Medical Students' Perceptions of an Assessment Program in the New Doctor of Medicine Curriculum

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Abstract

Purpose: We evaluated the perspectives of medical students on the roles of formative assessments (FAs) and their impact on academic performance, with the goal of identifying areas for improvement.

Methods: This cross-sectional study assessed the perspectives of students related to congruence, authenticity, consultation, transparency, and accommodation. Additionally, it explored students' preferences for FA, the usefulness of FA, and students' views and ideas on the effects of summative assessments (SAs) on their learning. A survey consisting of 36 items was distributed to medical students in their second and third years of medical school.

Results: Most of the 40 participating students had a positive attitude toward their perceptions of FA, ranging from 78.13% to 93.33%. In addition, the students expressed that FA was beneficial to their academic experience. There were varying viewpoints on the level of stress caused by FA and which specific aspects of FA could be enhanced.

Conclusions: FAs were feasible and beneficial. Most students viewed FAs favorably because they promoted learning experiences and achievements, and helped identify support needs for SAs, despite some concerns about them being time-consuming and stressful. The use of SAs facilitated better study strategies. However, potential improvements to FAs regarding the feedback process, assessment schedules, and alignment with teaching objectives were suggested to increase their usefulness.

Keywords

Formative assessment, Summative assessment, Student perception, Medical Education, Doctor of Medicine curriculum

Introduction

Formative assessment (FA) is a comprehensive assessment approach designed to identify students' and instructors' strengths, weaknesses, and opportunities for improvement (1). Extensive research has consistently demonstrated that FA positively impacts student performance in summative assessment (SA) by improving crucial skills, including motivation, self-efficacy, and time management (1-6). Furthermore, FA strongly encourages student involvement in the learning process, which greatly enhances their academic performance. FA plays a crucial role in promoting student development and academic success by effectively improving student study habits while establishing a better learning environment (2). Summative evaluations are used to assess the knowledge, competency, success, or learning of students and to determine their academic attainment (7-9). High-stakes examinations like the SA are important, but they can also negatively affect student learning and performance outcomes. Students can experience cumulative stress and anxiety from high-stakes tests and other stressors (10). Thus, preparing students for SA or high-stakes examinations is critical for their academic success and competency. The medical curriculum includes medical science and clinical skills. To qualify for medical degree certification or a medical license, undergraduates must complete fundamental medical science and clinical practice programs.

The Princess Srisavangavadhana College of Medicine (PSCM) in Thailand implemented a new Doctor of Medicine curriculum in 2020. This curriculum incorporates FA as a key method of evaluating student progress. The program provides FA consistently throughout the academic year with the goal of assessing students' medical knowledge and clinical skills. It also aims to encourage active learning, improve students' understanding of progress, and facilitate self-monitoring. In contrast, an SA is performed at the end of the academic year. At our institution, the FAs have been administered in the form of Single Best Answer questions and Objective Structured Clinical Examinations (OSCE). In Thailand, medical curricula do not usually include

FA as an instrument to aid student learning. However, previous research demonstrated that FA boosted the learning capabilities of students (11). Therefore, this study aimed to explore medical students' perspectives, opinions, and concerns regarding the use of FA as part of their learning process, and to determine whether they find it beneficial. The study findings might make significant contributions to enhancing the effectiveness of FA for PSCM medical students.

Methods

Study design

A cross-sectional study was conducted in September 2022, targeting PSCM medical students in their second and third years who had experience with FA throughout the academic year. These students were invited to participate in an online survey to share their perspectives on FA.

Participants

Students in their second and third years of medical school were eligible to participate in this study, except for third-year medical students who were co-investigators in this research—they were excluded to decrease the influence of bias on the study results. Medical students in the new Doctor of Medicine PSCM program in 2020 used FAs as an integral part of their educational learning. There is at least one FA for general education subjects and two to four FAs for major medical modules such as Infection and Defense, Endocrine System and Reproduction, Neuroscience and Behavior, and Mechanism of Drug Action. These FAs are essential components of the medical modules that students must complete throughout the course, at the end of each module, and before the SA. The interval between the FA and SA for second- and third-year students was approximately four weeks. Second- and third-year medical students were required to complete these FAs, providing them with sufficient experience to confidently discuss their perspectives and attitudes regarding FAs, including their impact on SA performance. In contrast, first-year students had limited exposure to both FAs and SAs, as

summative assessments are administered only once a year. Consequently, first-year medical students were not included in this study.

Questionnaire development

The survey commenced by obtaining informed consent from the participants, after which they were able to complete the five sections of the survey. Each set of questions was reviewed, validated, and approved by four medical education experts before the study. The first section provides the participants' background characteristics, including their age, gender, and academic year. Sections 2 to 4 focused on the evaluation of FA. Section 2 consisted of 17 questions, and section 3 had 11 questions, both of which were rated on a 5-point scale. In section 2, participants were questioned about students' perceptions of FA in relation to congruence, authenticity, consultation, transparency, and accommodation. These five important characteristics were necessary to ensure a satisfactory level of student involvement in FA and were used to evaluate the quality of FAs that are used during undergraduate training in medical school as a self-assessment skill (4). Congruence means that the assessment tasks should align with the instructional content. Authenticity refers to the tasks being relevant to the students' backgrounds and study context. Consultation involves allowing students to have a say in how their answers are evaluated based on specific criteria. Transparency implies that there should be no ambiguity in the wording of the assessment items and that they should clearly address the targeted content. Accommodation ensures that all students have an equal opportunity to complete the assessment tasks. Therefore, the questions in this section were developed according to the aforementioned content, which explores a deeper understanding of the students' viewpoints on FA. In the third section, our attention was directed toward students' preferences concerning FA. We gathered insights by asking students to rate both the perceived benefits and drawbacks of FA. In the fourth section, we asked participants to express their views on ways to enhance the functions of FA through open-ended questions with free-text answers. The fifth section included a question about the impact of SA on the students' learning process.

Statistical analysis

The study employed a mixed-methods research design, integrating both quantitative and qualitative methodologies. Quantitative variables were summarized using means and standard deviations (SDs), while categorical variables (e.g., demographics) were reported as frequencies and percentages. Qualitative data, including responses from open-ended questions, were analyzed and presented as frequencies and percentages. For students' perceptions of FA outcomes, the Mann-Whitney U test was used to compare results by gender and academic year, while the Kruskal-Wallis test was applied to compare results across age groups. All statistical analyses were conducted using Stata version 18.0 (StataCorp LLC, College Station, TX, USA).

Ethical approval

The study protocol was approved by the Chulabhorn Royal Academy Ethics Committee (EC 038/2565). Informed consent was obtained from all participants.

Results

A cross-sectional study was conducted in September 2022 for second- and third-year medical students in the PSCM program. Of 59 students eligible for the study, 40 completed the questionnaire, a response rate of 67.8%, with 57.5% of respondents being in their third year of medical school. Female respondents accounted for 67.5% of all respondents, and 85% were between the ages of 18 and 20 years. Table 1 summarizes the participants' characteristics. Table 2 shows the results of students' responses regarding their perceptions and preferences for FA, as well as the effects of SA on their learning.

Responses to the questions about students' perceptions of FA

In section 2, responses to questions about students' perceptions of FA indicated a positive perception across all aspects, with a mean score of 4.28 and SD of 0.45 on the 5-point rating scale. The results for each aspect, including the mean (SD), are shown in Table 2. The scores were as follows: congruence was 4.23 (0.53), authenticity was 4.13 (0.69), consultation was 3.25 (0.54), transparency was 4.85 (0.36), and accommodation was 4.80 (0.61). No statistically significant differences were found between the results based on age, sex, or academic year ($p > 0.05$).

Responses to the questions about students' preferences for FA

Rating scale for students' preferences for FA

The third section focused on students' preferences for FA. The third section explored students' preferences for FA, using a scale from 1 (strongly disagree) to 5 (strongly agree). Therefore, in this section, scores of 4-5 were grouped as "agreement," while scores of 1-2 were grouped as "disagreement" for analysis purposes. If more than 50% of students selected a particular score group, it was considered the majority response. Responses were largely clustered at the extremes-either agreement to strong agreement (scores of 4–5) or disagreement to strong disagreement (scores of 1–2)-with some neutral responses (score of 3) also recorded.

Across 11 questions in this section, the majority of students expressed positive attitudes toward FA. Between 92.5% and 97.5% of students gave scores 4–5, indicating agreement that FA enhanced their performance and learning. Students felt it increased their active engagement in the learning process, deepened their understanding, supported daily learning, helped them identify areas needing improvement, and encouraged discussions about those areas. FA feedback also helped their learning.

Interestingly, while only 12.5% of students agreed that FA was time-consuming, a notable 30% remained neutral on the statement. Views on stress were more mixed: 32.5% reported low levels of agreeing of stress (scores 1–2), 30% were neutral (score 3), while 37.5% agreed that

FA was stressful (scores 4–5). Regarding boredom, most students (67.5%) gave scores 1–2, indicating that FA was generally not perceived as boring. The results are presented in Table 2 and Figure 1.

Responses to open-ended questions that invited participants to comment on the FA

Section 4 featured open-ended questions about FA, allowing participants to freely share their thoughts and opinions. In the reasoning part, while participants could answered more than one reasons, the analysis focused solely on the reasons they provided.The responses in this section were consistent with those from the previous one, especially regarding the statement that "feelings stress me" (21.2%). Additionally, some students raised concerns about the time required for FA, with 21.2% indicating that it was time-consuming, although this was not the majority view.

Notably, 40% of students suggested that FA should be changed or improved. On a positive note, most participants (57.1%) agreed that having a positive perspective on FA helped keep them on track. However, there were also some negative perspectives, such as issues with feedback, which accounted for 21.2% of the respondents (Table 2 and Figure 2).

Responses to questions about the impact of SA on student learning process

The last section included questions regarding the effects of SA on students' learning. This section showed that 92.5% of respondents reported that FA was helpful in preparing for the National Licensing Examination of Thailand (NLE). Furthermore, 87.5% of respondents felt that the end-of-year SA enhanced their learning by promoting self-evaluation and improving study strategies, which helped them better prepare for improved performance in the next academic year.

Discussion

Students' perceptions of FA findings demonstrated a favorable perception of FA in all aspects. Transparency and accommodation received the highest scores in students' perceptions of FA component, accounting for 90%–93.33%. However, the question regarding the consultation component implies that the FA may have restricted them from providing an explanation for their answers and evaluations based on specified criteria. The main format for FA questions at our institute was the single-best-answer format, which allowed for only one response to be scored. Through this particular type of evaluation, students had restricted chances to demonstrate their comprehension of the subject matter covered in the course. Students may also have wished to defend their responses and present their knowledge to the instructors in a variety of ways. We also used the OSCE (12) for FA. In this type of examination, the students have a short time to answer questions. If students do not submit their answers within the time limit, they will not receive a score. During the examination, the examiner cannot assist the pupils. However, examiners are required to record students' weaknesses and strengths to improve their OSCE performance and provide feedback to the students after the exam. This strategy promotes and assists medical students in their studies.

Most of the students' responses expressed positive preferences regarding FA, which aligns with findings from previous studies (3, 4). They also reported that FA contributed to their learning by actively engaging them in the process, facilitating self-evaluation, and highlighting areas for improvement. These observations are in line with the results reported by Jain et al.(13) and Elmahdi et al.(3). Despite these benefits, some challenges were identified. Approximately one-third of students experienced significant stress related to FA in our study. Stress related to both formative and summative exams is a common issue. High-stakes summative exams were associated with even greater stress, as they play a decisive role in academic grading and final outcomes. Feedback provided through FA was seen as particularly valuable for enhancing

understanding and guiding further learning. The integration of technology was also noted as a way to further improve feedback quality (3).

Cardazo et al. (14) reported that active teaching combined with ongoing assessment reduced test-related tension and anxiety, enhancing student performance compared with traditional lectures. Therefore, FA designed to improve learning outcomes can be adjusted to reduce anxiety and stress, depending on the method used. FA can be administered online for more flexibility, allowing students to complete it when they are ready, reducing time pressure, and enabling focused learning for summative tests (15). This approach also lowers stress levels. A lack of feedback is a common concern among students (16-18), and our study supports this, with about one-fifth of participants expressing similar concerns regarding this issue in in their preferences for FA. In the open-ended questions section, the comments received aligned with the questions posed previously. However, there were some aspects that needed further exploration, particularly in relation to areas that could be improved. It is possible to classify all unfavorable responses obtained by students into three categories: (1) Timing, which encompassed the interval between FA and SA, as well as the frequency of FA; (2) Guidance for FA content; and (3) Reflection techniques. To improve student benefits gained from the FA, our research suggests that educators should consider these three areas when implementing FA. In addition, our study revealed that emotional factors, such as stress and low self-esteem resulting from low scores, should be considered when utilizing FA to improve and balance students' learning processes. Furthermore, the timing of in-curriculum evaluations is critical because it can have a great impact on the prompt detection of students who are underperforming and at risk of failing the SA. Early identification and clarification of an issue enables better academic support (19, 20). FA, therefore, serves as an initial assessment and academic indicator to identify and provide assistance to students who encounter difficulties, consequently helping them throughout their course (19-21). The feedback indicated the

effectiveness of FA in promoting student learning. Previous research findings indicated that medical students had a greater propensity toward receiving written formative feedback rather than in-person input. This style of feedback was associated with better student performance on the summative exam. This emphasizes the importance of developing effective methods for providing positive feedback to medical students, enabling them to fully utilize the benefits of FA in a medical school curriculum (22).

In our study, the students reported that FA helped them prepare for NLE. Our institute conducts FAs both as individual course examinations and as annual comprehensive curriculum examinations, which differs from the practices of other Thai medical institutions. The students receive regular FAs and SAs each year for three consecutive years, with each assessment designed to reflect the NLE at their respective level, before they sit for their first NLE. Thus, the students experience a comprehensive FA and SA assessment. Of note, a marked number of responses (92.5%) answered that FA helped prepare for the NLE. Regarding views on SA, the findings indicated that many students (87.5%) had a high level of confidence in SA to help them improve their study strategies for the upcoming academic year.

Finally, the FAs also helped prepare for the end-of-year SA by having a positive effect on student learning, in line with a study by Ceyhun et al. (23). The highlighted negative aspects included stress, time consumption, and feedback. To address the latter two concerns, an alternative strategy is to actively involve students in the design of FAs, giving them the opportunity to schedule and adjust their assessments for increased flexibility. This approach aims to establish an appropriate balance between FA and SA, as described by Al Kadri et al. (2). Enhancing constructive feedback is important, as some students experience diverse degrees of stress, with most distress being influenced by their performance and feedback. Thus, to better support our new curriculum, we found that the effectiveness of self-evaluation tools as FAs can be enhanced by providing more comprehensive feedback, optimizing assessment scheduling, and ensuring alignment with lecture objectives

Study strengths and limitations

This study provided insights into the perspectives of second- and third-year students who had experienced over one year of formative and summative assessments. However, there were some limitations because it was conducted at one institute with a relatively small sample size, and participants may not have experienced FA in a different format. Therefore, more research is needed to evaluate the short- and long-term effects of FA on student competency using a multi-site, homogeneous, and varied FA format. Among the areas that need further research are the development of FA methods, the evaluation of optimal timing to reduce student stress, the evaluation of staff perspectives and the investigation of FA costs, including technical and human costs. Additionally, it would be beneficial and crucial to perform observational studies to investigate associations between exam performance and graduation outcomes for cohorts that can be followed longitudinally.

Conclusions

Most students viewed FA positively, recognizing its role in enhancing their academic experience, boosting achievement, and identifying those who may need timely support for SA. However, some found FA stressful and time-consuming. Increasing student participation could further enhance the effectiveness of FA. End-of-year SA also supports learning by encouraging effective study strategies. FAs are more impactful when they provide insightful feedback, are thoughtfully scheduled, and are well aligned with lecture objectives, thereby supporting students in reaching their full potential.

Statements and Declarations

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Figure legends

Fig. 1 Results of students' preferences for FA (section 3). Abbreviations: FA, Formative assessment.

Fig. 2 Results of open-ended questions that invited participants to comment on FA (section 4). In this part, participants were allowed to give more than one answer, and the results were based only on the reasons they provided. **A** If students could change the FA and feedback process, describe how students would do it? (need to make changes). **B** What were the major negative effects of FA and feedback?. **C** What were the major positive effects of FA and feedback?. Abbreviations: FA, Formative assessment.