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TRANSFORMING STUDENT AUTONOMY IN CHANGING EDUCATIONAL CONTEXTS: LEARNING MATERIAL CHOICES FROM THE PANDEMIC ONWARD

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ABSTRACT

During the Covid-19 pandemic, the transition to online learning led to a significant increase in students' autonomy in selecting and using educational materials. A survey involving 832 higher education students collected data on their preferences regarding types of learning materials, their perceived usefulness, and various aspects of their learning experiences during the pandemic. The analysis also examined the influence of factors such as study modality (traditional, online, and blended), gender and year of study. The findings revealed clear patterns in students' independent selection and evaluation of educational resources, indicating an increased capacity for self-directed learning during crises. Students reported that, despite altered working conditions, they regularly attended classes, had suitable working conditions, and recognized the significant potential of distance learning. Nevertheless, despite recognizing the benefits of distance learning, approximately 60% of students would still prefer not to adopt it as the sole mode of instruction. In the current context of socio-political challenges frequently disrupting traditional teaching processes, the continuity of learning habits is a relevant question. This paper aims to present the pandemic-era learning experience as a foundation and potential direction for developing future teaching models emphasizing student autonomy and flexible use of educational materials.

Keywords: student autonomy, distance learning, learning materials, higher education.

INTRODUCTION

The Covid-19 pandemic brought about an unprecedented shift in higher education, forcing institutions worldwide to transition rapidly from traditional classroom settings to online modes of instruction (Bozkurt & Sharma, 2020). This transition was not only a logistical and technological challenge but also a pedagogical one, requiring both educators and students to adapt quickly to new learning environments. One of the most significant changes observed during this period was the increased autonomy of students in navigating their educational experience (Hassan et al., 2021; Stevanović et al., 2021). Faced with new circumstances, students were required to take greater responsibility for selecting, accessing, and utilizing learning materials that suited their needs and preferences (Stevanović et al., 2023).

This context provided a unique opportunity to examine how students develop self-regulated learning habits when formal structures are disrupted. While previous researches (Taranto & Buchanan, 2020; Zimmerman & Schunk, 2011) highlights the importance of autonomy and self-regulated learning in developing lifelong learning skills, the pandemic offered a direct insight into how such autonomy emerges and evolves in response to crisis (Stevanović et al., 2021; Stevanović et al., 2023). It became particularly important to explore which types of educational resources students found most useful, how they assessed their own learning conditions, and whether demographic and contextual factors, such as learning environments, gender, and year of study influenced these patterns.

The present study explores the online learning experiences of 832 students from two Serbian universities during the Covid-19 pandemic. Special attention is given to the ways in which students selected and evaluated learning resources, as well as to their overall engagement in online learning environments. In addition to examining students' general perceptions and participation, the study considers how these experiences were shaped by their prior learning environment (traditional, blended, or online), gender, and year of study. By doing so, it aims to shed light on the long-term implications of the pandemic for student agency, resource use, and preparedness for future online education.

To guide this investigation, the study addresses two key research questions:

How did students experience online learning during the Covid-19 pandemic in terms of participation, perceived potential, willingness to adopt it in the future, and access to learning resources, and how did these experiences differ based on their prior learning environment (traditional, blended, or online), gender, and year of study?

Which resources did students rely on during the Covid-19 pandemic, which of them were perceived as most useful, and how did these choices differ depending on students' prior learning environment, gender, and year of study?

The first research question focuses on how students experienced online learning during the Covid-19 pandemic, including how students see their level of participation, access to learning resources, perceptions of the potential of online education, and their willingness to adopt this mode of instruction in the future. The second question explores which learning resources students used, which ones they found most useful, and how their choices varied. Both questions are examined in relation to students' background characteristics, including their previous learning environment (traditional, blended, or online), gender, and year of study, in order to understand how these factors influenced their engagement with and attitudes toward online learning.

LITERATURE REVIEW

Transition to Online Learning During the Covid-19 Pandemic

The rapid shift to online education during the Covid-19 pandemic has prompted numerous studies examining how students adapted to new modes of learning and which resources they relied on during this period. Understanding the broader context of e-learning development and students' perceptions is essential for interpreting the impact of this transition. Over the past decades, various forms of distance education have been developed alongside traditional instruction. Initially relying on correspondence, telephone, and television (Hannay & Newvine, 2006), distance education gradually evolved into online learning, in which the entire educational process takes place via the internet (Bates, 2005). The Covid-19 pandemic significantly accelerated the adoption and development of online learning, prompting widespread use of digital tools for both communication and assessment (Stevanović et al., 2021). Research has shown that students with advanced technological competencies perceived the transition to online learning during the pandemic as relatively smooth and non-threatening (Radha et al., 2019). These findings are consistent with the results of a study by Ali et al. (2019), which involved approximately 700 students who engaged in various forms of e-learning. The participants largely perceived e-learning as user-friendly, time-efficient, and cost-effective. Similarly, Baber (2021) found that students in South Korea successfully adapted to online education during the pandemic, indicating that the shift from face-to-face (F2F) to virtual learning was not met with significant resistance. While the pandemic had a short-term disruptive impact on educational institutions and teaching staff, many studies emphasize the role of student motivation in the success of e-learning environments. Although initial motivation levels tend to be high, they often decline over time. The absence of face-to-face interaction in fully online environments further complicates the challenge of sustaining motivation (Samir et al., 2014; Harandi, 2015). A study conducted in Libya during the Covid-19 pandemic investigated students' attitudes toward e-learning and highlighted both the benefits and the limitations of this approach. Students reported that learning in an electronic environment offered several advantages, such as reduced costs and improved access, and served as an effective alternative to in-person education during the health crisis. However, they also identified significant

challenges, including the need for better technical and financial support, staff training, adequate infrastructure, digital literacy, and professional development. Notably, while students acknowledged that e-learning contributed positively to their learning experience, they perceived it as shifting more responsibility onto them, while reducing the workload for faculty. The most prominent barrier cited in this context was the poor quality of internet services during the pandemic (Maatuk et al., 2021). Taken together, these studies highlight that while students generally viewed online learning as a viable and even advantageous alternative, the effectiveness of this mode of education is closely linked to prior digital experience, available infrastructure, and sustained motivation throughout the learning process.

Although blended learning, an approach that combines face-to-face teaching with online components, has received increasing attention in recent years (Toptaş and Öztop, 2021; Fitri and Zahari, 2019), the Covid-19 pandemic created an exceptional situation in which many institutions were required to shift directly from traditional classroom instruction to fully online formats, while a number of institutions managed to transition from traditional to blended learning. Blended learning is generally associated with greater flexibility, opportunities for self-paced learning, and higher levels of student engagement (Setyaningrum, 2018). These characteristics have been shown to support student motivation and persistence (Anthony et al., 2022), as well as promote more effective knowledge acquisition (Božić et al., 2021). Although the present study does not focus directly on blended learning, it is important to acknowledge that during the pandemic, some studies emphasized the value of preserving certain elements of face-to-face interaction within digital learning environments. For instance, Aboagye et al. (2020) reported that the combination of traditional and online teaching had a positive effect during the transition period brought on by Covid-19. Similarly, Mali and Lim (2021) found that students viewed blended learning more positively during the pandemic but still preferred face-to-face learning in non-pandemic circumstances. Although blended learning is often praised in theory as a modern and flexible instructional model, some studies suggest that students perceive certain aspects of virtual learning environments as limited, especially in terms of interaction, group work, and access to complex technical content (Bentley, 2012; Turner, 2015). Numerous authors have highlighted the challenges students faced when transitioning from face-to-face to blended or online formats. These include reduced opportunities for interaction with instructors, weaker dynamics in group work, limited peer collaboration, lower levels of classroom engagement, and fewer chances to ask questions particularly in technically demanding subjects (Concannon et al., 2005; Robson and Greensmith, 2009; Selwyn, 2016). In addition, qualitative evidence shows that face-to-face instruction is perceived as socially richer and more supportive, as social aspects expected in a physical classroom are not easily replicated in digital learning environments governed by netiquette and asynchronous formats. On the other hand, some researchers argue that the sudden and large-scale shift to online and blended learning during the pandemic created opportunities for innovation in higher education. Sangster (2020) notes that the pandemic accelerated the development of more flexible teaching formats, such as pre-recorded lectures, which may contribute to the long-term transformation of educational practices (Bettis, 2020; Fogarty, 2020; Sangster et al., 2020).

The literature suggests that while many students adapted successfully to online learning during the Covid-19 pandemic, others encountered difficulties related to motivation, interaction, and technological access. Although blended learning offers certain pedagogical advantages, it does not fully replicate the social and academic benefits of traditional face-to-face instruction. These findings underscore the importance of contextual factors in shaping students' learning experiences and form a basis for further investigation into how students with different prior learning backgrounds navigated the transition to fully online education. The present study specifically examines how previous experience with traditional, blended, or fully online learning influenced students' adaptation to new educational circumstances during the pandemic. It explores whether students attended classes and had access to appropriate learning resources, their readiness to adopt similar instructional formats in the future, and their perceptions of the potential of online learning as a long-term educational model.

Self-Regulated Learning and the Use of Learning Resources in Online Education

Self-regulated learning (SRL) refers to students' ability to actively guide and manage their own learning through a set of cognitive, motivational, and behavioral strategies. These include setting learning objectives, drawing on prior knowledge, seeking out relevant content, and continuously monitoring and adjusting their learning process based on ongoing reflection and evaluation (Zimmerman, 1990; Pintrich, 2004; Zimmerman and Schunk, 2011). When faced with difficulties or uncertainty, self-regulated learners are also more likely to seek support and modify their strategies to improve outcomes. Researches have consistently shown that self-regulation plays a vital role in the success of students in online learning environments, which typically offer greater flexibility but demand higher levels of autonomy (Broadbent and Poon, 2015; Jia, 2021; Xu et al., 2022). Unlike traditional classroom settings, online learning requires students to take responsibility for organizing their time, managing their progress, choosing learning resourses, and staying motivated without direct supervision (Artino, 2007; Dumford and Miller, 2018). In such contexts, learners who can independently plan, monitor, and evaluate their study process are more likely to thrive (Mou, 2020; Mou, 2023).

An important but sometimes overlooked component of self-regulated learning is the strategic selection and use of learning resources. In online settings, students are typically presented with a wide array of digital materials—such as recorded lectures and exercises, textbooks, scripts, interactive e-learning content, PowerPoint presentations, and various documents, as well as platforms and instructional materials independently found online (Martin & Bolliger, 2018). The effectiveness of their learning often depends on how well they can navigate this abundance, assess the relevance and quality of materials, and incorporate them into their learning routines (Frontiersin review, 2021). Efficient use of resources thus becomes both a skill and a form of self-regulation, enabling students to adapt content to their personal needs, learning styles, and academic goals (Broadbent & Poon, 2015).

This study aims to explore which types of resources students found most valuable during the shift to online education caused by the Covid-19 pandemic. It also investigates the extent to which students participated in online classes and how their engagement with learning materials influenced their readiness to embrace this mode of instruction in the future. Finally, it examines how students perceived the long-term potential of online education, viewed through the lens of their self-regulated learning practices and their ability to meaningfully use available learning resources.

METHODOLOGY

Participants

There were 832 participants in this study, students from two universities in Serbia (626 participants from Faculty of Science, University of Novi Sad (UNS) and 206 participants from the faculties of Belgrade Metropolitan University (BMU)). The demographic data are shown in Table 1.

Table 1. Demographic data.

Category		N	%
Gender	Male	304	37%
	Female	528	63%
University	UNS	626	75%
	UM	206	25%
Learning environments	Traditional	633	76%
	Online	166	20%
	Blended	33	4%
Year of study	First	261	31%
	Second	198	24%
	Third	185	22%
	Forth	188	23%

Instruments and Procedure

The data for this study were collected using a structured questionnaire, which was distributed via email at the end of the academic semester. Participation was voluntary and anonymous. The questionnaire consisted of three sections. The first section gathered demographic information, including gender, university affiliation, prior learning environment (traditional, blended, or online), and year of study. The second section focused on evaluating students' experiences with online learning, including items related to attendance, access to learning conditions, perceived potential of online education, and preferences for future use. Responses were rated on a six-point Likert scale ranging from 1 ("strongly disagree") to 6 ("strongly agree"). The third section asked students to indicate which types of additional learning resources they had used during online learning by selecting from a predefined list (checkbox format). Scale reliability was assessed using Cronbach's alpha, and the overall internal consistency was acceptable ($\alpha = .795$).

To better understand students' engagement with online learning, four key dimensions were assessed: Attendance, Conditions, Potential, and Preferences. Attendance refers to the extent to which students reported regularly following online classes during the pandemic. Conditions captures students' opinion about access to essential technical resources, such as a computer and a stable internet connection, needed for effective participation in online education. Potential reflects students' beliefs about whether online learning can serve as a valid substitute for traditional classroom instruction. Finally, Preferences indicate students' openness to fully transitioning to online learning in the future.

Additionally, students were asked to evaluate the usefulness of specific types of learning materials they encountered during online instruction. The aim was to explore patterns in resource selection and to assess students' evaluations of the usefulness of specific materials in supporting their learning. Students rated five types of resources based on their perceived usefulness using a six-point Likert scale. These included: complete online video recordings of lectures and exercises (U_VM), textbooks, scripts, and PDF materials (U_PDF), interactive digital content for e-learning (U_INM), PowerPoint presentations from lectures and exercises (U_PP), and various documents and instructional materials independently found online (U_NET). This section of the questionnaire was designed to capture not only students' preferences, but also their perceived level of trust in and reliance on different forms of learning support during the pandemic.

Data Analysis

Data were analyzed using SPSS with nonparametric statistical tests due to non-normal distribution of data. The Mann-Whitney U test was applied for two-group comparisons, and the Kruskal-Wallis test for three or more groups, followed by post hoc analysis.

RESULTS

In line with the research questions, the results and discussion are organized into two main sections: Students' Experiences with Online Learning, and Selection and Evaluation of Educational Materials.

Students' Experiences with Online Learning

Student responses related to Attendance, Conditions, and Potential indicate generally high levels of engagement in online learning, as well as widespread access to the necessary technical requirements, such as a computer and internet connection (see Figure 1). In addition, students recognized the value and potential of online learning as a meaningful educational approach. However, when it comes to Preferences for fully transitioning to online learning, notable differences were observed depending on students' prior learning environments (see Figure 2). Those with experience in online or blended learning expressed a greater openness to continuing their education in a fully online format, while students with traditional learning backgrounds tended to be more hesitant.

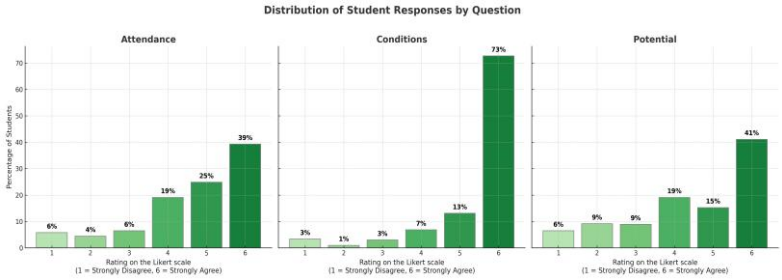

Figure 1. Distribution of students' responses by question.

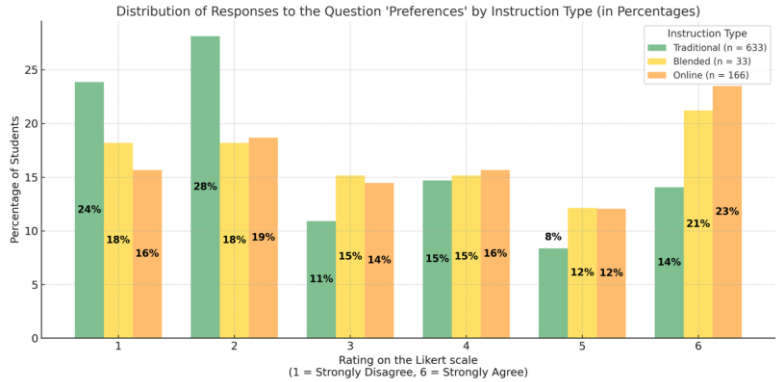

Figure 2. Distribution of students' responses by question "Preferences" by type instruction. **χ2**

The results of the Kruskal–Wallis tests examining differences in students' distance learning experiences across the three learning environments (Traditional, Online, and Blended) are presented in Table 2. Significant differences between the three subgroups were evident in the Preferences category (H = 17.598, p = .000), with a mean rank of 397.35 for traditional students, 480.05 for online students, and 464.21 for students in the blended subgroup. In the other categories (Attendance, Potential and Conditions), no statistically significant differences were observed between the subgroups.

The post hoc (pairwise comparisons) test (conducted for Preferences, as it was the only category showing a significant result) indicated that there was a statistically significant difference only between the traditional and online groups, with a significance level of p = .000.

A statistically significant gender difference was found in the Attendance variable, with female students reporting higher levels of regular participation in online classes compared to male students (U = 73064, p = 0.02). Although overall attendance was rated highly across all study years, results of the Kruskal–Wallis test indicated a statistically significant difference between groups (H = 23.84, p < 0.01). Post hoc comparisons using the Bonferroni correction revealed that second-year students reported significantly higher attendance compared to both first-year and fourth-year students (M_I = 4.64, M_{II} = 5.04, M_{IV} = 4.30; p = 0.014 and p < 0.01, respectively).

Table 2. Analysis of the correlation between the learning environment and online learning

Category	Mean Ranks			Kruskal-Wallis		
	Traditional	Online	Blended	χ2	Df	*p* Value
Attendance	423.36	391.82	409.02	2.509	2	.285
Potential	426.00	381.01	412.76	5.028	2	.081
Preferences	397.35	480.05	464.21	17.598	2	.000
Conditions	413.74	431.17	395.67	1.550	2	.461

Notes: χ2 = Chi square; Df = Degree of freedom

In terms of Potential, students across all years generally rated online learning positively (Fig. 1). However, a statistically significant difference was observed between groups ($H = 10.36$, $p = 0.02$). First- and second-year students expressed slightly more favorable perceptions of online learning potential compared to students in higher years, particularly those in the fourth year ($M_I = 4.62$, $M_{II} = 4.63$, $M_{III} = 4.51$, $M_{IV} = 4.22$). Bonferroni-adjusted comparisons confirmed significant differences between the first and fourth year ($p = 0.02$) and between the second and fourth year ($p = 0.04$).

As for Preferences regarding the future use of online learning ($H = 9.00$, $p = 0.03$), students in higher years showed greater readiness to fully transition to this mode of instruction. Mean scores increased progressively with each year of study ($M_I = 2.86$, $M_{II} = 3.14$, $M_{III} = 3.25$, $M_{IV} = 3.34$). Statistically significant differences were found between first and fourth year ($p = 0.03$).

Selection and Evaluation of Educational Materials

The results of the Kruskal–Wallis tests examining differences in perceived usefulness of various learning resources among students from different prior learning environments (traditional, online, and blended) are presented in Table 2. In general, all resources were rated as useful, with no statistically significant differences observed between groups for video lectures (U_VM), PDF materials (U_PDF), PowerPoint presentations (U_PP), or independently gathered online materials (U_NET). However, a significant difference was found in the usefulness ratings of interactive learning materials (U_ILE), χ^2 (2) = 11.239, $p = .004$. Post hoc pairwise comparisons using the Bonferroni correction revealed that students with prior experience in online learning rated interactive materials as significantly more useful than students from traditional learning backgrounds ($p = .003$). No significant differences were found between the blended group and the other two groups.

Table 2. Mean Ranks and Kruskal–Wallis Test Results for Perceived Usefulness of Learning Resources Across Learning Environments.

Category	Mean Ranks			Kruskal-Wallis		
	Traditional	Online	Blended	χ2	Df	*p* Value
U_VM	412.77	437.68	381.47	2.236	2	.327
U_PDF	412.21	436.51	398.12	1.703	2	.427
U_ILE	403.24	470.90	397.12	11.239	2	.004
U_PP	413.77	432.08	390.45	1.237	2	.539
U_NET	414.77	421.60	424.00	.147	2	.929

Notes: χ2 = Chi square; Df = Degree of freedom

When asked which educational materials they perceived as the most useful, the vast majority of students reported relying on PDF materials (textbooks, scripts, and lecture notes in PDF format), with 83.17% of respondents selecting this option. This was followed by PowerPoint presentations (59.74%) and interactive digital content (55.41%), indicating that structured and instructor-provided materials were the most commonly used. In contrast, online video lectures were selected by only 31.73% of students, while independently sourced materials from the internet were used by 37.74% of respondents. Notably, a very small proportion of students (2.76%) reported not using any additional resources beyond the standard course content. These findings suggest a clear preference for officially provided and static formats (PDFs and presentations), while more dynamic or self-directed formats such as video lectures or external web-based materials were less frequently used.

Students typically reported using two to three different types of learning resources during online instruction. The most frequently selected materials were PDF documents, interactive learning materials (INM), and PowerPoint presentations (PP). When students selected only two resources, the combination of PDF and PP was most common. Statistically significant differences were found in material preferences across gender and year of study.

Table 3. Student Use of Educational Resources During Online Learning

Educational materials	Number of students (N)	Percentage of students(%)
PDF	692	83,17
INM	461	55,41
PP	497	59,74
LN	264	31,73
NET	314	37,74
N	23	2,76

Notes: PDF - materials (textbooks, scripts, and lecture notes in PDF format), INM - interactive digital materials, PP - PowerPoint presentations, LN - online video lectures, NET- independently sourced materials from the internet and N - not using any additional resources beyond the standard course content.

Female studentsreported using PDF materials more frequently than male students (86.6% vs. 77.3%), a difference that was statistically significant ($\chi^2 = 11.44$, $p < .01$). Additionally, students in higher years of study reported using PDF materials more often than those in lower years ($\chi^2 = 18.61$, $p < .01$). On the other hand, male students reported slightly higher usage of internet-sourced materials and lecture notes, although overall usage of these resources remained relatively low. This difference was also statistically significant ($\chi^2 = 7.16$, $p < .01$).

DISSCUSION

The findings of this study show that a significant proportion of students (83%) reported high levels of attendance during online classes throughout the Covid-19 pandemic. Female students indicated more consistent participation compared to their male counterparts. This result aligns with previous research suggesting that female students are often more diligent and consistent in fulfilling academic responsibilities (Verbic et al., 2025). Regarding learning conditions, most students stated that they had adequate access to the technical resources necessary for participating in online learning. This finding contrasts with the results reported by Maatuk et al. (2021), where students expressed dissatisfaction with the conditions for online learning. Such a discrepancy highlights the importance of context, suggesting that the quality of online learning conditions can vary significantly across educational systems. In the present study, no statistically significant differences were found in reported learning conditions across gender, year of study, or learning background, which further suggests that, in the case of Serbia, the basic infrastructural conditions for online learning were met to a satisfactory degree. When asked whether online learning could serve as a substitute for traditional classroom instruction, approximately 75% of students responded positively, with only 6% explicitly rejecting this possibility. Interestingly, younger students were more likely to view online learning as a viable replacement for traditional instruction than older students. This generally favorable view may reflect the overall positive experiences students had with online learning during the pandemic. These findings are consistent with earlier studies that emphasize the adaptability of students and the potential of online education when implemented effectively (Ali et al., 2019; Radha et al., 2019; Baber, 2021). However, even though a majority of students believed online learning could replace traditional teaching, a smaller percentage (around 40%) actually expressed willingness to fully transition to this mode of education. Students who had previously participated in online or blended learning before the pandemic were more open to continuing in that format, while those with exclusively traditional learning backgrounds were more hesitant. This suggests that prior learning experience plays a crucial role in shaping students' readiness to adopt online learning in the future. Interestingly, while younger students perceived online education as having potential to replace traditional learning, they were less willing to make that transition at the time of the study. In contrast, older students showed greater readiness to switch to fully online learning. These findings suggest a distinction between students' cognitive acceptance of online education and their actual preference or readiness to engage in it fully. Although the benefits of online and blended learning have been widely discussed in the literature (Anthony et al., 2022; Božić et al., 2021; Bettis, 2020; Fogarty, 2020; Sangster et al., 2020), students in this study still recognized its limitations. Their reluctance

to fully embrace online learning, despite acknowledging its potential, aligns with findings from other research (Mali & Lim, 2021; Bentley, 2012; Turner, 2015), which also show that students tend to prefer traditional classroom instruction over fully online formats. In conclusion, the results of this study suggest that while students had adequate access to resources, demonstrated high participation, and expressed belief in the potential of online education, many of them were still not ready to abandon traditional learning environments. This gap between perceived potential and actual preference underscores the complex and multifaceted nature of students' attitudes toward online learning.

When it comes to the selection of learning materials during the Covid-19 pandemic, students most frequently reported that textbooks, scripts, and PDF materials were the most useful, followed by PowerPoint presentations. At first glance, this finding may seem surprising, considering the availability of various interactive and multimedia-based learning materials during this period. However, one possible explanation is that these types of resources had already been widely used in traditional classroom settings. Therefore, students may have simply intensified their use of familiar materials during the shift to online learning. While this interpretation appears plausible, further research is needed to confirm whether previous familiarity directly influenced students' choices during the pandemic. Supporting this assumption, the results indicate that senior students found PDF materials more useful than younger students. This may suggest that more experienced learners, who were already accustomed to this format, continued to rely on it during the transition to online learning. However, additional studies would be necessary to determine whether this preference is driven primarily by habit, prior exposure, or specific learning needs. This trend may also reflect the characteristics of the educational environment in which the study was conducted, where such materials were readily available both before and during the pandemic. Despite the increased availability of video and interactive content, students largely perceived the most value in materials they were already familiar with. Gender differences were also observed, with female students more often rating PDF materials as useful, while male students more frequently identified internet-sourced content as beneficial. This finding could potentially be explained by general patterns noted in previous research, where female students are described as being more diligent and inclined to rely on structured and reliable sources, whereas male students may be more open to exploration and taking risks in learning (Verbic et al., 2025). Nevertheless, these assumptions should be interpreted with caution, and further empirical investigation is required to validate gender-based preferences in online learning resource selection. Although most students selected traditional formats such as PDFs and PowerPoint slides, the results revealed a considerable number of combinations of different educational resources. This indicates that students were actively adapting their learning strategies by drawing on multiple types of materials, reflecting individualized, self-regulated learning practices (Artino, 2007; Dumford and Miller, 2018). Even when relying on resources typically used in face-to-face instruction, students' ability to adjust their resource selection to personal needs suggests the presence of self-regulated learning skills, which have been shown to be important for success in online education (Mou, 2020; Mou, 2023). Future studies could further explore how such resource selection relates to specific dimensions of self-regulated learning in diverse educational contexts.

CONCLUSIONS

The sudden shift to online learning during the Covid-19 pandemic served as a unique opportunity to explore how students respond to new educational challenges and adjust their learning strategies. Findings show that students generally had the necessary technical conditions to participate in online learning and were able to maintain continuity in their studies. While many students recognized the value and potential of online learning, a significant portion, particularly those in the earlier years of study, still preferred traditional formats, reflecting deeply ingrained expectations and learning habits.

These results, including the dominant use of PDF materials and other static content formats, reflect an educational system that continues to favor traditional approaches despite advancements in digital technologies. Within such a framework, students tend to rely on more linear, passive

forms of learning, even though more interactive and personalized options are increasingly available. Differences in student experiences and preferences based on demographic factors, underscore the importance of more flexible, individualized models of education. As students' progress through their academic journeys, they demonstrate a growing ability to independently choose and evaluate learning resources, pointing to an increasing level of learning autonomy.

These findings underscore the need for higher education institutions to design and implement student-centered approaches that encourage self-directed learning and are adaptable to both expected and unexpected changes. Based on the experience of the pandemic, it is possible to shape an educational system that not only meets contemporary demands but also actively supports the development of competent, self-directed learners equipped for the challenges of the digital age.

DECLARATIONS OF INTEREST STATEMENT

The authors affirm that there are no conflicts of interest to declare in relation to the research presented in this paper.

LITERATURE

Aboagye, E., Yawson, J. A., & Appiah, K. N. (2020). COVID-19 and E-learning: The Challenges ofStudents in Tertiary Institutions. *Social Education Research, 2*(1), 1–8. https:// doi. org/ 10. 37256/ ser.21202 1422.

Ali, M., Khaled Hossain, S. M., & Ahmed, T. (2018). Effectiveness of E-learning for university students: Evidence from Bangladesh. *Asian Journal of Empirical Research., 8*(10), 352–360. https:// doi. org/10. 18488/ journ al. 1007/ 2018.8. 10/ 1007. 10. 352. 360.

Anthony Jr, B., Kamaludin, A., Romli, A., Raffei, A. F. M., Phon, D. N. A. E., Abdullah, A., & Ming, G. L. (2022). Blended learning adoption and implementation in higher education: A theoretical and systematic review. *Technology, Knowledge and Learning*, *27*(2), 531-578.

Artino, A. (2007). Self-regulated learning in online education. Int. J. Instruct. *Technol.Dist.Learn. 4*, 3–18. Available online at: https://www.itdl.org/Journal/Jun_ 07/article01.htm

Baber, H. (2020). Determinants of students' perceived learning outcome and satisfaction in online learning during the pandemic of COVID-19. *Journal of Education and E-Learning Research, 7*(3), 285–292

Bates, A. W. (2005). *Technology, e-learning and distance education* (2nd ed.). Routledge Falmer.

Bentley, Y., Selassie, H., & Parkin, E. (2012). Evaluation of a global blended learning MBA programme. *International Journal of Management in Education, 10*(2), 75–87.

Betts, A. (2020). A lockdown journal from Catalonia. *Studies in Higher Education, 46*(1), 86–95.

Božić, R., Takači, Đ., & Stankov, G. (2021). Influence of dynamic software environment on students' achievement of learn ing functions with parameters. *Interactive Learning Environments, 29*(4), 655–669. https://doi.org/10.1080/10494820. 2019.1602842

Bozkurt, A., & Sharma, R. C. (2020). Emergency Remote Teaching in a Time of Global Crisis Due to CoronaVirus Pandemic. *Asian Journal of Distance Education, 15*(1), 1-6.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education, 27*, 1–13. https://doi.org/10.1016/j.iheduc.2015.04.007

Concannon, F., Flynn, F., & Campbell, M. (2005). What campus based students think about the quality and benefits of e-learning. *British Journal of Educational Technology, 36*(3), 501–512.

Fitri, S., & Zahari, C. L. (2019). The implementation of blended learning to improve understanding of mathematics. *Journal of Physics: Conference Series, 1188*(1), 012109. https://doi.org/10.1088/1742-6596/1188/1/012109

Fogarty, T. J. (2020). Accounting education in the post-COVID world: Looking into the mirror of erised. *Accounting Education, 29*(6), 563–571.

Frontiers in Psychology. (2021). Supporting Self-Regulated Learning in Distance Learning Contexts at Higher Education Level: Systematic Literature Review.

Stevanović, A., & Kaplar, M. (2025). Transforming student autonomy in changing educational contexts: learning material choices from the pandemic onward. *STED Conference 14*(2), 395-406.

Hannay, M., & Newvine, T. (2006). Perceptions of distance learning: A comparison of online and traditional learning. *Journal of Online Learning and Teaching, 2*(1), 1–11.

Harandi, S. R. (2015). Effects of e-learning on Students' Motivation. *Procedia—Social and Behavioral Sciences., 181*, 423–430. https:// doi. org/ 10. 1016/j. sbspro. 2015. 04. 905

Hassan, S.u.N., Algahtani, F. D., Zrieq, R., Aldhmadi, B. K., Atta, A., Obeidat, R. M., & Kadri, A. (2021). Academic Self-Perception and Course Satisfaction among University Students Taking Virtual Classes during the COVID-19 Pandemic in the Kingdom of Saudi-Arabia (KSA). *Education Sciences, 11*(3), 134. https://doi.org/10.3390/educsci11030134

Jia, M. (2021). "The influence of distance learning during COVID-19 pandemic on student's self-regulated learning in higher education: a qualitative study," *in 2021 5th International Conference on Digital Technology in Education* (New York, NY: Association for Computing Machinery), 47–52. doi: 10.1145/3488466.3488492

Maatuk, A.M., Elberkawi, E.K., Aljawarneh, S. et al. (2021). The COVID-19 pandemic and E-learning: challenges and opportunities from the perspective of students and instructors. *J Comput High Educ 34*, 21–38 (2022). https://doi.org/10.1007/s12528-021-09274-2

Mali, D., & Lim, H. (2021). How do students perceive face-to-face/blended learning as a result of the Covid-19 pandemic? *The International Journal of Management Education, 19*(3), 100552.

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. *Online Learning, 22*(1), 205–222. https://doi.org/10.24059/olj.v22i1.1092

Mou T-Y (2020) Students' evaluation of their experiences with project-based learning in a 3D design class. *The Asia-Pacific Education Researcher 29*(2): 159–70.

Mou, T. Y. (2023). Online learning in the time of the COVID-19 crisis: Implications for the self-regulated learning of university design students. *Active Learning in Higher Education, 24*(2), 185-205.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*(4), 385–407. https://doi.org/10.1007/s10648-004-0006-x

Radha, R., Mahalakshmi, K., Sathish, V., & Saravanakumar, A. R. (2020). E-learning during lockdown of Covid-19 pandemic: A Global Perspective. *International Journal of Control and Automation, 13*(4),1088–1099

Robson, N., & Greensmith, J. (2009). Educational podcasts: Some early evidence and thoughts. *International Journal of Management in Education, 8*(3), 107–117.

Samir, M., El-Seoud, A., Taj-Eddin, I. A. T. F., Seddiek, N., El-Khouly, M. M., & Nosseir, A. (2014). E-learning and Students' Motivation: A Research Study on the Effect of E-learning on Higher Education. *International Journal of Emerging Technologies in Learning., 9*(4), 20–26. https:// doi. org/10. 3991/ ijet. v9i4. 3465.

Sangster, A., Stoner, G., & Flood, B. (2020). Insights into accounting education in a COVID-19 world. *Accounting Education, 29*(5), 431–562.

Selwyn, N. (2016). Digital downsides: Exploring university students' negative engagements with digital technology. *Teaching in Higher Education, 21*(8), 1006–1021.

Setyaningrum, W. (2018). Blended learning: Does it help students in understanding mathematical concepts? *Jurnal Riset Pendidikan Matematika, 5*(2), 244–253. https://doi.org/10.21831/jrpm.v5i2.21428

Stevanović, A., Božić, R., & Radović, S. (2021). Higher education students' experiences and opinion about distance learning during the Covid-19 pandemic. *Journal of Computer Assisted Learning, 37*(6), 1682-1693. https://doi.org/10.1111/jcal.12613

Stevanović, A., Božić, R., & Štrboja, M. (2023). Impact of learning environments on students' achievements in Calculus contents before and during COVID-19 crises. *Interactive Learning Environments, 32*(9), 5724-5743. https://doi.org/10.1080/10494820.2023.2228828ž

Taranto, D., & Buchanan, M. T. (2020). Sustaining lifelong learning: A self-regulated learning (SRL) approach. *Discourse and Communication for Sustainable Education, 11*(1), 5-15.

Stevanović, A., & Kaplar, M. (2025). Transforming student autonomy in changing educational contexts: learning material choices from the pandemic onward. *STED Conference 14*(2), 395-406.

Toptaş, V., & Öztop, F. (2021). Primary school teachers' views on learning deficiencies in mathematics lessons in the process of distance education. *Eğitim Kuram ve Uygulama Araştırmaları Dergisi, 7*(3), 373–391.

Turner, Y. (2015). Last orders for the lecture theatre? Exploring blended learning approaches and accessibility for full-time international students. *International Journal of Management in Education, 13*(2), 163–169.

Verbić, S., Kaplar, M., Lužanin, Z., Trnavac, D. & Ranđelović, B. (2025). Simpson's paradox in mathematics grading: A case study of Serbian primary schools. *Zbornik Instituta za pedagoška istraživanja, 57*(1), 5−28. DOI: 10.2298/

Xu L, Duan P, Padua SA and Li C (2022) The impact of self-regulated learning strategies on academic performance for online learning during COVID-19. *Front. Psychol. 13*:1047680. doi: 10.3389/fpsyg.2022.1047680

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist, 25*(1), 3–17. http://doi.org/10.1207/s15326985ep2501_2

Zimmerman,B.J., & Schunk, D. H. (2011). Self-regulated learning and performance: an introduction and overview. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 1–14). Routledge.