WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 5, Issue 3, March - 2024

CONCEPTUAL BASIS OF INTEGRATED APPROACH METHODOLOGY IN TEACHING MATHEMATICS IN SECONDARY SCHOOLS

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Abstract
The methods and the scientific and theoretical basis for the organization of mathematics lessons based on integrative approaches in secondary schools are provided.

Keywords: integrative approach, conceptual, methodology, integration, education, teaching, subject, mathematics, pedagogical technology.

Introduction

According to the President of the Republic of Uzbekistan Shavkat Mirziyoyev, “Education of a mature generation that will be worthy successors of our great ancestors is an important issue” [1; 4-5] is very important in all areas, including strategic, in the next stage of development of Uzbekistan has identified our main goal, which must be followed in the education of young people. The economic, political, social and cultural development of developed countries today is closely linked with the development of science. Demonstrating the practical importance of all the theoretical concepts imparted to students in the implementation of the qualitative phase of education reform is one of the important factors in increasing the effectiveness of education.

The term integration means integrity, and the integration of mathematical sciences refers to the interdependence and interconnection of the contents of the sciences. The problem of integration is related to the development of science”.[2; 92]. This is due to the fact that the teaching of mathematics is organized on the basis of integrative approaches and is partially mastered in other disciplines, and their mastery does not create difficulties for students and helps them to complete the level of knowledge. “Integration is a combination of large volumes of educational material of a different nature, which can be characterized by deep “non-traditional education”. [3; 108]. In the encyclopedic and scientific literature, the term “integration” is understood as a developmental process associated with the integration of parts and elements of

different sexes into one whole. Integration is the joining of individual pieces or elements together, becoming a whole, rounding up. “The concept of integration was explained by the English philosopher and sociologist Herbert Spencer as early as the eighteenth century”. [4; 67].

Theoretical Framework

Analysis of problems related to the integration of school mathematics, mainly the implementation of internal and interdisciplinary relations (I.D. Zverov, V.Maksimova, V.N.Fedorova, V.A.Gusev, V.A.Dalinger, V.M.Monakhov, N.F. Borisenko, T.R. Tulaganov, A.L. Musurmanov, A.D. Salomov and others) Development of integrative courses, (V.F. Butuzov, Y.M. Kolyagin, G.L.Lukankin and others) in the framework of methodological mathematical directions, such as strengthening the practical direction, (N.R. Gaybullaev, N.O. Eshpulatov and others), ensuring consistency in mathematical education (Yu.M. Kolyagin, L.Yu. Nesterova, N.O. Alimov, and others) carried out.

Integration course is one of the usual lessons:

- accuracy, conciseness, density of educational material;
- comprehensive logical interpretation of the disciplines integrated at each stage of the lesson;
- has a wide range of information in the educational material.

In an integrated lesson, the goal will need to be set taking into account the interdependence of several disciplines. The advantages of the integrated course are:

1. In this type of activity, the student begins to imagine the world as a whole.
2. As the student's potential develops, he begins to explore his surroundings with great interest, and events begin to search for a logical, intellectual, causal solution in his mind.

As a result, students develop the ability to communicate, compare, generalize and draw conclusions. Thus, the organization of lessons in an integrated form not only guarantees an interesting and meaningful lesson, but also the comprehensive development of students' worldview. Interdisciplinary connection It is right not to provide an integrated lesson to the student without personally experiencing the interdisciplinary philosophical issues, because unintelligible integration leads the cognitive process in the student’s mind to an abstract state, through which confusing conclusions. To do this, it is expedient to conduct an in-depth analysis of interdisciplinary relationships in the study of mathematics and ensure their continuity and continuity. Passing mathematics lessons on the basis of integrative approaches requires a teacher with high pedagogical skills and a new approach to the educational

process. Therefore, the widespread use of mathematics lessons in secondary schools from the work experience of qualified professionals will increase the quality and effectiveness of education, as well as increase the interest of students in mathematics. To do this, the teacher must be familiar with several new teaching methods. The teacher creates an environment in the classroom that develops features such as creativity, inquisitiveness, comparison, similarity, and finding differences through alternative, engaging questions. In addition to asking students math questions, it also develops students 'ability to formulate questions that make them think. In addition, it is necessary to reveal the essence of the topic on the basis of a methodologically organic sequence of mathematics and the integration of the lesson.

In his monograph "Education in Primary School: An Integrative Approach" L. Chekin focused on key aspects of integration in the educational process, identified and analyzed integrative components, and demonstrated their feasibility "as a catalyst for balanced process efficiency". Integrated lessons help to form a holistic view of nature and society in the younger generation. Along with the teaching of mathematics based on integrated approaches in secondary schools, the use of technical means: duo projector board, stand, flipchart, smart boards is important for the development of students' independent thinking skills and increase lesson effectiveness.

This will increase the effectiveness of teaching mathematics in secondary schools, as well as increase students' mathematical knowledge. The broad interpretation of the issues of organization and use of the method of technological processes in the teaching of mathematics on the basis of integrative methods is characterized by the fact that today it is gaining importance and is reflected in the following:

1. There is a social need for interpretation of mathematics in the teaching of mathematics to secondary school students;
2. Methods of applying the methodology of integrative approaches in the teaching of mathematics in the educational process;

Mathematics is inextricably linked with other disciplines of education. In order to develop innovative-integrated interdisciplinary links in mathematics lessons, we need to take into account the psychological and pedagogical characteristics of the student, to establish a method of teaching accordingly and to take into account modern requirements, both mental and physical. This begs the question. What are the achievements and shortcomings that we achieve as a result of using the methodology of the integrated approach, especially in the transition to mathematics lessons? If we explain the topic to the students in mathematics lessons in an integrated way, we will not only instill in the student's mind the essence of the topic, but also increase their interest in other subjects. Students are interested in learning about the emergence and

development stages of the science of mathematics, the meaning (etymology) of the word mathematics, and how the formation of mathematics as a whole perfect science took place.

"Also, our great scholars Al-Khwarizmi, Abu Nasr Farobi, Ahmad Fergani, Abu Ali ibn Sino, Abu Rayhan Beruni, Ghiasiddin al-Kashi, Umar Khayyam, Nasriddin at-Tusi who studied general secondary school students in mathematics on the basis of State educational standards, It is no coincidence that in the process of studying the intellectual heritage of Mirzo Ulugbek, Ali Kushchi and other scholars in the development of mathematics, attention was paid to broadening the worldview of students, increasing their knowledge, educating them in patriotism and national pride". [5; 3].

Mathematics is the study of quantitative relations and spatial forms of the real world, and is the basis for all mathematical types of sciences-physics, astronomy, chemistry, geography and others. Mathematics is a broad-based science that serves as an important ideological tool in scientific research. The purpose of teaching mathematics on the basis of integrative approaches is to strengthen the theoretical knowledge of students, to provide additional knowledge on the basis of identified topics. In doing so, they do the following:

- preparation for practical training (examples and problem solving);
- theoretical (definition, axioms, theorem, proof) preparation;
- do homework;
- return to previous topics;
- mastering the topics designed for independent work.

Secondary schools are mainly focused on in-depth study of mathematics, and the organization of this subject on the basis of integrative approaches expands the scientific outlook and develops the creative potential of students. Establishing interdisciplinary integration for students: in the teaching of mathematics, along with the study of algebra and geometry, concepts and ideas about physics, biology, geography, the surrounding world, the social sciences are formed.

Method

The practical significance of the school mathematics course is growing day by day. Mathematics is one of the basic sciences of general secondary education. It serves as an important tool in the study of other sciences. This is especially true of the natural sciences. Education is always in need of improvement and renewal. Therefore, as much as possible, we need to research on new methods of education. Based on the form and content of the organization of teaching mathematics on the basis of

"methodology of integrative approaches" it is recommended to educate students, taking into account the nature of the subject.

An integrated lesson is a method of teaching that aims to connect and apply interdisciplinary communication and to determine the general level of knowledge of students. Therefore, by creating a methodology of integrated approaches in teaching mathematics and using it in mathematics lessons, students will understand and feel the interrelationship between mathematics and other disciplines. In this way, we create a basis for deeper teaching of mathematics to students. Integrative methods in teaching mathematics In the process of methodological approach, students are completely immersed in the process of learning and learning, they can even argue about what they know and think. In the organization and teaching of mathematics on the basis of integrative approaches, the topics are partially mastered in other disciplines, and their mastery does not pose difficulties for students and helps them to increase their level of knowledge. The contribution of regional scientists to the development of such sciences as mathematics, algebra, geometry, astronomy, geography, chemistry, biology, physics, and their recognition by the world scientific community in different historical periods is worth exploring. The use of these integrative methods, which we have mentioned above, is highly effective in the educational process. There is a serious need for the integration, logic and consistency of other disciplines of mathematics, to further deepen, improve and liberalize their most modern management systems. Mathematics is the main science in education, which is based on physics, chemistry, astronomy, and other sciences. An integrated course is a special type of course that combines the teaching of several related disciplines at the same time.

The problem of the integrated lesson is the technology of interaction of the two teachers, their sequence and order, the content and methods of presentation of the material, the duration of each action.

Researchers generally refer to the term 'differentiated instruction' (Deunk et al., 2018) and its definition by Tomlinson and colleagues as "an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunities for each student in the classroom" (Tomlinson et al., 2003, p. 121). Various adaptations of this definition have subsequently been made, focusing on different elements to match students' abilities such as the use of "systematic procedures for academic progress monitoring and data-based decision-making" (Roy et al., 2013, p. 1187). It is argued that "the core of differentiation is in teachers' deliberate and adequate choices

concerning instructional approaches and materials, based on well-considered goals and thorough analyses of students' achievement, progress, and instructional needs, combined with continuous monitoring during the lesson" (Van Geel et al., 2019, pp. 10–11).

How, and to what extent, teachers decide to apply differentiated instruction "seems to be related to the implicit or explicit learning goals they have for their classroom as a whole" and may depend on whether teachers want to reach convergent goals (ensuring all students reach the same performance levels), divergent goals (ensuring that all students can reach their highest potential), or a combination of both (Deunk et al., 2018, p. 32).

Other researchers adhere to the term 'adaptive teaching' (Corno, 2008; Parsons et al., 2018) or 'adaptive teaching competency' (Vogt & Rogalla, 2009), of which the latter can be defined as teachers' "ability to adjust planning and teaching to the individual learning processes of students" (Brühwiler & Blatchford, 2011, p. 98). Drawing on Corno's (2008) concept of adaptive teaching, it is assumed that learning takes place within a socio-cultural context that requires adaptive teachers who value the diversity of talent in the collective. As such, adaptive teaching is not about individualized or individually tailored instruction where teachers adapt their instruction to "individual students in a social vacuum" (Corno, 2008, p. 165), but about teaching that is situated within the social context of the classroom. It is argued that adaptive teaching entails both teachers' pre-planning efforts outside the classroom (i.e., macro-adaptations) together with "flexibly responding to students in the moment of teaching by improvising from previously established plans" (i.e., micro-adaptations) (Beltramo, 2017, p. 327).

One of the main issues in the teaching of science is that students are constantly exposed to isolated facts and missing central concepts which are 'the big ideas' that make sense in science learning (Olson, 2008). Students become disconnected with their experiences and lose interest in learning science (Aikenhead, 2006).

Comprehensive and careful planning of instruction is crucial in the teaching of scientific concept. Students are encouraged to engage in the learning and sense-making process through their preferred learning styles. Teachers in the classroom play an important role and is a significant factor in creating a conducive learning environment. These varied teaching styles all contribute to the effectiveness and efficiency of the delivery of science lessons.

According to Tytler, Waldrip & Griffiths (2004), one of the pathways to describe the effectiveness of a science lesson is through the description of the set of skills and techniques that good teachers embrace, referring to the repertoire of teaching styles

and strategies adopted by teachers in the classroom. Sanders and Horn (1998) in Johnson, Kahle & Fargo (2007) also agreed on the notion that teachers are the significant factor in facilitating the desirable progress of students in mathematics and science.

For mathematics teaching and learning, students are not only required to have knowledge of numerical facts, but also good in problem solving abilities that are adjustable in accordance with their individual strength and weaknesses (Jones & Tanner, 2002). Lessons in mathematics should be structured into three parts: a mental and oral introduction, the main teaching and activity and a conclusion. Effective teaching of mathematics do not depend on a fixed structure of instructional strategy but involves lively and interactive two-way process in which
students play an active part by answering questions and discussion, explaining and demonstrating their methods to others in the class where a rich set of teaching strategies is required from the teachers to ensure the effectiveness of the lesson.

The change and modification of mathematics and science teaching approaches is predominantly to enhance students' performances in mathematics and science and to broaden access in both fields so as to increase mathematics and science literacy of students in general. Hence one of the approaches is to change the emphasis of
teacher-directed teaching which is also known as teacher-centered approach of lecturing to more students-oriented (student-centered) approaches that involve a higher degree of students' active participation in the teaching and learning process (Quilter & Abu-Hola, 2000). Creativity plays a fundamental role in the design of student-centered activities as well as the key element in the building of scientific knowledge (Innamorato, 1998). Creativity could be regarded as an innate ability; however, it can be enhanced through activities in the classroom to assist students in learning mathematics and science (Park & Seung, 2008). The use of games and simulations (Foster, 2008) which is an alternative creative approach in the teaching of mathematics and science, deviating from traditional approaches are proven effective and extensively used in the science education.

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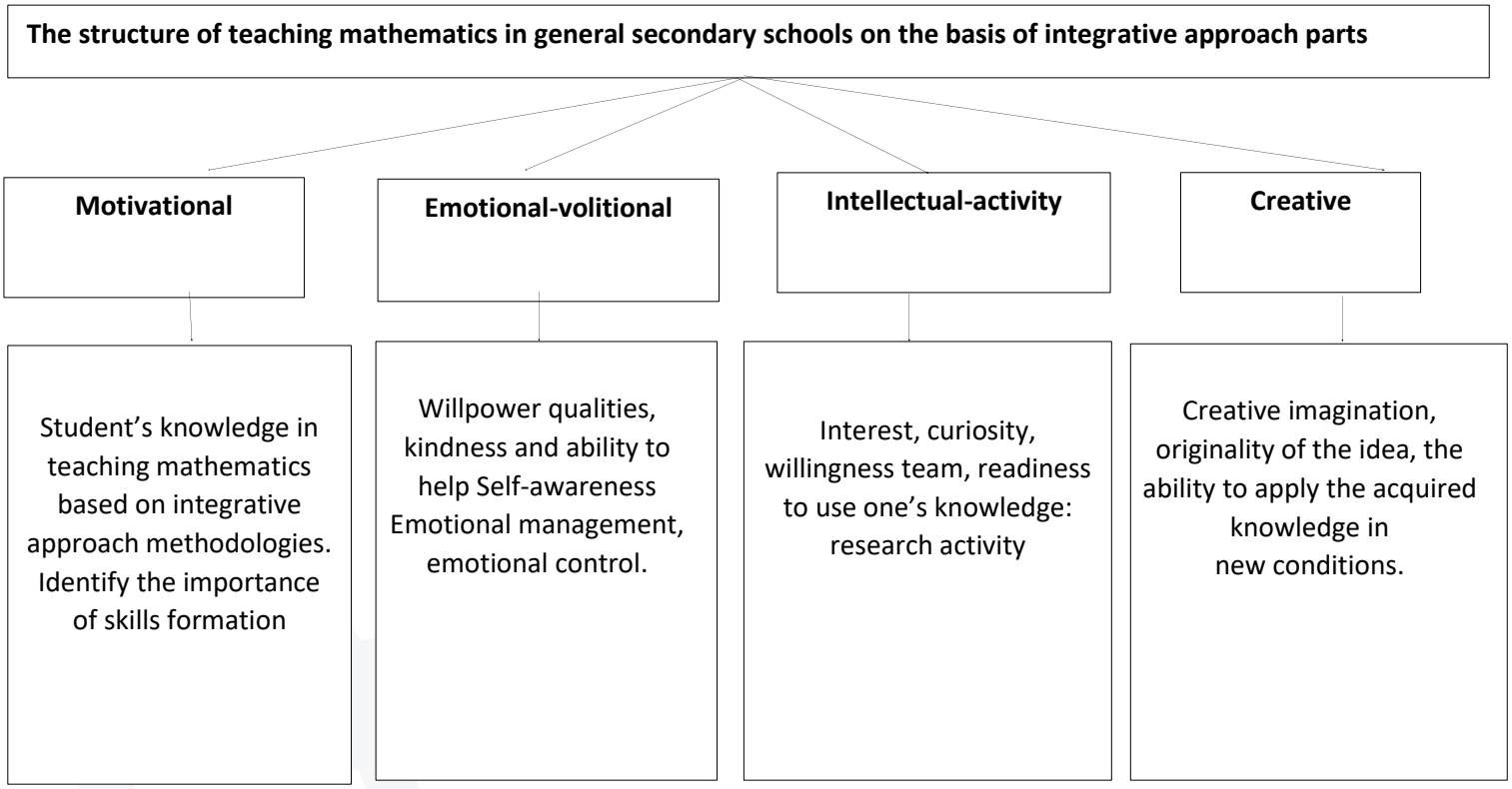
ISSN: 2776-0979, Volume 5, Issue 3, March - 2024

A system of components for teaching mathematics in general secondary schools based on integrated approaches. (Figure 1)



With the gradual emphasis on novel and creative teaching methods and approaches in contemporary classroom, many educators and teachers began to adopt the Multiple Intelligence (MI) approach in the teaching styles where it highlights the idea of individual differences for both teachers and students. The MI approach to teaching allows teachers to incorporate the element of creativity in their instructional design where student-centered activities could be conducted in eight different forms based on the eight types of multiple intelligences proposed by Howard Gardner (1983), reaching students with various abilities and styles in learning. In the MI model, it is proposed that every individual has their own intelligence profile which consists of the eight intelligences: visual/spatial, verbal/linguistic, musical/rhythmic, logical/mathematical, bodily/kinesthetic, interpersonal, intrapersonal and naturalistic. Individuals are found to be stronger in certain type of intelligences and weaker in some. Visual/Spatial Intelligence involves the ability to manipulate and create mental images as well as remember facts best by visualizing; Linguistic Intelligence involves having a mastery of language, learners are sensitive to the meaning of language and words; Musical/Rhythmic Intelligence involves the ability to recognize non-verbal sounds in the environment, sensitive to pitch, melody, tone

and rhythm; Logical/Mathematical Intelligences involves the ability to notice numerical or logical patterns.; Bodily/Kinesthetic Intelligence involves the ability to express themselves physically and excel in the area of sports; Interpersonal Intelligence involves the ability to understand and relate well to other people; Intrapersonal Intelligence involves the ability to identify and understand one's own feelings 514 Tajularipin Sulaiman et al. / Procedia Social and Behavioral Sciences 8 (2010) 512–518 and emotions; Naturalistic Intelligence involves the ability to relate to the natural environment and is good in identification and observation.

Abstract conceptualization refers to an analytical and conceptual approach to teaching based on logical thinking and rational evaluation, which in most cases results in high results based on concrete experience. The purpose of using integrative methods in teaching mathematics is to deepen and expand student's knowledge and skills. This means that students can apply the theoretical knowledge they have acquired in solving mathematical examples and problems, in analyzing solutions.

The concept of math development involves constantly leading oneself to mathematical maturity, lifelong independent learning, continuous improvement of cognitive skills and life experiences, and the ability to independently evaluate one's own behavior and make independent decisions. One of the important directions of our development at the present stage is the field of mathematics.

MATHEMATICS (Greek mathematique, mathematic-knowledge, science)-is the science of knowledge based on clear logical observations. Because the original object was number, it was often referred to as the "science of calculation".[6; 513].

"Methodology (from the Latin method and ...logos) - a system of principles and methods of organization, restoration of theoretical and practical activities of the researcher, as well as the doctrine of such a system. Methodology is also defined as the teaching of methods or the method of generals knowledge. Methodology can also be viewed as an algorithm for scientific knowledge, understanding and modification of reality. In Greece, for example, geometry served as a normative guide in the measurement of land areas, and the science of geometry was considered a methodology for the study of philosophy.

At the entrance to the tomb of Pluto was written: "Whoever does not know the geometry, do not come in front of us". Socrates and Aristotle made a significant contribution to the development of methodology. Farobi interprets Aristotle's works in terms of an Eastern style of thinking. Such interpretations have been a methodology in the study of Aristotle's legacy. In his memoirs, Ibn Sina wrote that even after reading Aristotle's Metophysics 40 times, he could not understand anything, and only after reading Farobi's commentaries did he realize the content of this work. About the

methodology F. Bekkon, R. Descartes, J. Locke, G. Galileo and other European scholars have written special books. Also, the development of methodology I. Kant, Fixte, Shelling, Gegel, etc. made significant contributions. They developed the basics of the methodology". [7; 414].

At the same time, a group of French mathematicians, who revised the definition of mathematics under the pseudonym Burbaki, introduced the definition of "Mathematics is the science of mathematical structures". Like all sciences, mathematics has its own alphabet. In his book "Boundaries and Perspectives of Mathematics", published in 2001 by the International Mathematical Union, the famous Russian scientist V.I. Arnold The following description is given by Arnold. "Mathematics is a part of philology based on a specific grammar". [8; 39].

Conclusion

Integrated lessons help to form a holistic view of nature and society in the younger generation. The development of a conceptual framework for the organization of teaching mathematics on the basis of integrative approaches, as well as increasing the effectiveness of the methodology of teaching. This will increase the effectiveness of teaching mathematics in secondary schools, as well as increase students' mathematical knowledge.

Because students don't like the same pattern of lessons, they get bored. As a result, the student is not able to master the lesson well. The variety of methods so as not to exceed the norm, not to bore the students, further increases the effectiveness of the lesson. In the teaching process, we need to pay great attention to teaching with an approach to forms of oratory, conversation, storytelling, independent work, written work, connecting with time, relying on independent thinking and integrative methods. Therefore, by creating electronic versions of these interactive methods and using them in math lessons, students will be able to interact with the computer. In this way, we create the basis for the student to learn science more deeply through these interactive electronic methods. Mathematical integration has its own technological infrastructure, its own basic educational technology. The interdisciplinary integration of mathematics is an educational process and a didactic condition in all its forms of teaching. In order to ensure integration in mathematics lessons, the materials of closely related subjects should be coordinated with the utmost care. The stronger the mathematical knowledge imparted in secondary schools, the more the students' worldview and intellectual potential develop and mature.

In short, the conceptual framework of the methodology of ensuring the continuity of teaching mathematics in secondary schools based on an integrated approach and the

application and improvement of modern pedagogical technologies in mathematics lessons requires the gradual introduction of interactive, interactive methods.

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