learning effects, the mean value in Round II ($M = 3.05$; 95% CI [2.99, 3.11]) was slightly lower than in Round I of the study, where it was 3.21. The standard deviation in Round II ($SD = 1.07$) was also lower than that in Round I ($SD = 1.22$).

In summary, the results of Round II of the survey suggest an overall, albeit small, improvement in aspects such as social interaction and motivation, with a slight decline in the perceived effectiveness of remote learning. The smaller standard deviations in Round II of the survey may indicate less variation in the respondents' answers. It is also worth noting that both rounds of surveys present moderate to positive attitudes toward remote education in various aspects.

The empirical study focused on analysing the impact of remote education on learning outcomes, taking into account key aspects such as social interaction, motivation to learn, and engagement in the distance learning process (see Figure 1). The analysis of the results presented in Table 4 relates Kendall's Tau correlations between the variables and the effects of distance learning in the first and second research rounds, with correlation values statistically significant at the $p < 0.05$ level, suggesting that these relationships are not random.

In Round I of the study, the correlation between students' interactions with the teacher during remote classes and the effects of remote learning was 0.411, while in Round II it was 0.402. This is a moderately positive correlation, suggesting that the quality of interaction with the teacher affects the effectiveness

Table 2
Descriptive statistics of IT, IS, ML, ES and PERL variables for 2020

Variable	Descriptive statistics (I Round of research)									
	N	*M*	–95.000% CI	95.000% CI	Me	Min	Max	Q1	Q3	SD
IT	648	2.34	2.26	2.43	2	1	5	2	3	1.11
IS	648	2.00	1.92	2.09	2	1	5	1	2	1.10
ML	648	2.60	2.51	2.70	3	1	5	2	3	1.16
ES	648	2.70	2.61	2.79	3	1	5	2	3	1.14
PERL	544	3.21	3.11	3.32	3	1	5	2	4	1.22

Source: authors' own work.

Table 3
Descriptive statistics of IT, IS, ML, ES and PERL variables for 2022

Variable	Descriptive statistics (II Round of research)									
	N	*M*	–95.000% CI	95.000% CI	Me	Min	Max	Q1	Q3	SD
IN	1180	2.40	2.34	2.45	2	1	5	2	3	1.01
IS	1180	2.12	2.06	2.18	2	1	5	1	3	1.04
ML	1180	2.72	2.66	2.78	3	1	5	2	3	1.09
ZS	1180	2.71	2.65	2.77	3	1	5	2	3	1.07
PERL	1173	3.05	2.99	3.11	3	1	5	2	4	1.07

Source: authors' own work.

Table 4

Kendall Tau correlations for the impact of distance learning on learning outcomes: comparison between 2020 and 2022

Variable	Kendall's Tau correlation, BDs removed in pairs (Round I of research: 2020) and (Round II of research: 2022). Marked correlation coefficients are significant with $p < 0.05000$	
	PERL (2020)	PERL (2022)
IT	0.411093	0.401538
IS	0.413304	0.425641
ML	0.512150	0.549584
ES	0.478344	0.526915

Note. IT – student-teacher interaction; IS – student-student interaction; ML – motivation for remote learning; ES – engagement in remote study; PERL – the perceived effectiveness of remote learning.

Source: authors' own work.

of remote learning, although it is not the only determining factor. In the case of inter-student interactions during remote learning, the correlation in Round I was 0.413, and 0.426 in Round II. The correlation is slightly higher in Round II, which may indicate the increasing importance of student interaction in terms of students' perceived effectiveness of distance learning. A significant correlation was observed for motivation for remote learning: 0.512 in Round I and 0.550 in Round II, and was the highest correlation of all the variables studied, increasing over time, suggesting that motivation is a key factor influencing respondents' perceived effectiveness of remote learning. The correlation between engagement in remote studying and perceived effectiveness of remote learning was also significant, at 0.478 in Round I and 0.527 in Round II. There is a noticeable increase in this correlation over time, suggesting that engagement is becoming an increasingly important element in the effectiveness of remote education.

In summary, all of the studied variables showed statistically significant, moderate-to-strong correlations with the effects of remote learning, with the highest correlation observed for motivation for remote learning, highlighting its key role in the context of the effectiveness of remote education. The correlation values in Round II were generally higher, which is a possible indication of the increased importance of these factors in remote education in the long term.

Discussion

As part of the empirical study, the focus was on analysing the impact of remote education on students' perceived learning effectiveness. Kendall's Tau correlation analysis, presented in Table 4, showed statistically significant relationships between the quality of social interaction, level of motivation, degree of engagement and learning effectiveness in remote environments, findings that are reflected in the theoretical frameworks discussed in the literature review (Karakose et al., 2022; Maini et al., 2021; Sitnicki et al., 2023; Svatos et al., 2022), in particular the theories of social constructivism, transactional distance, the social presence model and self-regulation theory (Garrison et al., 1999).

The statistically significant correlation between the quality of social interaction and learning effectiveness (correlation for IT and IS in both study rounds) confirms the assumptions of social constructivism and the social presence model (Vygotsky, 1978). These findings highlight the importance of building a strong online learning community, where student-student and student-teacher interactions are central to the knowledge construction process, which provides empirical support for the implementation of pedagogical practices that support active discussion, group work and mutual support in a remote environment (Svatos et al., 2022; Tsang et al., 2021; Yan, 2021).

It can be assumed that the change in the perception of social interaction (teacher-student and student-student) in the context of remote classes may be due to numerous factors, both individual and structural. At the individual level, participants may adapt to the new educational format and become more proficient in the use of remote communication technologies. Ultimately, it is the understanding of the mechanisms and tools available on educational platforms that can influence the positive evaluation of interactions with teachers and other participants in remote classes (Martin, 2023).

From a structural perspective, improvements in technology or changes in teaching methods can also play a role, for example, teachers can introduce interactive elements such as surveys, quizzes, or group discussions to increase engagement and social interaction. In addition, universities can offer training for teachers on effective pedagogical practices in remote education, which in turn can affect the quality and level of social interaction (Amon, 2021; Pons et al., 2013; Svatos et al., 2022). It is also possible that the social dynamics of the student group evolve, resulting in better interactions and a greater sense of community. This sense of connectedness can influence positive perceptions of social interactions, even in the context of remote education (Ober & Kochmańska, 2022; Xhaferi & Xhaferi, 2020). It is also worth noting that external circumstances, such as a pandemic or other socio-political events, can affect the overall atmosphere in which remote

education takes place, and thus the perception of social interaction. In summary, the change in the perception of social interaction is multifactorial, and may be the result of an interaction between changes at the individual, structural and contextual levels (Karakose et al., 2022; Saliba, 2023).

The strong correlation found between motivation and learning effectiveness (ML in both study rounds) is consistent with the assumptions of the self-regulation theory (Zimmerman, 2000), which highlights how critical it is to design remote courses in a way that engages students and reinforces their intrinsic motivation to learn. This suggests that educational practices should focus on autonomous goals, providing constructive feedback and allowing students more control over their learning (Ryan et al., 2020; Lisady et al., 2023; Martin, 2023).

The observed increase in motivation to learn remotely over the time period studied can be attributed to several factors. Firstly, study participants could become more competent in using e-learning platforms and tools, reducing stress levels and increasing their motivation to actively participate in class (Abbasnejad et al., 2023). Secondly, the adaptation process may also involve adaptation to new forms of interaction with instructors and coursemates, which in turn can foster a sense of community and increase the desire to learn (Karakose et al., 2022). Students with low levels of motivation may show less engagement in remote education, which could be related to the lack of the physical presence of others and, consequently, greater susceptibility to the distractions inherent in the online environment (Krzyżak & Walas-Trębacz, 2021). The impact of modifications in teaching methodologies made by educational institutions or individual teachers to improve the quality of remote education also cannot be ruled out, such as including more interactive forms of learning or adapting materials to online specificity, which could consequently increase the motivation to learn (Svatos et al., 2022; Tsang et al., 2021; Yan, 2021).

However, this is an issue that requires further research and analysis, which may also consider other variables, such as personal and social factors affecting motivation, including support from others, or stressful situations that may affect motivation levels, such as the need to continue remote classes due to an ongoing pandemic.

The observed increase in the correlation between engagement and learning effectiveness (ES in both study rounds) indicates the increasing role of engagement in the context of remote education. These findings are in line with the transactional distance theory (Moore, 1993), which points to the need to minimise the psychological and pedagogical distance by increasing interactivity and teacher support. This points to the need to develop teaching and assessment methods that promote students' active participation, providing them with a sense of being an integral part of the learning community (Deng, 2022). Similar to the motivation to study remotely, the increase in commitment to studying remotely may be the result of students' adaptive mechanisms in a remote education environment. For example, students may become more committed to studying as they begin to see the potential benefits of remote learning, such as flexibility in time management or access to online learning resources (Maini et al., 2021; Martin, 2023). Nevertheless, the small nature of this change may also suggest that existing barriers, such as lack of infrastructure, problems concentrating in the home environment, or limited opportunities for social interaction, remain important factors affecting engagement in remote studying (Krzyżak & Walas-Trębacz, 2021). Further research is needed that would consider other potential variables, such as students' educational preferences or personal and social factors that could influence engagement in remote studying (Krzyżak & Walas-Trębacz, 2021), as only then will a more accurate understanding of the dynamics and determinants of engagement in remote education become possible.

However, the observation of a lower average value regarding the effects of remote learning in the second round of the survey compared to the first round may have several potential causes that require further analysis. The decline in this indicator suggests that students' expectations regarding the effectiveness of remote education have decreased over time.

The first factor that could affect the drop in expectations is the novelty effect. At the beginning of the pandemic and the introduction of remote learning, students may have been interested in the new form of education and its potential benefits. However, over time, initial enthusiasm may have faded, especially if the educational experience did not meet initial expectations (Hopp et al., 2022; Martin, 2023). Secondly, students may feel thrown out of their routine and may lack regular face-to-face contact with their teacher and other class participants. Remote education limits opportunities for social interaction and live discussions, which can reduce the effectiveness of the learning process (Ahshan, 2021). A third factor may be the lack of access to adequate educational resources, such as laboratories, libraries, or specialised equipment, which is particularly important in technical disciplines (Ibrahim & Hidayat-Ur-Rehman, 2021; Svatos et al., 2022). A fourth possible reason is the adaptation to remote forms of teaching without the simultaneous adaptation of didactic methods. If didactic teaching methods are not adapted to the specifics of remote education, the effectiveness of the process may decrease (Estrada et al., 2022). Finally, it is also worth noting that the drop in expectations may be a result of experience – students who have already participated in remote education may have more realistic expectations and be more aware of its limitations. These findings suggest the need for further research considering these and other variables to more accurately understand the effectiveness of the dynamics of remote learning (Sitnicki et al., 2023).

In summary, the results of both rounds of research suggest generally stable, although slightly different, opinions of students regarding remote education. These differences may be the result of adaptation to remote

studies or changes in the implementation of this form by educational institutions.

Based on the results of Kendall's Tau correlation analysis from the two rounds of research, several important conclusions can be drawn regarding the effectiveness of remote learning and related factors:

1. Firstly, a moderate but consistent correlation was observed between the quality of student-teacher interactions and the perceived effectiveness of remote learning. This moderate correlation, which remained similar across both rounds of research, suggests that although these interactions are important, they are not the only element affecting the effectiveness of remote learning. An increase or decrease in this correlation could be a topic for future research to understand how teachers can more effectively engage students in the remote learning process.
2. The second observation concerns the correlation between student interactions and the perceived effectiveness of remote learning. Firstly, a moderate but consistent correlation was observed between the quality of student-student interactions and the perceived effectiveness of remote learning. This correlation was slightly higher in Round II of the study, which may suggest the increasing importance of inter-student interactions in terms of remote learning effectiveness, and may also suggest that adaptation to a remote form over time increases the importance of student collaboration and interaction.
3. The most important observation, however, was the significant and increasing effect of motivation on the perceived effectiveness of remote learning, with the highest correlation in both rounds, which suggests that maintaining and increasing motivation may be key factors in optimising the effectiveness of remote education. Based on these results, interventions to increase motivation for remote learning may have significant benefits.
4. The correlation between engagement in remote studying and the perceived effectiveness of remote learning also increases over time, which may suggest that engagement is an increasingly important element in the effectiveness of remote education, sending an important signal to educational institutions regarding the need to monitor and increase student engagement in remote education.

In summary, these results underscore the complementary nature of the various factors that influence the effectiveness of remote education. All the variables analysed – quality of interaction with the teacher, inter-student interaction, motivation, and engagement – are important, and their impact on learning outcomes appears to increase over time, which suggests that a comprehensive approach to remote education considering multiple aspects of educational experience is most promising for achieving high educational effectiveness (Lamanauskas & Makarskaité-Petkevičienë, 2021).

Conclusions

The results of this study can serve as practical guidelines for teachers and policymakers, as well as a basis for further research, which in turn can have a broad impact on shaping future educational practices. The following are key suggestions (guidelines) for three groups: teachers, policymakers and researchers, contributing to the quality level of remote education.

I. For Teachers:

1. Detecting and understanding the dynamics of remote student interactions is key, and the ability to use various pedagogical tools to increase the level of social interaction can have a positive impact on the effectiveness of remote learning.
   Here are some examples:
   - discussion platforms and forums: these allow the dialogue between students and teacher to continue outside the classroom, stimulating continued interest in the topic and discussion;
   - survey and quiz software: tools such as Kahoot, Google Forms or Quizlet can be used to interactively assess students' knowledge and understanding of material;
   - collaboration software: applications such as Google Docs or Microsoft Teams allow people to work on documents or projects simultaneously, increasing interaction and group understanding;
   - participation management systems: software such as Zoom or Teams, which offer hand-raising, polling, or subgroup functions, can help teachers better understand student needs in real time;
   - real-time feedback: tools that offer automated feedback can be useful for both students and teachers, enabling immediate understanding and improvement.
2. Student motivation and engagement are variables that can be susceptible to influence from teachers, as motivation and student engagement techniques can enhance the effectiveness of remote education.
   Here are some examples:
   - interactive whiteboards: tools such as Miro or Padlet allow collaborative note-taking and brainstorming in real time, which can increase engagement and learning efficiency;
   - simulations and educational games: these can be used to put theory into practice, often making complex concepts easier to understand;
   - blogs and wikis: these allow students to create and edit content, which can not only increase their interest, but also support a deeper understanding of the material;

- video and multimedia: interactive video activities in which students can answer questions or make decisions, increasing their engagement and understanding;
- directed research tasks: tasks that require students to independently seek information and analyse and present results can increase their engagement and depth of understanding.

II. For Decision Makers:

1. The results indicate the need for continued research, as well as the possibility of adapting teaching methods and tools to increase the effectiveness of remote education.
2. Investment in technology and support for teachers in the skills needed to effectively use remote education platforms are key.

III. For Researchers:

1. The noticeable dynamics in variables such as motivation, commitment, and interaction suggest the need for further research taking into account a variety of contextual variables.
2. Kendall's Tau correlations between different variables indicate complex relationships that can be explored further to better understand the mechanisms that affect the effectiveness of remote education.

Further research can also focus on identifying best practices and their application in different educational contexts.

Summary

Remote education presents numerous challenges with regard to student interactions, teacher-student relationships, motivation, and engagement. Understanding and addressing these challenges are crucial for enhancing remote learning outcomes, and this article offers a thorough examination of these dynamics, particularly accentuated by the COVID-19 pandemic.

Theoretical frameworks, such as social constructivism, the transactional distance theory, the social presence model, and the self-regulation theory provide insights into the challenges of remote education, emphasising the importance of interaction quality, motivation and engagement.

Grounded in theoretical exploration and empirical data from students at The Cracow University of Economics, the study focuses on understanding the impacts of remote education on learning effectiveness, specifically examining social interaction, motivation and engagement. The results from the research conducted in 2020 and 2022 with 1,828 respondents revealed modest improvements in social interaction and motivation over time, albeit with a slight decline in perceived effectiveness of remote learning, highlighting the need for nuanced adjustments in pedagogical strategies to optimise remote learning to effectively address the challenges. Empirical results underscore the importance of adjusting teaching strategies to address the challenges analysed, indicating that significant differences exist in the quality of interactions, levels of motivation, and degrees of engagement within remote education contexts. The study contributes to the body of knowledge by identifying gaps and offering practical recommendations for educators and institutions to improve remote learning efficacy, before concluding with several recommendations for educators, policymakers and future research. For educators, it emphasises the importance of employing diverse pedagogical tools and techniques to enhance social interaction, motivation and engagement in remote learning contexts, while for policymakers, it suggests continued investment in technological infrastructure and teacher training. Lastly, for researchers, it highlights the need for further studies exploring the complex relationships between different variables affecting remote learning effectiveness and the identification of best practices applicable across various educational settings.

Overall, the article provides insights into the crucial challenges and dynamics of remote education, offering a basis for future research and practical interventions aimed at improving the quality and effectiveness of remote learnings.

Acknowledgment

The publication/article presents the results of a Project financed from a subsidy granted to The Cracow University of Economics (047/ZZP/2023/POT and 050/ZZD/2023/POT).

The appendices are available in the online version of the journal.

References

Abbasnejad, B., Soltani, S., & Wong, P. (2023). A systematic review of online learning and teaching strategies during the COVID-19 pandemic: implications for the construction management sector. *Smart and Sustainable Built Environment* [Vol. ahead-of-print]. https://doi.org/10.1108/SASBE-08-2022-0174.

Adedoyin, O. B., & Soykan, E. (2020). Covid-19 pandemic and online learning: the challenges and opportunities. *Interactive Learning Environments*, *31*(2), 863–875. https://doi.org/10.1080/10494820.2020.1813180

Ahshan, R. (2021). A framework of implementing strategies for active student engagement in remote/online teaching and learning during the COVID-19 pandemic. *Education Science*, *11*(9), 483. https://doi.org/10.3390/educsci11090483

Amon, B. T. (2021). E-Studio: The use of information and communication technologies in the development of drawing competences in different educational environments. *Cogent Education*, *9*(1), 2007578. https://doi.org/10.1080/2331186x.2021.2007578

Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: critical conceptual and methodological issues of the construct. *Psychology in the Schools*, *45*(5), 369–386. https://doi.org/10.1002/pits.20303

Bergdahl, N. (2022). Engagement and disengagement in online learning. *Computers and Education*, *188*, 104561. https://doi.org/10.1016/j.compedu.2022.104561

Carmona-Halty, M. A., Schaufeli, W. B., & Salanova, M. (2019). The Utrecht Work Engagement Scale for Students (UWES–9S): Factorial validity, reliability, and measurement invariance in a chilean sample of undergraduate university students. *Frontiers in Psychology*, *10*, 1017. https://doi.org/10.3389/fpsyg.2019.01017

Deci, E. L., Olafsen, A. H., & Ryan, R. M. (2017). Self-determination theory in work organizations: The state of a science. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*, 19–43. https://doi.org/10.1146/annurev-orgpsych-032516-113108

Deng, Q. (2022). A research on online education behavior and strategy in university. *Frontiers in Psychology*, *13*, 1692. https://doi.org/10.3389/fpsyg.2022.767925

Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, *41*(10), 1040–1048. https://doi.org/10.1037/0003-066X.41.10.1040

Eccles, J., Adler, T., Futterman, R., Goff, S., Kaczala, C., Meece, J., & Midgley, C. (1983). Expectancies, values and academic behaviors. In: J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75–146). W. H. Freeman. http://education-webfiles.s3-website-us-west-2.amazonaws.com/arp/garp/articles/ecclesparsons83b.pdf

Estrada, F. J. R., Ruiz-Ramírez, J. A., George-Reyes, C. E., & Glasserman-Morales, L. D. (2022). Evaluation of a virtual campus adapted to web-based virtual reality spaces: Assessments of teachers and students. *Frontiers in Education, 7*, 1–11. https://doi.org/10.3389/feduc.2022.918125

Flick, U. (2020). *Introducing research methodology: A beginner's guide to doing a research project* (3th ed.). Sage Publications Ltd.

The full list of references is available in the online version of the journal.

Joanna Krzyżak is an Assistant Professor at The Krakow University of Economics in Cracow, Poland. She holds a Doctorate in Economics. Her research focuses on creative human activity and the application of neuroscience knowledge in effective self-management. She has also made significant contributions to educational literature, particularly in the field of economic education methodology.

Jolanta Walas-Trębacz is an Assistant Professor at The Krakow University of Economics in Cracow, Poland. She holds a Doctorate in Economics. Her research interests focus on contemporary concepts of management, human resources management, process management, crisis management, improvement of management systems and processes in organisations. She also contributed to educational literature, especially the issue of distance education.

We recommend

23rd Management International Conference (MIC 2024) „Next Generation Challenges: Innovation, Regeneration and Inclusion", June 5–8, 2024, Trento (Italy)

Innovation, regeneration, and inclusion are central pillars of the future agenda for strong societies and economies, as they are key to overcoming challenges and driving sustainable growth in a rapidly changing world. It is recognised by researchers and policymakers, as well as by individuals, that it is their responsibility to improve the quality of life while preserving the environment for future generations. Economies and societies must therefore plan, act and create a future that leaves room for future generations.

The MIC 2024 conference aims to explore the next generation challenges facing different industries, sectors and fields, with a particular focus on fostering innovation, building resilience, promoting regeneration and ensuring inclusivity - it is open to all contributions that address the next generation challenges. The conference also aims to bring together academics, professionals, and experts from management, economics, human resource management, organizational studies, finances, accounting, and other related fields, while providing a unique platform for knowledge exchange and collaboration.

More information at: **https://www.mic.fm-kp.si/**

„E-mentor" is one of the MIC 2024 conference supporting journals.