Acta Medical and Health Sciences, 1 (2): 71-78 (2022)

Advance Access Publication Date: October 2022
DOI :

ORIGINAL ARTICLE

The learning impact of the Online Formative Assessment system (OFAs) for undergraduate medical students

Sylvia M Sari [1*], Hindun Saadah[2]

1) Department of Medical Education, Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi, Indonesia.
2) Department of Anatomy, Faculty of Medicine, Universitas Jenderal Achmad Yani, Cimahi, Indonesia.

*Corresponding author. E-mail: sylvia.mustikasari@lecture.unjani.ac.id

ABSTRACT

Formative assessment is a continuum process of evaluating students' performance to enhance students' learning quality. The shift to full-online learning in pandemics reduces student-lecturer attachments during formative assessment. Therefore, we developed the Online Formative Assessment system (OFAs) based on a self-regulatory learning framework. This study aimed to explore the learning impact of OFAs, such as learning preparation, feedback perception, and self-reflection. We used the mixed method with an exploratory approach. We collected quantitative data from 150 students who experienced OFAs, using 26 questions adapted from AEQ (Assessment Experience Questionnaire) and analyzed by pre-post design (paired-T test). To explore a deeper understanding, we conducted 6 FGDs (N=28). Finally, we analyzed the quantitative and qualitative data sequentially. We found the difference in students' preparation ($p<0.5$), feedback perception ($p<0.5$), and no difference in self-reflection ($p>0.5$). In Qualitative data, we found three themes as follows: (1) OFAs improve student preparation in learning; 2) Students are aware of being assessed during tutorials; 3) Require more specific and individual written feedback; 4) Lack of self-reflection due to unspecific feedback. These findings represent that learning impact is a complex pathway that online assessment systems can drive. It needs externally driven feedback quality and internally driven factors such as self-reflection skills. However, we found the challenges to improving students' quality feedback and self-reflection skills. This study brings further research on student-lecturer engagement in online formative assessment.

Keyword: formative, learning, impact, online, undergraduate

INTRODUCTION

The quality of students' learning depends on how they perceive the assessment.[1,2] Therefore, medical institutions must continually develop assessment method that enhances students' learning. Norcini et al. stated that summative and formative assessments ideally have the same function of improving learning quality.[2] However, formative assessment has a role in continually evaluating student learning improvement during the learning process. [2,3]

The positive impact of the formative assessment can be achieved through facilitating constructive feedback and self-reflection in students. The mechanism of learning impacts following the concept of 'assessment for learning' can be achieved through formative assessment.[3-5] Larsen et al. and Green et al. introduced a concept of formative assessment as "test enhance learning" which is defined as a periodic measurement followed by feedback.[6,7] Various studies proved that the formative assessment with constructive feedback results in a better quality of students' learning. [8-10]

In the undergraduate phase of the Faculty of Medicine Unjani, formative assessment is carried out during the tutorial process, clinical skills training, and other learning methods. From the previous studies, we found that the perception of students and lecturers such as: 1) A formative assessment is perceived as summative; 2) The influence of sociocultural aspects in providing feedback; and 3) The need for standardized categories in formative assessment.[11] Furthermore, Sari SM conducted research through action research and found a paradigm shift in the formative assessment of students and lecturers and challenges, especially in providing feedback in the form of dialogue and students' self-reflection ability.[11,12] Formative assessment is implementing the "assessment for learning" concept.[4,13] These previous studies have shown the challenges during the formative assessment process that should be considered in our development.

During the pandemic, institutions worldwide developed their online learning and assessment platforms version.[14,15] Therefore, considering our previous studies, we create the online formative assessment system (OFAs). This underlies our focus on developing an online formative assessment system and exploring its learning impacts, such as learning preparation, feedback perception, and self-reflection.

METHODS AND SUBJECT

A. Study Design

This research method is a mixed method with sequential explanatory design.[16] A quantitative research design was conducted to explore the difference in students' learning preparation, feedback perception, and self-reflection before and after implementing OFAs. In the Qualitative method, we study a deeper understanding of students' experience with online formative assessment.

B. Population and study participants

We collected quantitative data from 148 undergraduate students who experienced OFAs. In qualitative data collection, we purposively selected 28 students to explore their experience in using the OFAs.

C. The development of the Online Formative Assessment System (OFAs)

1) Theoretical background

The development of OFAs is based on the theoretical framework of Self Regulation learning.[17,18] Learning improvement starts from an external process, such as the assessment method and its regulation. Furthermore, there is a need for external reinforcement in the form of constructive feedback. We adopt this perspective in our formative assessment design. (Figure 1)

2) OFAs design

In this study, we designed OFAs to facilitate written feedback that supports feedback directly during the learning process on the lecturers' front end. The direct and written feedback will encourage the students' self-reflection. Therefore, OFAs has the feature of self-reflection in students' front end.

Based on the adaptation of the theory of Self Regulation, in OFAs, there are two views: the view of the lecturer (lecturer's front-end) and the view of the student (student's front-end). OFAs charging cycle begins during the learning process (learning activities). The assessment rubric consists of aspects: 1) professionalism towards the task; 2) intrapersonal skills; and 3) professional behavior towards lecturers and peers.

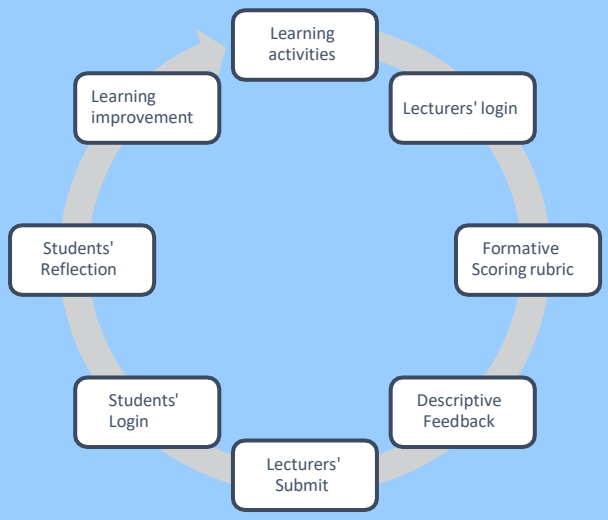

Figure 1. The implication of the Self-Regulated Learning cycle in OFAs development

Furthermore, OFAs facilitates the student's self-reflection process. Through the features in OFAs, we expect lecturers to provide written feedback on student performance regarding material mastery and intrapersonal skills that need to be developed. The written feedback feature is shown in Figure 2. Furthermore, the assessment results from lecturers will be visible to students after learning. Then students can fill out a self-reflection form to improve their performance in their learning. The student view is shown in Figure 3.

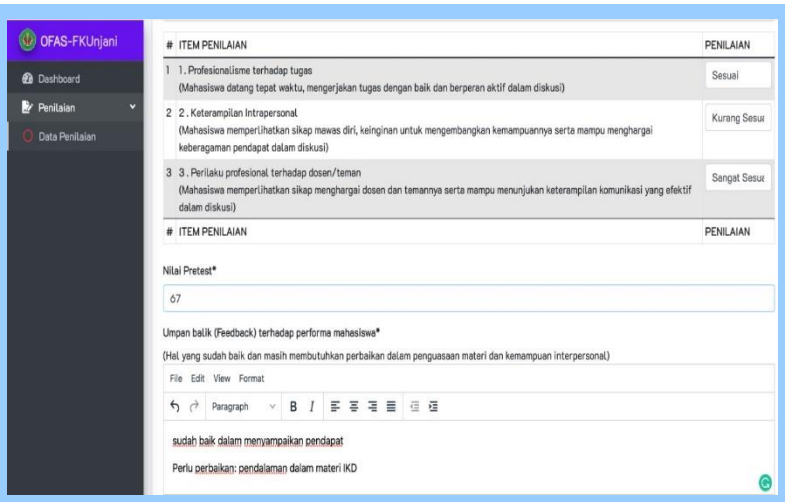

Figure 2. Lecturers' front end The implication of the Self-Regulated Learning cycle in OFAs development

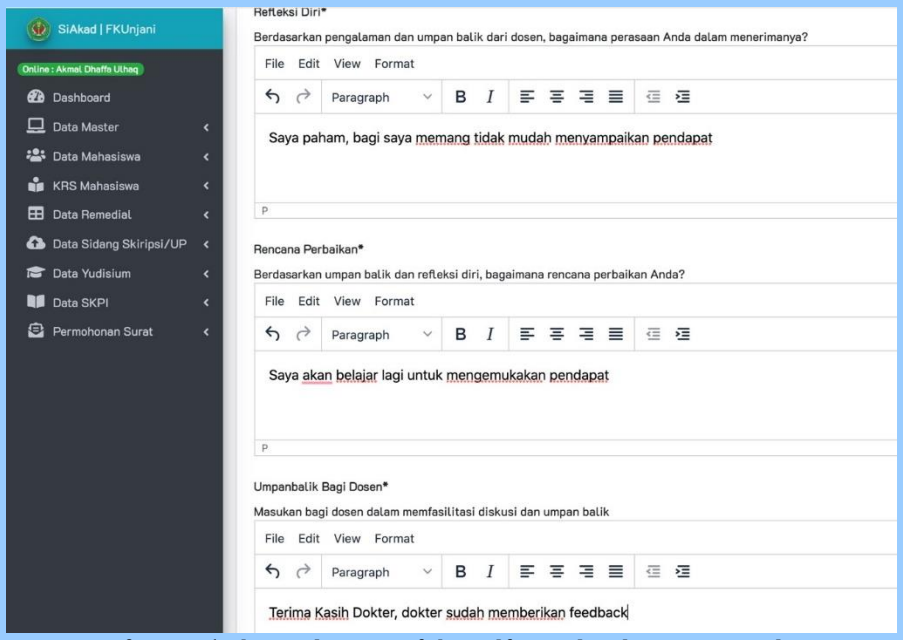

Figure 3. Lecturers' front end The implication of the Self-Regulated Learning cycle in OFAs development

D. Research Instruments

In quantitative data, we used the 26 questions adapted from AEQ (assessment Experience Questionnaire) that have already been validated.[1] In this study, we have translated and adopted the AEQ into our context on OFAs. In qualitative data collection, we used the leading questions for FGD, as follows: 1) How was your experience in using OFAs?; 2) Does this formative assessment have an impact on your learning?; 3) Can you describe your reflection based on the feedback from OFAs?

E. Analysis

1) Quantitative data analysis

The mean and standard deviation values are calculated in each domain and then as a whole. Quantitative analysis was completed using SPSS 22.0. Bivariate analysis using the different tests on pre and post-intervention data.

2) Qualitative data analysis

Transcript preparation is done, which is then validated by checking members. The transcripts are then ready to be analyzed by researchers and independent coders. Researchers and independent coders perform the stages of coding, re-coding, and categorizing to determine the theme, then seek theme agreement in the discussion.

3) Combined analysis

The subsequent analysis stage is a combined analysis using integration, linking quantitative and qualitative research data.

RESULTS AND DISCUSSION

A. The learning impact difference after using OFAs

In this study, the learning impact of OFAs measured with a pre-post test design by using paired T-test. Data were obtained from a questionnaire adapted from AEQ (Assessment Experience Questionnaire).[1,3] In this instrument, three sub-variables describe the quality of student learning, namely 1) the quality of student preparation; 2) The perception of feedback from lecturers; and 3) the ability of self-reflection in response to lecturer feedback.

Before implementing OFAs, we conducted socialization with students and lecturers. The data was obtained from 148 students, before and after OFAs implementation. Normality test results showed that both data are normal distribution (KS= p > 0.05).

Table 1. The Learning Impact Difference

Variable	Mean	Deviation Standard	T (t-test)	p-value
Student's effort				
Before	**32.51**	**5.46**	**- 2.128**	**0.034****
After	**33.52**	**5.56**		**(p<0.05)**
Feedback seeking				
Before	**50.41**	**8.2**	**- 4.832**	**0.000 ****
After	**53.81**	**8.11**		**(p<0.05)**
Response to feedback (Self-reflection)				
Before	**30.51**	**6.67**	**-2.568**	**0.035**
After	**30.67**	**6.17**		**(p>0.05)**

We found the difference in the student's effort and feedback-seeking variables based on the results above. However, we did not find any difference in response to feedback on self-refection variable.

B. Student's Perception of OFAs

The results of the interviews were transcribed, coded, and categorized. We continued the thematic analysis according to the rules of qualitative data processing.
Researchers found four themes that emerged from the categorization results: 1) OFAs improve student preparation in learning; 2) Students are aware of being assessed during tutorials; 3) Require more specific and individual written feedback; 4) Lack of self-reflection due to unspecific feedback.

Based on the results of qualitative data analysis, we found the positive influence of OFAs on student preparation and awareness of being assessed. These results strengthen the results of quantitative data analysis. However, there is an impression that the influence comes from the external value regulation on the formative assessment. Some of the quotes that support this finding are
"I was afraid of being judged by the tutor." (M_01.7)
"It is necessary to calculate the formative score."(M_04.5)

We also found the lack of constructive written feedback as the frequent sentences such as "you are good enough" without specifying the area that needs to be improved.

The students will change more in the assessment development.[1,19] This phrase can describe our results to evaluate the learning impact on the online assessment development. We developed OFAs based on the self-regulation learning framework. Therefore, we tried to design some features for students' and lecturers' front-end. Lecturers' front end will facilitate the feedback from lecturers about students' performance during a learning activity. Students' front end facilitates students' self-reflection through the score and written feedback from the lecturer. Students have to write down their self-reflection, and they can visualize the previous meeting.

Table 2. The Categories and Themes

Categories	Themes
Need more time to prepare tutorials Need to be active in the tutorial session I need to read more before the tutorial.	Improve the assessment preparation
Aware of being assessed Concern about the formative score	Awareness of the assessment process
The 'you are good enough' is a frequent comment in written feedback My feedback is the same with my friends Written feedback less constructive than direct feedback. Written feedback is less threatening.	The need for more specific and individual feedback
The frequent phrase in self-reflection is" thank you" We need more feedback to reflect. What should we improve if we are enough	Lack of self-reflection due to unspecific feedback.

We found significant differences in the preparation of student learning before and after implementing OFAs. Therefore, the OFAs have positively impacted the quality of student learning preparation. The assessment preparation changes showed as students perceived being assessed during the tutorial. The qualitative analysis also describes the findings, such as students feeling more challenged and concerned about their formative scores. In the same context, our previous results showed the "summative perception" of formative assessment.[11,20] This phenomenon showed the power of external motivation on students' learning from the assessment results.[10]

The positive impact of the OFAs also seen in the feedback perception that is delivered either directly or synchronized and supported by written feedback. In qualitative analysis, we found students preferable in direct or synchronized feedback better than written feedback in the OFAs. As already known in many studies, feedback is a powerful aspect of enhancing student self-reflection. The quality of feedback influenced the self-regulation skills of the student. In this study, we found the students are aware of less constructive written feedback. The students need a more specific description of "enough" in "good enough" feedback. The consequence of the lack of feedback delivery, as we found in this study, has no difference in self-reflection ability in students within the OFAs implementation.

We developed the OFAs based on self-regulation theory, which states that external and internal factors influence the improvement of student learning quality.[17,21,22] We found our development on formative assessment has a positive role on external factors. The internal factor has a more complicated pathway to enhancing students' learning. It needs the lecturers' awareness to provide conducive and constructive feedback to increase the students' internal motivation to improve their learning. [10,22]

This study brings more understanding of the 'assessment drives learning' mechanism. Studies have shown that feedback is essential as the 'motor' in driving or enhancing students' learning. In the perspective of self-regulation theory,

feedback can facilitate external to internal regulation that creates the self-reflection that continues as self-improvement.[17,21] We have developed a formative assessment system that facilitates feedback from lecturers and student self-reflection. We found not all aspects of the learning impact were achieved. Therefore, this study brought the space for improvement in the online version of formative assessment in another context. As we found a more challenging mechanism in the internal regulation, further studies can explore a deeper understanding of factors that influence students' self-reflection skills.

CONCLUSION

We found the influence or positive learning impact of OFAs in the quality of student preparation and perception of feedback. However, we did not find a significant effect on students' self-reflection ability. Deepening in qualitative analysis, we saw students are aware of being assessed during the tutorial and require more specific and individual written feedback to facilitate their self-reflection.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the IT team at Medical Faculty of Unjani for their contributions on the software development.

DECLARATION OF INTERESTS

Authors declared there is no conflict of interest in this study.

FUNDING

This study was funded by Lembaga Penelitian dan Pengabdian Masyarakat (LPPM) at Universitas Jenderal Achmad Yani.

REFERENCES

1. Preston R, Gratani M, Owens K, Roche P, Zimanyi M & Aduli BM. Exploring the Impact of Assessment on Medical Students' Learning. Assessment & Evaluation in Higher Education, 2020; 45(1): p109-24.
2. Norcini J, Anderson MB, Bollela V, et al. Consensus framework for good assessment. Medical Teacher. 2018; 2. doi: 10.1080/0142159X.2018.1500016J.
3. Kulasegaram K, Rangachari PK. Beyond "formative" assessments to enrich student learning. Advanced Physiology Education Journal. 2018; 42(1):p5–14. doi:10.1152/advan.00122.
4. Wiliam D. What is assessment for learning?. Studies in Educational Evaluation. 2011. Elsevier, 37: 3–14. doi:10.1016/j.stueduc.2011.03.001
5. Schuwirth LWT, Van der Vleuten CPM. Programmatic assessment: From assessment of learning to assessment for learning. 2011.Medical Teacher, 33: p 478–85
6. Larsen DP, Butler AW, Roediger HL. Test enhance learning in medical education. Medical Education. 2008. 42: 959–966, doi:10.1111/j.1365-2923.2008.03124.
7. Green ML, Jeremy J. Moeller & Spak JM. Test-enhanced learning in health professions education: A systematic review: BEME Guide No. 48, Medical Teacher. 2018; 40:4, 337-350, doi: 10.1080/0142159X.2018.1430354
8. Ten Cate TJ, Kusurkar RA, Williams GC. How self-determination theory can assist our understanding of the teaching and learning processes in medical education. AMEE guide No. 59. Med Teach. 2011;33(12):961-73. doi: 10.3109/0142159X.2011.595435.
9. Kusurkar RA, Croiset G, Mann KV, Custers E, Ten Cate O. Have motivation theories guided the development and reform of medical education curricula? A review of the literature. Acad Med. 2012 Jun; 87(6):735-43. doi: 10.1097/ACM.0b013e318253cc0e.
10. Evans DJ, Zeun P, Stanier RA. Motivating student learning using a formative assessment journey. J Anat.

2014 Mar;224(3):296-303. doi: 10.1111/joa.12117. Epub 2013 Sep 30. PMID: 24111930; PMCID: PMC3931541.
11. Sari SM, Inayati I, Sidiqa A. Towards Paradigm Change Of Formative Assessment In The Undergraduate Curriculum: The Participatory Action Research (Par). ICME Conference Book 2021. https://doi.org/10.2991/assehr.k.210930.049
12. Pressentin V. Towards tailored teaching: using participatory action research to enhance the learning experience of Longitudinal Integrated Clerkship students in a South African rural district hospital. BMC Medical Education. 2016;16:82.
13. Gibbs G, Simpson C. Conditions under which assessment suports students learning. Learning and teaching in higher education. 2005;12: p16-20.
14. Nagandla K, Sulaiha S, Nalliah S. Online formative assessments: exploring their educational value. J Adv Med Educ Prof. 2018 Apr;6(2):51-57. PMID: 29607332; PMCID: PMC5856905.
15. Marden NY, Ulman LG, Wilson FS, Velan GM. Online feedback assessments in physiology: effects on students' learning experiences and outcomes. Adv Physiol Educ. 2013 Jun;37(2):192-200. doi: 10.1152/advan.00092.2012. PMID: 23728137.
16. Creswell JW and David JC. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Fifth edition. Thousand Oaks, California, SAGE Publications, Inc, 2018.
17. Rust C, O'Donovan B, Price M. A social constructivist assessment process model: how the research literature shows us this could be best practice. Assessment & Evaluation in Higher Education. 2005. 30:3, 231-40.
18. Yardley S, Teunnissen PW, Dornan T. Experiential learning: AMEE guide No. 63. Medical Teacher. 2012. DOI: 10.3109/0142159X.2012.650741
19. Al-Kadri HMA, Al-Moamary MS, Magzoub ME, et al. Students' perceptions of the impact of assessment on approaches to learning: a comparison between two medical schools with similar curricula. Int J Med Educ. 2011 2: 44-52.
20. Al-Kadri HMA, Roberts C, Al-Moamary MS, Van der Vleuten CPM. Exploring assessment factors contributing to students' study strategies: Literature review. Medical Teacher, April 2012 DOI: 10.3109/0142159X.2012.656756
21. Mogali SR, Rotgans JI, Rosby L, Ferenczi MA, Low Beer N. Summative and Formative Style Anatomy Practical Examinations: Do They Have Impact on Students' Performance and Drive for Learning? Anat Sci Educ. 2020 Sep;13(5):581-590. doi: 10.1002/ase.1931. Epub 2019 Dec 12. PMID: 31733172.
22. Palmer E, Devitt P. The assessment of a structured online formative assessment program: a randomised controlled trial. BMC Med Educ. 2014 Jan 9;14:8. doi: 10.1186/1472-6920-14-8. PMID: 24400883; PMCID: PMC3893582.