

# ***Exploring the Implementation Path of ‘Teaching-Learning-Assessment’ in Teaching Maths in Primary School***

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**Abstract:** In recent years, the integration of ‘teaching-learning-assessment’ in primary mathematics has become a hot topic. In this paper, the current situation of the integration of teaching-learning-assessment in primary mathematics classrooms is discussed in depth, and its importance and challenges in the current education system are summarised. The study found that when teachers set teaching objectives, design teaching processes and conduct teaching evaluation, there are problems such as unclear teaching objectives, insufficient student participation and single evaluation means. These problems hinder the development of ‘teaching-learning-evaluation’ integration and affect the quality of teachers’ teaching and the cultivation of students’ comprehensive quality. The study analyses the reasons affecting the integration of teaching-learning-assessment and proposes multi-level implementation paths, including setting reasonable teaching goals, adopting reverse design, constructing a multi-dimensional evaluation system, and establishing a multi-party collaborative educational ecosystem. These paths help promote the close integration of teaching objectives, teaching process, and teaching evaluation, and improve students’ learning outcomes and core competencies. By integrating assessment into the teaching process, teachers are able to adjust their teaching strategies more flexibly to meet the needs of different students, ultimately realising a student-centred education model. It provides a theoretical basis and practical suggestions for promoting the integration of ‘teaching-learning-assessment’ in primary mathematics classrooms.

**Keywords:** Teaching-Learning-Assessment Integration, Student-Centered Learning, Multi-dimensional Evaluation System, Backward Design, Primary School Mathematics.

## **1. Introduction**

With the progress of the times, society’s demand for talent is becoming increasingly diversified globally, many countries have recognised the urgency of education reform and are actively promoting a student-centred education model. For example, Finland, the United States and other countries have focused on integrating evaluation into the teaching process in their education reforms, emphasising the improvement of learning outcomes through formative evaluation. The experiences of these countries in education reform have served as a reference for other countries and regions, promoting the in-depth development of research on the integration of ‘teaching-learning-assessment’. In China, the traditional teacher-centred teaching model and single outcome evaluation can no longer meet the needs of students’ all-round development under quality education, so the integrated teaching-

learning-assessment model has emerged. Students are the main recipients of the learning process, and teachers cannot offload information into the students' brains and expect them to process and apply it [1]. With the rise of the student-centred education concept, the education sector has recognised the importance of allowing students to become the main body of education. In contrast to the traditional teaching model, the integrated 'teaching-learning-assessment' model places equal emphasis on the development of fundamental skills like critical thinking, problem-solving, and independent learning throughout the learning process. This ensures that the idea of student-centered education is implemented at every stage of the teaching process.

The research theme of this thesis is to explore how to achieve the integration of 'teaching-learning-assessment' in primary mathematics classrooms. By analysing the current situation and problems of teaching objectives, teaching process and teaching evaluation in primary mathematics classrooms, we will find out the reasons for the problems and propose a path for the implementation of the integration of 'teaching-learning-assessment' in primary mathematics according to the reasons.

The purpose of the study is to solve the problem of the separation of teaching, learning and evaluation in primary school mathematics classrooms, and to improve the current situation of irrational teaching goal setting, single teaching method and unsound evaluation mechanism. Through the introduction of reasonable teaching goal setting, reverse design and multi-dimensional evaluation system, the study provides guidance for the integrated implementation of 'teaching-learning-evaluation' in primary school mathematics, improves the overall teaching effect of primary school mathematics classroom, and promotes the development of students' comprehensive ability.

## **2. The Dilemma of Integrating Teaching-Learning-Assessment**

### **2.1. Teaching Objectives**

Developing teaching objectives that align with curricular standards is the first step instructors must take to integrate "teaching-learning-assessment" in the primary school mathematics classroom. The curriculum standards represent the teaching objectives, and clear and reasonable teaching objectives require teachers to improve based on the curriculum standards and formulate teaching objectives in line with the content of the curriculum standards. However, most teachers rely heavily on teaching aids, and their knowledge and research of the curriculum standards are insufficient. Many teachers choose to directly copy the teaching objectives in the teaching aids and do not integrate the teaching objectives into the actual teaching process, and the connection between teaching and learning is not close enough. Courses that focus on operational objectives can be appropriately organised in terms of teaching and learning processes and procedures, but many of these courses usually place more emphasis on the aspects of literacy and reproduction than on understanding, application and problem-solving. The reason for this is that teaching is still conducted in a traditional manner and the objectives of teaching units are not set according to the level of knowledge that should be measured. As a result, the student is unable to demonstrate that he has met the objectives [2]. The author in the process of internship found that the mathematics teachers for the interpretation of the curriculum objectives of the ability are not enough, the 'rectangle area calculation' of this lesson as an example, in the development of teaching objectives, teachers will focus on allowing students to let students explore the rectangle area formula, and did not introduce the teaching process of the actual problem. In the course of teaching, the teacher did not introduce the solution of practical problems, neglecting the teaching goal of cultivating students' ability to solve practical problems.

### **2.2. Teaching Process**

The teaching process is also a process of student learning and a way for teachers to achieve their teaching objectives. Primary school mathematics teachers have a certain degree of purpose in

designing the teaching objectives of the lesson, but they lack flexibility in their activities and are unable to make timely adjustments according to the feedback and actual situation of the students in the classroom, resulting in a disconnect between the teaching content and the actual learning situation of the students, which affects the effectiveness of learning, and the connection between learning and assessment is not close enough. The performance of some primary school mathematics teachers in the teaching of the teaching method is relatively single, teaching mode to lecture-based, even through the teacher-student question and answer to start the classroom interaction, interaction and inquiry learning opportunities are still less, the degree of student participation is not high, and can not fully mobilize the students' interest in learning and motivation [3]. The teaching process focuses on the memorisation of formulas and the training of problem-solving steps, while neglecting the cultivation of core qualities such as mathematical thinking, logical reasoning ability, problem-solving strategies, etc., which restricts the development of students' comprehensive abilities.

### **2.3. Teaching Evaluation**

In the classroom teaching evaluation at present primary school mathematics teachers in the classroom teaching evaluation there is a one-sided understanding of the curriculum, teachers in the teaching design of the performance of the ability to be more traditional, and the form is more single. In the process of classroom, implementation is more prominent teacher's dominant position, ignoring the main position of students, focusing on the mastery of knowledge and skills, and not enough attention to students' innovative ability, and thinking development, teachers can not make timely evaluations of students, need to spend a lot of time outside the classroom for evaluation and reflection [4]. The monolithic nature of teaching evaluation is twofold. Firstly, the way of teaching evaluation is relatively single. Teaching evaluation can be teacher evaluation or student mutual evaluation. In traditional teaching, teachers tend to use only teacher evaluation as a form of evaluation, ignoring the role of students' mutual evaluation as a body of the evaluation system. The second aspect is the singularity of the evaluation content. The content of primary school mathematics teachers' evaluation of students is limited to the students' mastery of knowledge, and it is easy to ignore the comprehensive evaluation of students, especially with the missing content of students' learning habits and character.

## **3. Reasons for the Dilemma of Integrating 'Teaching-Learning-Assessment' in Primary School Mathematics**

### **3.1. Educational Environment**

Expectations for the quality of teachers' teaching and pupils' learning outcomes have become higher as the demands of education have risen, and the primary school years are a critical period for the development of pupils' thinking styles and problem-solving skills. However, the current exam-oriented education environment pays more attention to test scores and subject rankings, neglecting the cultivation of students' logical thinking, innovation and practical problem-solving abilities, as well as the cultivation and overall development of students' core qualities [5]. The teaching practices of educators have been significantly impacted by this test-focused educational atmosphere. Primary school mathematics teachers typically design learning objectives that prioritize knowledge transfer and skill training over the development of problem-solving and logical reasoning in order to meet these social expectations. This leads to a lack of diversity and innovation in the design of teaching objectives and activities. At the same time, the implementation of exploratory learning, interactive teaching and diversified evaluation is neglected in order to test the results. Additionally, rather than assessing students' general aptitude, teaching evaluation places more emphasis on the mastery of knowledge and skills.

### 3.2. Teachers' Pedagogical Competence

As the leader of classroom teaching, teachers' understanding of the curriculum standards and their ability to set teaching objectives have a direct impact on the effectiveness of the integration of "teaching-learning-assessment". Many teachers lack a deep understanding of the curriculum standards and personalised thinking when setting teaching objectives. This reflects the teachers' lack of professional competence, curriculum interpretation and instructional design skills in the process of setting teaching objectives. In the actual teaching process, insufficient teaching skills and reflection ability led to the inability to adjust teaching strategies and objectives in time according to students' feedback. In the teaching evaluation process, the single subject of evaluation is still teacher-oriented.

### 3.3. School

Teachers' professional development and improved teaching standards depend on continuous professional training and school resource support. As the main promoters of teachers' professional development, Schools should develop more systematic and targeted training programmes and provide more targeted support. At present, many schools fail to formulate systematic and continuous teacher training programmes, or they lack specificity in arranging training, resulting in unsatisfactory training for teachers. At the same time, the content of teacher training organised by schools is relatively homogeneous, lacking in-depth training in modern education concepts, innovative teaching methods and comprehensive evaluation methods. Currently many teachers have limitations in accessing and using teaching resources, especially in remote areas where schools are relatively short of educational resources and lack diverse teaching resources and effective guidance. Lack of sufficient time and energy to support them to "get out for study" because of few rural teachers retaining in village schools [6]. As a result, they are unable to keep abreast of the latest developments and methods of education reform in the teaching process.

## 4. The Integrated Implementation Path of 'Teaching-Learning-Assessment' in Primary School Mathematics

### 4.1. Setting Reasonable Teaching Objectives for Students' Realities

The role of educators is to work with students to design opportunities that "acknowledge individual goals, learning styles, and abilities [7]." Teachers under different teaching realities should take into account the differences of students, and teachers should design hierarchical teaching objectives according to students' foundation, interest and learning ability. Take the lesson "Axial Symmetric Figures" in Unit 7, "Motion of Figures (II)", in the second book of Grade 4 of the Humanistic Version of Primary Mathematics as an example. In the first stage, teachers can set up the basic objective of enabling students to have a preliminary understanding of the phenomenon of axial symmetry and the ability to make judgements through observation and manipulation. The teaching objective of the second stage is to enable students to cut out axial symmetric figures through practical hands-on operations. The final stage is to abstract the concrete so that students can use their spatial imagination to draw axial symmetric figures and draw the axis of symmetry.

### 4.2. Adoption of Reverse Design and Use of Scenarios for Teaching and Learning

In the traditional instructional design process, there are often two design misconceptions: "activity-oriented design" and "indoctrination". Reverse instructional design "flips" the customary practices, this instructional design puts evaluation in the front, and the design process follows the three stages of "identifying desired goals → selecting appropriate assessment evidence → designing

learning experiences and instruction" [8]. Primary school maths teachers need to anticipate the evaluation that may result from the objectives that have been formulated, and then select the teaching methods that can be used. Interaction and cooperative learning among students are then promoted through the creation of context-specific problems. Teachers can organize group discussions, role-plays and other activities for students to share their thoughts and solutions in an interactive way.

#### **4.3. Establish a Student-oriented Multi-dimensional Evaluation System and Develop Diversified Evaluation Tools and Methods**

The establishment of a student-oriented multi-dimensional evaluation system to develop diversified evaluation tools and methods, requires teachers to be good at guiding and exploring the strengths of students, abandon a single evaluation standard, the use of a variety of evaluation methods on the full range of objective evaluation of students [9]. It can be combined with students' self-evaluation, mutual evaluation, teachers' evaluation and parents' evaluation to form a teaching evaluation system in which multiple evaluation subjects participate. Students' self-assessment is an important way of involving students in the learning assessment process, which can help students to better understand their own learning process and effects, thus enhancing their self-reflection and regulatory capacity. Numerous empirical studies have demonstrated that self-assessment has positive effects on academic performance [10]. Teachers can design a series of clear self-assessment criteria and tools, such as self-assessment scales, learning journals, reflective journals, etc., according to the course objectives and students' learning tasks. The self-assessment criteria should include multiple dimensions such as knowledge mastery, skills application, learning attitude, problem-solving, and cooperation ability to ensure the diversity of evaluation content. The design of the evaluation mechanism should fully respect and reflect the student's main position and encourage students to actively participate in the learning and evaluation process. In the student-oriented evaluation mechanism, the role of the teacher is no longer the traditional evaluator, but the guide and facilitator in the evaluation process. Teachers need to help students better understand the evaluation standards, master the evaluation methods and gain learning motivation from the evaluation process through timely guidance and feedback. In this process, the teacher plays the role of coordinator, observer and feedback provider, and promotes students' self-reflection and growth.

#### **4.4. Building a Synergistic Educational Ecosystem**

Multi-party collaboration to form a synergy in education. The promotion of education reform requires the concerted efforts of the Government, schools, teachers, parents and all sectors of society. The Government needs to formulate scientific education policies and standards. As the most important teaching environment, schools can internally carry out training and teaching and research activities on educational evaluation for teachers, organize mutual exchanges and mutual evaluation among teachers, externally introduce external educational resources, establish cooperative relationships with universities, scientific research institutes, educational enterprises, etc., and provide teachers with opportunities for domestic and international learning and training, introduce advanced teaching concepts, methods and technical means, so that primary school mathematics teachers have a broader learning and development platform, while providing students with more diverse learning resources and experiences [11]. Teachers should continue to improve their professional competence, parents should establish a scientific concept of education, and society should provide support for education in various aspects. All parties should work together to create a favourable ecological environment that supports the integrated implementation of 'teaching-learning-assessment'.



## 5. Conclusion

A notable problem in current primary school mathematics classrooms is the separation between teaching objectives, teaching process and assessment. Teachers often rely on readily available teaching aids when setting teaching objectives, and lack in-depth interpretation of the curriculum standards and personalised design. Teachers are not flexible enough in classroom teaching. Some teachers adopt the traditional lecturing mode, with limited opportunities for classroom interaction and exploratory learning, and low student participation, which fails to stimulate their interest and intrinsic motivation in learning. Some of them use a typical lecture style that does not pique students' attention or inspire intrinsic desire in learning. This results in few possibilities for classroom interaction and exploratory learning as well as poor student involvement. In terms of teaching evaluation, the current evaluation mechanism is single-form and focuses on knowledge mastery, and does not pay enough attention to the evaluation of students' creative ability and thinking development. Students have fewer opportunities for self-assessment and mutual assessment, and the subjectivity of students in learning assessment is not given full play.

Based on these issues, the paper proposes specific paths.

Teachers should set multi-level and operable teaching objectives according to students' foundation, interest and learning ability, and set hierarchical objectives for different levels of students to ensure that the teaching objectives can be changed from knowledge transfer to ability enhancement.

Adopting a reverse instructional design helps teachers to reverse the selection of teaching content and methods from the students' learning outcomes, thus ensuring the organic integration of teaching, learning and evaluation. By creating specific problem situations in teaching, teachers can promote interaction and cooperative learning among students and enhance their classroom participation.

The thesis suggests the establishment of a student-oriented multi-dimensional evaluation system and the development of diversified evaluation tools and methods. By combining students' self-assessment, mutual assessment and teachers' evaluation, a multi-party evaluation mechanism is formed to promote students' reflection on their own learning process and the development of their regulatory capacity.

Establish a collaborative educational ecosystem. To realise the full implementation of 'teaching-learning-assessment', it requires the joint efforts of the government, schools, teachers, parents and the community. With the collaboration of all parties, a favourable environment can be built to support the integrated implementation of 'teaching-learning-assessment'.

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