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Application of Bloom's Taxonomy in the Formation of Students' Solving Skills

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This project is a study of Bloom's taxonomy in mathematics. Two groups of 7th Grade students were used to carry out the study, each undertaking a different set of tests at three different levels; the standard traditional test format and the new test based on Bloom's taxonomy format. The study was aimed at comparing the differences in the outcomes between the two test formats based on the mathematics performances of the students. This study shows how Bloom's taxonomy can be utilized to develop a clear methodology for creating a test direction when compiling reports and in conducting an experimental assessment of students' performance.

Keywords: Bloom's taxonomy, cognitive, psychomotor, affective, synthesis, evaluation

Introduction

History of the Origin of Bloom's Taxonomy

This taxonomy was introduced by Benjamin Bloom during the 1950 year and is an approach to classify the degrees of thinking abilities required in lectures and class circumstances. There are six proportions in the scientific categorization, each requiring a more elevated level of deliberation from the learners. As an instructor, you should endeavor to push learners up the scientific categorization as they experience growth in their insight. Tests composed exclusively to evaluate information gained are sadly quite many. Being that as it may, to make scholars rather than normal students who just remember knowledge taught, we should fuse the more elevated levels into exercise plans and tests.

Structure

He suggested that the learning process revolved around one of three psychological domains:

- Cognitive—processing information,
- Affective—attitudes and feelings,
- Psychomotor—manipulative or physical skills.

Bloom's taxonomy offers a classification of tasks set by teachers to students, and, accordingly, goals training. It distinguishes learning objectives into three areas: cognitive, affective, and psychomotor, which can be accordingly, describe as the words "I know", "I feel", and "I create". Within each sphere to move to a higher

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level requires the experience of previous levels that differ in this area.

Training Skills

According to N. S. Leites, training tasks can form the following skills:

- Reproductive—types of activities, for the key, is the capacity to rehash or duplicate keep the scholarly data without falsifying its importance;
- Cognitive—activities that they require cognitive skills aimed at the transformation of explicit or hidden pieces of information. These skills are based on knowledge, which is necessary for further knowledge of the disciplines or converted to an interdisciplinary-new knowledge;
- Behavioral—these are those external and internal behaviors in which the personality expresses its self-perception, which is acceptance of others, perception of distinctive life circumstances through their method of responding plan and act.

Affective Area

This depends on the sentiments, feelings, and state of mind in the education procedure. Affective domain is a term used to describe the emotional state of a person. Feelings, emotions, and attitudes are all part of the affective domain. Feelings, values, appreciation, enthusiasm, motivations, and attitudes are all examples of how we emotionally attach to things.

For example: show consideration for others by showing caring.

Keywords to use when applying: knowing, caring, attentive, polite, understanding, listening.

Result of the application: active participation of students, reaction to any phenomenon, readiness and motivation to respond.

Cognitive Area

Table 1

Cognitive Areas of Bloom's Taxonomy

The level of educational goals	Content	Task type (actions required for achievements of this project level)	Examples
1. Knowledge or memorizing	Memorizing and playback of images required material: specific facts, terms, ideas, definitions divisions, methods, principles, rules, laws.	Simple questions (Who, what, when, where?)	Write the formula of the law of universal gravitation. Find the true coal form on the specified images
2. Understanding	Explanation of facts, Interpretation rules, principles, laws. The allocation of the main ideas.	Clarifying question (Do you right understand?)	Using the diagram A Venn diagram, compare the law of gravity and Coulomb's law, imagine The differences and similarities Guess the next member sequences

Table 1 to be continued

3. Application	Application available information, principles and laws in specific conditions and new situations.	Practical issue (How can I apply?)	From the law world gravitational bring for mulu to determine gravitational constant-annoy Determine the surface area of the given table.
4. Analysis	Differentiation, organization. Dividing the text into software components a specific feature so that it was clearly. Its structure is visible.	Interpretive questions (Why?)	Analyze the reasons similarities and differences law of the world gravity and law Pendant, you get the picture In a mathematical problem divide the material, important information from insignificant
5. Synthesis	Generation. Planning. Comparing results, how to get it, system of abstract, relationship, new knowledge.	Creative question (What happens if...?)	Suggest a plan of experimental check of the World law of gravity Find an alternative variant of the solution of the mate A mathematical problem
6. Creating	Check. Criticism. Assessment of importance or significance of this or that information. Understanding knowledge, justification or inquiry refutation of one or the other approvals.	Evaluating questions (Do you agree with how you relate to...?)	Analyze and evaluate implementation plan The proposed experiment Specify the available internal contradictions

The Psychomotor Domain

The psychomotor zone alludes to the utilization of motor skills, coordination, and physical movements. Learning criteria can be measured in the following terms: Speed, strength, endurance, harmonization, accuracy, adaptability, agility, manipulation, grace, procedure. Psychomotor skills can be defined as skills that require a physical component. To develop mental or social skills (affective, interpersonal) for thinking (cognitive) or reflection (metacognitive), let's do all this physically, instead of using our ability to speak and control. These skills require a level of dexterity, flexibility, or strength. They require engine control.

The psychomotor sphere includes physical movement, coordination, and the use of motor skills. The development of these skills requires experience and is measured in terms of speed, accuracy, distance, procedures, or methods of execution. In this way, psychomotor skills move on to complex tasks such as digging ditches or washing cars, driving complex cars, or dancing.

Related Studies

Mr. Muhammad Tufail Chandio (Chandio, Pandhiani, & Iqbal, 2016) in his article, "Bloom's Taxonomy: Improving the Assessment and Educational Process", thinks the assessment system can play an important role in improving the educational process at the school and college level. Bloom's taxonomy includes six stages/areas of learning, starting with a low degree of learning, i.e., stages of memorization, understanding, and application, i.e., analysis, evaluation, and construction, which, if implemented, profoundly improve both the learning process and the evaluation experience.

Nancy E. Adams Deputy Director and coordinator for education and training, George T. Harrell Library of Medical Sciences, Penn Hershey State Medical Center Milton S. Hershey. He writes: The most common use of Bloom's taxonomy focuses not on psychomotor or affective skills, but on cognitive skills in two areas that are critical to the success of medical professionals. Examples of psychomotor and affective skills are not binding in surgery and proper attention to patients.

Talk about the results of his research: When researching this article, it was obvious that there are hundreds of applications of various forms that use Bloom's taxonomy. There is evidence to support how implementing a taxonomy ensures that goals are aligned with standards and prices.

Ilyas Zhansugurov (Republic of Kazakhstan), Ph.D. student of Altai State University says that Bloom's taxonomy allows the teacher to develop their own professional and pedagogical motivation and focus on all three areas of activity on intellectual development students. At the same time, enabling studying in a joint activity-development and implementation activities educational goals of various levels contributes to the understanding of intellectual property rights and becoming a professional is the teacher's image of the world.

Murzagalieva Arilana Yermekovna says that: The main competencies of the postgraduate program assume the presence of basic literacy in combination with a high level of thinking. The task of the teacher today is not to provide the student with a sum of knowledge, but to ensure that he receives it himself.

Z. Baktybayev said that: Bloom's taxonomy offers a classification of tasks set by teachers to students, and, accordingly, goals training. It divides educational goals into three areas: cognitive, affective, and psychomotor, which can be accordingly, describe as the words "I know", "I feel", and "I create".

T. I. Anisimova and A. R. Ganeeva from Yelabuga Institute says that: Following the requirements of the new standards, the teacher must master the methods and techniques for drawing up training tasks that allow you to evaluate not only subject-based but also meta subject and personal education. The designed lesson implements the steps of bloom's taxonomy; they provide a hint for the formulation of training tasks to achieve planned learning outcomes by the set goals.

E. K. Saudabekova candidate of philosophical sciences, associate professor of "Narhoz" University said: In bloom's digital taxonomy for each of the six levels of thought processes, such as remembering, understanding, applying, analyzing, synthesis (evaluating), and evaluation (creating) are considered specific applications and web tools.

E. S. Lyulina, Sh. A. Mirzakulov from Uzbek State University of Physical Culture, Chirchik, Republic of Uzbekistan stated: To optimize the processes in the education system, it is necessary to turn to modern methodology, a new pedagogical paradigm, and adequate foreign and domestic experience, and define a conceptual and scientific approach to the theory, trends, structure, and functions of processes in the educational system.

The article written by Nafisa Djuraeva and Tamara Atamuratova described results of testing the teaching methodology of the subject through a system of various control procedures. Using the Bloom's taxonomy to describe cognitive knowledge and taking into account the changes made, they discovered it is primarily associated with a meaningful approach to the content of the lecture by students, the development of content analysis skills, and increased educational and cognitive motivation, reducing the level of participants' anxiety, increasing the effectiveness of learning and updating knowledge, improving the psychological situation in the audience.

V. M. Antipenko and L. V. Kotovich stated, every teacher is faced with the need to formulate the goals and objectives of the educational process and improve the educational environment, making it modern, meeting the needs of society, and the challenges of the time. Performing training tests based on Bloom's taxonomy

develop students' critical thinking, as the content of the tests includes tasks for comparing alternative points of view, analyzing texts, interpreting, synthesizing, etc.

T. A. Petrova from Tomsk State Pedagogical University, Tomsk stated that, in a market economy, the formation of the necessary economic and financial competencies in a person should be formed during school education, while special attention should be paid to the methodology of teaching economics, which should include both theoretical foundations using traditional teaching methods, and necessarily practical tasks formed using the Bloom's taxonomy, which is based on step-by-step learning and the formation of knowledge, skills, skills when teaching economics at school.

Materials and Data Collection Methods

I experimented with two formats. The first is tasks obtained from school textbooks, which have long been used in the Soviet educational system and are already in use today. The second is a test task based on Bloom's taxonomy. In the preparation of the test it used verbs based on taxonomy.

Standard questions: Six test problems based on standard methods from the books of Altyn 7-9 class.

The tests are selected on three levels:

- light level,
- mid-level,
- difficult level.

New questions: 10 test tasks are based on Bloom's taxonomy.

Examples:

Table 2

Format of Questions Based on Bloom's Taxonomy

1	Remember	The seven powers of an unknown number are multiplied by three powers of that number and multiplied by seven. Determine the degree of a member.	A) 10
			B) 7
			C) 14
			D) 21
			E) 30
2	Understand	There are three types of lamps in the shop. The first has 32, the second 27, and the third 25. Write these as degrees.	A) $2^5; 3^3;\ 5^2;$
			B) $2^4; 9^3;\ 5^2;$
			C) $2^5; 3^4;\ 5^2;$
			D) $2^6; 3^3;\ 5^1;$
			E) $2^5; 9^2;\ 5^2;$
3	Apply	The volume of the company's goods increased 20 times and then decreased four times. How has the size of the firm changed?	A) decreased by 6 times
			B) multiplied by 16 times
			C) decreased by 5 times
			D) increased 5 times
			E) decreased by 16 times
4	Analyze	In the last two days, Arman has swum twice, played outside six times, and read three times. Write the difference between the most and the least of Arman's activities.	A) 2(3x-2y)
			B) 3y+6y
			C) 6y-3z
			D) 2z(6x-3y)
			E) 2(6z-2y)

5	Evaluate	The soldier had six red, 17 blue, 44 black, 21 white, and 31 brown bricks in the yard. His uncle instructed him to combine the common denominator. What is the number of bricks combined?	A) 27 B) 61 C) 44 D) 58 E) 23
6	Create	The company earned 15% for the first two years and then lost twice as much. Evaluate the state of the enterprise.	A) in case of failure B) at a cost of 2 times C) at a loss of 7.5% D) in case of success E) in case of bankruptcy

Participants and Context

Lack of modern methods and variability of old traditional methods in the country outdated pedagogical science. The differences and contradictions between the standards of Soviet times and modern standards are the main controversy here. In this study, we used mathematics students in 7th Grade to carry out the experiment. Test tasks were based on materials from secondary education and Bloom's taxonomy. I think that when creating mathematical problems, there is no difficulty since the concept of the theory has already been created in several versions. Many articles do not discuss the creation of test tasks. When creating test tasks, there were problems in writing several options in the "analysis", "synthesis", and "create" stages.

Results

The graphs show that a new version of the problem is easy for students and this shows that at what stage the level of students is. According to my results, students are more satisfied with the new type of tests and they are most difficult in the "create" and "evaluate" levels.

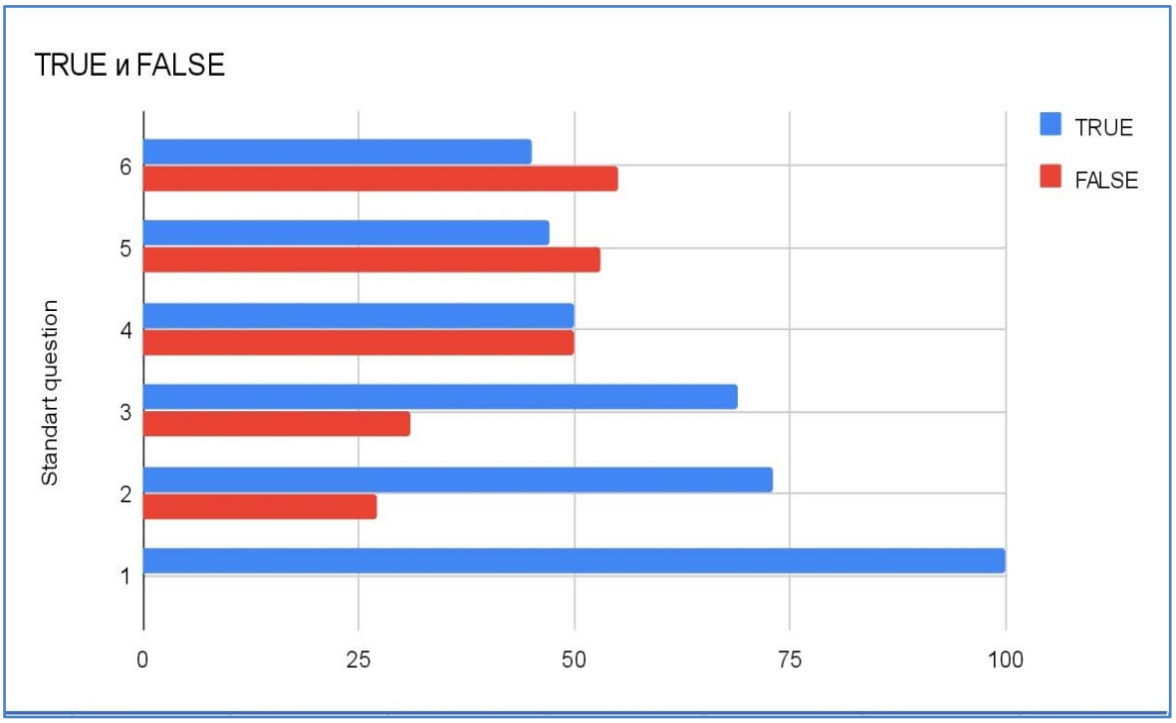


Figure 1. Standard question.

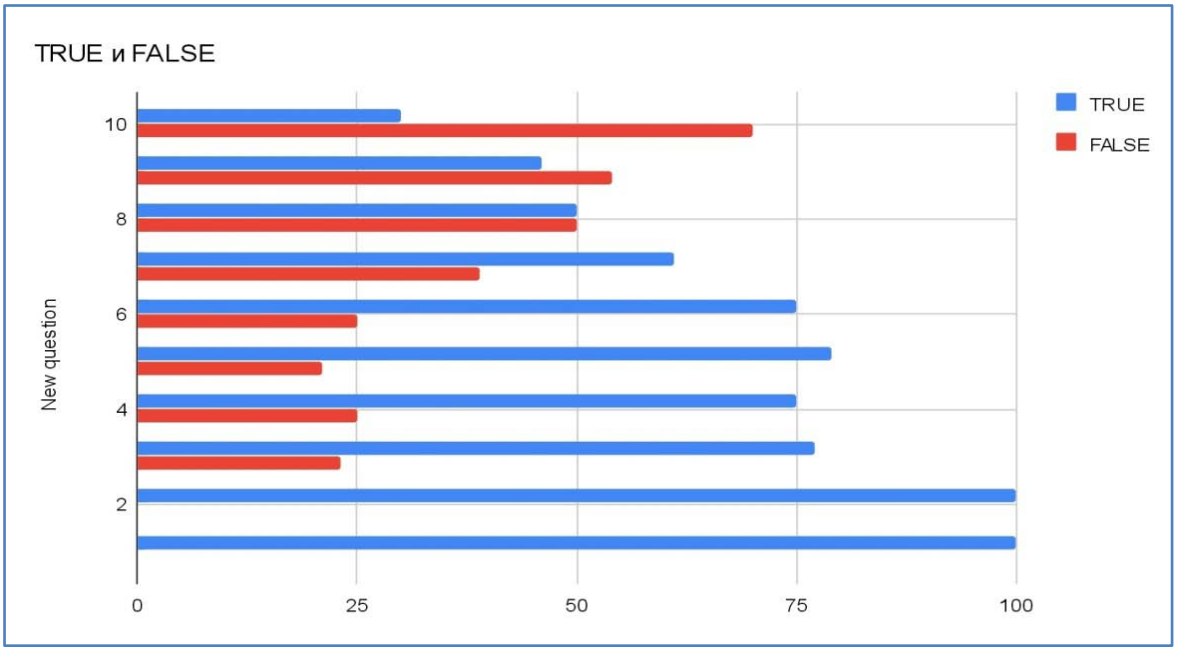


Figure 2. New question.

T-критерий

Статистика парных выборок

		Среднее	N	Среднеквадратичная отклонения	Среднеквадратичная средняя ошибка
Пара 1	V1	69,30	10	22,687	7,174
	V2	30,70	10	22,687	7,174

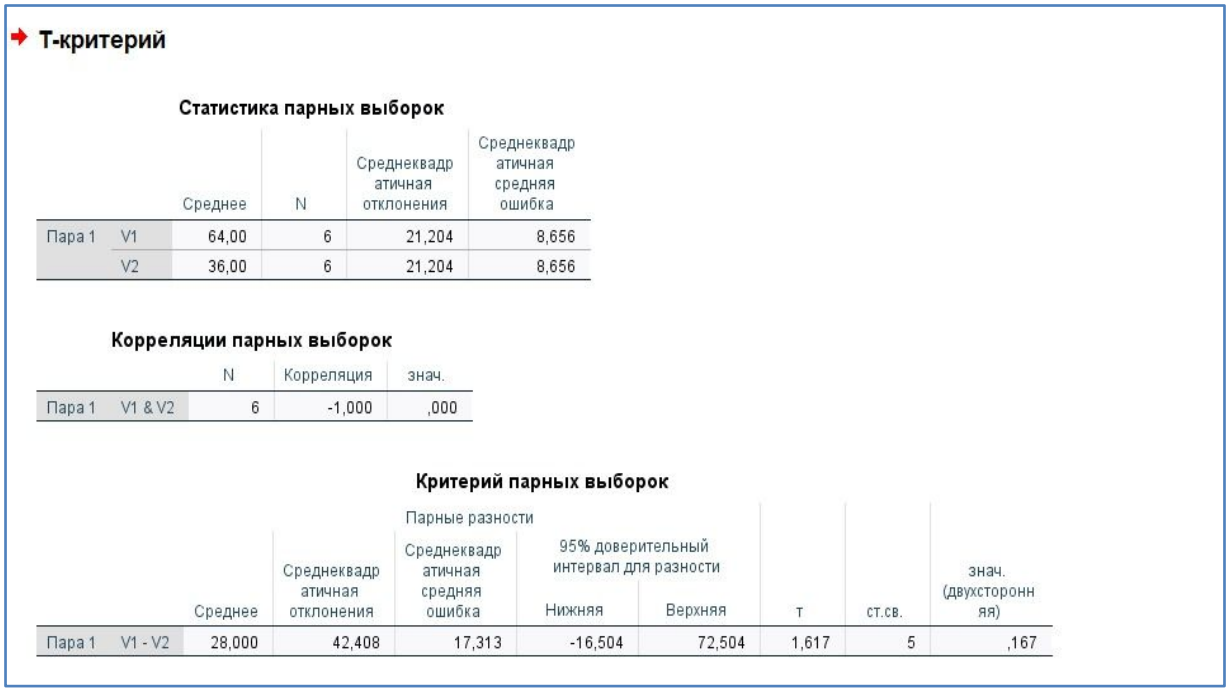
Корреляции парных выборок

		N	Корреляция	знач.
Пара 1	V1 & V2	10	-1,000	,000

Критерий парных выборок

		Парные разности							
		Среднее	Среднеквадратичная отклонения	Среднеквадратичная средняя ошибка	95% доверительный интервал для разности		т	ст.св.	знач. (двухсторонняя)
					Нижняя	Верхняя			
Пара 1	V1 - V2	38,600	45,373	14,348	6,142	71,058	2,690	9	,025

Figure 3. SPSS statics result.



Т-критерий

Статистика парных выборок

		Среднее	N	Среднеквадратичная отклонения	Среднеквадратичная средняя ошибка
Пара 1	V1	64,00	6	21,204	8,656
	V2	36,00	6	21,204	8,656

Корреляции парных выборок

		N	Корреляция	знач.
Пара 1	V1 & V2	6	-1,000	,000

Критерий парных выборок

		Парные разности							
					95% доверительный интервал для разности				
		Среднее	Среднеквадратичная отклонения	Среднеквадратичная средняя ошибка	Нижняя	Верхняя	т	ст.св.	знач. (двухсторонняя)
Пара 1	V1 - V2	28,000	42,408	17,313	-16,504	72,504	1,617	5	,167

Figure 4. SPSS criteria result.

Discussion and Conclusion

In a traditional test, as we can see from the diagram, students only meet the easy level. And the results of the traditional test do not reflect the level of learning abilities of students, and there is no definition of it. And since the modern student lives in the visualization period, the way they think and perceive information has changed compared to the last century. That is, it is difficult to understand if it is not visible in front of the student or without visualization. Another alternative is to give situational examples. For example, when interpreting the concept of degree, offer situational examples depending on age. The new approach allows you to determine the level of students' learning of the topic, taking into account existing problems, and work towards the next level. From the diagram, we can see that situational testing gives students more effective and simplifies their learning of the topic. We see that students who have passed the experimental testing have mastered well up to the level of analysis. And we see that we need to work with students at the level of synthesis, evaluation, or construction. Due to the quarantine, it is not possible to conduct testing in schools with a minimum of 30 students. I realized that it is convenient for students to solve more situational issues, rather than abstract ones. And bloom's taxonomy is well correcting this issue and defines in detail students. I think we should switch to this form of testing at the National level. If we test all students after school, then when determining grants, we can choose according to the skills available for the profession.

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