

## PAPER DETAILS

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## **The Usefulness of Activity Evaluation and Feedback Tool (AEFT) and Its Potential to Evaluate and Give Feedback to Practitioners**

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**Abstract:** Activity and activity-based learning is one of the important fields of study that remains up-to-date in the mathematics education community. In the context of activity-based learning, it makes it necessary to evaluate the quality of the design and implementation of activities. Within this framework, Bozkurt, Özmantar, Ağaç and Güzel (2022) developed the Activity Evaluation and Feedback Tool (AEFT). The purpose of this study is to examine the usefulness of the AEFT tool and its potential to provide evaluation and feedback to practitioners. Within the scope of the tool, the activity text and application processes, which are the basis for activity-based teaching, were dimensioned and indicators related to each dimension were created. The study was carried out in the fall semester of the 2021-2022 academic year. The study group consists of 12 secondary school mathematics teachers. Teachers were asked to apply this activity in their classrooms by choosing or developing an activity. Then, they were asked to evaluate these design and implementation processes with AEFT. According to the findings obtained from the research, AEFT has been found to be useful and has the potential for evaluation and feedback. It has also been seen that AEFT offers a clear performance target for agreed standards. The AEFT provides an opportunity to evaluate and give feedbacks to the users on activity scripts and on the implementation process along with the mathematical potential of both dimensions. As a result, it can be said that the performance criteria in AEFT can be used by mathematics teachers to evaluate the quality of activity processes.

**Keywords:** Mathematical activity, AEFT, Activity-based learning

### **Introduction**

Studies in the field of mathematics education have given special importance to the method and quality of mathematics teaching for many years. It is being worked on to construct a meaningful teaching approach and to ensure the permanence of learning. In this context, one of the methods and approaches adopted by mathematics educators is activity-based learning. Activity and activity-based learning is one of the important fields of study that remains up-to-date in the mathematics education community. So much so that in 2015, ICMI (International Commission on Mathematical Instruction), one of the important congresses of the field, focused on activities. At the congress, they presented a book titled "Task design in Mathematics Education", both as a supplementary and as a guide for further studies in the field (Watson & Othani, 2015). In short, activity and activity-based learning continues to be a topic of interest on a global scale.

An evaluation of the design and implementation of the activities that stand out in the context of activity-based learning is required. The evaluation process plays a key role in determining the quality of the teacher's activity design and implementation process, determining the steps to be taken and the decisions to be taken to improve the process. In addition, in the light of the evaluations made, it is necessary to provide feedback on the design and implementation of the activity. Feedback, which is used to give information about a certain behavior and

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practice (Wiggins, 2012), has an important place in the learning process. Feedback is conceptualized as information provided by an agent (e.g., teacher, peer, book, parent, self, experience) about another person's performance or understanding (Hattie & Timperley, 2007).

### Activity Evaluation and Feedback Tool: AEFT

AEFT, which was introduced by Bozkurt et al. (2022), is an evaluation tool that can be used to determine the quality of mathematical activity text and its applications separately. Based on these evaluations, it is aimed to use the text of the mathematical activity to give feedback to the users about the strengths and developmental aspects of the performance that emerges in the application of the activity. AEFT, which was developed for this purpose, was prepared as an analytical rubric. It is used when it is necessary to determine the components that make up the analytical rubric performance and to make a detailed evaluation about each component. One of the important benefits of using analytical rubrics is that they allow specific feedback on each of the components that make up the performance according to the scoring criteria. In the evaluation with the analytical rubric, it is possible to obtain more detailed information about the strengths and weaknesses. In addition, dividing holistic judgments about performance into more manageable parts is seen as a way to increase clarity and achieve objectivity in scoring (Sadler, 2009). This increases the confidence in the evaluation results. Evaluation with the analytical rubric is done separately for each component, and then the scores from each component are added to obtain a total score. Therefore, since the AEFT is prepared as an analytical rubric, it allows the assessment to be made in a more detailed and customized manner. It is also possible to produce a score related to activity design and implementation by summing the scores assigned for each component in the evaluation made with AEFT.

In order for AEFT to be used functionally, concrete indicators and observable criteria were taken as basis in its structuring process. It is aimed that AEFT will serve a reliable scoring as well as valid results. It has been developed to evaluate the AEFT activity text and activity implementation processes. The activity text is a concrete tool that can be found in various sources or produced as a document prepared by the teacher himself, and has observable qualities. The application, on the other hand, emerges based on the interaction between the student-teacher-content trios in the real classroom environment and has observable features. The dimensions and components of the AEFT are presented in Figure 1.

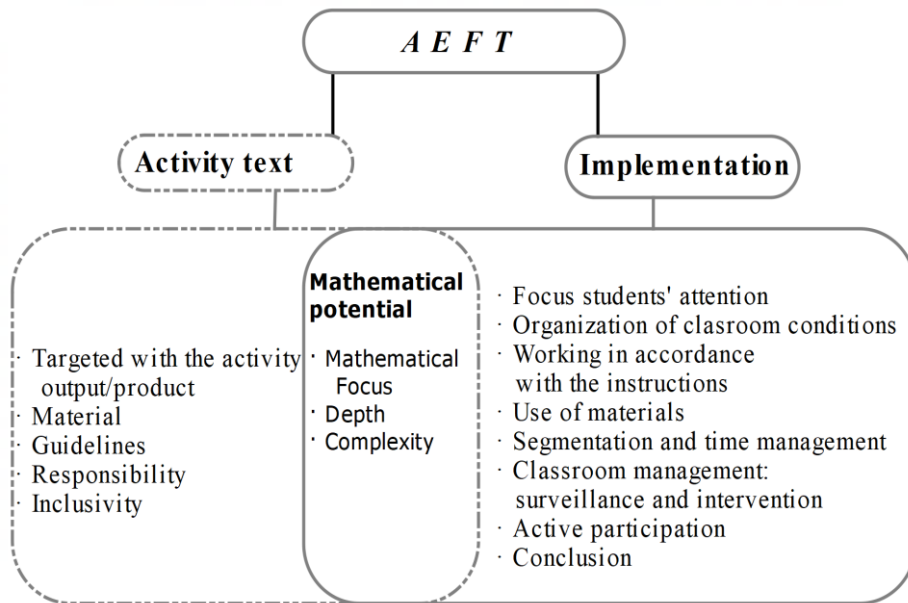


Figure 1. Dimensions and components of AEFT (Bozkurt et al., 2022)

As seen in Figure 1, the activity text has a total of 8 components and the application has a total of 11 components. Both the activity text and the application also include an evaluation in terms of mathematical potential (MP). The MP includes components for the activity text and the mathematical characterization of the application. The quality of the mathematical phenomenon, which was aimed to be developed with the activity, was evaluated over three components: mathematical focus, depth and complexity. Each of the activity text and

activity implementation dimensions, which AEFT is based on in the evaluation, are designed to be handled together with the MP.

The components in the AEFT are rated over 4 score types (0: Very low; 1: Low; 2: Medium; 3: High). Scores that can be produced in an assessment with AEFT are in the range of 0-24 points as minimum-maximum for the 8-component activity text dimension. The 11-component activity is in the range of 0-33 points as a minimum-maximum for the application dimension. According to these indicators, it is possible to determine the quality of any activity text and implementation processes. In order to fill these gaps identified in the literature, it is important to reveal the quality of activity-based teaching, to give feedback to practitioners, and to develop a tool with practical value built on theoretical foundations that will serve to structure the activity design and implementation processes in detail.

In this study, the usefulness of the AEFT tool, which was built on theoretical foundations, in examining the activity text and the quality of the application was investigated. It is also aimed to look at the tool's potential to provide evaluation and feedback to practitioners. In this context, answers to the following questions were sought within the scope of the research:

- Do the teachers differ in their personal evaluations of the strengths and weaknesses of the activity practices and in their evaluations using AEFT?
- Did the teachers have any difficulties in using AEFT in evaluating the activity text and its implementation?
- According to the teachers, does AEFT contribute to increasing the quality of the design and implementation of the activities?

## **Method**

The data of the study were obtained within the scope of the project (TUBITAK 119K773) carried out by adopting a design-based research pattern. In design-based research (DBR) studies, it is recommended to try the first applications through confident practitioners (Anderson & Shattuck, 2012). In this way, it will be possible to observe more dimensions related to the expected model (AEFT). At this point, it seems that there are two reasonable options for the continuation of the study:

1. Creating groups of teachers who are known to be experts in activity design and implementation
2. Providing professional development trainings to a group of teachers and making them specializing in activity design and implementation.

The second option was chosen within the scope of the research.

## **Participants**

The study group consists of 12 secondary school mathematics teachers whose professional experience ranges from 1 to 12 years in the fall semester of the 2021-2022 academic year. It was noted that these teachers were not involved in the previous stages of the development of the tool. The participants were graduate students in mathematics education and were also secondary school mathematics teachers. The trainings were conducted face to face and recorded. These teachers were given training on the use of AEFT and were asked to evaluate the design and implementation of sequential activities with AEFT.

## **Data Collection Process**

12 middle school mathematics teachers who participated in the training were asked to choose an activity text and apply this activity in their classrooms. They were then asked to evaluate both the activity they chose and the quality of their practice. While making the assessment, they were asked to make a personal assessment first and then to make an assessment using the AEFT tool. 11 teachers made the desired evaluations. A teacher did not evaluate because he could not train the application. The codes and frequencies obtained from the analysis of the participants' evaluations are given in the findings section.

## Results

### Findings on Teachers' Personal Evaluations of the Strengths and Weaknesses of Activity Practices and the Points They Differed in Their Evaluations with AEFT

It was determined that almost all of the teachers stated that they could not see the point that they differed with AEFT in determining the strengths and weaknesses of the activity applications. In addition, a teacher stated that the practices of evaluating with AEFT identified the deficiencies of their own evaluations. For example, a teacher used the following expression:

*"I had to slightly support the focus phase of the students' attention. I should have talked about things that might be of some interest to them. I also think that I should have repeated the output many times while finishing the activity."* (T2)

From this statement, it is seen that the teacher expressed some issues that he determined through AEFT in order to increase the quality of the activity implementation. Therefore, it can be said that AEFT provides guidance to the teacher in order to give feedback and increase the quality of its implementation.

### Findings on the Parts Where Teachers Have Difficulty in Using AEFT in Evaluating the Activity Text and Practices

6 of the participants stated that there were no parts that they had difficulty in using AEFT in evaluating the activity text and applications. It is understood from the statements of the teachers that using the tool contributes to an objective evaluation. Some participants stated that they had difficulty scoring the components. For example, two participants stated that they were between 2 and 3 points while scoring in the depth component and they were undecided about which direction to use points. Likewise, one participant each stated that they had difficulty in scoring in components such as mathematical focus, conclusion, responsibility, and material use. On the other hand, the teacher, who stated that she only had difficulties in the mathematical focus component of the mathematical potential dimension, expressed this situation as follows:

*"In the Mathematical Focus section, I do not think that the student's immediate awareness of the output is due to the activity, but I was undecided between 2-3 points due to the direct access of the students to the output."* (T6).

It is seen that the teacher is also undecided in the scoring due to the direct access of the students to the output. It cannot be said that there is an instability caused by the vehicle here. Because the tool indicates that 3 points should be given if the student has reached the mathematical output. The indecision here can be considered as a personal concern of the teacher.

### Teachers' Thoughts on the Potential of AEFT to Provide Feedback to Improve Its Quality after Activity Implementations

According to the findings obtained from the answers given about AEFT's contribution to increasing the quality of the activity's later applications, it was seen that almost all of the teachers (n=9) agreed that AEFT contributed to increasing the quality of the activity implementation and subsequent applications. One participant's opinion is as follows:

*"First of all, it definitely makes you more selective. It makes me think a lot while trying to organize the process"* (T7).

From the statements of the teachers, it can be said that he helped the teachers who he guided in the stages of choosing the activity, adapting it to the class and applying it. In addition, teachers stated that the use of AEFT contributed to their professional development in activity design and implementation (n=6). In addition, it contributes to raising awareness about the components of AEFT regarding activity design and implementation, such as ending the activity (n=5), active participation (n=3), classroom management (n=2), and teacher intervention style (n=2).

## **Discussion**

The usefulness of a measurement tool is related to its ease and affordability to obtain, prepare, develop, implement and score. During the development of AEFT, it was important to ensure that this tool is user-friendly. In order to ensure the usefulness of AEFT, indicators and example cases related to each component are reflected in the tool. In addition, sequential improvement studies were carried out within the scope of AEFT's competence, functionality and usefulness. However, within the scope of scoring, feedback was received from the teachers throughout the process and the parts in the scoring that were not understood or took time were emphasized. Thus, it has been tried to ensure that the tool is easy and economical in terms of development, implementation and scoring. Teachers' evaluations on the usefulness of AEFT also indicate that success has been achieved in this regard. Teachers stated that they found AEFT useful and useful. They stated that the use of it did not force them, they got used to the use of the tool after a few evaluations, that the evaluations made with AEFT did not take long and they found it memorable. All these indicate that the tool was found useful by teachers.

The most important criticism expressed regarding the use of AEFT from the teachers who evaluated the usefulness of AEFT was the difficulties experienced in scoring some degrees of some components, albeit in a limited number. Apart from this, no deficiencies were expressed about the difficulties experienced in use. Therefore, it has been understood that it is important to review the indicators and criteria that form the basis of scoring for a small number of components, to add explanations and to make directions for raters to draw attention to distinctive features.

The opinions of the teachers who made the evaluation that AEFT was effective in giving feedback came to the fore. It is understood from the explanations of the participants that AEFT has made practical contributions to their professional development regarding the activity design and implementation processes. Therefore, the potential of AEFT in providing feedback has been expressed by teachers and it has been a common point that the awareness it brings to them will guide their instructional decisions.

## **Conclusion and Recommendations**

It has been seen that AEFT is a tool that can be used for understanding and structuring activity applications in activity-based mathematics teaching. In this respect, it has a guiding feature for the successful selection and implementation of activities to be used in mathematics teaching. The performance criteria in the AEFT can be used by mathematics teachers to evaluate the quality of activity processes. AEFT provides clear performance targets for agreed standards. Therefore, teachers and academics can use AEFT to determine the quality of the designed and implemented activity.

## **Scientific Ethics Declaration**

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

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