INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140|p-ISSN: 2615-7071

Volume: 03 Issue: 6 |Jun 2021

SCIENTIFIC METHODS IN TEACHING MATHEMATICS

Ishkurbanova Munavar Turayevna

Math Teacher, Secondary School 5, Surkhandarya Region, Termez City, Uzbekistan

---***---

Abstract: The article is used to investigate the problem-solving abilities of primary school kids. The goal of this study is to see if students' mathematical problem-solving capabilities are improved by utilizing an article rather than a Mathematical Approach. The findings of this study revealed that pupils with strong mathematical problem-solving skills are more likely to succeed in school.

Keywords: research method, observation, experiment, analogy, comparison, synthesis and analysis, generalization, specialization, concretization, abstraction, induction, deduction

1. INTRODUCTION

It is known that mathematics deals with ideal objects, but in its content all mathematical objects reflect the objects of the material world, the essence of which is to ignore the secondary in the properties of material objects, and the properties under study are the most general and pure. This is affirmed "Mathematics learned through formal education (school mathematics) has an important role for students as a provision of knowledge to shape attitude and mindset".[1] Therefore, all mathematical concepts and rules require knowledge of the deepest and most general properties of being. In studying the laws of nature, mathematics uses special tools, scientific methods of research. "Learning to solve problems are the main reasons to learn mathematics". [2] In the process of teaching, students are placed in the position of discovering mathematical facts, and therefore the scientific methods of mathematical research are at the same time the methods of students' reading.

2. Material and Methods

Thus, the main methods of mathematical research used in teaching mathematics are: observation and experiment; comparison and analogy; analysis and synthesis; generalization, specialization, concretization and abstraction. Learning by the Scientific Approach is a learning process designed in such a way that students actively construct concepts, laws or principles through observing stages (to identify or find problems), formulate problems, propose or formulate hypotheses, collect data with various techniques, analyze data , draw conclusions and communicate concepts, laws or principles that are "discovered".[3]

Observation is a method of studying the properties and relationships of individual objects and phenomena in the environment in the natural conditions in which they exist. Observation should be distinguished from simple acceptance. The perception of an object is a process of direct reflection in the mind when this object affects our senses, and observation includes and is not limited to it. Tracking also depends on memorizing and then verbally (or in writing) recording the results of the tracking.

Experiment is a method of studying objects and phenomena in which we interfere with their natural state and development, create artificial conditions for them, break them down into parts, and make connections with other objects and phenomena. Each experiment is associated with observation. The experimenter observes the course of the experiment, that is, the state, change, and development of objects and events in the created artificial environment.

Observation and experimental methods play a key role in the natural sciences, physics, chemistry, and biology. Mathematics in general is not an experimental science, so these methods do not play an important role in mathematical research. Therefore, it is necessary for the teacher to actively study the students.[4]

1. Understand the meaning of prime and complex numbers by observing the division of natural numbers into prime factors, finding these distributions for different natural numbers.

2. Experimentally determine the values of the sum of the interior angles of a triangle and find that it is equal to the arc angle, and by making and measuring the same observation and experiment, an important geometric property, the ground for the discovery and proof of the law is prepared.

In short, although observation and experiment are not among the main methods in mathematical research,

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140|p-ISSN: 2615-7071
Volume: 03 Issue: 6 |Jun 2021

they can be used in teaching and learning. The results of these methods are not enough to substantiate this or that mathematical information, although it is useful in finding and searching for it.

3. Comparison - is the idea of distinguishing the similarities and differences of the studied objects. Comparison is used as a research method not only to study the mathematical properties of objects, but also to establish these properties. The following requirements must be met when using comparisons:

3. Results

1. It is necessary to compare objects that have certain connections and connections with each other, that is, to have meaning. For example, it is reasonable to compare the properties of two functions, two homogeneous quantities, but it does not make sense to compare the perimeter of a triangle and the mass of a tetrahedron.

2. The comparison should be made according to the plan, ie the stages and properties of the comparison should be clearly defined. For example, when polygons have the same perimeter, they can be compared by steps or properties, such as comparing surfaces, comparing the sum of their interior angles, and comparing the radii of internal and external circles.

3. Comparisons of mathematical objects with the same properties must be complete, that is, complete. This means that it is necessary to study all the properties of the object sufficiently for the property being compared. For example, it is necessary to check the magnitude of an internal drawn angle for different situations and to derive its unique general property. The use of comparisons is also important in the teaching of mathematics. For example, in the study of arithmetic progression, students are given a number of different sequences to find out which of them have a common property, and then determine the regularity of their structure: 1) 2,4,6,8 ,. ; 2) –3, -5, -7, -9,.; 3) 1, -1,1, -1,.; 4) 2,2,2, ..; 5) 2,5,8,11,14, .. 6) 3, 9,27 ,. When comparing sequences of numbers 1), 2), 4), 5) the sequences are invariant to the general property, that is, each term of the sequence (except for the first) is invariant to the previous term of this sequence for this sequence. They determine the regularity of formation by adding the desired number. However, other important properties of arithmetic progression are that the desired term is equal to the arithmetic mean of two adjacent terms, that the sum of terms at the same distance from the edges of the current arithmetic progression is equal to the term, and so on there is. An analogy is a statement based on the similarity of the properties (characteristics) of the objects being compared. For example, in any parallelogram, the opposite sides are equal to a pair, and in any parallelepiped, the opposite sides are equal to a pair. A parallelogram and a parallelepiped have axes of symmetry, and the face of a parallelogram and the volume of a parallelepiped are calculated by similar formulas. Many properties of a circle, sphere, and circle with a similar sphere are derived by analogy. And they can be shown to be reasonable, but solid proof is required. The analogy is widely used in teaching. Using it makes it easier to master concepts, for example, by studying the properties of decimal fractions and operations on them, and by using analogies with operations and properties on whole numbers. Similarly, in the study of algebraic fractions, an analogy between ordinary fractions can be used. Although analogy is not a solid mathematical proof, its conclusions are simple and straightforward, so it can be used both in the study of theory and in the teaching of problem-solving techniques. At the same time, students need to master the past, because based on the analogy, mistakes can be made and incorrect conclusions can be drawn. The math teacher needs to be able to anticipate the possibility of encountering false assertions by analogy and respond appropriately to them. For example, students are required to avoid misinterpreting analogies when reducing fractions and replacing certain irrational expressions, and to be clear about their nature.

4. Research methods of analysis and synthesis are manifested in different forms in the teaching of mathematics: the method of solving problems, the method of proving theorems, the method of studying the properties of mathematical concepts, and so on. Analysis and synthesis are inseparable, they complement each other and form a single analytic-synthetic method. For example, with the help of analysis, the problem is divided into several simple problems, and then with the help of synthesis, the solutions of these simple problems are combined. Initially, analysis was seen as a way of thinking, a transition from the whole to the parts, and synthesis as a way from the parts to the whole. Analysis is then seen as a way of thinking, a way of thinking about the transition from the result to the cause. Finally, analysis is understood as a method of research, a quantitative study of an object based on the concepts of numbers and measurements. Synthesis is a way of thinking that involves studying the qualitative properties of an object.

4. Discussion

In mathematics teaching, analysis and synthesis are used in the sense of the second stage of understanding. These methods are manifested not only as a research method, as a method of studying the teaching material, but also as a form of thought process. Analysis can be used in two different ways: in the form of a "filter" and by synthesis. For example, when solving the problem of making 4 equilateral triangles from 6 matchsticks, different methods of solving the problem are considered, and it is only when the problem is considered in space that the solution is available. An example of the application of analysis by synthesis is to prove, for example, that the perimeter of an equilateral triangle drawn outside a circle is twice the perimeter of an equilateral triangle drawn inside this triangle. First we consider the triangle AOS and prove that A1S1 is the midline of this triangle, and then it is proved that the sides of the same inscribed triangle are equal to half. It follows that the perimeter of a triangle is twice the perimeter of an inscribed triangle.

Analysis and synthesis are also widely used to prove theorems. For example, in proving that the arithmetic mean of two numbers is greater than or equal to their geometric mean, first the inequality is derived from the given inequality, and then the given inequality is derived from the given inequality. In the analytical method, the theorem is derived from a reasoned statement with logically based steps as a known fact. In the synthetic method, the truth is sought in such a way that it is possible to derive a given reasoning in logical steps. So, it seems that this method is artificial. Thus, analysis and synthesis are used together in mathematical research and teaching. The teacher must be able to distinguish between analysis and synthesis, taking into account that analysis is a way to discovery and synthesis is a way to justify.

5. In generalization, any property that belongs to a set of objects and unites these objects is distinguished. For example, the study of the formula of the p-term of arithmetic progression is considered on the basis of concrete examples of finding different terms according to its given first term and difference, and a general formula is derived. ladi. In generalization: a) replacing an object with a variable (a triangle with a polygon); b) methods of removing the constraint imposed on the object under study (for example, the angle in the first quarter with an arbitrary angle) are used. In specialization, a property consists of separating an idea from a set of properties of the object under study. For example, by separating rhombuses of equal diagonals from a set of rhombuses, we create a set of squares.

Customization is the transition from a given set to a set that lies in it. For example, the transition from looking at a set of positive fractions to looking at a set of natural numbers is a specialization.

Abstraction can take two forms: analysis and generalization. The first form is the emotional cognition of an object, in which one property of an object is distinguished from another, regardless of its properties. As a geometric object, it is considered to be the shape, size, position of the object in the plane or in space. The second form of abstraction stems from emotional cognition in general. For example, in the classification of triangles by different angles, the concept of an abstract triangle is considered, regardless of the property of the triangle having different directions. On the downside, it ignores some of the properties of the object under study. But in addition to these qualities, there are some that are important to us. Hence, abstraction is the study of an important property to study a property without paying attention to some of its non-essential properties.

Concretization is used in the early stages of learning. It is a one-way study of one side of the object under study, and this study is carried out independently of its other aspects. It can be used in a visual form or as an example of an abstract procedure. For example, the laws of substitution or grouping of rational numbers can be derived from looking at specific examples. Or, in the study of a formula, the consideration of specific cases of calculations using this formula is concretization.

6. . Induction. There are two types of confirmation: induction and deduction. Of these, induction is associated with the name of the ancient Greek scientist Socrates (469-399 BC). Induction, in the sense of directing and arousing, has three main forms:

1) a new general sentence is inferred from two or more units or special sentences;

2) is a method of research in which the properties of a set of objects are studied in some separate objects;

3) from the less general rules of teaching as a method of narrating the material to the general rules (conclusions and results).

Examples: Unit sentences: Circles, ellipses, and other lines intersect with a straight line at no more than two points. Special sentences: ellipses, hyperbolas, etc. are

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140|p-ISSN: 2615-7071
Volume: 03 Issue: 6 |Jun 2021

types of conic sections, where the second-order curves intersect with a straight line at no more than two points. There are two types of induction: incomplete and complete. In the case of incomplete induction, not all special cases relating to the given situation are considered.

For example, from the equation 5 + 2 = 2 + 5 derive the formula a + v = v + a or the arithmetic progression p-th term, in which the hypothesis is derived, and the proof is deductive. A complete induction is based on drawing conclusions based on the consideration of all units and particular judgments pertaining to a given situation. For example, you can look at all the numbers to determine the number of prime numbers between the first 10 digits. Sometimes a lake is used to prove complete induction, for example, when measuring an internal drawn angle, three special points can be considered: one side of the angle is the diameter, the diameter inside the angle, and the diameter outside the angle.

Deduction is a form of affirmation, derived from the Latin deductio, which is derived from one general sentence and one particular sentence, a new less general or special sentence. The general sentence is EKUB (6,7) = 1. New special sentence: 6 and 7 are mutually prime numbers. There are three types of deductive conclusions: a) the transition from a more general rule to a less general (or unit) judgment, as in the example above; b) transition from the general rule to the general rule (for example, all even numbers are divisible by 2, all current numbers are not divisible by 2, no even number can be a current number at the same time);

c) transition from singular to singular (2 is a prime number, 2 is a natural number, some natural numbers are prime numbers). In mathematics, there is also the principle of mathematical induction, through which many arguments can be proved. Its stages are as follows:

1) observation and experience;

2) assumption;

3) substantiation (proof) of the hypothesis. It can be done in three steps:

1) The correctness of the statement for p = 1 is checked:

2) The statement is correct for p = k, and the statement is proved to be correct for p = k + 1.

3) Based on the first two steps of the proof and the principle of mathematical induction, it is concluded that the theorem or reasoning is correct for any p. It is widely used in teaching and can be used to prove a variety of equations and inequalities.

5. Conclusion

Early childhood mathematics is vitally important for young children's present and future educational success. Research demonstrates that virtually all young children have the capability to learn and become competent in mathematics. Furthermore, young children enjoy their early informal experiences with mathematics. Unfortunately, many children's potential in mathematics is not fully realized, especially those children who are economically disadvantaged. This is due, in part, to a lack of opportunities to learn mathematics in early childhood settings or through everyday experiences in the home and in their communities. Improvements in early childhood mathematics education can provide young children with the foundation for school success. To have an effective math lesson, teachers must care about using exact methods and theories from their experience.

Acknowledgments
My thank to the school principal who has given permission data retrieval, teachers and student 11th grade who actively participated in this study.

References:

[1] Asari A R 2014 Mewujudkan Pendekatan Saintifik dalam Kelas Matematika ConferencePaper March 2014 Doi: 10.13140/2.1.5059.2808 Universitas Negeri Malang (Malang: Indonesia)

[2] Posamentier A S and Krulik S 2009 Problem Solving in Mathematics, Grades 3-6: Powerful Strategies to Deepen Understanding (California: Corwin)

[3] Daryanto 2014 Pendekatan Pembelajaran Saintifik Kurikulum 2013 (Yogyakarta: Gava Media)

[4] Sumarmo U 2000 Kecenderungan pembelajaran matematika pada abad 21 Makalah pada Seminar di UNSWAGATI Tanggal 10 September 2000 Cirebon