



The impact of formative assessment techniques on students' self-assessment skills

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Abstract

The introduction of formative assessment to improve students' self-assessment skills was one of the main innovations in Kazakhstan. However, there are issues with the implementation of formative assessment and its introduction. This study aims to examine the impact of the author's formative assessment techniques on students' self-evaluations. One of the methods was experimental work carried out in 2021-2022 at Almaty Secondary School No. 198. This study was carried out using 55 fourth grade students consisting of 27 students in grade four "A" (16 girls and 11 boys) as the experimental group (EG) and 28 students in grade four "B" (18 girls and 10 boys) as the control group (CG). The results identified problems with the introduction and implementation of formative assessments. This highlighted the importance of developing formative assessment strategies to improve students' self-evaluations. Our findings confirm that the identified and methodically substantiated procedures for improving self-assessment in students in primary school may be employed in classes with younger students and in teacher training groups.

Keywords: Formative assessment methods, Impact, Self-assessment skills, Teaching, Young students'.

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Contribution of this paper to the literature

This study analyzes whether the author's method of formative assessment using innovative methods and assessment tools that were not covered in previous studies contributes to increasing students' self-esteem and the growth of their educational results (knowledge, skills, competencies, etc.) which reduces social disorientation in younger adolescents.

1. Introduction

Assessment is a method to assess learning outcomes at all levels of education. It has become one of the most significant prerequisites for educational reform and an essential component influencing its development. Kazakhstan is striving to develop a reliable, effective and fair evaluation system like other post-Soviet countries to reform the republic's entire educational system.

Unfortunately, assessment usually serves a "punitive and management" role which results in a loss of motivation to learn due to the emergence of dread for school and the educational process in Kazakhstani schools. Assessment without specified standards and a lack of coherence in assessment systems can have a negative impact on the educational process.

The introduction of the standard which imposes new requirements on the outcomes of educational program development resulted in a shift in approaches to assess school children's learning outcomes. However, there are currently several contradictions between assessment practice and the requirements of the standard as illustrated by the following:

The learning process is continuous and assessment is episodic, demands for subject and meta-subject educational results are evaluated and only subjects are taken into account. Student development occurs in the classroom (lessons) and extracurricular time (extracurricular activities) and the child's achievements are examined only during the lesson. The purpose of assessment is child development which occurs during the class. As a result, there was a need for new approaches in the system of assessing students' achievements.

Formative assessment is an effective tool for increasing student motivation to learn and assessing each student's progress while taking into account his age and individual characteristics (Andrade, Bennett, & Cizek, 2019; Burton et al., 2018; Dayal, 2021). Formative evaluation is critical for both students and teachers (Barnes & Marks, 2020; Swan & Foster, 2018). The student establishes learning objectives for himself, determines solutions, evaluates his progress and plans the next steps with the help of the teacher. Formative evaluation requires getting close to the learner and encouraging him to succeed. Formative assessments allow teachers to objectively assess present levels of knowledge, detect shortcomings in content comprehension and help in the future improvement of the learning process.

The use of clearly stated assessment criteria is required for formative assessment. They should be explained in simple terms that students and parents can comprehend. As a result of this response, the evaluation process will become more objective and transparent (Chigonga, 2020; Granberg, Palm, & Palmberg, 2021). Each student should be aware of how his or her work will be assessed.

Students assess each other and highlight the positive and negative aspects of their work reinforcing the material studied. Students assess and review their progress during self-assessment. These forms of assessment are initially challenging for students. As a result, assessment criteria are critical when conducting self-assessment and mutual assessment.

Thus, comparative research can be employed to determine the current state of education at various levels (classes, schools, regions and countries) and to align educational goals with the assessment's goals and objectives. In this context, the task is to develop a system for gathering objective information about school conditions and improving their activities.

Conducting national studies to assess students' achievements as well as regular participation in international large-scale studies can help Kazakhstan develop a system for monitoring education quality and conduct a comprehensive analysis of assessment using scientific tools to ensure the effective application of assessment results to improve education quality.

1.1. Problem Statement

Kazakhstan's updated educational content requires new formats for assessing learning outcomes to improve the quality and objectivity of assessment and the need for students themselves to understand what they have achieved and what remains to be done.

However, the success rate of Kazakh students in the international exam Programme for International Student Assessment (PISA) has not yet reached a sufficient level despite these updates (Sarmurzin, Amanzhol, Toleubayeva, Zhunusova, & Amanova, 2021).

In 2018, Kazakhstan ranked 69th out of 79 countries in the Programme for International Student Assessment (PISA) conducted by the Organization for Economic Cooperation and Development (OECD). The knowledge taught in school is not practical and most students cannot apply it in real life. The OECD classifies these students as "functionally illiterate". The results show that Kazakhstan's modern education system cannot meet the demands of the modern world. It should be noted that Kazakhstan has some experience with educational system evaluation but this is not a consistent and reliable system.

Furthermore, schoolchildren in Kazakhstan may not always know how to organise and analyse the material required composing diverse creative works for formative assessment.

Teachers frequently forget that the simple collection and systematization of information is not an effective assessment tool because information can simply be borrowed from the internet or the project is carried out by third parties (parents, friends, etc.) when using standard formative assessment methods and techniques such as project activity or case technology.

Certain conditions must be met for a relevant assessment of such work. The majority of the work should be implemented in school under the supervision of a teacher. It is necessary to discuss each stage of work with students to determine what they have already done and what difficulties they are facing, use self- and mutual assessment regularly and motivate students to do work on their own by referring to their own life experience.

In addition, teachers have not used their evaluation abilities because of their relatively authoritarian subjective and objective perspective which has historically emerged in the Kazakh education system.

Another issue is the inclination to simply assess the outcome of educational activities to obtain meta-subject and personal results. It is essential to consider not only the outcome but also the process of reflection. The majority of teachers in Kazakhstani schools try mainly to evaluate subject knowledge without paying attention to the meta-subject results of educational activities.

The findings of an investigation of teachers' perspectives on professional and pedagogical goals reveal that they have remained practically constant over the previous decade. The relevance of the pragmatic aspect of the studied content is considered to be 8-10% for the majority of teachers (approximately 70%).

After examining these discrepancies, we can conclude that a modernized evaluation method is necessary to gauge students' capacity for self-evaluation.

Hence, it is necessary to develop such a method to evaluate students' educational outcomes which will help to:

- (1) To foster the improvement of self-evaluations and the student's growth in educational outcomes (knowledge, skills, competencies, etc.) where the student can gain experience in organizing and carrying out his learning, developing "healthy self-esteem."
- (2) To put into practice the evaluation of new formative assessment techniques.

This study aims to examine the impact of the author's formative assessment techniques on students' self-evaluations.

The research question is:

- (1) What impact do the author's formative assessment techniques have on the development of students' self-assessments?

2. Literature Review

Reforming the content of school education is impossible without rethinking the system of school assessment. Reforming knowledge and assessment methods are essential to implementing any systemic changes in the field of education and today we need not only changes but transformations of a global nature. Hence, there is a need to change the assessment process to assess not only disciplinary knowledge but also meta-disciplinary and personal knowledge.

Formative assessment is becoming increasingly important in educational practice (Raaijmakers, Baars, Paas, van Merriënboer, & Van Gog, 2019; Ratminingsih, Marhaeni, & Vigayanti, 2018). This type of assessment corresponds to a student-centered and competency-based approach. A review and analysis of the studies led to the conclusion that researchers have studied the theory and practice of formative assessment (Ababei, Ababei, Dobrescu, & Ababei, 2019; Akoul, Loffi, & Radid, 2021; Barana, Conte, Fissore, Marchisio, & Rabellino, 2019; Butler, 2018; Harris & Brown, 2018; Xiao & Yang, 2019).

"Formative assessment" and "classroom assessment" are the same form of assessment which makes it difficult to understand the essence of the educational category (Aricò & Lancaster, 2018; Asamoah, Shahrill, & Abdul Latif, 2022; Panadero, Broadbent, Boud, & Lodge, 2019; Yan & Carless, 2022). This term refers to the assessment of students' intermediate-level learning outcomes designed to change their competencies through the continuous and purposeful improvement of educational outcomes (Ismail, Rahul, Patra, & Rezvani, 2022; Ozan & Kincal, 2018; Remmi & Hashim, 2021). The teacher is encouraged to use a variety of assessment forms and methods while conducting formative assessments. Forms and means of assessment include oral or written assignments, practical assignments, educational projects, casework, portfolios, etc. The assessment will be formative if the following conditions are satisfied: the tasks for assessment are in forms that are familiar to students, they identify potential problems in each student and the tasks demonstrate evidence of the reflective process that led to this finding (Knight, 2020; Mahshanian, Shoghi, & Bahrami, 2019).

Today, children in the same class come from different cultural backgrounds, abilities and interests. Formative assessment allows the assessment of different groups' cognitive interests and needs, obtaining information about each student's progress, assisting in the development and implementation of individual learning strategies for students and creating favourable conditions for the cognitive development and personality formation of students with different cognitive abilities and needs (Van Der Kleij & Adie, 2018). In addition to participation in teacher assessment, formative assessment involves the child's self-assessment, mutual assessment of children and subsequent work either on eliminating gaps or on building a plan along with the child for the child to move forward in the process of mastering the educational program. However, since the glossaries of foreign and Kazakh pedagogy sometimes do not include compatible interpretations of a particular category of didactics, the translated sources are not very successful (in terms of translation with errors) into the Kazakh language. Inaccurate translations of several terminologies by Kazakh researchers (and the difficulty of exact translations at all) have implications.

We perceive that many of the terminology used in practical education are useful but do not accurately reflect the nature of the occurrences or objects being discussed. We believe that conducting national studies and regularly participating in international studies will allow us to establish a system in Kazakhstan for monitoring the quality of education, using scientific tools to ensure the effective application of evaluations (Nurgaliyeva et al., 2023; Ospankulov, Zhumabayeva, & Nurgaliyeva, 2023; Zhumash et al., 2021; Zhussupbayev et al., 2023). Therefore, Kazakhstan should continue to conduct national studies on student achievement and regularly participate in international comparative studies for in-depth analysis of their results to address educational issues more effectively.

3. Method

3.1. Research Design

The study's design used a quasi-experimental methodology. In the field of education, quasi-experiments are important especially in those fields where interdependent features are not clearly defined. Scientific research in education commonly uses quasi-experiments as a form of compromise between reality and the "rigour" of methodological rules (Stratton, 2019). It is possible to accurately test the relationship hypotheses in such studies by combining quasi-experimental designs with statistical data processing. The difference between groups may simply be the presence or absence of an effect. Random assignment of participants avoids the dependent characteristics of pre-experimental participants (West, 2017).

3.2. Research Sample Formation

We used diagnostic techniques to achieve the aims and objectives and confirm the research hypothesis. One of the methods was experimental work carried out in 2021–2022 based on secondary school No. 198 in the city of Almaty (Kazakhstan). This study was carried out using 55 fourth grade students consisting of 27 students in grade four "A" (16 girls and 11 boys) as the experimental group (EG) and 28 students in grade four "B" (18 girls and 10 boys) as the control group (CG).

In the control group, the conditions for the implementation of formative assessment were not established. In this study, priority was given to students in the fourth grade as elementary school age is the most favorable for students to develop self-esteem. A random assignment of participants was the basis for the study. According to probability theory, only a random decision will truly reflect the characteristics of the research participants.

3.3. Research Approach

We recognised the following steps for planning and preparing experimental studies: identification, formation, and control. The purpose of the first phase is the initial self-assessment of the two groups.

In this regard, the selected diagnostic tools have defined levels (low, average and high) and criteria (to compare one's actions to detect coincidences, similarities and differences, the ability to formulate requirements for verification tasks, the ability to determine the boundaries of one's capabilities and the ability to exercise reflexive control of the action performed).

- The diagnosis of the two groups and the further processing, analysis and generalization of the results obtained.

The purpose of a formative experiment is to produce conditions for formative evaluation in math lessons and the author's formative assessment techniques. At the formative stage:

- Developed and described the main activities in the math lessons in grade 4.
- Developed criteria for evaluating activities in the process of teaching math.
- Techniques and assessment tools have been developed (forms for recording the progress of work and the achievements of younger students).

The final analysis of the level of these skills in groups and their statistical processing, summarization and evaluation took place in the control phase.

3.4. Data Collection Tools

Information for this study was collected through a series of progressively complex tasks. Increasingly complex assignments in which there is a transfer of authority to organize and manage self-assessment activities from the teacher to the students have been used. Thematic verification and independent work including a self-assessment component, forms of organization of educational activities in the lesson (individual, frontal, pair and group), maintaining for each subject "notebooks of achievements", role-playing games, reflexive class hours, etc. were carried out.

3.5. Data Analysis

To achieve maximum similarity between the control and experimental groups, statistical methods were used to eliminate differences between them.

4. Results

The results of level input diagnosis for the low-grade students in both groups are displayed in Table 1.

Table 1. Summary of the input diagnostics

| Level of formation | EG | | CG | |
|--------------------|----------|-----|----------|-----|
| | Quantity | % | Quantity | % |
| 1 | 2 | 3 | 4 | 5 |
| Low | 14 | 52 | 11 | 39 |
| Average | 11 | 41 | 15 | 54 |
| High | 2 | 7 | 2 | 7 |
| General indicator | 27 | 100 | 28 | 100 |

Comparative data are shown in Figure 1.

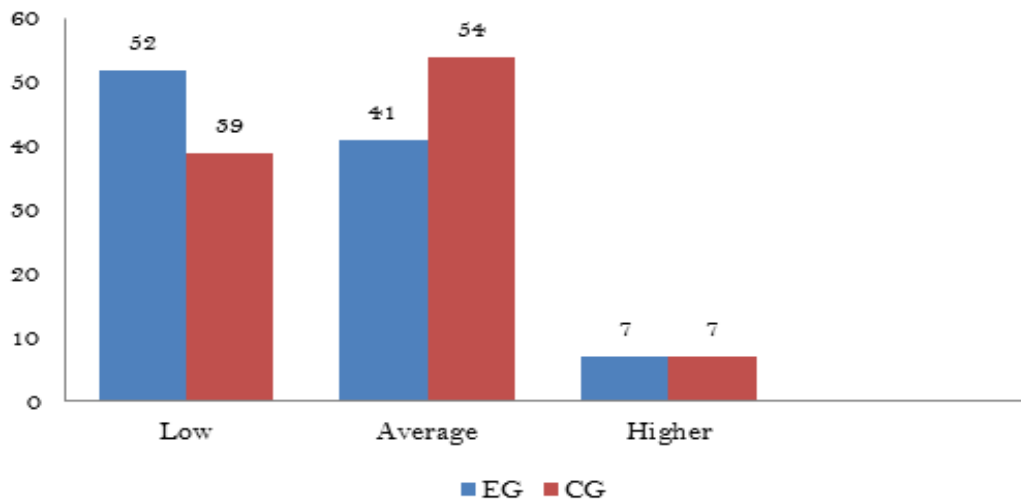


Figure 1. Diagnosis of students' self-evaluation level.

The following data were collected: 7% were found to be high in both groups, 41% and 54% were average in self-assessment skill formation and 52% and 39% were low. The average percentage of students in both groups who have low self-assessment skills is close to 50% which shows how difficult it is for younger students to complete tasks like comparing actions, spotting coincidences, similarities and differences, formulating requirements for verification tasks, identifying one's capabilities' limits and exercising reflexive control based on the outcomes of the task. Next, we have introduced in math lessons the author's formative assessment techniques for the development of students' self-assessments (see Table 2).

Table 2. Conditions for the implementation of formative assessment

| Condition | Condition implementation |
|--|--|
| Identify and describe the main activities in the lesson on math. | Major activities are identified and described for fourth-grade math. |
| Develop criteria for assessing key activities in math lessons. | Criteria for assessing key activities in math lessons have been developed. |
| Ensuring open access to assessment criteria for younger students. | Criteria communicated to or co-developed with lower school students. |
| Develop assessment tools. | Forms have been developed to monitor the progress of work and the accomplishments of younger students. |
| To teach assessment methods to younger students and assist them with assessment as needed. | Younger students do self-assessments of their activities and accomplishments with guidance from the teacher as needed. |

We introduced formative assessment in a math lessons following the algorithm for creating a system of formative assessment (see Figure 2).

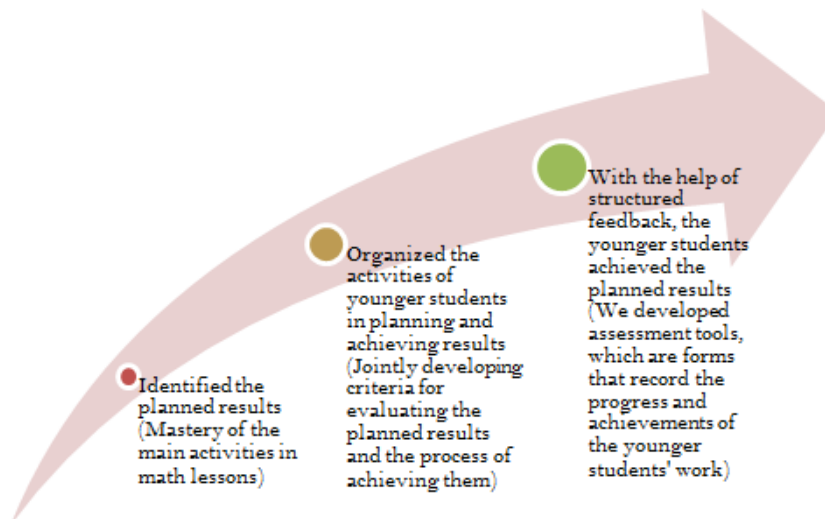


Figure 2. Algorithm of a system of formative assessment.

On the final diagnostics, the task set used in lower grades was similar to the input control. Summary information for the two groups during the control phase is shown in Table 3 and Figure 3.

Table 3. Summary information for the two groups during the control phase.

| Level of formation | EG | | CG | |
|--------------------|----------|-----|----------|-----|
| | Quantity | % | Quantity | % |
| 1 | 2 | 3 | 4 | 5 |
| Low | 2 | 7 | 9 | 32 |
| Average | 16 | 60 | 16 | 57 |
| High | 9 | 33 | 3 | 11 |
| General indicator | 27 | 100 | 28 | 100 |

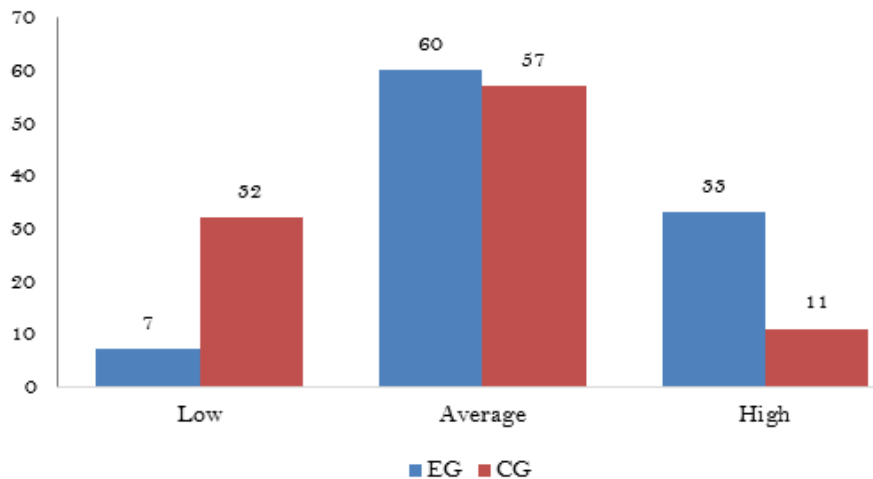


Figure 3. Diagnosis of students' self-evaluation level.

According to the results of the final diagnosis in the experimental group, 33% had a high level of self-assessment, 37% had an average level and 30% had a low level.

In the control group, 57% of students assessed their performance as average, 32% as low and 11% as high. It was observed that the self-evaluation of the lower grades in the EG showed a positive growth trend.

We compare the results using mathematical-statistical methods to determine the mean score for the two groups.

$$\bar{x} = \frac{x_1f_1 + x_2f_2 + \dots + x_n f_n}{f_1 + f_2 + \dots + f_n} = \frac{\sum xf}{\sum f}$$

F_1, F_2, \dots, F_n of weight (repetition frequencies of identical features).

$\sum xf$ is the sum of the products of the magnitude of features and their frequencies.

$\sum f$ is the total number of population units.

For the experimental group:

$$X_{av} = (6*2 + 9*6 + 10*10 + 11*1 + 12*4 + 13*1 + 14*3) / 27 = 10,37$$

For the control group:

$$y_{av} = (5*1 + 6*9 + 7*4 + 8*1 + 9*8 + 10*2 + 11*1 + 12*1 + 14*1) / 28 = 7,68$$

The data obtained allowed us to conclude that the EG coped better with a set of exercises to determine the level of self-assessment than the CG. The average score of the EG increased from $x = 7.55$ to $x = 10.37$ and the average score of the CG increased from $\bar{y} = 7.61$ to $\bar{y} = 7.68$ indicating large changes in the EG and insignificant changes in the CG.

5. Discussion

Studying the impact the author's formative assessment techniques have on the development of students' self-assessments allows educators to improve self-evaluations and the student's growth in educational outcomes (knowledge, skills, competencies, etc.), develop "healthy self-esteem" and put new formative assessment techniques into practice.

This result demonstrates that formative assessment provides continuous feedback between the student and the teacher without scoring or grading and the student has the right to make a mistake and correct it after the introduction of the author's method. This made it possible to determine the student's capabilities, identify difficulties, help achieve the best results and timely adjust the learning process.

This finding supported the findings of [Boström and Palm \(2023\)](#) who found in their study that formative assessment focuses on the development of learner competencies. Evaluation consists of criteria understandable to the student, stimulates and motivates them and makes the learning process more meaningful in the EG than in the CG. Furthermore, the results are in line with [Rodríguez-Martínez, González-Calero, Del Olmo-Muñoz, Arnau, and Tirado-Olivares \(2023\)](#) and [Grapin and Llosa \(2022\)](#) who found that formative assessment focuses on a particular student and is intended to identify gaps in the student's mastery of one or another element of the content of education to fill them with maximum efficiency.

The results of the research also revealed that learning assessment relies on the learner's motivation and emphasizes progress and achievements rather than mistakes and failures. The ability to choose the content and the level of difficulty of the task enhanced students' self-assessments in the experimental group ([Johnson, Sondergeld, & Walton, 2019](#); [Lee, Chung, Zhang, Abedi, & Warschauer, 2020](#); [Stanja, Gritz, Krugel, Hoppe, & Dannemann, 2023](#)). According to [Ghaffar, Khairallah, and Salloum \(2020\)](#), learning should support progress towards learning objectives and hence involve an understanding of the criteria against which it is evaluated.

According to the findings, not only teacher knowledge is essential for effective formative assessment but adequate assessment skills also play an important role ([Leighton, 2019](#); [Radmehr & Drake, 2019](#); [Rakoczy et al., 2019](#); [Thaçi & Sopi, 2022](#)). Teacher training in this study was brief to foster the improvement of self-evaluations and the student's growth in educational outcomes (knowledge, skills, competencies, etc.) where the student can gain experience in organizing and carrying out his learning, developing "healthy self-esteem" confirming the earlier results by [Alonzo \(2018\)](#) and [Wiyaka, Prastikawati, and Adi \(2020\)](#). Finally, the experimental group adequately formed such criteria as the ability to determine the limits of their capabilities, the ability to form

requirements for test tasks, the ability to identify criteria for evaluating the results of an action, the ability to determine the causes of their own and others' mistakes and the ability to choose from a variety of options which is consistent with the results of the work by Schildkamp, van der Kleij, Heitink, Kippers, and Veldkamp (2020) and Murphy, Roschelle, Feng, and Mason (2020).

As a result, we can conclude that the author's formative assessment technique can adapt instruction to learners' needs and provide high-quality and constructive feedback (Güler & Celik, 2022; Shepard, Penuel, & Pellegrino, 2018; Veugen, Gulikers, & Den Brok, 2021).

6. Conclusion

The introduction of the standard which sets additional standards for the results of educational programme development has resulted in a shift in ways to evaluate schoolchildren's learning outcomes. However, there are currently several inconsistencies between assessment practice and the requirements of the standard. The assessment frequently serves a "punitive and managerial" function in Kazakhstani schools resulting in a decrease in motivation for learning and the appearance of fear or dislike for the school and the learning process.

The International Assessment of Functional Literacy suggests that Kazakhstan's modern education system does not meet the demands of the modern world. Kazakh students lag behind their OECD colleagues by a year and a half to two years. The study confirmed the issues with the implementation of formative assessment and its introduction to create a consistent and reliable assessment system. This fact requires a shift in the evaluation process to include not just discipline knowledge but also meta-disciplinary and personal information. As a result, assessment criteria are critical when conducting self-assessment and mutual assessment. These issues confirmed the need to develop updated formative assessment techniques for the development of students' self-assessments.

The author's formative assessment techniques in the study aimed at identifying and describing the main activities in the math lesson, developing criteria for evaluating activities, the openness of criteria (they are provided to younger students or developed jointly with younger students) and developing assessment techniques and tools (forms for recording the progress of work and achievements). Criteria are defined as the ability to compare one's actions with a given model, the ability to detect coincidence, similarity and difference, the ability to formulate requirements for verification tasks to determine the limits of one's capabilities, the ability to exercise reflexive control of the results of the action performed by the proposed tasks those with which the identified errors can be eliminated and the ability to identify criteria for evaluating the results of action. The author's formative assessment technique can allow instruction to meet learners' needs and provide high-quality and constructive feedback. Conducting national studies to assess students' achievements as well as regular participation in international large-scale studies can build a system for monitoring education quality in Kazakhstan and conduct a comprehensive analysis of assessment data using scientific tools to ensure the effective application of assessment results to improve education quality.

7. Suggestions and Implications for Further Research

We believe that the study does not address all issues concerning the development of students' self-esteem when using formative assessment technology and recommend additional research in the following areas:

1. The study of new approaches to the assessment system in developed countries that meet the requirements of modernity. These studies would be of great help to researchers from developing countries allowing them to assess the state of affairs in their education systems and identify factors that affect the effectiveness of using this technology in foreign schools that provide quality education.
2. Exploration of the development and application of various models and methods of using formative assessment tools at various stages of learning may be beneficial.
3. Formative assessment is critical for both students and teachers. It needs additional work to carry out a specific algorithm for the interaction between the teacher and students. Teachers must acquire methods and techniques to assess not only subjects but also meta-subjects and individual educational outcomes.
4. Formative assessment involves the application of well-defined assessment criteria. Hence, it would be helpful to carry out a research investigation into evaluation criteria using foreign experience. Consequently, the assessment process will become more objective and transparent in its selection of formative assessment techniques that provide valid and well-defined assessment criteria.

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