International Journal of Learning, Teaching and Educational Research
Vol. 21, No. 5, pp. 46-63, May 2022
https://doi.org/10.26803/ijlter.21.5.3
Received Feb 19, 2022; Revised Apr 29, 2022; Accepted May 10, 2022

Exploring Preclinical Medical Students' Reflections on their Learning Experience during the COVID-19 Pandemic

Siti Yusrina Nadihah Jamaludin
Pharmacology Unit, Faculty of Medicine, Universiti Sultan Zainal Abidin, Malaysia

Mohd Salami Ibrahim*
Medical Education Unit, Faculty of Medicine, Universiti Sultan Zainal Abidin, Malaysia

Abstract. The coronavirus disease 2019 (COVID-19) pandemic has posed considerable challenges to higher education. To understand how the new landscape of curriculum delivery affects learning experience, a qualitative descriptive study was conducted among preclinical medical students in Universiti Sultan Zainal Abidin, Malaysia between March 2021 and April 2021. Data were collected using an online Padlet platform which included an open-ended question with additional guided questions whereby students wrote their reflective writings, describing their perceptions on how online learning due to the COVID-19 pandemic affected their education. All reflective writings were transcribed verbatim. Data were analysed based on an established framework of systematic, robust, and credible thematic synthesis. A total of six students provided their reflective writings. The analyses revealed four themes. 'Adaptability and flexibility' appeared as the prominent theme, followed by 'reduced learning acuity', 'compromised tacit learning', and 'supports from policy and practice'. Students' adaptability to the new educational practices is indispensable to harvest the advantage of being flexible with online-based learning. It was concluded that key strategies for quality online-based learning during the COVID-19 pandemic include educators' training on engaging techniques, planning that avoids excessive and successive online classes, support for dedicated learning space at home, family engagement to reduce distractions, and students' access to quality technological hardware and software. Engineering solutions for affordable and reliable Internet connectivity are the main policy issues. Finally, the study recommends long-term educational goals which should address the irreplaceable aspects of tacit learning that are lost when transitioning to online-based learning.

Keywords: coronavirus disease 2019; medical education; reflections; undergraduate

* Corresponding author: Mohd Salami Ibrahim; *salamiibrahim@gmail.com*

1. Introduction

More than five million deaths have been attributed to coronavirus disease 2019 (COVID-19)(WHO, 2020). In addition to incurring a significant burden to the healthcare systems worldwide, the pandemic has caused tremendous changes in virtually every aspect of human life, including higher education (Nicola et al., 2020; Pauzi & Juhari, 2020). The varying degrees of restriction and the closure of higher educational institutions (HEIs) have presented an unprecedented challenge to curriculum delivery. The lockdown of educational institutions is prudent to effect social and physical distancing in order to curb the spread of the COVID-19 (Chu et al., 2020) by minimising the risk of the emergence of education sector clusters. Unfortunately, such restrictions hamper and disrupt conventional educational practices, leaving online learning as the main medium of instruction. As a consequence, universities globally have to shift rapidly from traditional face-to-face interactions to online platforms to avoid significant interruptions in the students' learning process (Burgess & Sievertsen, 2020; Pauzi & Juhari, 2020).

Although online learning has been suggested as a panacea for dealing with potential future global pandemics (Dhawan, 2020; Mukhtar et al., 2020), it is questionable whether the online platform is equivalent to the traditional face-to-face delivery in terms of effectiveness, engagement, and acceptability among both students and lecturers (Ismail et al., 2020). Before the COVID-19 crisis, Pei and Wu (2019) conducted meta-analyses of 16 studies with objective assessments of learning outcomes to compare the traditional face-to-face learning and online-based learning for undergraduate medical education. The random-effects statistical model established no significant difference between the two mediums of teaching delivery in pre- and post-test scores (Pei & Wu, 2019). Nonetheless, the pooled-effect statistics produced by the systematic review of the literature need to be interpreted with caution since the fidelity of implementation of online-based learning in real practice may vary considerably during the COVID-19 pandemic with critical repercussions for the actual outcomes of learning. Therefore, the rapid transition of curriculum delivery towards a virtual-based platform due to the COVID-19 pandemic may have created distinct circumstances that challenge our initial understanding of ubiquitous online-based curriculum delivery.

The concern is evident in the increasing reports on challenges associated with online learning during the pandemic. In Saudi Arabia, Rajab et al. (2020) conducted a quantitative survey among students and staff of the College of Medicine, Alfaisal University, on educational challenges during the COVID-19 restrictions. The survey revealed almost half of the respondents reported no prior experience with online-based learning with a wide-range of limitations including poor quality of communication, anxiety, and technophobia (Rajab et al., 2020). Furthermore, the implementation of student assessments via online platform was crucially limited by reduced assessment fidelity and unestablished application of technology to command wide acceptability on data integrity, security, and ethical issue on confidentiality and privacy (Rajab et al., 2020). Meanwhile, change of routines gave rise to time management challenges due to the competing priorities to address new learning materials, adaptations of curriculum delivery and innovative teaching approaches (Rajab et al., 2020). On the other hand, Gong

(2020) and Rahman (2020) insightfully described the challenges faced by two HEIs to embrace technology-enhanced education fully due to the lack of experience and steep learning curve caused by sudden changes of culture and routines of practice. Likewise, quantitative studies to determine how the pandemic has affected medical education have also been conducted in the United Kingdom (UK)(Dost et al., 2020), Jordan (Muflih et al., 2021), Poland (Baczek et al., 2021), Sudan (Gismalla et al., 2021), and Malaysia (Roslan & Halim, 2021). These studies reported multiple new types of challenges as well as known challenges with new magnitude. Thus, these original studies established a degree of evidence on changes due to the COVID-19 pandemic that mandate a new consideration of educational practices.

Further supporting the empirical evidence are findings from review studies on the educational impact of the COVID-19 on higher education. A meta-synthesis of seven studies by Camargo et al. (2020) concluded varying challenges and gaps of evidence that warrant the need for future educational studies to focus on the analyses of the curriculum structure during the pandemic. Echoing a similar concern, the narrative review by Iwanaga et al. (2021) highlighted the deficiencies of online-based learning in compensating for the immersive experience of face-to-face dissection of cadavers which is one of the core competencies of anatomy education. Consequently, they recommended anatomy educators to be familiar with all existing teaching methods to innovate a new approach that can maximise compensation owing to the lack of real experiential learning (Iwanaga et al., 2021). On the other hand, a critical review of dental education during the COVID-19 era by Machado et al. (2020) urged educators to exercise caution when relying on Internet-based teaching owing to the non-uniform learning experience as a result of unequal Internet access. Their concern was underpinned by the reports of all dental schools around Europe to embrace Internet-based as the main mode of teaching owing to access restrictions to academic buildings (Machado et al., 2020). Taken together, uncertainties remain due to gaps of evidence from both empirical and review studies which signify the urgent need to explore the role of online learning to meet the new challenges of educational needs.

As a result, a qualitative study was conducted via reflective writings among the second-year medical students at the Faculty of Medicine of the Universiti Sultan Zainal Abidin (UniSZA). The undergraduate medical programme (MBBS) consists of two learning phases; Phase 1 (preclinical) for years 1 and 2, and Phase 2 (clinical) for years 3, 4, and 5 (Rahman et al., 2015). The MBBS programme in UniSZA was started almost ten years ago; previous research has indicated a favourable learning environment and positive learning experience among medical students (Rahman et al., 2015). However, there are some concerns about the quality of medical education received by the current undergraduate medical students as a result of the sudden change in curriculum delivery due to the COVID-19 pandemic. Questions remain as to whether the current strategies adopted by the faculty members are effective enough to help the preclinical medical students continue their education without major interruptions and delays. Even though the undergraduate medical students in UniSZA have experienced online learning during pandemic era for more than a year now, appropriate strategies on how to make online teaching and learning effective to cater for the specific needs of the medical education process still need to be

established. A comprehensive review of students' experience would be useful to illuminate gaps in the current educational practices during the COVID-19 pandemic as well as providing further insights into more targeted and effective educational interventions for future pandemics' preparedness. Therefore, qualitative research was adopted that seeks to explore and generate a deeper understanding of this important issue.

Consequently, students' reflections may serve as a significant source of information to gain an in-depth understanding of the challenges regarding quality of education via the online platform during the COVID-19 pandemic. As a central element for experiential learning, reflection is a metacognitive process whereby one rethinks their thought process and tries to immerse, sometimes with deep emotion, in order to achieve a new height of abstract conceptualisation (Kaufman & Mann, 2013). Reflection therefore explains why two people who have had the same experience may reach different conclusions despite being exposed to the same event. Similarly, reflection may enlighten a deeper, richer learning experience which brings in-depth insights into the strengths, weaknesses, opportunities, and threats (SWOTs) of current educational practices. Hence, students' reflection is one of the richest sources of information to meet the objective of this study.

The main objective of this study was to explore the perceptions of the preclinical medical students on their learning concerning the impact of online learning due to the COVID-19 pandemic. In this study, the following research question was addressed: How does online learning due to the COVID-19 pandemic affect the learning experience of preclinical medical students?

2. Methodology

2.1 Study Design

This is a qualitative descriptive (QD) study (Kim et al., 2017) with thematic analysis (Braun & Clarke, 2006) conducted from March 2021 to April 2021 in the Faculty of Medicine, Universiti Sultan Zainal Abidin (UniSZA), Medical Campus, Kuala Terengganu, Terengganu, Malaysia (Figure 1). QD design is a particularly common qualitative research design in fields related to healthcare (Polit & Beck, 2009). This is partly because the QD design confers a flexibility on data interpretation to explore new understanding that is supported by but not bound to, existing theories (Kim et al., 2017).

2.2 Study Participants

The study participants were recruited from Year 2 of undergraduate preclinical medical students from the Faculty of Medicine, Universiti Sultan Zainal Abidin (UniSZA), Medical Campus, Kuala Terengganu, Terengganu, Malaysia. The class representative of the second-year preclinical medical students was contacted as he had direct contact with both the principal investigator and his classmates. The class representative acted as a mediator to disseminate the information regarding this study and to invite potentially interested participants. The recruitment of the study participants was carried out via purposive sampling (Palinkas et al., 2015). The inclusion criteria for participation in this study were 1) second-year medical students at the time of recruitment; and 2) being able to communicate and write in English or Malay. Upon contact and fulfilment of the inclusion criteria, each

study participant was introduced to the background of the study and invited to participate.

2.3 Ethical Considerations

Ethical approval for conducting the study was obtained from the UniSZA Human Research Ethics Committee (UHREC) (Study Protocol Code: UniSZA/UHREC/2021/229). All participants for this study were informed about the details of the study. Participation in this study was entirely voluntary and the study participants could withdraw from the study without any consequences. All participants provided signed informed consent (i.e. using digital signatures since data collection was performed using an online platform) before participating in the study. The anonymity and confidentiality of study participants were guaranteed. Only research team members had access to the data.

2.4 Data Collection

To comply with social distancing protocols and other restrictions imposed during the COVID-19 pandemic, data were collected using an online Padlet web platform (Padlet, 2021) (similar to a virtual bulletin board) which included an open-ended question that was specifically designed for this study: tell us about how the COVID-19 pandemic has affected your learning experience. The following guided questions were also used to further encourage the participants to express their thoughts:

- What do you find useful and/or interesting from this experience?
- What do you think is/are particularly discouraging?
- How do you think this experience can be improved?
- In what ways do facilities such as devices and Internet connections influence this experience?
- In what ways does the teacher's conduct (e.g. teaching style, his/her expertise, etc.) affect your experience?

The students who opted to participate in our study were given a unique Padlet link to share their reflections voluntarily on how the COVID-19 pandemic affected their learning experience. They were given freedom to write their reflections at their own convenient time but within the period of data collection. To preserve the naturalistic perspective of the QD design, researchers refrained from giving comments or making suggestions about the study participants' reflections throughout the conduct of this study.

2.5 Data Analysis

The reflective scripts collected from the Padlet were transcribed verbatim by the researchers. The reflective scripts were analysed using thematic analysis. The open coding procedures were carried out by the researchers; prominent patterns were identified independently and then corroborated to ensure analytical triangulation. Subsequently, all reflective scripts were analysed manually, and case by case analysis was done by all researchers, followed by cross-case analysis to identify themes. The process of analysis followed the six-step framework as designed by Braun and Clarke (2006), including familiarisation with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the scholarly report of the analysis.

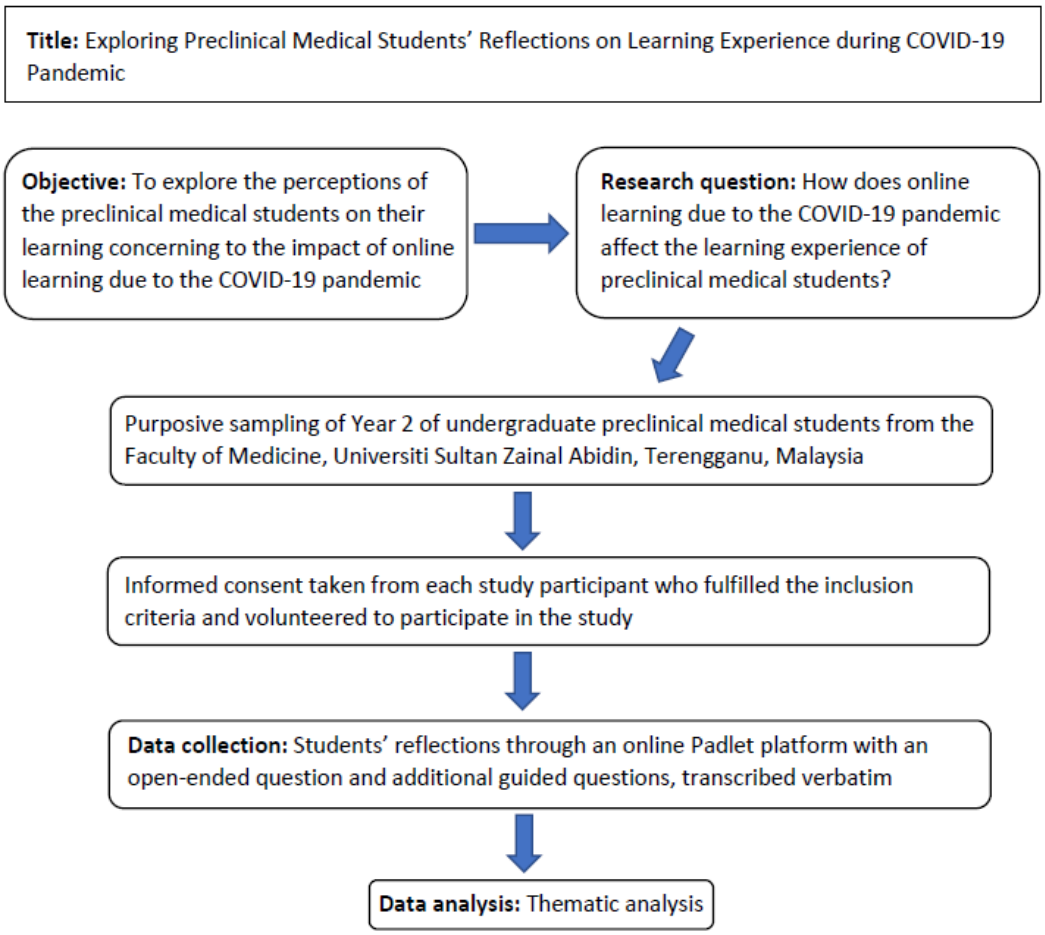

Figure 1: Study flowchart

2.6 Credibility

Credibility refers to the confidence of data interpretation (Polit & Beck, 2013). The six-step framework of data analysis by Braun and Clarke (2006) provides a systematic and methodologically robust approach to support the transparency of data analysis. Additionally, to generate the initial codes, name themes, and review themes, the two-stage data interpretation as proposed by McNiff was adopted (2017, p. 183). The first stage was the surface-level factual perspective which departs from searching the context-driven by immediate answering the questions on what, why, when, where, and how (McNiff, 2017). At this stage, researchers avoid investing deep interpretation of the original text. This method was critical to ensure researchers 'listened' to what the respondents were expressing, rather than falling into the common trap of select-interpretation by focusing only on certain text of interest. Thus, this step guided the exploratory-oriented goal of this qualitative study.

Furthermore, the second stage involves deep interpretation which was underpinned by educational perspectives as value-as-criteria that transformed the data from information to evidence (McNiff, 2017). Educational perspectives were adopted as the value-as-criteria because of the educational-oriented goal of this study. This process was supported by professional expertise from a qualified

medical educationist (MSI), established educational philosophies (learning theories), and empirical evidence from educational studies.

Therefore, the two-stage thematic synthesis of surface-level factual perspective and deep-level interpretation provides an audit trail to support the transparency and credibility of data analyses.

2.7 Triangulation

Triangulation is a distinct methodological approach to authenticate data sources and data interpretation of a qualitative study (McNiff, 2017). The authentication is achieved by the incorporation of multiple perspectives, thus enriching the scope of analyses from being narrowly defined and understood in a simplistic or self-serving way (Herr & Anderson, 2014). Consequently, triangulation supports the democratic validity of a qualitative analysis because of multiple points of departure that produce robust and wide perspectives that are relatively resistant against fake or deceptive information (Herr & Anderson, 2014).

There were three aspects of triangulation employed in this study, namely data source, evaluators, and theories (Patton, 2014). A minimum of three participants who provided similar information provided the triangulation of data source. In this study, deep-level interpretations were only conducted when three or more participants were describing similar phenomena. This was achieved by identifying three or more similar subthemes from the surface-level factual perspectives.

Additionally, three researchers who arrived at the similar interpretations of the same data provided triangulation of evaluators. To achieve the triangulation of evaluators, a qualitative methodological expert (YMY) was invited to participate during the data collection and data analysis of this study.

Initially, evaluators conducted independent interpretations then compared each other's findings. Any discrepancies were discussed, and final evaluations were reached via discussion and consensus. Finally, three distinct educational theories were used to describe the same theme to achieve the triangulation of perspectives (McNiff, 2017; Patton, 2014; Yin, 2009).

The triangulation of these three aspects served as additional measures with a robust audit trail to support the credibility, transferability, conformability, and dependability for the overall trustworthiness of discussion and conclusion of this study (Elo et al., 2014). Figure 2 illustrates the flow of analysis which is based on interconnected methods of triangulation to support this goal.

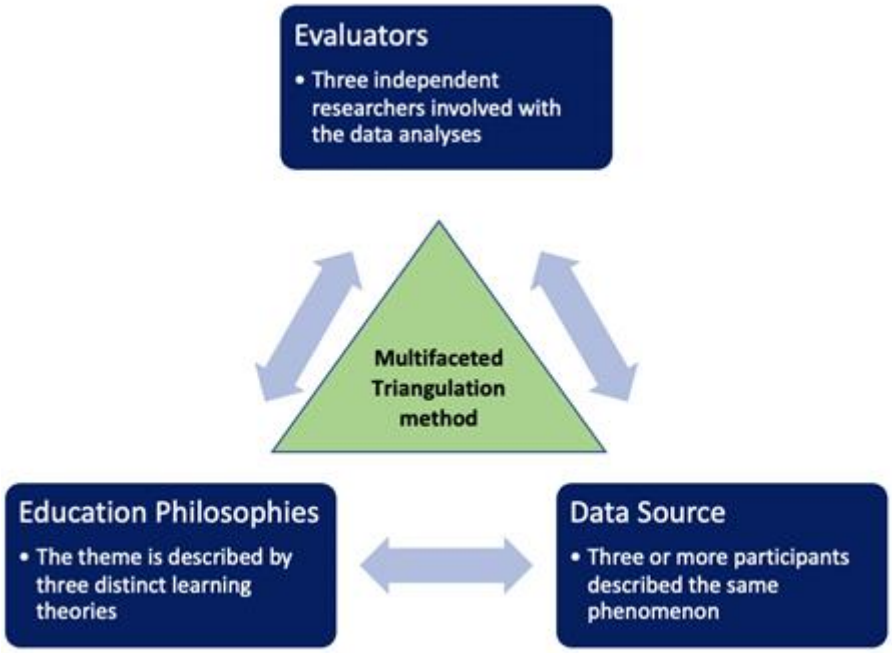

Figure 2: The multifaceted triangulation methods employed in this study

3. Results

Six participants for this study produced reflective writing from a total of 60 second-year medical students who were invited to participate. This resulted in a 10% response rate. Two were males and four were females. All of the study participants were 21 years old and all were used to English as their second language.

The thematic analysis yielded four main themes, namely 'adaptability and flexibility', 'reduced learning acuity', 'compromised tacit learning', and 'supports from policy and practice'.

3.1 Adaptability and Flexibility

With online-based learning, participants appreciated that they could save time, make greater financial savings and have easier access to family support. Collectively, these advantages signified a new gain of flexibility compared with the traditional conventional face-to-face time. These flexibilities confer wider autonomy to plan and commit to issues that relate to transport, food, professional appearance, and emotional support. To the question of encouraging experience from online-based learning, Participant 4 insightfully responded as follows:

> *"The most interesting thing is that no need to be dressed up and rushed to go to the online classes every morning. Also, when I got too stress out about studying and examination, I have my family in front of me to get some support."*

The benefits of flexibility, on the other hand, were not completely understood until students were able to adapt to their new learning habits. Participant 1 wrote the following:

> *"At first it was a very awkward moment and we found it quite tough because we never experienced such an experience like this. But after being at home and having online classes, I slowly adapt how to be a flexible student at home."*

Adapting to the new habit and being flexible have also aided in the development of innovative learning abilities. Participant 5 shared the experience of adopting a new learning style:

> *"…the most interesting part that I experience is I became more creative (a little bit). If before, I just read the lecture notes and do some revision but during online class, I know that I need to survive in this Med school. I do a lot of simplified notes, diagram, and mind map that helps me on revising."*

3.2 Reduced Learning Acuity

Unfortunately, the transition to a virtual platform had also been associated with reduced learning acuity which denoted compromised aspects of the environment that were crucial for effective learning. This theme encapsulated issues such as unreliable and expensive Internet connection, poor audio-visual clarity, lack of opportunity for private face-to-face access to lecturers, eye-strain due to prolonged screen exposure, and distractions posed by the Internet content. Participant 2 shared the following:

> *"Besides, the biggest challenge of online learning was the struggle with focusing on the computer screen for a long period. I was distracted easily by social media and other sites… Network coverage was bad and affected my study in such that the audio and video breaks, became an inconvenience and distraction to me. I often lost focus and interest when this happened."*

Additionally, the blurring of demarcation between home and dedicated educational environment was also associated with reduced learning acuity. Participant 3 expressed the following:

> *"I do not own a room so it is an inconvenience for me to attend an online class at family room even though I own a study desk….Sometimes when relatives came, I also need to stop attending for a while to greet them and this somehow makes me lose focus."*

3.3 Compromised Tacit Learning

Unlike reduced learning acuity which could be remediated with comprehensive planning and resource investment, this theme emphasised irreplaceable components of learning that were undermined by transitioning to a virtual platform. Tacit learning could be understood as gaining knowledge that is not readily expressed but resides within the mind, behaviour, and perceptions of individuals (Dampney et al., 2002). Consequently, participants articulated loss of tacit learning via various statements that contrast the quality of learning between the traditional face-to-face and online-based learning.

For example, in response to the question on the most discouraging experience of online-based learning, Participant 6 reflected as follows:

> *"Probably the ability to have the face-to-face lecture. Human expresses emotions through their face and it affects others' psychology. By having the face-to-face lecture, students can see the honesty in teaching that is expressed by their lecturers so it can affect the students' psychology to feel more encouraged and interested in their study. In online learning, you don't get the same effects as face-to-face learning."*

Furthermore, participants implied loss of tacit motivational drive via statements such as the absence of teaching gestures, inability to invest similar focus and being sleepy during online classes. Participant 2 wrote the following:

> *"Being physically present in class put a pressure on me to focus more, which online learning did not have. I tend to take studying lightly when I was at home compared to in college."*

Participant 1 meanwhile summarised the loss of the tacit motivational aspect of learning by contrasting the home environment against the prior dedicated learning atmosphere:

> *"… for me as a student who used to stay at the hostel, home is for rest and enjoy my holiday not for focusing on study too much."*

3.4 Supports from Policy and Practice

All participants shared one universal message for policy-making, namely the need for reliable and affordable Internet connection. Participant 5 reflected as follows:

> *"About the Internet, I need to change my place always. Sometimes in the bedroom, living room, or the kitchen. Tiring but what can I do?"*

Consequently, participants appreciated several initiatives by the teachers to deliver quality education. These initiatives include recording the online classes for offline use by students with poor connectivity, the use of mobile applications such as WhatsApp as alternative access to teacher and peer support, and adopting engaging teaching techniques. Among the favourable techniques that were reported to help with engagement were the use of diagrams and video-based lectures, personal video calls for certain students, and positive emotional appeals such as occasional jokes, a short break between topics, quick game sessions, and commitment to more teacher-student interactions and interactions among peers.

Participant 2 recalled the effect of teaching techniques on the learning experience:

> *"Most of my lecturers know how to make their students gain interest in every topic. They used a lot of diagrams and real-life examples that we can relate and this gives a positive impact on my online learning experience. But there were also times that the class was dull."*

4. Discussion

4.1 Study Highlights

To the best of our knowledge, this is the first qualitative study to use students' reflective writings to explore preclinical medical students' perceptions of the influence of online-based learning due to the COVID-19 pandemic at a public university in Malaysia. The derived themes of flexibility and adaptability, reduced learning acuity, compromised tacit learning and support from policy and practice encapsulate students' reflection on the impact of COVID-19 on their learning experience. The new understanding may prove useful because decision-

making for policy and practice is a complex process that requires multifaceted perspectives, evidence, and a deeper understanding of the issue to bring relevant and meaningful changes to the actual educational practices (Petticrew, 2015).

Moreover, each institution is unique in its experience, expertise, and resources to adopt technology-enhanced educational practices. Therefore, unlike quantitative studies that seek the generalisation of statistical conclusions to the wider population, this qualitative study illuminates evidence of the roles of policy makers, teachers, students, and elements of learning environments that are critical for the learning process specific to our context. Institutions that share similar challenges to our context may benefit from the experience of this study. Consequently, the narrative approach has been adopted in the discussion on the findings below to bridge the synthesised themes towards insights, perspectives, and relevance to educational policies and practices.

4.2 Themes of the COVID-19 Impact on Learning

In this qualitative study, adaptability and flexibility appeared as the prominent theme. This finding was also reflected in reports on quantitative studies on education during the pandemic. For example, to determine the impact of online learning owing to the COVID-19, the 2020 nationwide survey by Dost et al. (2020) among 2721 medical students across 39 medical schools in the United Kingdom (UK) revealed flexibility as the highest-rated perceived benefit of online learning. Consistent findings have also been reported from surveys among 1210 medical students in Jordan (Muflih et al., 2021), 814 medical students in Poland (Baczek et al., 2021), 358 medical students in Sudan (Gismalla et al., 2021), and 178 medical students in Malaysia (Roslan & Halim, 2021). Participants of this qualitative study extend the understanding further by attributing flexibility to the convenience of not having to dress professionally, alleviating the commitment to routine travelling, a repeat of access to recorded materials, and the proximity of family support, food, and drink. More importantly, students only appreciated being flexible after they had adapted to new routines, indicating that the advantage of flexible learning time is not immediate and the attention to students' adaptation is crucial.

Adaptation is a manifestation to achieve security. Maslow (1943) described safety as denoting humans' physiological needs such as clothing, nutrition, and shelter, whereas security, which resides in the ability to know what to expect from a certain set of events or circumstances, is a higher need of human motivation. With time, students gain more understanding of various factors such as schedules, teaching styles, events, and outcomes. This understanding leads to the ability to know what to expect and how to respond, thus facilitating the motivation to commit to new learning behaviours. Departing from a different angle of perspective, Knowles (1978) described the security from being able to expect a safe environment as essential for learning because adults can better operate to reflect, interrogate, and appraise new knowledge without being undermined by psychological handicaps due to mistakes. Acquiring new learning strategies over time, as exemplified above by one of the participants of this study, was a manifestation of these frameworks of learning. Therefore, harvesting the advantage of flexibility should be understood together with learning adaptation

because attaining security following new norms of educational practices needs to be accompanied by investment in time and resources for consistent strategies.

Consistent strategies on remediable factors and challenges are particularly important for continuous quality improvement to address reduced learning acuity. Under this theme, the participating students reported issues related to the lack of conducive learning space at home; dual roles of being a student and being a member of a family when at home; distractions from the Internet contents; unsatisfactory quality of displays, audios, and microphones; and unreliable Internet connection.

Some of the aforementioned challenges had also been reported before the COVID-19. For example, for the period of 10 years from 2006 till 2016, a comprehensive review by O'Doherty et al. (2018) identified seven high-quality studies and three low-quality studies on barriers and solutions to the implementation of online-based learning for undergraduate and postgraduate medical education. The review identified challenges that include technicalities of technology use, skills of technology users, lack of supportive attitudes, and incentives to drive motivations for online content creations (O'Doherty et al., 2018). However, the findings of this study suggest that the COVID-19 may have crucially magnified these challenges because students must endure a much higher volume of learning through a virtual platform (Dost et al., 2020).

Thus, as reported above, Participant 2 of this study insightfully assigned prolonged screen-based learning as the biggest challenge of online-based learning during the COVID-19. The new perspectives on the magnitude of challenges may consequently serve to better inform policy and practice. For example, resources allocation may need to include support for students to gain access to a dedicated learning space at home. Likewise, a schedule of learning delivery may have to be planned in liaison with other educators to avoid successive and excessive online delivery of education. Planning which incorporates engagement with families may also prove to be helpful. Therefore, consistent strategies for online-based learning should depart from the new understanding of challenges on learning, rather than teaching, that arise owing to the pandemic.

More importantly, understanding learning challenges from students' reflections illuminate the fundamental compromise of tacit knowledge when transitioning towards virtual platforms. Participants of this study had described elements of learning from face-to-face teaching that go beyond syllabus delivery. These include complex values such as teachers' role-modelling, peer-influence, professionalism, ethics, cultures, social skills, team-working, responsibility, accountability, volunteerism, and risk-taking. Most of the prominent educational theories such as the seminal works of Vygotsky on a zone of proximal development (Vygotsky & Cole, 1978), constructivism by Piaget (Wadsworth, 1996), action research by Lewin (Adelman, 1993), self-actualisation by Rogers (Rogers, 2008), and learning by dialogue by Freire (Shor & Freire, 1987) articulated complicated processes of experiential learning that were all underpinned by interactions between learners and their environment. The more contemporary theory of situated learning encapsulated these behaviourism philosophies from the perspective of professional identity development for

medical students when the real contextual learning inherently promotes peripheral participation of a community of practice (O'Brien & Battista, 2020). When students of this study were comparing face-to-face and online learning in response to the question on challenges as demonstrated above, their articulations indicated the loss of the tacit process of learning that was not readily expressible but understood and appreciated. Therefore, compromised tacit learning signifies a major limitation of online-based learning to serve as an overarching educational platform for personal and professional development.

As a result, understanding the impact of the COVID-19 on education also signals heightened roles for both policymakers. All participants of this study consistently emphasised the need for affordable and reliable Internet connection. They described the loss of focus, reduced motivation, interrupted knowledge acquisition, and excessively reliance on peers and recorded materials to compensate for poor Internet connectivity. Within the Malaysian context, the policy for higher education has advocated synchronous teaching which is characterised by real-time interactions as a distinct category of online learning (MQA, 2018). This is in contrast with asynchronous online learning which is characterised by the convenience of access towards repetitive exposure to educational resources (MQA, 2018). Findings of this study indicate that many students, and on many occasions, must resort to the latter owing to connectivity issues that are beyond their control. These issues create gaps between policy on education and policy on investment that supports its implementations. As a result, although students have been describing affordable and reliable Internet connection as a problem they need to endure, this theme should be viewed as a key message for policymakers to engineer solutions for this challenge.

Additionally, lecturers also share bigger roles for effective online-based learning during the COVID-19 pandemic. Medical students appreciate better learning by teaching which embraces a real problems-oriented instead of topic-oriented focus, diverse teaching styles, and innovative engagement techniques as reported in the above findings. The process of how these strategies deliver superior learning compared with the traditional didactic lectures has been well articulated by several learning theories. For example, self-directed learning theory emphasises that the real problem-oriented focus stimulates an internally motivated process of emancipatory endeavour that is facilitated by tasks and materials that are within the learners' reach and control (Kaufman, 2003). Social constructivism, meanwhile, theorising engagement with external facilitation is a sine qua non to attain higher levels of achievements (Vygotsky & Cole, 1978). Moreover, diverse styles of teaching promote multifaceted perspectives on similar materials of learning, which may induce reflection on actions (Schon, 1983), conceptualisation of higher abstract knowledge (Kolb, 1984), and eventually reflection that manifests in actions (Schon, 1983). Therefore, the experience of students of this study on varying effective roles among teachers during the rapid and mass adoption of online-based learning necessitated by the COVID-19 pandemic helps to navigate the focus of strategies on educators' training.

4.3 Recommendations for Future Educational Strategies

In particular, the transition of adoption and adaptation of flexible online-based learning from select practices towards mainstream policies may have fundamentally magnified the return of educational investment for technology-enhanced formative assessment. This is the lesson learnt from digital health in the healthcare sector. Despite the smartphone having been available to a niche market of corporate customers in the early 1990s, it was the mass smartphone adoption by the general population in late 2000s which revolutionised its use as the main modality for technology-enhanced quality patient care (Ibrahim et al., 2022). Similarly, formative assessment was first touted by Scriven (1966) and was traditionally understood and implemented in the context of education during the era after the World War II. Nevertheless, findings of this study and others on the adaptation among mass population of teachers and learners for online-based education may signify the volume of potential by investing resources for strategies in technology-enhanced formative assessment.

This notion is supported by the grand theory of constructivism which postulates teachers' facilitation through formative assessment is crucial for learners to develop new knowledge, understanding, and skills (Kaufman & Mann, 2013). Formative assessments may deliver this outcome via two key advantages. Firstly, repeat access and attempts for online assessment modules is a screen-based simulation training which promotes mastery of learning through deliberative practice. Secondly, the non-credit bearing of formative assessment supports a safe academic environment for students to explore the extent of understanding and learn via constructive feedback on mistakes (Ibrahim et al., 2021). These mistakes subsequently illuminate learning gaps where teachers may formulate a personalised teaching plan to match the unique learning trajectories of each student (Ibrahim et al., 2021). Nonetheless, it is important to recognise that all these advantages are encapsulated in an effective execution of formative assessment modules with quality feedback. Therefore, training of educators on these aspects of technology-enhanced formative assessment may prove fundamental to facilitate the acquisition of new knowledge, understanding, and skills among learners.

5. Limitations

As with any qualitative study, the findings of this study are context-specific and are not immediately generalisable to the population of medical students or students of higher education. The reflection and themes synthesised from Year 2 preclinical medical students should be understood and interpreted according to their setting of the study. For example, clinical students are more dependent on quality learning through direct patient contact. Likewise, workplace-based learning for courses that depend on industrial training may also experience different kinds and magnitude of impacts from the COVID-19 restrictions. Such critical circumstances should be taken into consideration since the impacts may not be adequately represented in this study.

Furthermore, comparison between multiple contexts of higher education may require a larger sample of participants via quantitative study design with inferential statistical analysis to determine differences that can be generalised to a

larger population. Nonetheless, because the restrictions of the COVID-19 on teaching contacts and the rapid transition towards online-based learning are universal, we believe the findings of our study may remain useful to derive insights and perspectives that bring relevance towards a wider context of educational practice.

6. Conclusion

Two years into the COVID-19 pandemic, the world continues to face unforeseen challenges posed by this newly emerging global pandemic. The COVID-19 has affected many aspects of human life, including higher education. The decision for the emergency closure of higher educational institutions in Malaysia as a public health measure to stem the transmission of COVID-19 has caused a rapid shift from traditional face-to-face learning to online platforms. By gleaning from the preclinical medical students' reflections on their learning experience during the COVID-19 pandemic, our study concludes that online-based learning necessitated by this global crisis offers a major advantage of the flexibility to our study participants. Such flexibility with online learning allows the students participating in this study to have more control of and accountability for their learning process. Despite being able to adapt gradually to the new learning habit, at the same time a large majority of our study participants reflect on some challenges to the acquisition of knowledge via online-based learning which have resulted in a decline in their learning acuity and the missing elements of tacit learning. All participants reflectively conveyed an important message to inform policy and practice to provide the students with relevant support for improved learning experience and continuous quality medical education amid the COVID-19 pandemic and beyond.

In view of the qualitative nature of the present study that does not allow generalisability of the study findings, future research should consider a quantitative study approach using the findings from our study to determine the impact of COVID-19 on the preclinical medical students' learning experience. Nevertheless, the findings from this qualitative study have important future implications by providing insights into formulating long-term effective educational strategies for medical education to suit the new norm of higher education in the post-COVID era.

7. Acknowledgements

The authors would like to thank Dr. Yuzana Binti Mohd Yusop (Universiti Sultan Zainal Abidin) for her expertise and assistance in the initial part of data analysis. The authors also thank the students who participated in this study.

8. References

Adelman, C. (1993). Kurt Lewin and the Origins of Action Research. *Educational Action Research*, *1*(1), 7-24. https://doi.org/10.1080/0965079930010102

Baczek, M., Zaganczyk-Baczek, M., Szpringer, M., Jaroszynski, A., & Wozakowska-Kaplon, B. (2021). Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. *Medicine*, *100*(7), e24821. https://doi.org/10.1097/md.0000000000024821

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Burgess, S., & Sievertsen, H. H. (2020). *Schools, skills, and learning: The impact of COVID-19 on education*. https://voxeu.org/article/impact-covid-19-education

Camargo, C. P., Tempski, P. Z., Busnardo, F. F., Martins, M. A., & Gemperli, R. (2020). Online learning and COVID-19: a meta-synthesis analysis. *Clinics (Sao Paulo)*, *75*, e2286. https://doi.org/10.6061/clinics/2020/e2286

Chu, D. K., Akl, E. A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H. J., & authors, C.-S. U. R. G. E. s. (2020). Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *Lancet (London, England)*, *395*(10242), 1973-1987. https://doi.org/10.1016/S0140-6736(20)31142-9

Dampney, K., Busch, P., & Richards, D. (2002). The Meaning of Tacit Knowledge. *Australasian Journal of Information Systems*, *10*(1). https://doi.org/10.3127/ajis.v10i1.438

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5-22. https://doi.org/10.1177/0047239520934018

Dost, S., Hossain, A., Shehab, M., Abdelwahed, A., & Al-Nusair, L. (2020). Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross-sectional survey of 2721 UK medical students. *BMJ Open*, *10*(11), e042378. https://doi.org/10.1136/bmjopen-2020-042378

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative Content Analysis: A Focus on Trustworthiness. *SAGE Open*, *4*(1), 215824401452263. https://doi.org/10.1177/2158244014522633

Gismalla, M. D.-A., Mohamed, M. S., Ibrahim, O. S. O., Elhassan, M. M. A., & Mohamed, M. N. (2021). Medical students' perception towards E-learning during COVID 19 pandemic in a high burden developing country. *BMC Medical Education*, *21*(1), 377. https://doi.org/10.1186/s12909-021-02811-8

Gong, R. (2020). Coping with Covid-19: Distance Learning and the Digital Divide. https://www.krinstitute.org/assets/contentMS/img/template/editor/Views_Distance%20Learning%20and%20the%20Digital%20Divide.pdf

Herr, K., & Anderson, G. L. (2014). *The action research dissertation: A guide for students and faculty* (2nd ed.). SAGE.

Ibrahim, M. S., Mohamed Yusoff, H., Abu Bakar, Y. I., Thwe Aung, M. M., Abas, M. I., & Ramli, R. A. (2022). Digital health for quality healthcare: A systematic mapping of review studies. *DIGITAL HEALTH*, *8*, 205520762210858. https://doi.org/10.1177/20552076221085810

Ibrahim, M. S., Yusof, M. S. B., & Abdul Rahim, A. F. (2021). Why Assessment Which Carries No Grades and Marks is the Key for the Future of Education? *Education in Medicine Journal*, *13*(2), 91-95. https://doi.org/10.21315/eimj2021.13.2.8

Ismail, N. S., Bakar, N. M. A., & Wafa, S. W. W. S. S. T. (2020). Online Learning Challenges during Pandemic COVID-19 in Malaysian Higher Learning Institution. *Universal Journal of Educational Research*, *8*(12). https://doi.org/10.13189/ujer.2020.081282

Iwanaga, J., Loukas, M., Dumont, A. S., & Tubbs, R. S. (2021). A review of anatomy education during and after the COVID-19 pandemic: Revisiting traditional and modern methods to achieve future innovation. *Clinical Anatomy*, *34*(1), 108-114. https://doi.org/10.1002/ca.23655

Kaufman, D. M. (2003). ABC of learning and teaching in medicine: Applying educational theory in practice. *BMJ*, *326*(7382), 213-216. https://doi.org/10.1136/bmj.326.7382.213

Kaufman, D. M., & Mann, K. V. (2013). *Teaching and learning in medical education: How theory can inform practice*. https://doi.org/10.1002/9781118472361.ch2

Kim, H., Sefcik, J. S., & Bradway, C. (2017). Characteristics of Qualitative Descriptive Studies: A Systematic Review. *Research in Nursing & Health*, *40*(1), 23-42. https://doi.org/10.1002/nur.21768

Knowles, M. S. (1978). Andragogy: Adult Learning Theory in Perspective. *Community College Review*, *5*(3), 9-20. https://doi.org/10.1177/009155217800500302

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

Machado, R. A., Bonan, P. R. F., Perez, D. E. D. C., & Martelli JÚnior, H. (2020). COVID-19 pandemic and the impact on dental education: discussing current and future perspectives. *Brazilian Oral Research*, *34*, e083. https://doi.org/10.1590/1807-3107bor-2020.vol34.0083

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, *50*(4), 370-396. https://doi.org/10.1037/h0054346

McNiff, J. (2017). *Action research - All you need to know* (2nd ed.). SAGE.

MQA. (2018). *COPPA 2.0: Code of Practice for Programme Accreditation*. Selangor, Malaysia: Malaysian Qualifications Agency, MQA Retrieved from https://www2.mqa.gov.my/qad/garispanduan/COPPA/COPPA%202nd%20Edition%20(2017).pdf

Muflih, S., Abuhammad, S., Al-Azzam, S., Alzoubi, K. H., Muflih, M., & Karasneh, R. (2021). Online learning for undergraduate health professional education during COVID-19: Jordanian medical students' attitudes and perceptions. *Heliyon*, *7*(9), e08031. https://doi.org/10.1016/j.heliyon.2021.e08031

Mukhtar, K., Javed, K., Arooj, M., & Sethi, A. (2020). Advantages, Limitations and Recommendations for online learning during COVID-19 pandemic era. *Pakistan Journal of Medical Sciences*, *36*(COVID19-S4), S27-S31. https://doi.org/10.12669/pjms.36.COVID19-S4.2785

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., . . . Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery (London, England)*, *78*, 185-193. https://doi.org/10.1016/j.ijsu.2020.04.018

O'Brien, B. C., & Battista, A. (2020). Situated learning theory in health professions education research: a scoping review. *Advances in Health Sciences Education: Theory and Practice*, *25*(2), 483-509. https://doi.org/10.1007/s10459-019-09900-w

O'Doherty, D., Dromey, M., Lougheed, J., Hannigan, A., Last, J., & McGrath, D. (2018). Barriers and solutions to online learning in medical education - an integrative review. *BMC Medical Education*, *18*(1), 130. https://doi.org/10.1186/s12909-018-1240-0

Padlet. (2021). *Padlet*. Padlet. https://padlet.com

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. *Administration and Policy in Mental Health and Mental Health Services*, *42*(5), 533-544. https://doi.org/10.1007/s10488-013-0528-y

Patton, M. Q. (2014). *Qualitative research & evaluation methods*. SAGE.

Pauzi, M. F., & Juhari, S. N. (2020). Digital Transformation of Healthcare and Medical Education, Within, and Beyond Pandemic COVID-19. *Asian Journal of Medicine and Biomedicine*, *4*(2), 39-42. https://doi.org/10.37231/ajmb.2020.4.2.363

Pei, L., & Wu, H. (2019). Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis.

Medical Education Online, *24*(1), 1666538. https://doi.org/10.1080/10872981.2019.1666538

Petticrew, M. (2015). Time to rethink the systematic review catechism? Moving from 'what works' to 'what happens'. *Systematic Reviews*, *4*, 36. https://doi.org/10.1186/s13643-015-0027-1

Polit, D. F., & Beck, C. T. (2009). International differences in nursing research, 2005-2006. *Journal of Nursing Scholarship*, *41*(1), 44-53. https://doi.org/10.1111/j.1547-5069.2009.01250.x

Polit, D. F., & Beck, C. T. (2013). *Essentials of nursing research: Appraising evidence for nursing practice*. Wolters Kluwer.

Rahman, D. (2020). A reckoning for online learning in times of crisis. *The Star*. https://www.thestar.com.my/opinion/columnists/whats-your-status/2020/03/24/a-reckoning-for-online-learning-in-times-of-crisis

Rahman, N. I., Aziz, A. A., Zulkifli, Z., Haj, M. A., Mohd Nasir, F. H., Pergalathan, S., . . . Haque, M. (2015). Perceptions of students in different phases of medical education of the educational environment: Universiti Sultan Zainal Abidin. *Advances in Medical Education and Practice*, *6*, 211-222. https://doi.org/10.2147/AMEP.S78838

Rajab, M. H., Gazal, A. M., & Alkattan, K. (2020). Challenges to Online Medical Education During the COVID-19 Pandemic. *Cureus*, *12*(7), e8966. https://doi.org/10.7759/cureus.8966

Rogers, C. R. (2008). The actualizing tendency in relation to 'motives' and to consciousness. Nebraska Symposium on Motivation, 1963, NE, US; Reprinted from the aforementioned conference,

Roslan, N. S., & Halim, A. S. (2021). Enablers and Barriers to Online Learning among Medical Students during COVID-19 Pandemic: An Explanatory Mixed-Method Study. *Sustainability*, *13*(11), 6086. https://doi.org/10.3390/su13116086

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.

Scriven, M. (1966). *The methodology of evaluation*. Purdue University.

Shor, I., & Freire, P. (1987). What is the "Dialogical Method" of Teaching? *Journal of Education*, *169*(3), 11-31. https://doi.org/10.1177/002205748716900303

Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes*. Harvard University Press.

Wadsworth, B. J. (1996). *Piaget's theory of cognitive and affective development: Foundations of constructivism*. Longman Publishers.

WHO. (2020). *WHO COVID-19 Dashboard. Geneva: World Health Organization*. https://covid19.who.int/

Yin, R. K. (2009). *Case study research: Design and methods*. Thousand Oaks; CA Sage.