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A Review of Formative Assessment Techniques in Higher Education During COVID-19

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Abstract

To meaningfully determine how well students have achieved learning targets, instructors must adopt specific formative assessment techniques. During the COVID-19 pandemic, existing studies have discovered the techniques instructors in higher education use in their formative assessment practices. However, there has not been any consensus on the prevalent formative assessment techniques used. In this study, we examined empirical documents to determine to what extent formative assessment has supported formal or informal techniques, or both. A total of 15 samples of published documents on the formative assessment techniques used by instructors in higher education were purposively selected and subjected to summative content analysis. The findings revealed that instructors have used more formal than informal formative assessment techniques. The most predominant techniques were paper and pencil tests. The findings imply that formative assessment in higher education amid COVID-19 has followed responsive evaluation/feedback techniques compared to assessment conversations and dialogues. This calls for the need to refocus formative assessment to include both informal and formal techniques by embracing and adapting to technologically enhanced assessment and learning.

Keywords

formative assessment, formal and informal assessment techniques, higher education, COVID-19, summative content analysis

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A Review of Formative Assessment Techniques in Higher Education During COVID-19

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To meaningfully determine how well students have achieved learning targets, instructors must adopt specific formative assessment techniques. During the COVID-19 pandemic, existing studies have discovered the techniques instructors in higher education use in their formative assessment practices. However, there has not been any consensus on the prevalent formative assessment techniques used. In this study, we examined empirical documents to determine to what extent formative assessment has supported formal or informal techniques, or both. A total of 15 samples of published documents on the formative assessment techniques used by instructors in higher education were purposively selected and subjected to summative content analysis. The findings revealed that instructors have used more formal than informal formative assessment techniques. The most predominant techniques were paper and pencil tests. The findings imply that formative assessment in higher education amid COVID-19 has followed responsive evaluation/feedback techniques compared to assessment conversations and dialogues. This calls for the need to refocus formative assessment to include both informal and formal techniques by embracing and adapting to technologically enhanced assessment and learning.

Keywords: formative assessment, formal and informal assessment techniques, higher education, COVID-19, summative content analysis

Introduction

Originating in December 2019 from Wuhan, China, the novel coronavirus disease, termed COVID-19, has spread throughout all countries (World Health Organisation, 2021). The pandemic affected and continues to affect almost all economic activities, including the educational sectors in all countries. It resulted in an abrupt lockdown of all basic, secondary, and tertiary educational institutions. For institutions of higher learning, such as universities, there was a paradigm shift in instructional activities where classes and teaching tasks were and continue to be held online, except for the few circumstances that require face-to-face interactions. Instructors in institutions of higher learning needed to and are continuously designing synchronous and asynchronous teaching and learning activities to ensure instructional continuity.

While instructors continue to use synchronous and asynchronous pedagogies, challenges such as limited training to conduct online classes, the lack of training in online assessment, and students' uncertainty on assessment have been reported (Mirza, 2021; Shahrill et al., 2021). Others include academic dishonesty, low commitment of students in submitting assessment tasks, lack of assessment resources, and inability of instructors to cover learning targets (Guangul et al., 2020). A study by Cleofas and Rocha (2021, p.1) found that "Students from poorer households, who do not own laptops and desktop computers, and those with

limited internet connection exhibited higher levels of COVID-19 anxiety.” Considering that instructional activities, including formative assessment, require the use of these gadgets in online learning, students without access to these devices may be less fortunate to participate in learning and assessment processes. They may be anxious to borrow and use such devices from other individuals due to COVID-19 anxiety, which consequently poses a challenge in online assessment. Despite these challenges, it is necessary to continue online pedagogy: a combination of online and face-to-face pedagogy is necessary for the future, even after COVID-19 (Tartavulea et al., 2020). This is necessary for the infrastructure preparedness of schools and the improvement of the readiness of both instructors and students to use such devices in teaching and learning.

As COVID-19 continues to affect educational sectors, the competency of instructors to use appropriate formative assessment techniques have attracted a lot of attention in institutions of higher learning (Gupta et al., 2020; Syafrizal & Pahamzah, 2020). Formative assessment is important because it provides evidence to modify instruction (as compared to summative assessment; Andersson & Palm, 2017; Menendez et al., 2019; Torres, 2019; Vogelzang & Admiraal, 2017). In the instructional setting, assessment procedures are formative if activities undertaken by both students and instructors provide information that can be used as feedback to modify instruction and monitor student learning (Black & Wiliam, 2009, 2018). Thus, formative assessment emphasises assessment *for* learning that allows instructors to monitor teaching and learning daily. Another component of formative assessment is assessment *as* learning that focuses on peer and self-assessment. Under the supervision of the instructor, assessment *as* learning allows students to use assessment procedures as learning opportunities (Bennett, 2011).

Instructors use formative assessment techniques or tools to determine how well students have achieved learning targets (Angelo & Cross, 1993). Emerging trends in educational assessment research have revealed that formative assessment, whether assessment *as* or *for* learning, can be practiced using formal and informal techniques (Arrafii & Sumarni 2018; O’Keeffe et al., 2020; Ruiz-Primo & Furtak, 2006; Yorke, 2003; Zhao, 2018). Generally, formal techniques involve paper and pencil tests. They comprise written tests, assignments, exercises, and homework (Griffin et al., 2016). In contrast, informal techniques encompass assessment conversations and dialogues (Muhonen et al., 2020). From the two techniques, informal techniques have been argued to be more effective in instructional modifications and lifelong learning, when compared to formal techniques (López-Pastor & Sicilia-Camacho, 2015; Nieminen et al., 2020; Ruiz-Primo & Furtak, 2006; Zhao, 2018). Using informal formative assessment techniques develops creativity among students and encourages their participation in classroom conversations. This helps instructors to monitor the thinking processes of students and immediately modify teaching tactics to address learning gaps. However, Aji and Hartono (2019) stress that a combination of both assessment techniques is necessary for student learning, and one should not be a replacement for the other.

Instructors in institutions of higher learning are to guide and promote student learning. They are to use assessment techniques that can help them to modify and shape their teaching tactics. Perhaps these instructors have been adapting to different formative assessment techniques in their teaching experiences. Considering the outbreak of COVID-19, how has the choice of formative assessment techniques changed over the period? While we sought to answer this question, we believe that instructors must continue to ensure effective teaching and learning, including the use of valid and reliable formative assessment techniques amid COVID-19. Based on this important responsibility, are instructors in higher education using online and/or face-to-face formal formative assessment techniques that conform to paper and pencil tests? Or are they largely resorting to online and/or face-to-face instructional dialogues and assessment conversations? Although previous studies look promising in uncovering the

formative techniques in institutions of higher learning during the COVID-19 pandemic, emphasis has not been placed on the prevalent technique(s) used. This study analyses empirical documents on formative assessment techniques in higher education. It gathers evidence from the existing literature to examine whether instructors have generally resorted to formal or informal formative assessment techniques, or both.

Literature Review

Formal and Informal Formative Assessment

One of the important characteristics of formative assessment is that assessment information is used to address student learning gaps, which help them to achieve learning goals (Black & Wiliam, 2018; Wiliam, 2011). This makes formative assessment an ongoing activity. How are formal and informal formative assessments distinct? Generally, formal formative assessment is planned and designed by teachers to monitor student learning and requires students to answer such assessment tasks in writing (Griffin et al., 2016). Feedback only happens when the teacher evaluates or scores the assessment tasks.

Conversely, informal assessment is unplanned and unpredictable. It involves assessment dialogues and conversations that occur during the instruction (Muhonen et al., 2020; Ruiz-Primo, 2011). It presents an assessment situation where the instructor uses classroom discussions and dialogues to assess student understanding about instructional concepts (Ruiz-Primo & Furtak, 2006). Unlike formal assessment, feedback in informal formative assessment is immediate. It also encourages students' participation in the classroom and helps them to reflect on their knowledge and understanding about instructional concepts under the guidance of the instructor.

Formal and Informal Formative Assessment Techniques

Formative assessment techniques could be as simple as asking students to raise their hands to inform understanding of learning a new concept, or it could be as challenging as asking students to complete an independent self-assessment task. Formal formative assessment technique is generally referred to as "paper and pencil tests." Examples of such techniques include classroom tests, quizzes, and graded assignments (Heritage, 2013). They emphasise norm-referenced tests (i.e., tests used in comparing learners among themselves), and criterion-referenced tests (i.e., tests used to determine if set standards have been met by learners). Formal formative assessment techniques are planned and prepared by the teacher in advance (Bales, 2019), and follow a response-evaluation-feedback cycle. In this process, the instructor gives the assessment task in the form of a test, students respond normally in writing, the instructor takes time to assign scores, and provides feedback. In the context of higher education, formal formative assessment approaches can be comprised of graded assignments and quizzes, midterm tests, exercises, and computer-adaptive tests.

Informal formative assessment techniques encourage classroom dialogues. Instructors use observations, oral questions, presentations, interviews, and video discussions to assess student learning (Mzenzi et al., 2019). One common example of informal techniques is an exit slip, in which students are made to say the key concept they have learned before they are allowed to leave the classroom (Fisher & Frey, 2004). Other informal methods include demonstration, discussion, checklist, portfolio, rating scale, time and sampling, and anecdotal records (Eshun et al., 2014), as well as drama, narration, puzzle, oral examination, and group tasks (Ababio & Dumba, 2013; Alkharusi, 2011; Oz, 2014).

The above techniques, whether formal or informal, can be used to make assessment decisions on students. While COVID-19 is continuously affecting pedagogical activities in institutions of higher learning, does formative assessment so far favour formal or informal techniques, or does it involve a combination of both? This study provides insights on the use of these assessment techniques among instructors in institutions of higher learning and makes the necessary recommendations.

Researchers' Contexts

The researchers of this study are interested in improving the quality of teacher professional development programs for academics at the graduate school of education, and for students who are currently undertaking *Assessment for Learning* as one of their core modules in the Master of Teaching program. The second and the third authors are lecturers teaching this module at the university. The first author is a Ph.D. student, currently under the supervision of the second and third authors, whose thesis is also in the field of assessment in education. We hope that the findings of this research will provide more insights into formative assessment practices during COVID-19. We believe that this review can supplement training for academics in universities to effectively deliver formative assessment that could inform and guide them on the learning progression of students.

Methods

The study adopted qualitative content analysis, as it assesses and evaluates existing studies (Creswell, 2014). This technique as part of qualitative research is appropriate for analysing text data (Cavanagh, 1997), and because this study reviewed and analysed existing documents on formal and informal formative assessment techniques, this design is seen as appropriate. In particular, we used summative content analysis to quantify and analyse the number of times existing studies have reported formal or informal formative assessment techniques used in higher education during the COVID-19 pandemic (Hsieh & Shannon, 2005). Manifest content analysis, as part of summative content analysis, is suitable for analysing the number of times certain formative assessment techniques appeared in the existing texts (Potter & Levine-Donnerstein, 1999).

Before the content analysis, a systematic and rigorous search of existing literature was done through academic platforms such as Google Scholar, Scopus database, and Crossref metadata. Keywords such as “informal formative assessment techniques in higher education” and “formal formative assessment techniques in higher education” were searched from the academic databases. Relatively, these academic platforms contain high-quality documents, which have undergone the respective rigorous publication processes. This improved the authenticity, content representativeness, and credibility of the documents that were used (Creswell, 2009). In all, we identified 65 articles for screening from our database search, of which three duplicates were removed.

The inclusion criteria that guided the selection of relevant articles was the year in which the articles were published. Based on this, only publications for the years 2020 and 2021 were selected, since COVID-19 was declared a pandemic in those years. It was also during those years when both synchronous and asynchronous instructional activities in institutions of higher learning were prioritised. Therefore, the trend of formative assessment techniques in higher education was reviewed and evaluated over the two years. Articles conducted through qualitative, quantitative, or mixed-method approaches that focused on key formative assessment techniques amidst COVID-19 were also included.

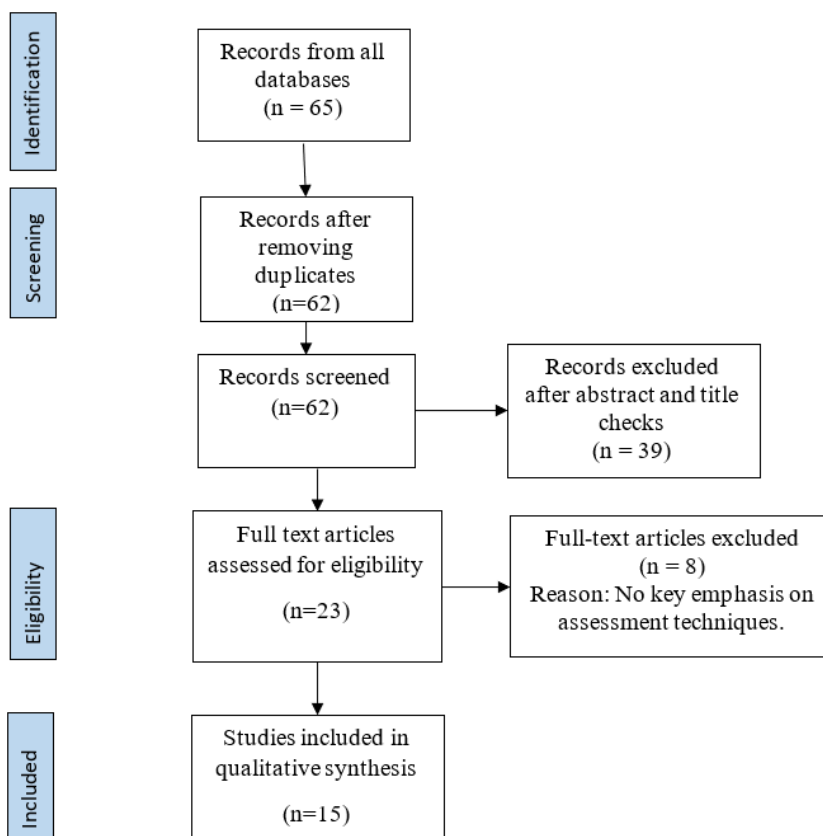
We excluded all articles that were published outside the years indicated (that is, 2020-2021). All articles that focused on formative assessment practices relative to key formative assessment techniques were excluded. We found through our literature search that there were limited studies that focused on formative assessment techniques, although there were several studies that focused on formative assessment practices. This resulted in few articles in our analysis ($n=15$). Studies that did not focus on higher education institutions were also excluded.

Based on the inclusion and exclusion criteria, we first conducted a title and abstract screening on all the 62 eligible articles. This reduced the number of articles to 23, since most of them did not meet our inclusion criteria. To be mindful of adequate content representativeness of our search themes, we also conducted a full article screening on the 23 articles. We found that 15 of the 23 excellently suited our analysis based on the inclusion criteria. We excluded the eight articles after the full article screening because, although their topics depicted formative assessment techniques in higher education, we realised that they did not indicate any key formative assessment techniques. Hence, 15 direct publications were purposively sampled, analysed, and examined.

By applying the inclusion and exclusion criteria, the first author conducted the preliminary screening (title and abstract check) and the full article screening. The latter was done by reading the full articles. To enhance the reliability and validity of the information gathered from the final articles, the second and third authors individually read and evaluated each of the 15 articles to further decide whether to include them in the final analysis. Through a unanimous decision of all authors, all the final 15 articles served as the final data set for the summative content analysis. Figure 1 illustrates the flow chart of the Preferred Reporting Item for Systematic Reviews and Meta-Analysis (PRISMA).

Figure 1

PRISMA flow chart showing the literature search



Data Extraction

The first and third authors extracted the data from the articles that were included in our qualitative synthesis. The two authors developed a comprehensive table (see Table 1) that detailed the components of the extracted data. Key themes such as author(s) and year, country, research design, analysis strategy, and formative assessment technique (whether formal or informal) were used as the basis for the data extraction. These themes were agreed by all the authors. In the data extraction, the first and third authors read each of the included articles thoroughly and entered the data under the indicated themes. The second author vetted each of the entries under each of the themes after the data extraction. At this point, the first author conducted a frequency count following the summative content analysis. The number of articles that cited each technique (or both) was counted and recorded. This helped to determine the prevalent formative assessment techniques that have been used during the COVID-19 pandemic.

Table 1
Summary of selected articles from 2020-2021

No.	Author(s) & year	Country	Research/study design	Analysis strategy	Key findings (formal techniques)	Key findings (informal techniques)
1	Azlan et al. (2020)	Malaysia	Case study	Frequencies and percentages	Online written and test assignment	Video presentations
2	El Said (2021)	Egypt	Mixed techniques	Thematic and descriptive statistics	Online quizzes and tests	×
3	Guangul et al. (2020).	Oman	Survey	Descriptive statistics	Open book written assignments	Projects
4	Gupta et al. (2020)	Barbados	Quantitative	Descriptive and inferential statistics	Online quizzes	×
5	Joshi et al. (2020)	India	Scoping review	Interpretative	Online test	×
6	Khan & Jawaid (2020)	Pakistan	Scoping review	Interpretative	Online assignments and tests	Portfolios
7	Krawiec & Myers (2020)	United States	Feasibility study	Descriptive statistics	×	Video recorded oral presentations
8	Lailaturrahmi et al. (2020)	Indonesia	Qualitative case study	Interpretive analysis	Online written quizzes through Google forms	×
9	Mirza (2021)	Lebanon	Qualitative	Thematic through theoretical sampling	Performance assessment tools through written test	Projects, oral presentations, reflection papers
10	O'Keeffe et al. (2020)	Australia	Qualitative and evaluative	Interpretative	×	Online observations
11	Senel & Senel (2021)	Turkey	Mixed techniques	Descriptive, inferential, and thematic	Online tests and assignments	×
12	Shahrill et al. (2021)	Brunei Darussalam	Conceptual paper	Experience sharing	Online tests and written assignments	Online student presentations and collaborated group projects
13	Syafrizal & Pahamzah (2020)	Indonesia	Qualitative case study	Qualitative thematic analysis (Miles and Huberman's procedure)	Online classroom tests and exercises	×
14	Tartavulea et al. (2020).	Romania	Survey	Descriptive statistics	Graded homework, online quizzes (mostly used)	Online discussions, audio conference, video conference, projects (least used).
15	Tuah & Naing (2021)	Brunei Darussalam	Scoping literature review	Content analysis	Online self-test	Online discussion forums.

Source: Google Scholar, Crossref metadata, Scopus database (2020-2021)

Findings

Brief description of the articles

Of the 15 articles that formed our dataset, ten were published in 2020. The articles were from various countries such as Malaysia (Azlan et al., 2020), Oman (Guangul et al., 2020), Barbados (Gupta et al., 2020), India (Joshi et al., 2020), Pakistan (Khan & Jawaid, 2020), United States (Krawiec & Myers, 2020), Indonesia (Lailaturrahmi et al., 2020; Syafrizal & Pahamzah, 2020), Australia (O’Keeffe et al., 2020) and Romania (Tartavulea et al., 2020). The articles published in 2021 were from Egypt (El Said, 2021), Lebanon (Mirza, 2021), Turkey (Senel & Senel, 2021), and Brunei Darussalam (Shahrill et al., 2021; Tuah & Naing, 2021). The majority (two in each case) of the articles were from Indonesia and Brunei Darussalam.

As shown in Table 1, more than half of the articles used qualitative systematic reviews, while the others used quantitative and mixed-technique approaches. For those that used systematic reviews, thematic and content analysis were largely used to analyse the data gathered. Descriptive and inferential statistics were the data analysis options for the articles that were conducted through the quantitative approach. All the articles focused on public universities.

The Prevalent Formative Assessment Technique Amid COVID-19

Table 1 illustrates that several formative assessment techniques have been used since the onset of the COVID-19 pandemic, most of which are online formative assessment techniques. The findings in Table 1 reveal that instructors largely utilise paper and pencil tests (online quizzes, assignments, and exercises) as the key formative assessment techniques during the COVID-19 pandemic. This is because 13 of the reviewed articles mentioned these assessment techniques (e.g., Azlan et al., 2020; El Said, 2021; Gupta et al., 2020; Guangul et al., 2020; Joshi et al., 2020; Khan & Jawaid, 2020; Lailaturrahmi et al., 2020; Mirza, 2021; Syafrizal & Pahamzah, 2020; Senel & Senel, 2021; Shahrill et al., 2021; Tuah & Naing, 2021; Tartavulea et al., 2020). This confirms that formal formative assessment techniques have been predominant in formative assessment practices in higher education during the COVID-19 pandemic. From Table 1, approximately seven articles mentioned both techniques; however, formal techniques remain dominant. For example, video presentations were mentioned in Azlan et al. (2020). Projects, oral presentations, reflection papers, and performance assessment tools were mentioned in Mirza (2021) and Krawiec & Myers (2020). Others listed include video observations (O’Keeffe et al., 2020), discussion forums (Tuah & Naing, 2021), portfolios (Khan & Jawaid, 2020), online student presentations, and collaborated group projects (Shahrill et al., 2021). Furthermore, two articles reported that instructors utilised only informal techniques (see Krawiec & Myers, 2020; O’Keeffe et al., 2020).

Discussion

Formal formative assessment techniques such as quizzes, mid-term tests, exercises, and computer adaptive tests give instructors the leverage to plan assessment tasks ahead of time, and allow students to respond in writing (Bales, 2019). Instructors score at the later date and provide assessment feedback to students. Compared to informal assessment, such assessment techniques in this era of COVID-19 may be easier to conduct than informal techniques. Instructors can plan ahead of time and craft the needed test items, which can be uploaded through asynchronous means for students to answer. This might have explained the dominant use of such techniques. Amidst the COVID-19 pandemic, we are not surprised that formal

assessment techniques have been more dominant than informal assessment techniques. This is because, with reduced face-to-face contact, there is a probability that formal assessment techniques may enhance the easy administration of assessment tasks. This might have contributed to the dominant use of such techniques based on the articles we analysed.

On the other hand, informal assessments are unplanned, unpredictable, and require instructional dialogues and conversations (Ruiz-Primo & Furtak, 2006). With their ability to encourage creativity among students and prompt feedback due to students' participation in conversations and classroom dialogues (Muhonen et al., 2020) they can be relatively difficult to use when there is inadequate training or infrastructure to support the use of such techniques. This characterises the sudden emergence of the COVID-19 pandemic. Most higher learning institutions were not prepared to train instructors and provide the infrastructure needed to support the use of informal formative assessment techniques. Other demerits that may hinder the use of such techniques include the difficulty in planning assessment procedures (Tartavulea et al., 2020), and the time and cost that accompany assessment conversations and dialogues through the use of technology (Azlan et al., 2020).

Compared to formal assessment, informal techniques, such as video presentations, projects, oral presentations, observation, discussion forums, and portfolios confirmed by previous studies (Alkharusi, 2011; Eshun et al., 2014; Mzenzi et al., 2019; Oz, 2014), can require high expertise and time from both students and instructors. Planning and executing informal assessment techniques is not only demanding but involves much time to design and implement such techniques (Krawiec & Myers, 2020; O'Keeffe et al., 2020). When these parameters are not set, coupled with the difficulties in planning and inadequate infrastructure to support the use of informal assessment techniques, implementing them may be difficult.

Although we expected to observe that both formal and informal techniques should be dominant and equally used in the formative assessment of instructors during the COVID-19 pandemic, we conclude that formative assessment has largely supported formal techniques (mainly paper and pencil tests), as compared to informal techniques. This implies that formative assessment in higher education during the COVID-19 pandemic has largely focused on responsive-evaluation/feedback techniques rather than instructional dialogues and assessment conversations. From our analysis, the predominant use of formal techniques may be attributed to the leverage it gives instructors to plan and upload assessment tasks online or through other technological means for students. The low use of informal techniques could suggest inadequate training, time, and infrastructure to support the implementation of such techniques.

Given the COVID-19 pandemic, it appears relatively convenient to adopt formal formative assessment techniques to assess students. This calls for the need for instructors and policymakers in higher education to embrace technology in formative assessment practices that emphasise both formal and informal assessment techniques. With this, formative assessment will not only focus on norm or criterion interpretations of assessment tasks but will also incorporate monitoring student thinking and learning skills. This will help instructors to provide immediate feedback to address student learning gaps. Formative assessment in higher education, therefore, should not largely focus on formal techniques but should involve an equal blend of both techniques. This will ensure a holistic formative assessment process, which will improve the reliability and validity of formative assessment decisions.

Although this study lacks the empirical evidence to support that formative assessment amidst COVID-19 is affected by inadequate training and infrastructure, the literature provides a shred of evidence to support this point of view (e.g., Cleofas & Rocha, 2021; Guangul et al., 2020; Mirza, 2021; Shahrill et al., 2021). Naturally, the transition of instructional activities in higher education from traditional learning contexts to synchronous and asynchronous interactions requires the training of instructors and the provision of infrastructure. Based on

this, we recommend that in developing policies to meet current and future instructional activities in higher education, policymakers should provide the infrastructure and training needed to facilitate the use of formal and informal formative assessment techniques to both instructors and students. Furthermore, future researchers may consider using primary data on large samples through mixed-method approaches to investigate the formal and informal formative assessment techniques in higher education during and after the COVID-19 pandemic.

Limitations

This study contributes to the literature by advocating the need to use both formal and informal techniques in formative assessment. However, there were some limitations to its conduct. First, the findings in this study are based on the results of articles that focused on formal and informal formative assessment techniques in higher education during the COVID-19 pandemic (from 2020 to 2021). For this reason, our findings may not be applicable when COVID-19 is adequately controlled: there can be changes in instructional activities that can lead to changes in the use of formative assessment techniques, as this current study has reported. Lastly, our findings and conclusions were derived from articles that appeared in the search for documents and as such, those articles were directly related to our search themes. Although a systematic and thorough search for literature on reliable academic platforms controlled this limitation, generalising the findings in this study should be done with care.

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