Tan GR et al., JPKI, 2023;12(2):109-121
doi: 10.22146/jpki.73707

ORIGINAL RESEARCH

JPKI

MIDWAY TO DIGITAL TRANSFORMATION OF MEDICAL EDUCATION: CURRENT PERCEPTION AND ADAPTATION OF MEDICAL STUDENTS TOWARDS SYNCHRONOUS ONLINE LECTURES

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Submitted: 09 May 2022; Final Revision from Authors: 11 Feb 2023; Accepted: 15 Feb 2023

ABSTRACT

Background: The Covid-19 pandemic had forced majority of medical institutions to cease face-to-face learning and implement online synchronous technology. Thus, the improvement of online synchronous learning had become a priority for the continuity of medical education. This study explored students' self-regulated online learning behavior and perception towards synchronous online learning during the Covid-19 pandemic.
Methods: This study used a cross-sectional mixed-method design. Stratified random sampling was applied for participant recruitment that included 101 participants, whom are medical students from academic year 1 to 3 (2018-2020) . A total of 12 interview participants were recruited purposively to allow adequate representation of each batch. Data were collected using a modified Self-regulated Online Learning Questionnaire-Revised and a semi-structured interview. Descriptive statistics and thematic analysis were used for data analysis.
Results: Approximately 72.28% of participants (N = 101) were of the higher self-regulated online learning behavior group. Batch 2019 had the highest percentage of higher-self regulated learning participants (27.72%, n = 35, p = 0.899). The environmental structuring average score was the highest ($\bar{x}$ = 5.77), while persistence domain was the lowest ($\bar{x}$ = 5.03). The participants appreciated the use of technology to provide quality lectures and flexibility of attending lectures. However, classroom interaction and accountability was a major challenge.
Conclusions: Synchronous online lectures have the potential to allow students find their effective study time and method during the Covid-19 pandemic.

PRACTICE POINTS

- The improvement and novel modifications of synchronous online lectures in medical education were appreciated by students.
- Different synchronous online lecture-styles impacted the motivation and self-regulated learning behavior of students.
- The future implementation of synchronous online lectures can be adjusted based on students' perception towards synchronous online lectures and their learning behavior during synchronous online lectures.

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INTRODUCTION

The Covid-19 pandemic has forced the majority of schools, including medical schools to cease face-to-face learning. Before the pandemic, many health care training institutes had integrated blended learning and flipped classroom models.[1–3] Online learning has many advantages, such as reducing delivery costs, increased scalability, improved access and availability[1]. Although preclinical students were reported to prefer live lectures when given the option, almost all studies assessing the effectiveness of online lectures reported high satisfaction and increased knowledge following intervention.[2]

According to studies before the Covid-19 pandemic, the effectiveness of online learning and online lectures could also be influenced by the students' characteristics, such as gender, learning style, attitude, satisfaction, and level of engagement.[3] During the initial stage of the Covid-19 pandemic, medical schools were not prepared to move into a fully online course.[2–7] However, when online education had become the only standalone option, Indonesia's infrastructure and technical support for online learning had been improved. Following the phenomenon, there is a need to explore students' perceptions towards synchronous online lectures.

Medical students have to be mindful of their study routines in the fully online learning setting and self-regulate themselves to attend synchronous online lectures. According to Curry's learning behavior model and Riding and Wigley's three-level model, the external world experiences most readily affect instructional preference, which is the students' observable preference of learning environment, and observed behavior of learning.[8,9] Therefore, the implementation of synchronous online lectures might affect medical students' instructional preference and study behavior. Approaching this issue with the SRL model would provide more insight on the factors that affect the participation and adaptation of medical students to synchronous online lectures.

This study would like to assess whether students self-regulate themselves effectively during synchronous online lectures, and explore students' current perception towards synchronous online lectures.

METHODS

Study design

This study was a descriptive mixed-method cross-sectional study design. This study included three batches of undergraduate medical students from academic year 2018, 2019, and 2020, of which each batch had distinctive differences in the synchronous online learning method, including the lecture-style, interactivity, the media used, and the time when the study materials were given.

A modified self-administered Self-Regulated Online Learning Questionnaire-Revised (SOL-Q-R) was used as the instrument to assess self-regulated learning behavior. We used stratified random sampling to include questionnaire participants. Then, a semi-structured interview was conducted to explore medical students' perceptions towards online lectures and self-regulated online learning behavior. We used a purposive sampling strategy to approach questionnaire respondents to participate in the interview.

Study setting

The medical faculty of Universitas Gadjah Mada has implemented synchronous online lectures since 2020 in response to the Covid-19 pandemic. The batches of students that had to immediately attend synchronous online lectures were batch 2018, 2019, and 2020.

The synchronous online lectures were conducted using Zoom®, and the initial synchronous online lecture method was the conventional lecture style. A few other lectures were formatted as a panel discussion between experts in the field. Later, Universitas Gadjah Mada also had discussion-style lectures, where the students were given lecture materials and asked to prepare questions before attending lectures. Then, the 50-minute lecture session was used for lecturer-student discussion. The Zoom® link for the lectures was sent to the student's batch group, and the attendance of the students was recorded using Google® forms.

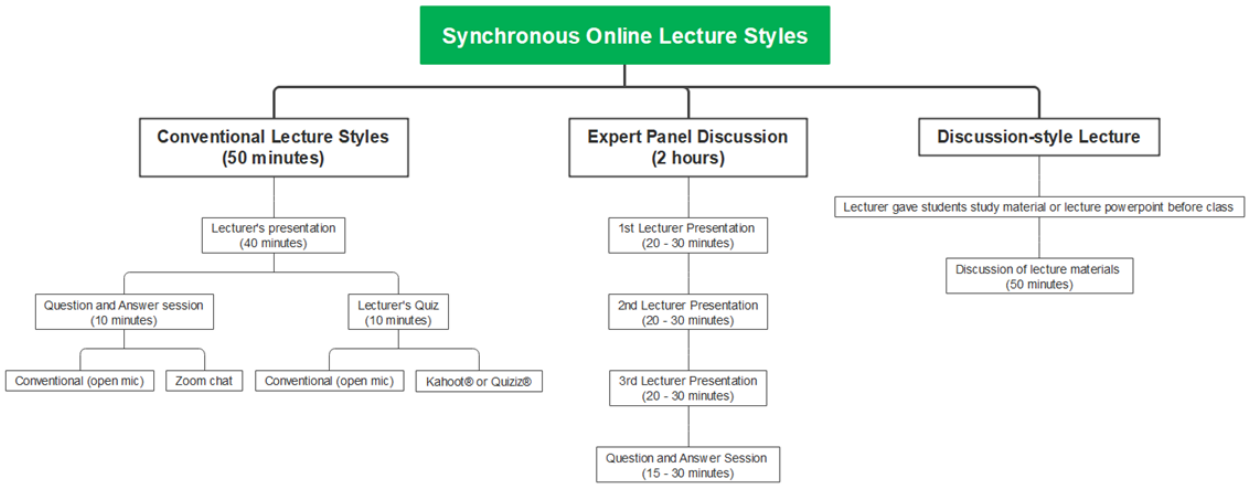

Figure 1. Synchronous Online Lecture Style at Medical Faculty of Universitas Gadjah Mada

The medical faculty of Universitas Gadjah Mada also had an e-learning platform, Gamel®, to provide the students with the lecture slides. Since implementing synchronous online lectures, Gamel® had also been used to post lecture recordings to the students.

Participants

A total of 101 undergraduate medical students of Universitas Gadjah Mada were recruited with the inclusion criteria: medical students from batch 2018, 2019, and 2020; and the exclusion criteria: students with pre-existing physical or psychological conditions that hinder their online learning experience and students who did not sign the informed consent. Each batch had notable characteristic and lecture delivery differences during the time when this study was conducted (Table 1).

This study was approved by the Ethics Committee at Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada. All participants signed a written consent that explained the research project and its objectives, methods, procedure, and analysis. Data were anonymized, and upon completion of the questionnaire or interview, the participants were given monetary gift vouchers.

Table 1. Participant Enrollment Design

Comparison	Batch 2018	Batch 2019	Batch 2020
Duration of offline lectures*	2 years	1 year	-
Lecture-style**	Conventional leture style, panel discussions	Conventional lecture style, panel discussions, discussion-style lectures	Conventional lecture style, panel discussions
Provided lecture slides before lecture	No	Sometimes	Yes
In-lecture quizzes***	No	No	Yes

Note: *conventional offline lecture prior to the Covid-19 pandemic, **implemented during the data collection phase of this study, ***given using Kahoot® and Quiziz® and were not graded

Data collection

A 7-point Likert scale questionnaire was prepared based on the SOL-Q-R[10], which was a questionnaire developed in response to the increasing emergence of massive open online courses and other online education schemes, thus fit the condition of synchronous online classroom during the Covid-19 pandemic social isolation better than other preceding validated self-regulated learning questionnaires. In this study, the SOL-Q-R was modified to fit the context of synchronous online lectures in Universitas Gadjah Mada. The questionnaire had 35 items consisting of 7 scales. Pilot testing was conducted. The modified SOL-Q-R validity was tested through expert judgement, and scale reliability was tested by Cronbach's alpha (Table 2). The results showed that the modified SOL-Q-R is reliable. The questionnaire was provided digitally and spread to medical students of Universitas Gadjah Mada through a Line® group chat of each batch throughout June – July 2021.

Table 2. Reliability of Study Instrument

Scale	Items	α-value
Metacognitive activity before learning	7	0.882
Metacognitive activity during learning	7	0.612
Metacognitive activity after learning	5	0.918
Time management	2	0.774
Environmental structuring	4	0.938
Persistence	5	0.775
Help-seeking	5	0.621

A semi-structured interview guide was prepared based on the research objectives and expert suggestions. Interviews were conducted by the first author face-to-face (n=12) in the Indonesian language. The qualitative study participants were chosen by purposive sampling from the questionnaire participants who had previously given consent at the end of the questionnaire. Interviews were video-recorded, and the median time of the interviews was 25 minutes (range 14-51 minutes). Conversations were transcribed literally, and the interviewees then verified the transcriptions.

Data analysis

The quantitative data was tabulated to Microsoft Excel® and exported to IBM SPSS Statistics® version 26 to conduct descriptive statistics (a measure of central tendency, frequency, percentage). To assess the study participants' self-regulated learning level, the participants who had a mean score of self-regulated learning ≥5 were classified into the higher self-regulated learning group. In contrast, participants whose mean score of self-regulated learning were <5 were classified into the lower self-regulated learning group. The relationship between gender and self-regulated learning was analyzed by the Mann-Whitney U test, and the relationship between batch and self-regulated learning was analyzed by One way ANOVA.

Analysis of qualitative data employed an inductive thematic analysis approach. Initially, the interviews were verbatim-transcribed. The interview transcripts were then coded by two independent coders. Codes emerged from the transcripts were then synthesized into categories, which then further resulted as themes. Member checking was conducted to ambiguous transcripts. The qualitative data analysis were monitored by an independent supervisor to ensure data trustworthiness.

RESULTS AND DISCUSSION

Quantitative and qualitative data were collected subsequently to: 1) assess and explore students' self-regulated online learning during synchronous online lectures; and 2) students' perception towards synchronous online lectures in a developing country. The questionnaire results, including the participants' self-regulated learning category, difference of each participant variable towards their average SRL score, and the participants' average score on each SRL domains, is presented. The interview results include the themes: 1) "self-regulated online learning" with subthemes "Supportive factors", "inhibitory factors", and "changes of study behavior" to add the depth of understanding towards the participants' questionnaire results; and 2) "synchronous online learning" with subthemes "opportunities", "challenges" and "continuity of synchronous online lectures" to answer the second aim of this study.

Questionnaire

The data of this study was collected from May – December 2021 at Universitas Gadjah Mada. 101 participants were included in the study (Table 3). Goodness of fit chi-square test was done and there was no difference between the population and study participants from each batch (α = 0.985). There was also no difference between the population and study participants of male and female gender (α = 0.159).

Based on the questionnaire result, 60.87%, 80.00%, and 69.70% of students from batch 2018, 2019, and 2020, respectively, had higher self-regulated learning behavior. Amongst the higher self-regulated learning behavior group within all batches, batch 2019 has the highest number of students classified into the higher self-regulated learning behavior group (27.72%) than batch 2018 (21.78%) and batch 2020 (22.77%). One way ANOVA was done to compare the average score of self-regulated online learning between each batch, and the result showed a statistically insignificant difference. Overall, 72.28% of participants from all batches were classified into the higher self-regulated learning group (Table 3).

Table 3. Participants' Characteristics (N=101)

No.	Variable			n(%)	$\bar{x}$	Category		p-value
						Higher	Lower	
						n (%)	n (%)	
1	Gender	Female		74 (73.27)	5.42	58 (78.38)	16 (21.62)	.090
		Male		27 (26.73)	5.15	17 (62.96)	10 (37.03)	
2	Batch of Undergradate Entry	2018	Regular class	23 (22.77)	5.24	22 (66.67)	11 (33.33)	.899
			International class	10 (9.90)				
		2019	Regular class	26 (25.74)	5.35	28 (80.00)	7 (20.00)	
			International class	9 (8.91)				
		2020	Regular class	22 (21.78)	5.39	23 (69.70)	10 (30.30)	
			International class	11 (10.89)				
3	All participants				5.35	73 (72.28)	28 (27.72)	

Table 4. Average Scores of Each SRL Domains

Domain	Variable ($\bar{x}$)					All participants ($\bar{x}$)
	Gender		Batch			
	Male	Female	2018	2019	2020	
Metacognitive activity before learning activity	5.11	5.27	4.99	5.26	5.43	5.23
Metacognitive Activity During Learning	5.51	5.49	5.54	5.45	5.50	5.50
Metacognitive Activity After Learning	5.10	5.31	5.18	5.18	5.42	5.26
Time Management	4.63	5.11	5.18	4.96	4.82	4.99**
Environmental Structuring	5.44	5.90	5.86	5.74	5.72	5.77*
Persistence	4.96	5.05	4.93	5.05	5.11	5.03**
Help-seeking	4.96	5.76	5.59	5.80	5.38	5.54*
All domains	5.15	5.42	5.24	5.35	5.39	5.35

Note: *domains with the highest average SRL score **domains with the lowest SRL score

Kolmogorov-Smirnov test of normality was tested for the female (.sig = 0.009, <0.05) and male (.sig = 0.200, >0.05) respondents' average scores, therefore, Mann-Whitney U test was done. Even though the average score of self-regulated online learning between the male and female participants showed a statistically insignificant difference (Table 3), this study found a significant relationship between gender and the help-seeking domain (p = 0.001), in which the female respondents showed higher help-seeking behavior compared to the male respondents (female mean rank = 57.07, male mean rank = 34.35).

Interview

Table 5. Themes Emerged from Semi-Structured Interviews

Synchronous Online Lectures	
Opportunities	**Challenges**
Effective	Inadequate internet connectivity
Flexible	Diminished classroom interaction
Technological convenience	Loss of focus
Continuity of Synchronous Online Lectures	
Strongly prefer synchronous online lectures	(n = 8)
Strongly prefer traditional face-to-face lectures	(n = 2)
Provide synchronous online lectures as alternative	(n = 2)
Self-Regulated Online Learning	
Supportive of SRL	Inhibitory of SRL
Spare time	Less peer support
Comfortable study space	Monotonous routine
Discussion-style lectures	Disruptive study space
In-lecture quiz	Digital fatigue
Internal commitment	
Graded academic assessment	
Changes in study behavior	
Environmental structuring	(n = 11)
Multitasking	(n = 7)
Skipping lectures	(n = 4)
Rewatching lecture recording	(n = 4)
Better notetaking	(n = 3)
Reflecting study method	(n = 2)
Braver to ask questions	(n = 2)
Studying alone	(n = 2)

Note: *domains with the highest average SRL score **domains with the lowest SRL score

Self-Regulated Online Learning during the Covid-19 Pandemic

Quantitative results found that majority of this study's participants self-rated themselves highly in self-regulated online learning, and 72.28% of participants were classified into the higher self-regulated learning group.

What are the factors that affected the participants self-regulated online learning?

During the interview, almost all participants agreed that having spare time and a comfortable study space gave them control to manage and reflect on their studying.

> *"I can discover my study method because I have so much spare time that I can use to study and review my studies. I have also learnt how to review well, I know how I should study. This (discovering own study method) is possible through the implementation of online lectures because there is so much time that I can use to understand myself in terms of studying." (Male, batch 2019 International class, SRL score 6.11)*

> *"(during the implementation of online lectures) I make sure to study on my table to avoid getting sleepy.. and umm stay focused. But I actually prefer to study outside (coworking spaces) when I have the chance because the space is better for studying…I can be more focused.. maybe because when I decide to study outside, I already made the decision to study, so I become more enthusiastic, I guess..." (Female, batch 2019 Regular class, SRL score 4.57)*

Some participants expressed that when external factors were unfavorable to maintain their motivation to study during the block, their own internal commitment towards their grades prevented them from neglecting online lectures altogether. These same participants also exercised more persistence and time management nearing the block exam.

> *"I don't want to waste my time if I didn't pay attention to the lectures, even though we have recordings—rewatching the recordings would still take time." (Female, batch 2020 Regular class, SRL score 6.31)*

"For me, it (staying focused to lectures) is more about how we view attending lectures as an obligation. I fear that if I fail my test and have to take remedials during the holidays, I would feel so sad. So that's my motivation. It's fine to study very hard right now to avoid taking remedials." (Female, batch 2020 Regular class, SRL score 4.46)

Quantitative result showed that batch 2019 has the highest number of students classified into the higher self-regulated online learning behavior group (27.72%), while batch 2018 has the lowest number of participants classified into the higher self-regulated learning behavior group (21.78%). Although the difference between the average SRL score of each batch was statistically insignificant, qualitative findings revealed that discussion-style lectures and in-lecture quizzes implemented in batch 2019 and 2020 drove the students to prepare for the lectures so that they could contribute to the discussion. Having discussions during the lecture helped them stay motivated and focused, which in turn supported the participants' momentum of maintaining self-regulated learning behavior throughout the block.

"..(during our favorite block) we were given the chance to study and prepare questions first, the lecture sessions were used to discuss" (interactivity during lecture). (Male, batch 2019 International class, SRL score 4.69)

This finding correlates with Henriksen, Creely and Henderson,[11] who suggested that asking the students to prepare questions before the lecture to be discussed during the session ensured purposeful participation and could overcome communication barriers. The effectiveness of discussion-style lecture found in this study also corroborates with several previous studies.[12,13]

Having novel Question-and-Answer sessions using Kahoot!®, Quiziz®, or interacting through the Zoom® chatbox also increased the students' enthusiasm, engagement, and understanding of the lecture topic. Low-stake quizzes which did not contribute to the overall score gave them a break from the monotonous conventional-style lecture.[14–16]

"...at the end of the session, the lecturer gave us Quiziz® and our identities were anonymous, so we were actively answering the quiz and it made us understand the objective of the lecture" (use of technology). (Female, batch 2020 Regular class, SRL score 4.46)

The statistical insignificance between the average SRL scores of each batch might be caused by the short duration of discussion-style lecture implementation at the time of data collection, which had only been implemented a few times throughout one block (6 weeks).

For each self-regulated online learning domain, what behavioral changes had the participants felt they made during the implementation of synchronous online lectures?

Overall, at the time this study was conducted, the synchronous online lecture environment was a novel environment. Based on the questionnaire results, the participants generally scored high on the environmental structuring and help-seeking domains. On the other hand, they scored themselves lower on the persistence and time management domains. Both the higher and lower self-regulated online learning groups expressed that they made changes in their study behavior to adapt with the opportunities and challenges that came with the implementation of synchronous online lectures (Table 5). In the following paragraphs, each domain is discussed in a descending order based on their average score (Table 4).

Environmental structuring.

In general, all batches of students appreciated that they could choose their conducive environment, arrange their physical setting, and limit social distractions to enhance their learning.

"We can arrange the tables and chairs so that we can get comfortable, and we can eat and drink as we like. If we attend lectures at the campus, we would not be allowed to eat and drink freely, there are more regulations at campus." (freedom during lecture) .(Male, batch 2019 International class, SRL score 6.11)

"During online lectures, I had to study at home – in my room. I had to buy some accessories,

like laptop standee, study lamp, get a new pair of reading glasses, to make my study environment at home more comfortable. Making these efforts reduced my discomfort while forced to study at home.. Also, there are many distractions at home, so I avoid them by closing my room when I had to attend lectures or study." (Female, batch 2018 International class, SRL score 4.63)

Wang, Shannon and Ross[17] stated that students have to set up a specific place as if they were taking traditional courses to concentrate on the learning materials of the online courses. However, the participants of this study not only recreated the traditional model of a conducive classroom but also did activities to make themselves focused during lectures, such as eating and drinking or watching the lecture while laying down or walking around a little.

Nevertheless, the immediate behavior to make themselves comfortable in their respective locations might reflect that students generally view the external environment as a greater determining factor of their study quality than their intrinsic motivation. Thus, when the external environment was unfavorable for studying, students tended to neglect their studies more quickly.

Help-seeking

The data from this study suggests that the students feel that they are adequately facilitated to seek help during the implementation of synchronous online lectures. However, for some students, the lack of face-to-face meeting with peers or lecturers allowed them to avoid asking questions altogether and study alone. On the other hand, select participants expressed that asking questions in video-conferencing settings decreased their social embarrassment, thus previously shyer students became braver to ask questions.

"The question and answer sessions sometimes become more interactive, maybe because some students can turn off their cameras when they ask questions, so they became braver (in asking questions)." (Female, batch 2018 International class, SRL score 6.71)

These findings corroborates with the students' help-seeking behavior through online synchronous and asynchronous means in a previous study[18] conducted with nursing students in Jordan. However, proactiveness in help-seeking is more critical during the implementation of online lectures and Covid-19 social isolation.

Metacognitive activity

The findings of this study suggests that the behavioral changes that the participants made were more related with having more spare time and technological conveniences (including the lack of monitoring that allowed students to fake their attendance) during the implementation of full online classes in general. Changes in metacognitive activity include having the space to reflect on one's study method, the ability and time to rewatch lecture recordings, and making better notes as well as having the time to review them.

"I become more diligent in notetaking… because the implementation of synchronous online lecture makes it easier to get lecture recordings. (If I miss something) I can rewatch the lecture many times, and I don't have to bring a heavy laptop to class for digital notetaking." (Female, batch 2019 Regular class, SRL score 5.63)

"My current strategy during online class is, because it's flexible, so I don't have to exert all my energy during the allocated (synchronous) lecture time.. I can save my energy to later study by myself when the time is more appropriate for me." (Male, batch 2019 International class, SRL score 4.69)

These findings is consistent with a previous study, in which student's attendance during morning classes was lower than later classes, and the students who missed class opted to watch lecture recordings instead.[19] From the qualitative data results, it can be inferred that the students' preference between attending synchronous online lectures and watching lecture recordings was influenced by personal environmental circumstances, personal characteristics, study strategy, moral values, and participants' sense of responsibility.

Time management

Even though quantitative data shows that the average score in the time management domain was low,

the interview participants expressed that they had better time management skills than they did during offline lectures prior to the Covid-19 pandemic. The perception of better time management skills might also be caused by the stagnant routine that made it easier for students to keep track of the classes they had attended each day. According to a previous study, the perception of the time management of students enrolling in online courses increased with the number of online courses they had completed.[20]

Evident of some degree of compromised time management behavior, some participants of this study expressed that they often neglected synchronous online lectures by multitasking on other academic or non-academic responsibilities during the lecture.

> *"I feel like I have more time to spare for studying during online lectures… I can use the spare time during lunch break to study or have a short nap, for example, because having lunch is quicker during online classes compared to the offline environment. But I sometimes also use the time during lectures to do organizational activities.. by using double device for example, or I study other lecture topics… there are also more distractions at home, so the atmosphere is not supportive for immersive studying." (Female, batch 2020 Regular class, SRL score 4.46)*

The results of this study suggests that having too much spare time could be counter-effective towards students' time management skill. While time management is a good predictor for academic performance, students can overindulge in entertainment during their spare time instead of using some of their time to study.[21]

Persistence

Most participants revealed that it was easy for them to lose focus or become bored of the lecture, which motivated them to skip lectures. Most of the inhibitory factors (Table 5) found in this study, namely less peer support, monotonous routine, and digital fatigue, compromised the participants' persistence in attending synchronous online lectures.

> *"During online classes, we always use our laptops. Once.. my eyes hurt due to viewing my laptop screen all the time, so I thought, since I couldn't pay attention anyway, I just entered the Zoom®, but (physically) left the lecture." (Male, batch 2018 Regular class, SRL score 6.12)*

> *"Paying attention to lecture schedules from my phone became tiring… so I sometimes avoid opening my phone. In the end, I forgot important schedules and class information, so I missed some lectures. This has happened once or twice… during online classes, my peers became less aware of each others' attendance, and nobody reminded me when I missed class." (Male, batch 2019 International class, SRL score 6.11)*

This finding is consistent with a previous study conducted before the Covid-19 pandemic, in which lack of accountability, lack of interactivity, feelings of isolation, and lack of instructor presence lowered the students' persistence in completing online courses.[22]

Students' Perception towards Synchronous Online Lectures

What are the opportunities and challenges of synchronous online lectures?

The results of this study regarding students' perception towards synchronous online lectures during the Covid-19 pandemic is consistent with previous studies. Several previous studies have confirmed that students perceived synchronous online lecture as more efficient and structured in academic scheduling,[23,24] more cost effective,[7,25] as well as flexible and allows less hassle in attending the lectures.[7,26,27]

Data from this study strongly suggests that students appreciated the technological conveniences made possible by the implementation of synchronous online lectures, and corroborates findings from previous studies: 1) the ability to adjust lecture sound quality and make students feel as if they always have front row seats during the lecture,[28] 2) control one's own social presence,[25,29,30] 3) use digital tools to take better notes (screenshot the lecture slide directly from the screen, quickly add supplementary references to the lecture notes), and 4) get high quality lecture recordings.[13,23,26,27,31–33]

During the time of the data collection phase of this study, medical students of Universitas Gadjah Mada had familiarized themselves with the synchronous online environment for over 12 months. Indonesia had also improved its quality of network connectivity since the start of social isolation and had provided subsidies for students to access Zoom®. However, the participants of this study still expressed that internet connection sometimes became a challenge. The same difficulty was also found in previous studies conducted in developing countries.[7,32]

This study also corroborates diminished classroom interaction in synchronous online lectures found in previous studies.[27,34,35] The students in this study was hesitant to unmute during video-conferencing because they were unsure of when to speak and not to speak because they couldn't see their lecturers' and peers' body language fully. This phenomenon can be explained by Bambaeroo and Shockpour, who wrote in their study that non-verbal cues can draw the students' attention to more understanding, motivate students during the interaction, and serve as guidance on when to speak, when to let others speak, and how to speak.[36]

The participants of this study strongly expressed that they easily lose focus while attending synchronous online lectures and lose their overall motivation for the whole block. This finding is consistent with previous studies.[7,25,27] Students suggested that synchronous online lectures were monotonous and lacked stimulation. However, their attention could be renewed when lecturers invite non-intimidating classroom interaction. Nevertheless, not all participants felt the need to maintain their focus during every lecture and they should be allowed to lose focus too at certain times. Such students knew which times they could study the best.

Why would participants be in support or against the implementation of synchronous online lectures in the future?

Overall, most participants of the interview stated that they supported the continuity of synchronous online lectures in the medical faculty of Universitas Gadjah Mada (n = 8). The students most appreciated the time and place flexibility, as well as the availability of high quality lecture playbacks taken from the Zoom® screen recording. The select few interviewees strongly against the continuity of synchronous online lectures are students who did not have an undisrupted study space or could not self-regulate themselves to focus during online lectures. Some other few participants were in support of having offline lectures, but moving to online lectures as an alternative when the lecturer and students couldn't meet at an appropriate time and place.

Study Strengths and Limitations

This study was a mixed-method study with stratified random sampling. Thus, this study could more completely assess and explore the students' perception and study behavior during synchronous online lectures under appropriate population representation, as each batch had different learning experience and characteristics. Subsequently, this study had some potential limitations. First, a cross-sectional study might not quantitatively compare students' self-regulated learning before and during the implementation of synchronous online lectures. Second, the students' self-regulated learning was self-reported. Bias and misunderstanding might still occur despite of prior explanation on the tools.

CONCLUSION

This study enrolled 3 batches of medical students of Universitas Gadjah Mada with different synchronous online lecture styles. Most medical students of Universitas Gadjah Mada was classified to have a higher self-regulated online learning behavior. Most notably in this study, having more spare time, a comfortable study space, and discussion-style lectures or in-lecture quizzes were suggested to be supportive of the participants' self-regulated online learning. On the other hand, less peer support, monotonous routine, disruptive study space and digital fatigue diminished the participants' motivation and self-regulated learning momentum. The participants of this study suggested that technological conveniences was a valuable opportunity of synchronous online lectures. However, students of this study also used

this opportunity to skip lectures, especially since the students reported that they lose focus faster during synchronous online lectures.

This study revisited concept of self-regulated learning, albeit in a full online environment and developing country setting. The findings of this study strengthens the findings of previous studies done in both developing and developed countries, as well as add unique insights on the implementation of synchronous online lectures through the perspective of medical students in Universitas Gadjah Mada. To conclude, synchronous online lectures have the potential to allow students find their effective study time and method.

RECOMMENDATION

Understanding the impact of the online environment towards medical students' self-regulated learning and perception towards the online classroom model would inspire institutions to adopt learning environments that improve the students' knowledge acquisition and academic outcomes. Institutions striving to implement synchronous online lectures should explore the ideal combination between different lecturing styles, scheduling, and attendance regulations.

Future research should include students, lecturers, and faculty staffs' perceptions. Furthermore, since self-regulated learning is associated with increased academic achievement, researching students who were given explicit self-regulated learning instruction and a group without instruction to compare academic achievement would contribute to current knowledge of self-regulated learning during online learning.

ACKNOWLEDGEMENT

This manuscript was adapted from a thesis research titled "Current Perception and Adaptation in Study Behavior of Medical Students of Universitas Gadjah Mada Towards Synchronous Online Lectures" which was presented at the Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada on 31 December 2021. The authors appreciate all students who were actively participated in the study.

COMPETING INTEREST

This study was granted research fund by Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada. The authors declare that there are no competing interests related to the study. The article searching for this paper was supported by Gadjah Mada University's website for database and partnership (http://ezproxy.ugm.ac.id).

LIST OF ABBREVIATIONS

SRL : Self-regulated Learning
SOL-Q-R : Self-Regulated Online Learning Questionnaire Revised

AUTHORS' CONTRIBUTION

Giovanna Renee Tan – developing research proposal, collecting data, data analysis, and publication manuscript

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