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Web-Based Four-Tier Formative Assessment Training for Teachers to Improve Literacy and Numeracy

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Abstract

This community service activity aims to improve students' literacy and numeracy skills in Balangan Regency through training on "Developing Four-Level Web-Based Formative Assessment" for teachers. This training was attended by 21 participants from 8 sub-districts in Balangan Regency, with a gender composition of 28.57% male and 71.43% female. Partners in this activity are the Balangan Regency Education Office and the Balangan Regency Junior High School Science Teacher Working Group (MGMP). The method used in this training is Participatory Action Research, which allows participants to be actively involved in the learning process. The evaluation results showed that this training was very beneficial for the professional development of participants, with an average score above 4.0 in various aspects of the assessment. Participants felt that this training provided a clear understanding of the development of formative web-based evaluations and concrete examples of their application. In addition, this training was considered relevant to support innovative learning in schools and could facilitate teachers in training students' literacy and numeracy skills. The highest score was obtained on questions regarding clear understanding given by the speaker, with a value of 4.42. Thus, it is hoped that this activity can significantly contribute to improving the quality of education in Balangan Regency, especially in literacy and numeracy, as well as encouraging teachers to implement more effective formative assessments in the learning process at school.

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INTRODUCTION

Education is vital in developing high-quality human resources, especially in areas such as Balangan Regency, where literacy and numeracy remain critical challenges. Although various initiatives have been undertaken to improve the quality of education, the evaluation of school education report data in Balangan Regency show that students continue to have difficulties with basic concepts in reading, writing, and arithmetic. This situation highlights the need for more effective interventions to improve students' literacy and numeracy skills in the region (Sholeh & Baharuddin, 2022). Formative assessment

has been identified as a promising strategy to address these challenges, as it provides ongoing feedback that can significantly improve the learning process for both students and teachers (Elmahdi et al., 2018; Evans et al., 2014; Ketonen et al., 2020; Menéndez et al., 2019).

Partnership with the science subject teacher working group (MGMP) at the junior high school level in Balangan District is essential for professional development and improving the quality of learning. However, many teachers lack the skills needed to implement innovative and technology-based assessment methods, which are critical to identifying and addressing student learning difficulties. Effective formative assessment practices can provide constructive feedback, thereby enhancing the overall learning experience. (Seagrave et al., 2022; Vu & Dall'Alba, 2014). The four-tier assessment method, which includes assessing students' answers, measuring their confidence, providing reasons, and evaluating those reasons, has emerged as a highly effective approach (Andriamiseza et al., 2021; Grob et al., 2017). This method allows teachers to gain deeper insight into student understanding and identify specific areas that need improvement (Vučemilo & Borovečki, 2015).

To address these issues, we propose a training program that focuses on developing web-based formative assessments tailored for teachers in science subject teacher working group. This training would cover the basic concepts of formative assessment, techniques for developing assessment tools, and the integration of technology into the assessment process. (King, 2023; Mdlalose et al., 2023). By equipping teachers with these skills, we anticipate significant improvements in their ability to design and implement effective assessments that meet students' needs (Ofosuhene, 2022). Expected outcomes include increased teacher competency in formative assessment and significant improvements in students' literacy and numeracy skills in Balangan District (Patel & Annapoorna, 2019). Thus, this community service initiative aims to make a meaningful contribution to the quality of education in Balangan District, especially in literacy and numeracy. With the support of MGMP and the active participation of teachers, this activity is a solution and provides significant benefits for the development of education in the Balangan district area, especially training teachers to develop literacy and numeracy-based formative assessments to overcome literacy and numeracy problems experienced by students (King, 2023; Mdlalose et al., 2023).

METHODS

The community service activity team led by Andi Ichsan Mahardika consists of 3 lecturers, 1 education staff member and 3 students. This activity is in collaboration with MGMP IPA SMP and the Balangan district education office.

Community service activities were carried out on September 21, 2024 at the Balangan District Government Inspectorate, South Kalimantan Province. Participants were teachers who were members of the science subject teacher working group (MGMP) at the Junior High School (SMP) level throughout Balangan Regency. Invitations were given to 31 participants, but only 21 participants were able to attend, and they still included all junior high schools spread across all sub-districts in Balangan.

This community service activity (PKM) uses the *Participatory Action Research* (PAR) method, which focuses on developing teachers' literacy and numeracy knowledge and providing training in a web-based four-tier assessment application to make it easier for teachers to assess the literacy and numeracy levels of the students they teach. By implementing literacy-numeracy formative assessments web-based in the classroom, teachers will be better equipped to understand and address the learning needs of their students.

In using the PAR method, the following stages are carried out:

1) Problem Identification: Conducting discussions with teacher representatives to identify challenges in formative assessment and literacy/numeracy in Balangan district.
2) Data Collection: The team conducted observations and interviews with resource persons from the MGMP IPA SMP Balangan Regency to collect information about existing assessment practices.
3) Analysis and Planning: The team analyzed the data collected with teachers to formulate solutions and training action plans. Based on the analysis results, a four-level assessment application was designed and developed to make it easier for teachers to assess students' literacy/numeracy levels. The team also created an application usage guide to make it easier for each participant to use the application.
4) Implementation of Action: The team conducted training covering literacy and numeracy theory as well as training practices on the use of a web-based four-level formative assessment application.
5) Evaluation and Reflection: Collecting feedback from participants and conducting reflection to evaluate the effectiveness of the training.
6) Follow-up: Prepare a training report and plan follow-up sessions to support implementation in class.

RESULTS AND DISCUSSION

The implementation of the activity was carried out according to the schedule that had been jointly determined by the PKM team together with partners, namely the Balangan Regency Education Office and the Balangan Regency SMP Science MGMP, on September 21, 2024, at the Balangan Regency Government Inspectorate. The venue was adequately equipped, though internet connectivity was initially unavailable. However, this can be resolved by the PKM team by bringing a MiFi, which is a portable WiFi that more than 30 people can access. The distribution of participants' regions of origin is shown in Figure 1.

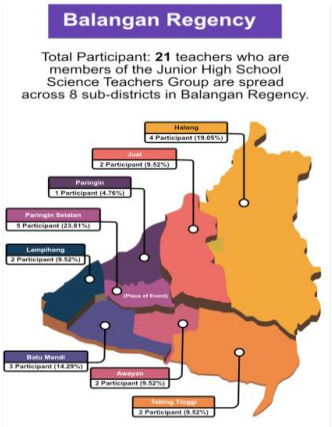


Figure 1 Distribution of participants' regional origins

Based on Figure 1, the data shows the distribution of participation frequency based on sub-district, with a total number of respondents of 21 people. Paringin Selatan Sub-district has the largest respondents, five people or 23.81% of the total. This is because the activity location is not far from their school. In contrast, the Paringin Sub-district is represented only by one respondent, or 4.76%, the lowest proportion in this data. Other sub-districts such as Halong (19.05%) and Batu Mandi (14.29%) also show significant levels of participation, but lower than Paringin Selatan.

In addition, several sub-districts have made similar contributions to this data. For example, Lampihong, Juai, Awayan, and Tebing Tinggi each contributed 9.52% of the total respondents. This reflects a relatively even distribution in several areas despite their small differences. The distribution of this data provides an initial picture of respondent participation, where all teachers from all sub-districts in Balangan Regency have participated.

Table 1 shows that most participants in this activity are female teachers. This situation is unintentional, as each school submits the names of its delegates to the Balangan District Education Office based on the individual interests and considerations of the respective teachers.

Table 1 Gender distribution of participants

Gender	Frequency	Percentage (%)
Man	6	28.57
Woman	15	71.43
Total	**21**	**100.00**

Table 2 shows that more than 50% of teachers over 40 participate. However, this does not reduce the enthusiasm for the activity, as older teachers are highly interested and often ask the speakers and accompanying students questions.

Table 2 Age distribution of participants

Age	Frequency	Percentage (%)
21 - 30 years	3	14.29
31 - 40 years	6	28.57
41 – 50 years	8	38.10
51 - 60 years	4	19.05
Total	**21**	**100.00**

The activity started in an orderly manner and went well. Two parties gave welcoming speeches: the first greeting by the head of the community service and the welcoming and opening speech by the head of the Education Office Balangan district, H. Abiji, S.Pd., M.Ap. The core training is divided into two sessions. The first is a session explaining the concept of literacy and numeracy and training in using a web-based four-level assessment application.

Dr. Andi Ichsan Mahardika, M.Pd, filled the first session. The first session became very interesting when the teacher asked how to implement it for students. Because the conditions in the field are sometimes not in accordance with the ideal theory. This is certainly a challenge when implementing efforts to improve student literacy and numeracy. The second session was related to training on using a web-based four-level assessment application by Novan Alkaf Bahraini Saputra, S.Kom., MT. The following is the presentation of material from the two speakers as shown in Figure 2.

Figure 2 Presented by (a) Dr. Andi Ichsan Mahardika, M.Pd and (b) Novan Alkaf Bahraini Saputra, S.Kom., MT

A web-based four-level assessment application has two types of users: teachers and students.

The flow of use on the teacher's page is as follows

a) Required to register an account
b) Create a class (see Figure 3)

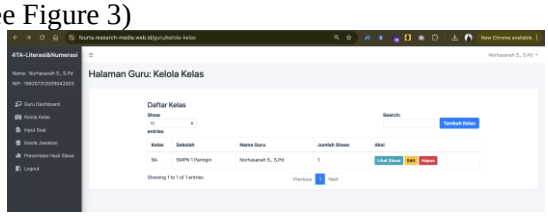


Figure 3 Create class menu

c) Create questions with literacy and numeracy types. In this section, question management includes time per question, active-inactive questions, and the ability to delete questions (see Figure 4).

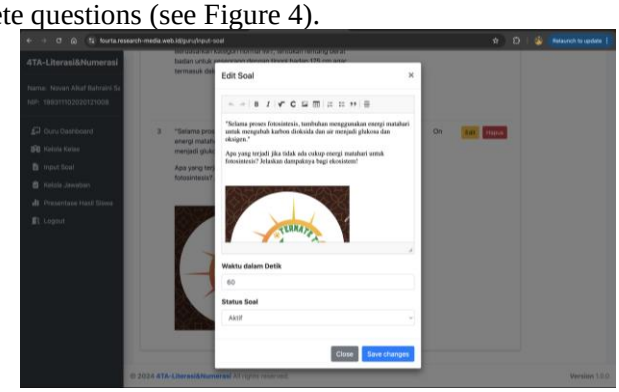


Figure 4 Make the question for evaluation

d) Manage answers from student evaluations by providing assessments and comments (see Figure 5).

Figure 5 Student evaluation answer management

e) View student evaluation results and can download the results in a spreadsheet or PDF format, both detailed and summary versions (see Figure 6).

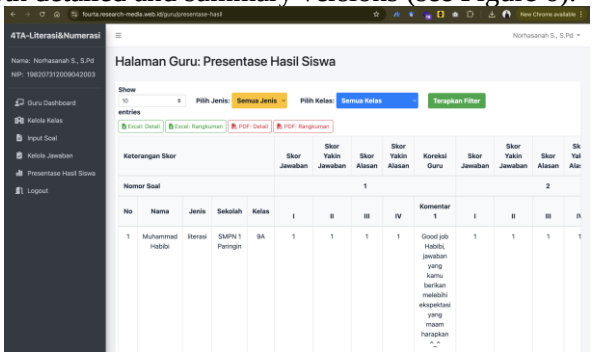
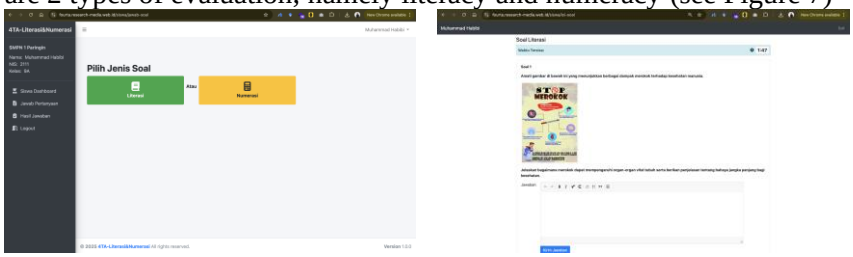


Figure 6 Result of all students who have taken the evaluation

The flow of application usage on the student page is as follows

a) It is mandatory to register an account and choose a class and class teacher that suits the class.
b) Follow the evaluation provided by the teacher in the class of his choice. There are 2 types of evaluation, namely literacy and numeracy (see Figure 7)



(a) (b)

Figure 7 (a) 2 Type of evaluation, literacy and numeracy, and (b) Example of literacy question evaluation

c) See the results of the teacher's grades and comments on the evaluations that have been carried out (see Figure 8).

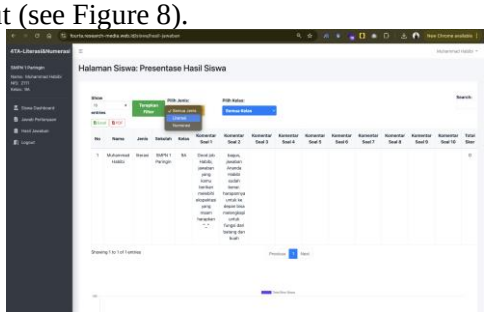


Figure 8 Result of evaluation taken by the student

The homepage of the web-based four-level assessment application is shown in Figure 9.

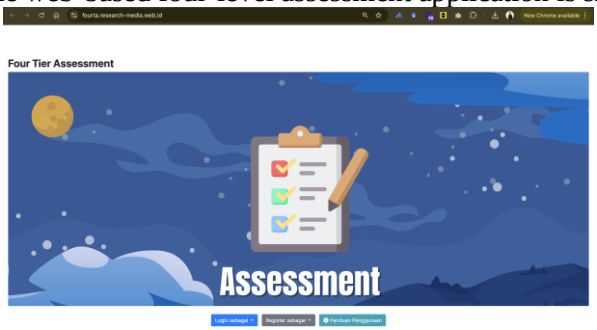


Figure 9 Homepage of web-based four-level assessment application

In this second session, there were quite a lot of questions and answers due to the inconsistency of the function and system flow. This is certainly a very meaningful input for the team so that it can be improved so that it meets the needs of the teachers. The challenge in this section is for the participants to understand the features and functions of the assessment application. Although it is designed with an interface that is relatively easy to do, some participants who are generally over 40 years old face difficulties. However, with the presence of accompanying students and also speakers who are in person to all participants, this can be overcome well.

After the presentation session was completed, it was continued with a reflection session and further questions and answers. Participants were very enthusiastic about using

the application developed by the PkM team, but several adjustments were needed to prepare the server so that users could use it better. The results of the community service activity questionnaire are shown in Table 3.

Table 4 Community service activity questionnaire results

No.	Questionnaire	Score
1	The web-based four-tier formative assessment development training is beneficial for my professional development.	4.32
2	The speakers have provided a clear understanding of the web-based four-tier formative assessment development.	4.37
3	The speakers have given concrete examples of using the web-based four-tier formative assessment application.	4.42
4	The speaker delivered the material in an easy-to-follow language.	4.37
5	The community service training on web-based four-tier formative assessment development can support innovative learning in schools.	4.32
6	The community service training on web-based four-tier formative assessment development is relevant for implementation in school learning.	4.11
7	I am interested in implementing the web-based four-tier formative assessment in school learning.	4.21
8	The implementation of web-based four-tier formative assessment development in school learning can facilitate teachers in training students' literacy skills.	4.11
9	The implementation of web-based four-tier formative assessment in school learning can facilitate teachers in training students' numeracy skills.	4.11
10	The community service on web-based four-tier formative assessment development is seen as capable of motivating and inspiring participants/teachers to innovate and create.	4.21
11	The committee's service during the web-based four-tier formative assessment activity was satisfactory.	4.37
12	What if there is a follow-up activity from this training?	4.37

The data presented in Table 3 provides a clear picture of participants' assessment of the Web-Based Formative Assessment Development training. Using a 1-5 rating scale where 1 is strongly disagree and 5 is strongly agree, the results show that most participants responded positively to various aspects of the training. The highest score was obtained on the third question, which was 4.42, which showed that participants felt the speaker could provide concrete examples in applying formative assessment. This reflects that participants understand the theory and can see how the concept can be used in everyday practice. This good understanding is very important, especially in education, where applying theory to practice can affect student learning outcomes.

However, although most of the questions scored above 4, some questions showed lower scores, such as the sixth and eighth questions, which scored 4.11 each. This indicates that although the training was considered relevant, there were concerns among participants regarding implementing formative assessment in the context of school learning. This could signal that participants felt less confident or needed more information and support to implement this assessment effectively. Therefore, it is important to explore further the challenges that participants may face in implementing formative assessment in the school environment.

Recommendations for future training include providing more hands-on sessions or case studies that allow participants to apply the concepts they have learned directly. In addition, holding focus groups or Q&A forums can help participants share their

experiences and challenges in implementing formative assessment. This will not only enhance understanding but also build a learning community among educators, who can support each other in the implementation process.

The criticism that can be given is the need for a more in-depth evaluation of the material presented, especially related to relevance and application in the field. Suggestions for improvement are for training organizers to consider participant feedback to improve the material and teaching methods. Thus, future training can be more effective in meeting the needs of participants and supporting innovation in learning in schools. Through a more interactive and practice-based approach, it is hoped that participants can be more prepared and confident in implementing formative assessment in the teaching and learning process.

CONCLUSION

The Four-Level Web-Based Formative Assessment Development Training for Teachers in Improving Literacy and Numeracy in Balangan District has shown significant results. Involving 21 participants from 8 sub-districts, this training has improved teachers' understanding and skills in implementing innovative formative assessments. The evaluation results showed that most participants felt that this training was helpful in their professional development, with an average score above 4.0. However, challenges still exist, especially related to the relevance of implementing formative assessments in school learning, which is reflected in the lowest score (4.11). Therefore, ongoing support such as *follow-up sessions* is needed. Overall, this training has made a positive contribution to improving student literacy and numeracy, and expanding the reach of the training and developing more applicable materials will further strengthen its impact on the quality of education in Balangan District.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization, AIM and NABS; methodology, AIM and MA; formal analysis, AIM, MDA, SH, and RPL.

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