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Problems of Teaching Mathematics in Primary Education

Aygul Kaldibaeva Jakhsilikovna
A teacher, Nukus State Pedagogical institute named Ajhiniyaz

Annotation: *Teaching mathematics in primary education helps children develop thinking. At the same time it creates a unique set of basic knowledge, focused on the formation of the necessary methodological assumptions and logical structures of thinking. In this thesis, major issues and solutions in teaching mathematics in primary education are explained.*

Key words: *didactic games, intellectual development, problem-solving strategies.*

Psychologists have proven that it is a period responsible for the formation of thinking skills of children aged 6-10 years. Therefore, one of the tasks of the methodology of primary education, in particular, the methodology of primary education in mathematics, is to accelerate the impact of teaching on the mental development of children while ensuring a sufficiently high developmental efficiency of teaching. Basic educational tasks in mathematics can be solved only on the basis of a system of theoretical knowledge. This includes the scientific outlook, psychology, didactics, the theory of teaching mathematics (mathematical didactics). However, theoretical knowledge alone is not enough. Various methodological issues arising in the process of practical application of theoretical knowledge should be addressed. Methodological issues arise in every lesson; however, they usually do not have a single valuable solution. The teacher needs to be sufficiently prepared in this area in order to be able to find quickly the most appropriate solution to the methodological problem that arises in the lesson for this learning situation. Didactic games are used as a teaching tool in primary education due to the lack of content in terms of logic and mathematics, and didactic games are used only as a means of reinforcing the material studied. Problems arise in the content of teaching a child from 6-7 years. This is solved through teaching in kindergartens and schools. Learning to count, addition and multiplication in the first stage (till 20) has been a major task of primary education. However, this task is not unique, but it is a broader and more comprehensive part of the preparatory work for the study of children's mathematics is determined in two main ways:

1) The pedagogical way, i.e. the mathematical way in which children's thinking is applied preparation for feedback;
2) Mathematical way, that is, the child is the most to prepare for the study of important mathematical concepts and, above all, the concepts of natural numbers and geometric shapes.

Why teach mathematics in the primary school? The statement about the importance of mathematical understanding in the primary National Curriculum programmed of study quoted at the head of this chapter is packed with worthy intentions and is consequently rather difficult to take in as a whole. I find it helpful, therefore, to identify within this statement at least five different kinds of **aims of teaching mathematics** in primary schools. They relate to the contribution of mathematics to:

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1. everyday life and society;
2. other areas of the curriculum;
3. the child's intellectual development;
4. the child's enjoyment of learning;
5. The body of human knowledge.

These are not completely discrete strands, nor are they the only way for structuring our thinking about why we teach this subject.

In shaping, monitoring and evaluating their medium-term planning, teachers

Should ensure that sufficient prominence is given to each of the five reasons for

Teaching mathematics:

1. Its importance in everyday life and society;
2. Its importance in other curriculum areas;
3. Its importance in relation to the learner's intellectual development;
4. Its importance in developing the child's enjoyment of learning;
5. Its distinctive place in human knowledge and culture.

This strand includes what are sometimes referred to as *thinking skills*, but I am including here a broader range of aspects of the learner's **intellectual development**. We teach mathematics because it provides opportunities for developing important intellectual skills in problem solving, deductive and inductive reasoning, creative thinking and communication. We may note here, for example, the reference in the importance statement for mathematics to 'thinking strategies', to using mathematics to 'solve a problem' and to 'use logical reasoning, suggest solutions and try out different approaches to problems' – these are all distinctive characteristics of a person who thinks in a mathematical way. Sometimes to solve a mathematical problem we have to reason logically and systematically, using what is called deductive reasoning.

Other times, an insight that leads to a solution may require thinking creatively, divergently and imaginatively. So the importance statement for mathematics quoted at the head of this chapter rightly, if surprisingly, also claims that 'studying mathematics … fosters creativity'. So mathematics is an important context for developing effective problem solving strategies that potentially have significance in all areas of human activity. But also in learning mathematics, children have many opportunities to 'look for patterns'. This involves inductive reasoning leading to the articulation of generalizations, statements of what is always the case. The process of using a number of specific instances to formulate a general rule or principle, which can then be applied in other instances, is at the heart of mathematical thinking.

Learning experiences for children in mathematics should include a focus on the child's intellectual development, by providing opportunities to foster: (a) problem-solving strategies; (b) deductive reasoning, which includes reasoning logically and systematically; (c) creative thinking, which is characterized by divergent and imaginative thinking; (d) inductive reasoning that leads to the articulation of patterns and generalizations, and (e) communication of mathematical ideas orally and in writing, using both formal and informal language, and in diagrams and symbols.

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Then finally, in this section, in terms of intellectual development we should note that in learning mathematics children are developing a 'powerful way of communicating'. Mathematics is effectively a language, containing technical terminology, distinctive patterns of spoken and written language, a range of diagrammatic devices and a distinctive way of using symbols to represent and manipulate concepts. Children use this language to articulate their observations and to explain and later to justify or prove their conclusions in mathematics. Mathematical language is a key theme throughout this book.

What do children learn in using and applying mathematics in the primary school?

Much of this attainment target is about using and applying mathematics in real-life contexts: 'children use mathematics as an integral part of classroom activities'. This leads on to the development of problem-solving strategies. These are used and developed not just in realistic problems set in real-life contexts, but also through what we might regard as essentially problems within mathematics itself: 'children develop their own strategies for solving problems and use these strategies both in working within mathematics and in applying mathematics to practical contexts'. In practice, it makes little sense to categorize problems as either 'within mathematics' or in 'practical contexts'. There is really a continuum of contexts for using and applying mathematics. At one end are problems that are purely mathematical, just about numbers and shapes, in which the outcome is of no particular practical significance. An example is shown in Figure 2.1, where the challenge would be: how many different shapes can you make by joining five identical squares together edge to edge? At the other end of the continuum would be problems that are genuine, real-life situations that need to be solved. An example might be: how much orange squash should we buy to be able to provide three drinks for each player in the interschool football tournament? But many other problems or investigations are set in real-life contexts, but are perhaps less genuine. An example might be: find out as many interesting things as you can about the way the page numbers are arranged on the sheets of a newspaper. Three areas of skills to be developed in teaching children to use and apply mathematics are (a) problem-solving strategies, (b) reasoning mathematically and (c) communicating with mathematics.

Learning teaching point

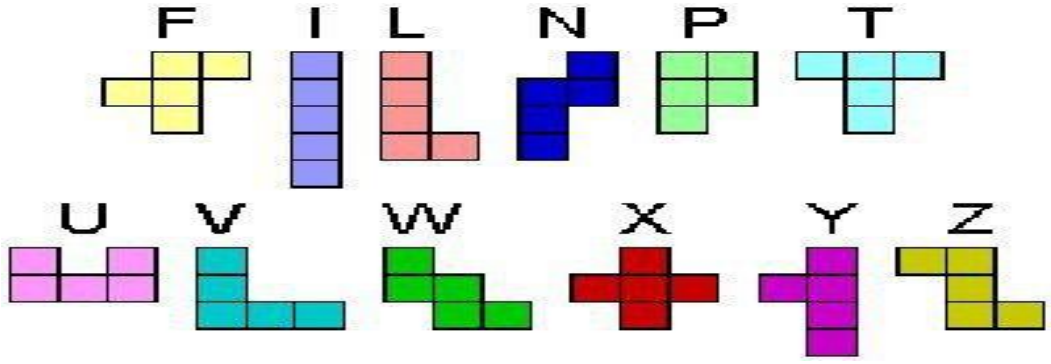

Figure 2.1 *How many different shapes can you make with five squares joined together like these?*

The using and applying mathematics attainment target also includes the development of mathematical reasoning: 'children show that they understand a general statement by finding

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particular examples that match it … they look for patterns and relationships.' The key processes in mathematical reasoning include those associated with recognizing patterns and relationships, making conjectures, formulating hypotheses, articulating and using generalizations.

Then, another clear strand is about the development of skills in communicating with mathematics: 'they explain why an answer is correct … presenting information and results in a clear and organised way … draw simple conclusions of their own and explain their reasoning.' It is in using and applying mathematics that children get the most powerful experience of communicating with mathematical language, symbols and diagrams. This will involve explaining insights, describing the outcomes of an investigation, providing convincing reasons for a conclusion they have drawn, or offering evidence to support a point of view.

Three areas of skills to be developed in teaching children to use and apply mathematics are (a) problem-solving strategies, (b) reasoning mathematically and (c) communicating with mathematics.

To develop the key processes involved in using and applying mathematics children should have opportunities to use mathematics in a range of tasks, including:

a) Activities within their everyday experience in the classroom, such as planning their timetable for the day, or grouping children for various activities;

b) Identifying and proposing solutions to genuine problems, such as where in the playground staff should park their cars;

c) Tackling artificial but realistic problems, such as estimating the cost for a family of four to go on a two-week holiday on the Norfolk Broads;

d) Applying mathematics in practical tasks, such as making a box to hold a set of calculators;

e) Solving mathematical problems, such as finding two-digit numbers that have an odd number of factors;

f) Pursuing mathematical investigations, such as 'find out as much as you can about the relationships between different paper sizes (A5, A4, A3, and so on)'.

References:

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