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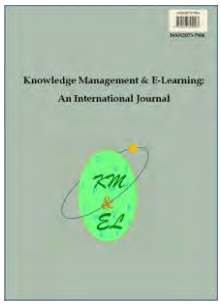

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Undergraduate students' learning experiences and strategies in online learning during the pandemic: An Indonesian perspective

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Abstract: Transitions in learning implementation have occurred at various levels of education during the COVID-19 pandemic. Learning that previously took place in conventional, face-to-face formats has been adjusted to fully online

learning. Not all educational institutions are equally prepared for a pandemic, necessitating the study of student learning experiences and the strategies they employ in online classes during the pandemic. This study focuses on the positive and negative contributions of Virtual Learning Environment (VLE) features in student learning experiences and strategies during the pandemic. This study used a survey method consisting of closed- and open-ended questions. Data analysis using descriptive statistics and qualitative data analysis was employed to obtain several themes. Approximately 1,400 students from 23 higher education institutions across several provinces in Indonesia participated in this research. The results show both positive and negative contributions of VLE features. Among the VLE features that positively contribute to learning during the pandemic are video materials and downloadable documents. More than half of the respondents claimed there were no negative features of the VLE. Findings also revealed the most frequently reported negative aspect is poor internet performance. In addition, seven themes related to student learning strategies emerged including: considering the availability of infrastructure, monitoring the class schedule and calendar (or announcements), collaborating with peers, participating in the university's learning management system, applying notetaking strategies and other specific strategies, searching for additional learning resources, and no specific strategy applied while learning during the pandemic.

Keywords: Learning experience; Online learning; Regulation strategies; Virtual learning environment; Pandemic

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1. Introduction

Since the outbreak of COVID-19 in 2020, the ongoing pandemic has necessitated changes in teaching and learning practices in higher education institutions, from traditional face-to-face interactions to internet-based online learning. At the peak of the pandemic in March 2020, one and a half-billion students engaged in remote learning around the world (UNESCO, n.d.). This change in conditions disrupted the learning process, as students had to adjust and adapt to study successfully in a new learning environment. These changes require adjustments in class administration, which has primarily taken place face-to-face in the classroom. Although some educational institutions have previously used information and communication technology to support the learning process, others are not yet familiar with online learning modes, including both full online and blended learning.

Indeed, distance education and online learning are not novelties in Indonesia. Indonesia has an open university which was established in 1984, called Universitas Terbuka (UT). It has extensive experience in organizing distance education. Additionally, at the national level, Indonesia has an Indonesian Online Learning System, abbreviated as SPADA in Bahasa. It includes Online Lectures and Open Lectures held by various universities. Blended learning has also been implemented by higher education institutions, according to their needs and capacities. Beyond individual institutions, the Association of Computer and Informatics Higher Education (Aptikom) has a Massive Open Online Course (MOOC), MOOC Aptikom.

In pandemic conditions, educational institutions at various levels need time to adjust, especially regarding the preparation of infrastructure, Virtual Learning Environments (VLE), and teaching staff trained in online pedagogy. Lecturers have limited time to prepare for online classes; however, they can use the available time to improve their competence in teaching in an online learning environment.

In general, pedagogy refers to theory and practice related to teaching activities and is also called the "art of teaching". Teaching itself is related to knowledge clusters, types of teaching material, technological media, learning environments, and the personal characteristics and objectives of students. Online learning environments require a different teaching approach than classroom teaching (Bates, 2015; Humphrey & Wiles, 2021; Leyer et al., 2023), and online pedagogy informs the implementation of online learning.

The design of online classroom administration is closely related to the choice of technology (Bates, 2015). This design considers the usability of a learning management

system (LMS) product, communication tools, and internet access. A variety of LMS and communication tools are now available, even if an institution does not use a particular application in its academic community. A number of questions related to technology must be considered in planning online classes. To what extent has technology supported the instructional design developed? To what extent is the accuracy and convenience of the technology chosen to support student learning and assessment activities? How can the challenge of high bandwidth be addressed if access is individual and outside the campus environment? Indeed, challenges related to bandwidth encourage us to consider the details of interaction strategies with students through online discussion forums in the LMS.

The implementation of unplanned online learning raises questions regarding VLE features' contribution to student learning experiences. The extent to which students adapt to unplanned, fully online learning also needs to be studied. Previous studies have investigated factors related to students' experiences in online learning, including the implementation of online learning in different contexts during the pandemic. These factors include emotion (AlDahdouh, 2020; Jiang & Koo, 2020); course design, instructional strategies, and online instruction (Rios et al., 2018); technology (Urazbaev & Kholmatov, 2019); feelings towards the experience, particularly negative ones (Kaufmann & Vallade, 2020; Munir et al., 2021); demography (Abdous, 2019; Rizvi et al., 2019); prior online learning experience (Wang et al., 2020); culture (Bhagat & Chang, 2018); IT and computer skills (Al-Taweel et al., 2020); and media diversity (Lange & Costley, 2019). Studies related to online learning experiences during the pandemic are extensive, mostly investigating students' perceptions and challenges in studying online during this period. Researchers from many countries have attempted to elucidate the phenomenon of emergency remote learning, such as in Jordan (Al-Salman & Haider, 2021), Malaysia (Selvanathan et al., 2020), and Indonesia (Rahiem, 2020).

However, studies of VLE features' contribution to undergraduate students' learning experiences and strategies, especially during the pandemic, remain limited. Thus, it is necessary to explore the level of student ability in using virtual learning environments and their perspectives on their learning experiences and strategies.

Two research questions guide the current study:

RQ1: What are the positive and negative contributions of virtual learning environment features to student learning experiences?

RQ2: What strategies do students employ to handle unplanned, fully online learning during the pandemic?

The paper is organized into the following sections: Introduction, Literature Review, Method, Findings and Discussion, and Conclusion.

2. Literature review

This section outlines literature relevant to the study of virtual learning environments, online learning experiences and strategies, and fully online learning during the pandemic. Literature was searched using the Scopus database. At the first iteration, we found 690 related papers; then, after applying inclusion and exclusion criteria using Kitchenham's method for Systematic Literature Review (Kitchenham et al., 2009), the final number of papers to be reviewed totalled 17 journal papers and 1 conference paper. The papers' publication years spanned from 2018 to 2021 (the search was conducted on 22 April 2021).

2.1. Virtual learning environment: Its features and learning facilitation

For each clinical case, the patient information including texts, charts, and images is organized into different categories and subcategories. Learners may access initial information and perform clinical actions such as ordering a specific lab test to achieve additional information to explore and solve the problem. Most clinical cases are progressive and patient information is achieved in a time sequence, instead of one snapshot.

Learning paradigms have shifted from teacher-centred learning to student-centered learning (Rayens & Ellis, 2018), and the rapid development of Information and Communication Technology (ICT) has impacted the form of both learning and teaching. Many technologies have changed dramatically over the last two decades, but VLE has remained stable, supporting online learning services throughout universities (Newman et al., 2018). In general, VLEs are defined as web-based applications that implement Web 2.0 and enable learners to interact with teachers and peers, access learning materials, and use cutting-edge technology to enhance their learning (Farrelly et al., 2020). Educational institutions frequently develop their own form of VLE or use available open source-based VLEs such as Moodle, a Learning Management System (LMS) platform.

One of the most prominent concepts in online learning theory that penetrates virtual learning environments is student-centered learning (Bates, 2015), in which students are able to learn at their own pace. Applying this concept, students become the major players in the learning process rather than teachers, and, ideally, students are metacognitively involved in their learning process (Wong et al., 2019). Additionally, pedagogies are becoming more dynamic as they evolve in response to the innovative teaching and learning modes made possible by ICT. To implement effective online pedagogy, the teacher must integrate technology, select relevant VLE features to accommodate student needs and preferences and optimize online teaching strategies.

While VLEs provide features, such as quizzes, assignments, virtual laboratories, feedback forums, online discussions, and more, to enhance the learning process, not all features are universally relevant to students. A study at Middlesex University reported several VLE features were favored in students' preferences (Hamutoglu et al., 2020). This study was conducted before the COVID-19 pandemic, confirming that student preferences for VLE features and the selection of VLE features by instructors are key concerns even in normal learning situations. Moreover, courses made available online in response to a crisis or disaster are significantly different from well-planned online learning experiences.

2.2. Online learning experiences and strategies

Although online learning would seem advantageous for students, since they are able to learn at their own pace and on their own time, providing students with positive and satisfying online learning experiences continues to be a challenge. Our review showed that studies addressing student online learning experiences both before and during the pandemic are extensive. Before the pandemic, the literature primarily confirmed that conducting online learning using a specific VLE positively impacts student learning experiences, such as augmented reality to enhance learning (Czerkawski & Berti, 2021), a simulation of virtual patients for pharmacy students (Lim et al., 2020), and a 360o video for craft skill learning (Hallberg et al., 2020). They acquired feedback on the learning experience created in well-planned online learning from the learners. Before the COVID-19 outbreak, many studies aimed to compile students' perceptions of to shift from face-to-face to online

learning, such as in dental education in Saudi Arabia (Linjawi & Alfadda, 2018) and in Lithuania (Valantinaitė & Sederevičiūtė-Pačiauskienė, 2020).

Meanwhile, during the pandemic, almost all studies focused on gathering student perspectives on unplanned online learning. With varying numbers of participants, from either a single institution or several, most of these studies were conducted online using such tools as Google Forms, online interviews, and SurveyMonkey. The resulting literature showed the existence of different points of view regarding the shift away from traditional, face-to-face education, with some in favor of online learning during the pandemic and others not. Two out of 17 papers state that students were frequently not in favor of the shift away from traditional, face-to-face education (Humphrey & Wiles, 2021; Selçuk et al., 2021), while other literature gave a more optimistic perspective. Several challenges that arise in unplanned online learning are the internet connection (Prieto et al., 2021; Rasiah et al., 2020), homework load (Rahiem, 2020), technological adaptability (Al-Taweel et al., 2020; Prieto et al., 2021; Rahiem, 2021), and financial issues (Rahiem, 2021). On the other hand, the reasons why students are in favor of online learning are its flexibility (Jaradat & Ajlouni, 2021; Prieto et al., 2021; Rahiem, 2021) and the opportunity it affords for self-development and self-care, since they do not have to travel.

Several studies claim to be representative of a specific country, such as Jordan (Al-Salman & Haider, 2021) and Indonesia (Rahiem, 2020, 2021). Meanwhile, several others aimed to compile student perceptions of specific subjects and specific backgrounds (e.g., academic background) of students during the COVID-19 outbreak, such as student assessments of a mathematics course (Almarashdi & Jarrah, 2021) and feedback from biology students (Humphrey & Wiles, 2021), medical students (Ibrahim et al., 2020), theology students (Selçuk et al., 2021), and public affairs students (Ni et al., 2021). In addition, existing literature recommends several improvements for unplanned online learning, such as effective instructional design (Al-Salman & Haider, 2021; Ni et al., 2021; Selvanathan et al., 2020) and increased social presence (Ibrahim et al., 2020; Ni et al., 2021; Rahiem, 2020).

The factors impacting the online learning experience are course design, including the type of learning resources used, the interaction between instructor and students, and learning activities, each of which may lead to positive or negative learning experiences for students (Caskurlu et al., 2021). Factors introduced by the students' personalities may also impact the learning experience (Cohen & Baruth, 2017).

According to our review, most of the studies were related to the term "learning strategy" or "self-regulated learning strategy." One study categorized learning strategies into four groups: cognitive strategy, metacognitive strategy, resource management strategy, and affective strategy (Ariffin et al., 2021). However, the definition of learning strategy is commonly agreed to refer generally to particular learners' patterns while learning (Schwendimann et al., 2018). Although the use of particular learning strategies was shown to have no significant relationship with student performance (Stark, 2019), an understanding of students' learning strategies may still be useful to educators.

2.3. Completely online learning during the pandemic

Due to the emergency caused by the pandemic, educational institutions have been forced to shift learning formats from face-to-face to online teaching. This unplanned situation creates a dilemma for teachers. On one hand, during the pandemic, teachers are expected

to guide, assist, and offer feedback to students remotely and conduct all teaching online, using innovative strategies (Davis et al., 2018) and synchronized or asynchronized learning. On the other hand, the use of many types of technology may seem overwhelming (Hamutoglu et al., 2020), especially in the pandemic situation in which many students return to their hometowns and not all have internet access. In this situation, a digital divide (Talandron-Felipe, 2020) exists in Indonesia that may contribute to device accessibility (Puspitasari & Ishii, 2016). Consequently, students with limited internet access prefer text-based instruction to video-based instruction (Istenič, 2021).

3. Method

3.1. Research design

The research employed a survey research design. An online questionnaire was created consisting of both closed- and open-ended questions.

3.2. Participants and context of the study

A total of 1,485 students participated in this study, including both male students (811 students) and female students (631 students). 43 students did not disclose their gender. The students were from 23 higher education institutions that participated in the study of unplanned online learning during this pandemic. The institutions whose students participated are in various provinces throughout Indonesia and represent the regions of Western (19 institutions), Central (3 institutions), and Eastern Indonesia (1 institution). The three universities with the most participants were: two universities from the Western part of Indonesia (207 participants from University A and 347 participants from University B) and one university from the Central part of Indonesia (115 participants from University C). In addition to the distribution of regions, the universities in which the respondents' study can be divided according to their status: state universities and private universities.

The research participants came from different levels of study. More than 50% of the participants were freshmen (460 participants) and sophomore students (452 participants), while the remainder were junior (295 participants) and senior students (278 participants) (see Table 1).

Table 1
Participants' level of study (academic status)

	Level of study	*N*	%
1	Freshman and have taken under 30 credits	460	31.0
2	Sophomore and have taken 30-59 credits	452	30.4
3	Junior and have taken 60-89 credits	295	19.9
4	Senior and have taken more than 89 credits	278	18.7
Total		1,485	100

Most of the participants had a GPA greater or equal to 3.00 (84.3%). Meanwhile, participants who had a GPA smaller than 3.00 were 15.7%. Detailed information regarding participants' GPAs can be seen in the following Table 2.

Table 2
Distribution of participants based on GPA

	GPA	*N*	%
1	3.50 or more	588	39.6
2	3.00 – 3.49	664	44.7
3	2.50 – 2.99	180	12.1
4	2.00 – 2.49	40	2.7
Total		1,485	100

Of the total participants, 664 students had taken online classes before even (spring) semester of 2020 (see Table 3).

Table 3
Participants' experience in online class

Question	Response	*F*	%
Respondents' experience of taking online classes before even semester 2020	Yes	664	44.7
	No	821	55.3
	Total	1,485	100

3.3. Survey instrument

Participants' perceptions related to their learning experiences and strategies were collected using an online questionnaire. The questionnaire consists of demographic information questions and closed- and open-ended questions related to learning experiences and strategies while engaged in fully online learning during the pandemic.

The survey consists of nine questions (eight multiple choice and one open-ended) and requires no more than 15 minutes for completion. The questions are categorized into students' demographic profiles, perceptions regarding the online learning environment used in their classes and learning strategies while taking online lessons. Details of the survey items can be found in the Appendix I.

3.4. Data collection procedures

Data were collected in the online questionnaires involving undergraduate students from July 2020 to September 2020. The students participated in the study voluntarily. They were asked to reflect upon their participation in their online classes before filling out the questionnaire. They were free to leave the study or to not fill out the questionnaire. No reward was given to the students.

3.5. Data analysis

Data collected were analyzed using descriptive statistics and thematic analysis. To observe the learning strategies implemented by students while taking online classes during the pandemic, researchers conducted an analysis of the frequency of keywords that appeared, as well as a thematic analysis of answers given by participants. Using a free web-based text mining tool, www.voyant-tools.org, researchers obtained a number of relevant keywords.

Thematic analysis was applied to analyze the qualitative data and reveal the themes for open-ended questions. There are five steps for data analysis, which are in accordance with Peel's (2020) recommendations: 1) getting familiar with the data; 2) coding the extract from data; 3) creating code categories from the codes; 4) constructing themes from the coded extracts that have been classified; and 5) Contextualize and represent the results. The coding analysis was conducted by two raters.

4. Findings and discussion

This section elaborates on the findings that address two research questions.

4.1. Findings and discussion for RQ1

RQ1: What are the positive and negative contributions of virtual learning environment features to student learning experiences?

In implementing online learning, each higher education institution uses a different online learning environment with variations in their features. Respondents stated that most of the features used were exams, as seen in Table 4, including midterm and final semester exams (1,337 respondents); downloadable documents or files (1,270 respondents); electronic homework collection (1,266 respondents); video material (1,224 respondents); and quizzes, including formative quizzes/exercises (1,143 respondents). It is also interesting to note that 1,347 respondents stated that virtual laboratories were not available in the learning environment they used. In addition, as many as 1,091 respondents stated that no assistance was provided online by teaching assistants.

Table 4
Features of the VLE available for the respondents

	Features of the VLE	*N*	%
1	Exams (midterm exam and final exam)	1,337	90.0
2	Downloadable documents or files	1,270	85.5
3	Electronic homework collection	1,266	85.3
4	Video material	1,224	82.4
5	Quizzes, including formative/practice quizzes	1,143	77.0
6	Online group discussions	984	66.3
7	Online tutoring sessions	761	51.2
8	Synchronous chat facility	757	51.0
9	Projects (tasks that are larger than homework)	702	47.3
10	Assistance provided by assistant lecturers	394	26.5
11	Virtual labs	121	8.1
12	Others	20	1.3

In online learning, it is crucial to identify the features that support the student learning process. Below, Table 5 shows the features of the online learning environment that respondents thought contributed positively to their learning activities. A total of 1,144 respondents stated that video material contributed positively to their learning activities. The existence of downloadable documents also contributed positively, according to 1,029 students (69.3%).

Nearly half of the respondents (49.4%) stated that online group discussions also made a positive contribution to their learning activities. These results align with previous studies of the relationship between online collaborative learning and learning performance. Previous studies also found that several teaching and learning strategies can enhance the learning experience: team-based learning in online learning (Hernández et al., 2021), social presence (Akcaoglu & Lee, 2018; Andel et al., 2020; Weidlich & Bastiaens, 2019), effective instructional strategies (Rios et al., 2018), active learning (Lamon et al., 2020), collaborative learning (Vahed & Rodriguez, 2020), and learning design (Bearman et al., 2020).

Other features that have an average percentage of contribution, between 20-48% were quizzes, exams, internet network performance, and synchronous chat facility. Meanwhile, less contributed to students' learning experiences were virtual labs. Virtual labs might have the least impact on students' learning experiences because it is rare to be implemented by the instructor in online learning. Only specific courses need virtual labs to feature in online learning.

Table 5
Positive contributions of VLE features to students' learning experiences

	Features of the VLE	*N*	%
1	Video material	1,144	77.0
2	Downloadable documents or files	1,029	69.3
3	Electronic homework collection	773	52.1
4	Online group discussion	734	49.4
5	Online tutoring sessions	699	47.1
6	Quizzes, including formative/practice quizzes	690	46.5
7	Exams (midterm exam and final exam)	679	45.7
8	Internet network performance	646	43.5
9	Synchronous chat facility	505	34.0
10	Assistance provided by assistant lecturers	294	19.8
11	Projects (tasks that are larger than homework)	280	18.9
12	Virtual labs	110	7.4
13	I feel that none of these features have a positive contribution to my learning activities	58	3.9
14	Others	15	1.0

The findings of this study indicate that not all features in the online learning environment contribute positively to student learning activities. Table 6, below, shows features of the online learning environment that respondents believed contributed negatively to their learning activities. Some of these features include projects or tasks that are larger than homework (33.9% of respondents), virtual laboratories (15% of respondents), and internet network performance (39.7% of respondents). Meanwhile, 29.8% of respondents stated they felt that none of these features had a negative contribution to learning activities. Several previous studies mentioned internet providers as a primary challenge in unplanned online learning (Prieto et al., 2021; Rahiem, 2021; Rasiah et al., 2020).

The responses from the respondents were almost consistent. Several features that have highly positive contributions to their learning experience were also features that have less negative contributions to their learning experience. Video materials and downloadable

documents were in the first and second rank in Table 5. In line with that, these features were in the 12th and 13th rank in Table 6.

Table 6
Negative contributions of VLE features to students' learning experiences

	Features of the VLE	*N*	%
1	Internet network performance	589	39.7
2	Projects (tasks that are larger than homework)	504	33.9
3	I feel that none of these features have a negative contribution to my learning activities	443	29.8
4	Virtual labs	223	15.0
5	Exams (midterm exam and final exam)	194	13.1
6	Quizzes, including formative/practice quizzes	175	11.8
7	Online group discussions	164	11.0
8	Electronic homework collection	141	9.5
9	Online tutoring sessions	134	9.0
10	Assistance provided by assistant lecturers	129	8.7
11	Synchronous chat facility	106	7.1
12	Video material	71	4.8
13	Downloadable documents or files	41	2.8
14	Others	29	2.0

Nearly half of respondents, 686 or 46.2% of respondents, stated that online learning features have an influence or effect on their learning activities (see Table 7). Other features that do not highly influence students' learning experiences, with a percentage between 10-20%, were synchronous chat facility, virtual lab, online group discussions, assistance provided by assistant lecturers and projects. Meanwhile, the internet network performance was in the bottom rank, which means that the internet performance highly influences student's learning experience.

Table 7
VLE features that do not influence students' learning experiences

	Features of the VLE	*N*	%
1	I feel that all of them have an influence or effect on students' learning activities	686	46.2
2	Synchronous chat facility	227	15.3
3	Virtual lab	211	14.2
4	Online group discussions	180	12.1
5	Assistance provided by assistant lecturers	171	11.5
6	Projects (tasks that are larger than homework)	156	10.5
7	Electronic homework collection	140	9.4
8	Quizzes, including formative/practice quizzes	138	9.3
9	Downloadable documents or files	130	8.8
10	Online tutoring sessions	128	8.6
11	Exams (midterm exam and final exam)	127	8.6
12	Video material	117	7.9
13	Internet network performance	107	7.2
14	Others	8	0.5

4.2. Findings and discussion for RQ2

RQ2: What strategies do students employ to handle unplanned, fully online learning during the pandemic?

To observe the learning strategies implemented by students while taking online classes during the pandemic, researchers conducted an analysis of the frequency of keywords that appeared as well as a thematic analysis of answers given by participants. Based on the results of the analysis, the researchers obtained a number of relevant keywords, shown below in Table 8.

Table 8
Most frequent words in the corpus

Words	*N*
Assignment	373
Checking	362
Schedule	289
Well-organized	188
Course	185
Calendar	167
Online	164
Class	160
Creating	159
Announcement	128
Lesson	127
Information	115
Group	114
Time	114
Looking at	110
Learning material	105
Checking	97
Learning	94
Friend	89
Lecturer	87
Deadline	73
Following	73
Course	72
Taking notes	70
Alarm	61

Findings also revealed the effective strategies respondents employed during their online learning. From the data gathered, the researchers divided each participant's comments into different categories. Each category represents a theme found in the qualitative data. The researchers identified seven themes: (1) considering the availability of the infrastructure; (2) time scheduling and monitoring the calendar (or announcements); (3) collaborating with peers; (4) monitoring and participating in the university's learning management system; (5) applying notetaking strategies and other specific strategies; (6) additional learning resources; and (7) no specific strategy applied while learning during the pandemic.

4.2.1. Theme 1: Considering the availability of infrastructure

A number of 41 statements from students show that some students considered the availability of infrastructure or facilities to support their learning during the pandemic. This finding is in line with previous studies which show that poor internet connection is a challenge for online learners (Prieto et al., 2021; Rasiah et al., 2020). Moreover, the issue of the digital divide (Puspitasari & Ishii, 2016; Talandron-Felipe, 2020), especially in Indonesia, is a challenge that policymakers should address. These are the examples of students' statements:

> *"Prepare the internet device properly..."*
>
> *"Usually, I check the facilities provided by the campus for online classes and write it down in my cellphone notes."*
>
> *"Set an alarm every hour when a class is about to start and ensure a stable connection."*
>
> *"Make sure the city has enough internet and install an alarm, so I am not late if there are classes."*

4.2.2. Theme 2: Monitoring the class schedule and calendar (or announcements)

A number of 810 statements from students indicate that some students were concerned about the schedules of their learning activities and the calendar of announcements while learning in completely online classes during the pandemic. This finding is very much in accordance with previous studies in Jordan (Jaradat & Ajlouni, 2021) and Malaysia (Rasiah et al., 2020). Despite the high flexibility of time and place afforded by studying online, 53% of respondents in Jordan faced the challenge of lacking time management skills (Jaradat & Ajlouni, 2021), and students in Malaysia reported the same issue (Rasiah et al., 2020). Therefore, learning strategies related to scheduling are considered important (Aeon & Aguinis, 2017) for online learners. These are examples of students' statements:

> *"Regularly check class groups to find out academic information because sometimes a lot of information provided on the website or mobile app is not in sync properly."*
>
> *"Regularly I like to check whether there are assignments given by the lecturer and also always check the deadlines for submission."*
>
> *"I always record important dates such as quiz and exam dates."*
>
> *"I am able to manage time and adequate rest."*

4.2.3. Theme 3: Collaborating with peers

A number of 63 statements show that some students chose to learn collaboratively. Collaborative learning is an effective active learning strategy. Studying online during the pandemic may cause negative feelings in students (Kaufmann & Vallade, 2020; Munir et al., 2021) since lecturers and peers are not physically present. By learning collaboratively with peers, students cooperate and ask their friends if they encounter difficulties in learning. These are examples of students' statements:

"Not ashamed to ask questions and ask for opinions when experiencing problems in the learning process, especially with friends who are in the same group on the project."

"Discuss with friends to discuss problems in class."

"Cooperating with friends to remind each other of the class material, deadlines, etc."

"Ask a friend if I don't understand."

4.2.4. Theme 4: Monitoring and participating in the university's learning management system

A number of 119 statements from students indicate that some students regularly monitored updates in the university's LMS. This theme suggests that LMS promotes student-centered learning (Hasibuan & Santoso, 2005) and plays a number of roles in enhancing learning, such as facilitating students' self-regulated learning (Wong et al., 2019) and increasing student engagement through VLE features such as quizzes and synchronous and asynchronous discussions. However, the usability and user experience of LMS should be considered to maximize its benefits. These are examples of students' statements:

"Because the online system has to catch up to the demands of this pandemic, it is much more accessible than it has ever been. I am rarely late on an assignment anymore. I can learn things at my own pace, and the test calendar provided by my campus is very good."

"Regularly checking the online web course that has been determined by the campus."

"Checking the learning platform and class group, then adjusting the time and assignments/classes according to priority."

"Every day I see on Microsoft Teams if maybe there are friends who are asking questions or have other info."

"I always check the e-learning website from my university every morning, then set an alarm for every course hour."

4.2.5. Theme 5: Applying notetaking strategies and other specific strategies

A number of 273 statements from students reveal that they applied notetaking strategies and other specific strategies while learning in completely online classes during the pandemic. Studies found that notetaking strategies contribute positively to students' learning performance or academic achievement (Salame & Thompson, 2020). These are examples of students' statements:

"I set goals every day."

"Recording material in the form of presentation or video files."

"Doing assignments properly and always attending online lectures."

"My strategy is to study hard and have discipline."

"Joining each class to understand the material. Regularly checking the material."

4.2.6. Theme 6: Searching for additional learning resources

A number of 30 statements from students show that some students were willing to 'go the extra mile' to search for additional learning resources. Students with the initiative to learn more can be characterized as self-directed or self-regulated learners, one of the characteristics of which is possessing metacognitive skills. One study states that metacognitive strategy is an invaluable skill in learning online, which may present a challenge for instructors attempting to support students' self-regulated learning skills while teaching online (Wong et al., 2019). These are examples of students' statements:

"Looking for other learning resources."

"Looking for a video as clarification."

"Studying the material through YouTube or other media so that it can be understood."

"Often open the laptop, study alone on YouTube."

"Looking for learning materials on the internet when not understanding any lessons, watching the video uploaded by the lecturer."

4.2.7. Theme 7: No specific strategy applied while learning during the pandemic

A number of 60 statements from students show that some students did not apply specific learning strategies to completely online learning during the pandemic. Although some students stated that they did not have a specific strategy, this statement represented a small proportion of all respondents. The statement may have come from students who were familiar with online classes. They may have been taking online classes for several semesters before the pandemic. These are examples of students' statements:

"There is no strategy."

"Nothing. I just follow what is, learning online as usual."

"So far, I don't have any strategy. I tend to look at the possibility of when assignments are given and collected because every Saturday and Sunday, I have to go back to the village."

From the student preferences and perceptions of VLE features and the thematic analysis of students' learning strategies, several implications and recommendations for stakeholders emerge. The recommendations are provided below.

5. Conclusion

This study examined the use of VLE features and students' learning strategies during the COVID-19 outbreak. It can be concluded that among the VLE features that positively contribute to learning during the pandemic are video materials and downloadable documents/files. More than half of the respondents claimed that there were no negative features of the VLE. However, the most frequently reported negative aspect is poor internet performance, with roughly 40% of respondents experiencing this problem. Furthermore, seven themes of students' learning strategies were found in this study: considering the availability of infrastructure, time scheduling and monitoring the calendar (or

announcements), collaborating with peers, monitoring, and participating in the university's learning management system, applying notetaking strategies and other specific strategies, additional learning resources, and no specific strategy applied while learning during the pandemic. To conclude, the research findings provide insight to any stakeholders in education, including students, lecturers, and institutions, on how to improve their strategies for online learning implementation, particularly during the pandemic.

6. Recommendations

The current research findings suggest several recommendations for relevant stakeholders. Firstly, the research findings are useful for lecturers or instructors to accommodate learners' experiences and strategies and reconsider their teaching strategies. Choosing appropriate learning resources and offering alternatives to students with internet performance problems is one of the recommendations. Another is improving course design (such as course materials and learning activities) by thoroughly adapting to the pandemic situation. For course materials, lecturers might provide more videos, and for learning activities, lecturers might implement collaborative learning, which would be beneficial to students who are in favor of collaborating with peers. Furthermore, lecturers should identify the most effective instructional design in order to optimize the learning process during the pandemic.

Secondly, institutions might deliver relevant policies and regulations to support learners, especially concerning infrastructure. Reliable infrastructure should be prepared for online learning. Additionally, training related to online pedagogy could be offered to support lecturers who teach online. The usability and user experience of the current VLEs in institutions also deserve consideration. Since video is the most popular item among online students, institutions might employ specialists in video editing to accompany lecturers.

Thirdly, students may use these research findings to improve their learning strategies. Students who are reluctant to read additional learning materials might alter their approach or begin to practice notetaking.

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Appendix I

Survey Instrument (English Translation)

Q0. Write down the last five digits of your Student Identification Number?

Q1. Your current academic status:

- First Year (Freshman) – Has taken under 30 credits
- Second Year (Sophomore) – Has taken 30-59 Credits
- Third Year (Junior) – Have taken 60-89 Credits
- Fourth Year (Senior) – Have taken more than 89 credits

Q2. What is your current cumulative GPA?

- 3.50 or more
- 3.00 – 3.49
- 2.50 – 2.99
- 2.00 – 2.49
- Under 2.00

Q3. What is your gender type?

- Men
- Woman
- Prefers not to mention

Q4. Have you ever taken online classes before this Even semester 2020?

- Yes
- No

Q5. What features in the online learning environment are available for you to use in your online classes? Please select all that are appropriate.

- Video material
- Synchronous chat facility
- Electronic collection of homework
- Projects (tasks that are bigger than homework)
- Virtual lab
- Quizzes, including formative/practice quizzes
- Exams (mid and final)
- Online tutoring sessions
- Online group discussion
- Downloadable documents or files
- Assistance provided by a lecturer assistant
- Others: _____

Q6. Which of the following features of the online learning environment do you think contributes POSITIVELY to your learning activities? Please select all that are appropriate.

- Video material
- Synchronous chat facility
- Electronic collection of homework
- Projects (tasks that are bigger than homework)

- Virtual lab
- Quizzes, including formative/practice quizzes
- Exams (UTS and UAS)
- Online tutoring sessions
- Online group discussion
- Downloadable documents or files
- Assistance provided by a lecturer assistant
- Internet network performance
- Others: _____
- I don't think any of these features contribute POSITIVELY to my learning activities

Q7. Which of the following features of the online learning environment do you think is contributing NEGATIVELY to your learning activities? Please select all that are appropriate.

- Video material
- Synchronous chat facility
- Electronic collection of homework
- Projects (tasks that are bigger than homework)
- Virtual lab
- Quizzes, including formative/practice quizzes
- Exams (UTS and UAS)
- Online tutoring sessions
- Online group discussion
- Downloadable documents or files
- Assistance provided by a lecturer assistant
- Internet network performance
- Others: _____
- I don't think any of these features contribute NEGATIVELY to my learning activities

Q8. Which of the following features of the online learning environment do you think is contributing UNEFFECTIVELY to your learning activities? Please select all the options that you think are appropriate.

- Video material
- Synchronous chat facility
- Electronic collection of homework
- Projects (tasks that are bigger than homework)
- Virtual lab
- Quizzes, including formative/practice quizzes
- Exams (UTS and UAS)
- Online tutoring sessions
- Online group discussion
- Downloadable documents or files
- Assistance provided by a lecturer assistant
- Internet network performance
- Others: _____
- I feel all of them have INFLUENCE / EFFECT on my learning activities

Q9a. How do you feel about your ability to succeed in an online learning environment? Please select all that apply.

- Motivated
- Not sure
- Safe
- Fear

- Confident
- Isolated or feeling alone
- Anxious
- Depression
- Comfortable
- Depressed
- Independent
- Have the power/control to do something
- Feeling supported
- Others (please specify): _____

Q9b. Why do you feel you have the feelings shown above.

Q10. How do you describe how you feel during online learning?

- I grow MORE POSITIVE about my ability to succeed
- I grew up MORE NEGATIVELY about my ability to succeed
- My feelings have NOT changed

Q11. What are you doing to adapt to your new online learning environment in this class?

Q12. What effective strategies did you use during online learning in this class (e.g. regularly checking calendars/course announcements, etc.)?