International Conference on
Humanities, Social and Education Sciences

www.ihses.net April 22-25, 2021 New York, USA www.istes.org

Multidisciplinary Development of Sustainable Education

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Abstract: The reason for the interest in the use of learning technologies that protect health in education is not to harm the physical and psychological health of learners in the process of training and education. After the creation of new types of innovative educational institutions, the knowledge load of learners increases, the increasing learning load can disrupt the normal development of students' central nervous system, vision, musculoskeletal system. This seriously harms the health of students. Only 5-15% of school leavers are healthy. To partially eliminate this problem, the project "Healthy Education-Healthy Nation" is being implemented in Azerbaijan to develop education. During the implementation of the project, its goals were expanded psycho-pedagogically in a local school. The goal was to develop students' thinking while maintaining their health. To achieve this goal, changes were made in the learning process: - the purpose of training was replaced by the purpose of learning; - active training - replaced by constructive learning; - The structure of the knowledge of programs is based on a complete and fuzzy model; -Tasks that ensure the operational development of student thinking, price criteria were created to measure the level of development. The article reflected the work done within the project.

Keywords: healthy education 1, training on the move 2, transition from teaching to learning 3; constructive learning 4, fuzzy subject programs 5.

Introduction

The main goal of the "Healthy Education-Healthy Nation" [1] project was to raise a physically, mentally and spiritually healthy, progressive Azerbaijani citizen with high training and creative abilities. A working group under the President was established in the United States in the early 20th century with the problem of "healthy education". The group conducted research on "Environmental Impact on Children's Health" and concluded that

Bunyatova, F. K., Bunyatova, A., & Shahhuseynbayova, N. (2021). Multidisciplinary development of sustainable education. In S. Jackowicz & I. Sahin (Eds.), *Proceedings of IHSES 2021-- International Conference on Humanities, Social and Education Sciences* (pp. 232-249), New York, USA. ISTES Organization.

chemical, physical, social and psychological factors have a negative impact on children's health. The Congress stated that the results of the research were not satisfactory in comparison with the health status of children in other developed countries, and adopted the "Children's Health Program". [2] In Europe, 43 countries have joined the European School of Health Network, adopting health promotion as part of European education and health policies, and listing the damage to children's health. These are: the lack of rich and age-appropriate training materials with modern developmental knowledge; non-application of new psycho-pedagogical teaching methods to the learning process; failure to take into account the level of health; each child was not seen as an individual, and his inner development did not take into account his needs.

In order to solve these problems, the European Network of Schools of Health based its development on the development of the learning process, the structure of teaching materials in accordance with the structure of students' cognitive structures, and the needs of children.

The solution of these problems in the Azerbaijani education system requires serious renewal and modern reforms. At the state level, in 2016, within the framework of cooperation with the National Center for Educational Technologies, the project "Healthy Education - Healthy Nation" was launched. The main goal of the project is to protect the physiological and psychological health of children in schools and to develop their internal potential.

Materials

Within the framework of the project, the Center conducted medical-hygienic, social-psychological monitoring to study the current situation in Azerbaijan in terms of the problem and collect material and collected the following information:

1. The information on the state of medical services for students in 4,500 secondary schools in 65 cities and regions of the country, the latest date and purpose of medical examination of students.
2. The Ministry of Health provided information on the dynamics of students' health status by class, including the most common pathologies (scoliosis, deformities, nearsightedness, neuropsychiatric and cardiovascular diseases) in school-age children over the past five years.
3. The quality of psychological services was studied for the students, and proposals were given to the draft “Regulations on Psychological Services” for the purpose of training or retraining of practical psychologists.
4. The current state of the material and technical base of general education institutions was analyzed in terms of medical-hygienic and socio-psychological criteria.
5. Work was carried out to promote the urgency of the problem in preschool, general education, technical vocational, college and higher education institutions, and opinions and suggestions of the educational community: teachers, parents, pupils, students, organizations cooperating with the educational institution were collected.

6. With the involvement of specialists from the Azerbaijan Medical University, 2.500 students in Baku were examined

As a result of the analysis of the data obtained, “Healthy Education Classes” (HEC) were created in the country's schools. According to the project, a number of innovations were implemented in HEC, which distinguish the educational process from the traditional training process.

Technical Innovations

1. According to the hygienic norms, the HEC is designed for a maximum of 24 people, with a capacity of 2-2.5 m2 per student in the classroom. As teaching in HEC is organized in a learning environment, the classrooms are equipped with tables for appropriate standing and sitting work, which are adjusted to the size of the students. The working surface of the tables was 160 inclined.

2. Pupils change their position every 15 minutes from a sitting position to a standing position and vice versa. To train the visual and vestibular apparatus on the ceiling of the classroom, a special prof. V. Bazarni's [3] "Universal Symbol Schemes" ("USS") and "Visual-Vestibular Coach" ("ZEVS") automated systems were installed. In the 15th minute of the lesson, the movements are performed using "ZEVS" and in the 30th minute by "USS". The level of lighting in the classrooms is 300-500 lux on the work surface.

3. Micro pauses are given every 15 minutes during the lesson. In this case, children perform exercises in the automated system "Universal Symbol Schemes" ("USS") and "Visual-vestibular trainer" ("ZEVS") to train the visual and vestibular apparatus. Through these movements, both the eye muscles and the muscles of the upper body are trained, and static work that requires attention is replaced by dynamic activity. After micro pauses, children take on a new work position by changing places (sitting and standing).

Unlike traditional classes, HEC does not involve regular work on the same muscle group, which helps to maintain a high level of mental and physical performance of students for a long time. In addition, the adjustment of the student's tables to the height of the children, the inclination of the working surface of the table at an angle of 160 degrees prevents excessive bending of the upper body and head during work. This promotes normal blood circulation, good nutrition of the body's organs and tissues, and adequate oxygen supply. Regulation of the number of children in the classroom according to the class area (2-2.5 m2 per student) prevents excessive pollution of the classroom air with microorganisms and harmful gases and oxygen starvation, and 300-500 lux lighting levels during work.

Methodology

The project uses healthy educational technologies, and the main goal is to "produce the right" students - to protect and develop their body, soul, mind, health. The learning process in healthy educational technologies was

organized under the following conditions: ensuring physical activity and protection from psychological stress; increase learning interest and create a learning environment that causes students to love learning.

For this purpose, healthy educational technologies have been developed, which include medical-hygienic and socio-psychological aspects.

1st direction

medical hygiene.

The following elements were added to the design and equipment of the classroom to ensure the physical activity of students during the training process:

- height-adjustable standing and seating tables for students;
- eye trainers; reaction equipment; pendants; lighting; hand sanitizer.

2nd Direction: Socio-psychological

In order to ensure the emotional activity, psychological stability and socialization of students, the following activities were carried out:

- Creating a mild psychological climate through the "panorama effect";
- Preparation of psychological characteristics of each student;
- Ensuring an individual approach to students in classroom management and training;
- Creating a fertile environment for students to socialize in the learning process and outside of training;
- Providing psychological services to teachers and students;
- Support the regulation of the training load to protect students from psychological pressure.

Studies

In addition to medical and hygienic monitoring carried out within the project, socio-psychological research was planned to monitor the proper organization of the above work.

Monitoring at the beginning and end of the school year and analysis of the results were provided for a comparative study of the factors shown between HEC and control class-brief (CC) students.

Research objectives:

• To study the impact of HE technologies on students' social adjustment process and communication skills.

• Identify differences between HEC and CC students in terms of social adjustment and communication skills. To determine a satisfactory social environment for students.

As a result of the research, differences in the physical and psychological condition of HEC and CC students

after 3 years should be identified and optimally compared.

Organization and Methods of Research

Medical Hygienic Monitoring

Within the project, 650 children (300 HEC and 350 CC) were compared at the beginning of the school year and 3 years later by checking their height and weight, which are the main indicators of physical development, according to the “Baku city schoolchildren's physical development standards and assessment tables”. [4]

Results:

- The number of healthy children among the CC students involved in the project decreased. Thus, during the study, 82.8% of students in these classes were physically healthy. After 3 years, this figure was 70.1%.
- The health of HEC students fell from 82.8% to 80.2%.
- The positive effect of dynamic control is the growth of students' height. Thus, the number of short boys in HEC decreased by 7.9 times and 3.2 times in CC students.
- Comparative studies of HEC and CC over 3 years have shown that the environment created in HEC classrooms ensures students' physical development and height growth. This is considered to be a technology that provides health protection.

Psychological Research

The main purpose of the psychological research conducted on the project was to assess the impact of new healthy educational technologies applied in this project on the cognitive and emotional-volitional processes of students from a psychological perspective.

Research Methods

In the choice of research methods, preference was given to methods that accurately and clearly show the dynamics of the development of basic cognitive, emotional-volitional processes of young students [5]
For first graders:

- Raven matrix methodology for studying the potential of the intellect.
- M. Luscher's color test to determine the emotional state of children.
- E. Varteg's "Circles" test on revealing children's creative potential.
- A. Etkind's test to determine children's emotional attitudes towards the class, the teacher, and themselves.
- F. Gudinaf's "Take a picture of a man" test to study the general intellectual level.

For second graders:

- D. Wexler's "Encryption" (11th subtest) test to determine attention.

- P. Rdichan's (TIP) methodology for studying the potential of the intellect.
- A. Etkind's test to determine children's emotional attitudes towards the class, the teacher, and themselves.
- M. Luscher's color test to find out the emotional state of children.
- E. Varteg's "Circles" test on revealing children's creative potential.
- F. Gudinaf's "Take a picture of a man" test to study the general intellectual level.

The following indicators were taken into account in the psychological research: the development of cognitive processes of students; emotional - the development of the volitional sphere and feelings; development of creative potential; personality development and interpersonal relationships. Statistical processing of the results was carried out in Microsoft Excel-2010, Pearson's X2 (x-square) criterion and Fisher's Precision Method were applied in the analysis of quality indicators during the statistical analysis [6].

Comparative Analysis of Development Dynamics

Based on the results of the monitoring conducted in the 2nd HEC and 2nd Control Classes in October 2015 and May 2016, the dynamics of student development was systematized and compared. According to the analysis of the research materials, the positive development dynamics on the indicators indicated in HEC is observed as follows:

Attention-grabbing HEC as the main psychological indicator was studied at low, medium and high levels.
In October: *HEC - low-73.2%, medium 20.3%, high 6.5%*
CC - low-66.6%, medium 24%, high 1 8.8%; development dynamics were noted.
In May: *HEC-low -39.9%, medium, -20.6, high-39.5;*
CC low-41.6%, medium 23.8%, high 34.7%
As a result, the decrease in low attention was ***HEC 30.1%,*** while the decrease in ***CC was 25%*** (see Table 1.)

Table 1. Concentration

Levels	Concentration HEC October 2015	Concentration CC October-2015	Concentration HEC May-2016	Concentration CC May-2016	Concentration HEC and CC October-2015	Concentration HEC and CC May-2016
Low	73,2	66,6	39,9	41,6	6,6	-1,7
Medium	20,3	24,6	20,6	23,8	-4,3	-3,2
High	6,5	8,8	39,5	34,7	-2,3	4,8

2) During the monitoring, IQ measurement was taken at 4 levels:
Level 1-55, Level 2-60-85; Level 3-90-110; Level 4 -115-135.
Monitoring indicators for October:

HEC 1-11.8%; 2- 29.7%; 3-28.1%; 4- 30.4%

CC 1-12.8%; 2- 30%; 3-30.2%; 4- 27%

Monitoring indicators for May:

HEC 1-9.1%; 2- 33.3%; 3-23.3%; 4- 34.3%

CC 1-12.8%; 2- 32.2% 3-30%; 4- 25%

Thus, the average *IQ level* of STS (90-110) decreased from *28.1% to 23.3%.* While the high *IQ level* (115-135) increased from *30.4% to 34.3%,* the CC, on the contrary, decreased from *34.9% to 25%* (see Table 2.)

Table 2. IQ Measurement

Levels	Intelligence testing HEC October 2015	Intelligence testing CC October-2015	Intelligence testing HEC May-2016	Intelligence testing CC May-2016	Intelligence testing HEC and CC October-2015	Intelligence testing HEC and CC May-2016
IQ 55	11,8	12,8	9,0	12,8	-1,0	-3,8
IQ 60-85	29,7	30,0	33,3	32,2	-0,3	1,1
IQ 90-110	28,1	30,2	23,3	30,0	-2,1	-6,7
IQ 115-135	30,4	27,0	34,3	25,0	3,4	9,3

3) Towards the end of the school year, the creative skills of HEC students increase significantly. Thus, HEC originality increased from 0.5% to 4.0% when assessed on a 3-point scale. CC this figure was 1.7%. (See Table 3).

Table 3. Development of Creative Potential (Agility)

Creative potential (agility)	HEC October 2015	CC October-2015	HEC May-2016	CC May-2016	HEC and CC difference October-2015	STS and CC difference May-2016
weak agility	40,4	46,6	17,6	24,8	-6,2	-7,2
average agility	55,6	51,2	60,5	62,1	4,4	-1,6
strong agility	4,0	2,2	21,9	13,2	1,8	8,7

4). The development of agile creative potential is measured on three levels: weakly agile, moderately agile and strong agile.

HEC in October: weakly flexible - 40.4%; average agile -55.6%; strong flexible -4%
CC in October: weakly flexible - 46.6%; average agile -51.2%; strong flexible -2.2%

In May, the difference was as follows:
HEC in May: - weakly flexible - 17.6%; average agile -60.5%; strong agile -21.9
CC in May: weakly flexible - 24.7%; average agile -62.1%; strong flexible -13.2%
HEC's preference for extracurricular activities (organization of various programs, events, excursions, theater performances, art classes, competitions, etc.) had a positive effect on the development of students' creative potential, increasing their agile creativity from 4% to 21% during one school year. the increase was from 2.2% to 13.2%. (see Table 4)

Table 4. Results of Creative Potential (Originality)

Creative potential (originality)	HEC October 2015	CC October-2015	HEC May-2016	CC May-2016	HEC and CC difference October-2015	HEC and CC difference May-2016
No.	94,6	87,0	57,1	68,7	7,6	-11,6
1 point	1,5	7,2	15,9	16,4	-5,7	-0,5
2 point	3,4	5,0	22,9	13,2	-1,6	9,7
3 point	0,5	0,8	4	1,7	-0,3	2,3

5)The results of the comparative analysis showed that the adaptive skills of HEC students are also developing. A survey of students' emotional abilities in October revealed that:
HEC low adaptation - 6.3%, medium adaptation - 63.2%, high level 30.5%
CC low adaptation - 14.3%, medium adaptation - 61.7%, high level 25%
These indicators changed in May:
HEC low adaptation - 5.6%, medium adaptation - 60.3%, high level 34.1%
CC was low adaptation - 13.7%, medium adaptation - 60.2%, high level - 26.1%. (See Table 5)

Thus, the results of our research conducted in October and May 2016 prove that the "Healthy Teaching" conditions, organized in accordance with the hygienic norms of Healthy Education, optimizing the number of students in the classroom, physical activity develops students' mental processes, emotional states and creative potential. This development creates positive conditions for the reduction of students' negative attitude towards school and the formation of student personality.

Table 5. Adaptation Skills

Levels	Emotional state HEC October 2015	Emotional state CC October-2015	Emotional state HEC May-2016	Emotional state CC May-2016	Emotional state HEC and CC October-2015	Emotional state HEC and CC May-2016
Low adaptation	6,3	14,3	5,6	13,7	-8,0	-8,1
Secondary adaptation	63,2	61,7	60,3	60,2	1,5	0,1
High adaptation	30,6	24,1	34,1	26,1	6,5	8,0

The comparative analysis showed that the development of HEC students is much higher than the potential development of students receiving traditional training.

Local multidisciplinary-psychopedagogical experiment of sustainable education in the project "Healthy Education - Healthy Nation": changing the purpose of training, technology, structural structure of subject programs and assessment criteria.

The HE project focused mainly on the physical and psychological development of students, with little attention paid to research in the psycho-pedagogical direction in the teaching process. However, when the "Transition from teaching to learning" project was implemented at City Experimental School No. 23, [7] several HECs joined the project at the initiative of the school principal. The aim was to observe how changes in the psycho-pedagogical direction - the "transition from teaching to learning" - will affect the cognitive development of students, along with their physiological and psychological development in the conditions of the created HEC. In order to carry out the observation, 4 target classes from primary school were involved in the experiment. One of these classes is the pilot class of the project "Transition from teaching to learning", in short - (PC); 2 Pilot HE class, short (PHEC), 3 control HEC, short CHEC and 4 Control traditional class, short (CC). Extensive comparative experiments made it possible to investigate and psycho-pedagogically evaluate the reasons for achieving the real results of the learning objectives set for each class.

The following work was done with PC and PHEC teachers as part of the local “Transition from Teaching to Learning” project implemented at the school:

- The structure of the traditional Azerbaijani language (mother tongue) program was compared with PC and PHEC teachers and the differences between the structure of the “Complete and fuzzy Azerbaijani language” program to be applied in the local project were investigated.

- PHEC teachers regularly participated in trainings for 2 years to help the pilot classes involved in the project - Bunyatova, who has the same cognitive learning technology as PC teachers, to conduct lessons with constructive learning technology [8]. Most of the trainings were conducted in a practical, "lesson by lesson" format. In addition, demonstration classes and mentoring were provided for teachers.
- State programs of the Azerbaijani language (mother tongue) used in primary school were given in a new structure in the structure of “Complete and fuzzy model of the Azerbaijani language” [9]. This model was modeled using the “Technology of modeling of integrity and fuzzy model of knowledge – IFMK” [10]. The technology of "completeness and fuzzy modeling of knowledge" was created on the basis of J. Piaget's logic of completeness [11]. and Zadeh's fuzzy logic [12].
- Mathematics programs were adapted to students' developmental levels.
- The number of knowledge-oriented tasks was reduced, and emphasis was placed on thought-provoking tasks (on Azerbaijani language and mathematics).
- The section on language skills, assignments and work with knowledge was built in the direction of J. Piaget's logical operativeness of thinking [11].
- It was determined what academic social and intellectual skills the students would acquire.
- New assessment criteria were developed and open and closed tests and logical tasks were developed in accordance with them

During the experiment in 4 classes: 1) PC, 2) Pilot HEC; 3) control HEC and 4) CC pre- and final monitoring. The purpose of the pre-program monitoring was to determine the level of program knowledge, and the results were the same in almost all classes with a difference of 10-15%.

At the end of the two school years, the final monitoring was conducted in the classes involved in the experiment for comparative analysis, measuring the level of cognitive development.

Monitoring was conducted in 3 formats to investigate the results of the experiment, the reasons for this result, and its authenticity:

1. Comparison of software materials and analysis of differences.
2. Observation of PC, PHEC, control HEC and CC demonstration lessons and analysis and comparison of their goals and results from a psychopedagogical approach.
3. Conducting cognitive tests.

Monitoring Results

Format 1: Review of the Programs Taught

1) The Azerbaijani language (mother tongue) was taught on the basis of the state program in the control HEC and CC. When the structure of program knowledge was analyzed logically, it became clear that knowledge was

studied as a unit of knowledge and that there were weak connections between them. Due to the lack of a systematic and sequential structure of knowledge units, students in primary school are not able to learn language skills in a concise, complete scheme of knowledge. Because students in the upper grades reach the full knowledge of different units of knowledge, they are not able to apply this knowledge in a systematic way in written and oral speech.

As we know, each language is governed by its own rules, which are hidden in itself, and these rules are transmitted to us by the mother through the mother tongue. And therefore, the goal of mother tongue programs should be to develop the ability to use the words of the transmitted language in local dialects, dialects and deformed in a correct, orderly written and oral manner.

2) The mother tongue programs taught in PC and PHEC were fuzzyly modeled by the technology of state programs “Technology of modeling of integrity and fuzzy model of knowledge – IFMK” [9].

During the analysis of the created “Complete and fuzzy Azerbaijani language” program, it was found that the capacity of the learning material given in the complete and fuzzy logical structure was 35-40% more than in the state programs.

The increase in the program's knowledge was due to the use of logical tools of Piaget's technology of "completeness and fuzzy modeling of knowledge" based on natural and Zadeh's fuzzy logic. In the program, knowledge was presented not as a unit of knowledge, but as logical knowledge structures. These knowledge structures were divided into invariant and variable knowledge structures and numbered. Continuous mental operations performed on logical knowledge structures, such as "multiplicative operations", "logical classification", "logical substitution", "logical enrichment", put that knowledge into a qualitatively new form. The knowledge in the new form refers to the knowledge that students will learn in the upper grades and in the future. According to this, the knowledge of PCand PHEC students participating in the project exceeds the knowledge of control HEC and CC students studying in the traditional program by 35-40%.

The "Complete and Fuzzy Azerbaijani Language" program develops the student's mind as a smart program. The student, who carries out logical operative operations of thinking on the knowledge based on completeness and fuzzy scheme, gradually develops his thinking mechanisms in this direction.

Format 2: Lessons for Demonstration

The purpose of this format of monitoring was to observe the use of psycho-pedagogical tools aimed at the development of thinking in the teaching process and to compare the results on the basis of cognitive development paradigms. The hearings were conducted in each of the four classes with a developed listening scheme that included questions and points indicating the “teaching and learning” indicator. (See Table 6.)

Table 6. Listening Scheme of Demonstration Lessons

Translation of knowledge by the teacher	How was the meaning (essence) of the topic revealed? What previous knowledge was used?	Types of questions. Rationale for the questions	Reflection of new knowledge	Building new knowledge (real and future)	Educational and mental activity of students.	Comparison of built knowledge with a tutorial

Results of the Hearings

PC- Pilot Class and PHEC-Pilot Healthy Education Class

1.PC and PHEC teachers participating in the project conducted classes with F. Bunyatova's constructive learning technology [8]. In constructive learning, the students at the center of the lesson were involved in cooperative collaboration and intellectual activity. After the students' level of understanding of the topic was revealed in these 4 activity activities, this meaning was transformed into new knowledge with the teacher's logical foundations and the addition of a new element of knowledge. This transformation is related to past and future knowledge. After consolidating the acquired knowledge, the work of how to reflect it in thinking takes place in activities 3 and 4.

2.Students used the knowledge and skills they acquired to answer the teacher's rationale and thought-provoking questions. In this process of acquiring cognitive knowledge, students who reasoned and answered the logical questions posed by the teacher demonstrated the ways in which new knowledge is formed by performing logical operations on knowledge. These actions are considered as an indicator of high thinking skills.

3. In the process of constructive teaching, the teacher asked a question in the role of managing learning, and when he received a question, he did not answer it himself. The question was discussed in teams and the answer was brought to the class discussion. It was clear during the discussion whether the answer was correct. Incorrect answers were not corrected by the teacher. This correction was made by the students themselves, who thought about the teacher's new question, which was a little closer to the answer, with a logical justification. Knowledge was reflected in 5 parameters:

1. Specificity of the acquired knowledge;
2. Their application
3. Tasks involving logical operations on knowledge;
4. Creative tasks;

5. "Animation" of new knowledge, ie personification of knowledge based on internal visions. In this animation, the students demonstrated their new knowledge in a thoughtful way, giving them an emotional color, talking to living and non-living images and explaining them in a new way.

Since most of the questions and assignments asked during the lessons were thought-provoking, the students came to a mental conclusion in the cooperative as a cooperative mental activity.

CHEC-Control Healthy Education Class and CC-Control Class

CHEC and CC teachers demonstrated their lessons through active training, working with government programs. In these lessons:

1. The knowledge-oriented questions posed by the teacher in the center of the lesson are aimed at revealing the acquisition of a large number of students' academic knowledge.
2. Cognitively passive students mechanically answered knowledge-oriented questions posed by the teacher with the knowledge they had memorized. At this time, students showed their level of knowledge by working with the acquired knowledge.
3. It was observed that teachers transfer new knowledge in a convenient way using technical means as a ready-made knowledge. The study of knowledge as a didactic unit, when students' past knowledge is not used in this learning, knowledge gradually becomes passive.
4. In order to acquire and memorize knowledge in the classroom, teachers gave knowledge-oriented tasks of the same type at different stages of the lesson. The students who completed these tasks worked with knowledge and tried to master it well.
5. The success of a group in large and small group work in active learning depends on the leader of the group. In addition to the responsibilities of one-person, other members of the group were less active

Comparing the structure of questions and assignments in the lessons with the questions of B. Bloom's cognitive taxonomy [13], the cognitive development of HEC and CC students studying in the state program was seen at the primary level, ie at the level of "knew, understood, applied".

Comparison of Results

An extensive discussion of the lessons in both formats led to the following conclusion:

1. The main goal of state programs is to master the data and apply it knowingly and correctly. That is, "I know, understand and apply." Fulfillment of these criteria was observed in the lessons of CHEC and CC.
2. Since most of the questions asked in the CHEC and CC were knowledge-oriented, the students only demonstrated their academic knowledge and skills in answering these questions. This demonstration was a demonstration of a kind of thinking.
3. PC and pilott HEC the structure of the questions and tasks asked by teachers and students in the teaching process depends on high cognitive skills - the acquisition of knowledge, their analysis and synthesis, practical

continuous change, their " animation".

4. During the discussion of the questions in a cooperative way, students of different forms of thinking shared their ways of thinking. During this sharing, their ways of thinking are enriched and developed in a multidisciplinary format of thinking.

5. Why and how are most of the questions asked by students and teachers? There were open-ended questions. And from the answers to these questions, it was possible to clearly see at what level the students think: intuitive, concrete and formal. In the process of researching an issue from several levels, the boundaries of the knowledge created by the students were removed and re-established. This dismantling and creation was evident in their answers. This process of creation is psychologically considered one of the highest abilities of the human mind.

Format 3: Cognitive Tests

Cognitive tests were developed to measure the mental development of students participating in the project. Each of the 6 questions in the tests was taken as an indicator of the level of development of cognitive skills. The questions were based on the mechanisms of thinking processes in J. Piaget's theory of cognition [11]. The evaluation criteria were the key words of B. Bloom's cognitive taxonomy. Tests were conducted on PC and pilot HEC, control HEC and CC involved in the project.

Content and Explanation of Cognitive Tests

1. Measuring the scope of knowledge given in the program with an open-ended question - (associative thinking; synthesis). Each correct answer is worth 2 points. Out-of-program answers are evaluated by 3 points.

2. Division of the set into elements: classification, analytical thinking. Each correct distribution is worth 3 points.

3. Continue the sequence of data (substitution operation, creative thinking). For each change (“+”); (“-“) 2 points;

return (“x” “:”) is given 4 points. Mixed ("+" "-" "x" ":") variables are given 6 points.

4. Solve (multiplicative operation; ability to find similarities). 2 points are given for each correct solution and 4 points for each solution that goes beyond the program.

5. Correction of geometric figures from the given (creative thinking). Each figure is given 4 points.

6. Continue the story (creative thinking). Interesting plot - 6 points; author's voice - 4 points; thought-provoking point - 6 points; 40–50 words - 4 points; 60–80 and more words are given 6 points. No mistakes - 5 points; 2–4 errors –4 points; 5–6 errors 3 points; 7 mistakes are given 2 points.

The test was evaluated on a 100-point scale. Students who score 51 or more have high thinking skills. Students who score below 50 and below have low thinking skills.

Test Results

1. Pilot class - PC Out of 29 students, 7 scored less than 51 points and 22 more than 50 points. 75% of students

showed a high level of cognition.

2. Pilot HE class - PHEC Out of 28 students, 8 scored less than 51 points and 20 scored more than 50 points. 71% of students showed a high level of cognition.

3. Control HE class - 15 out of 22 students of CHEC scored less than 51 points, 7 - more than 50 points. 31.8% of students showed a high level of cognition.

4. Control class - CC Out of 22 students, 16 scored less than 51 points and 6 more than 50 points. 27.7% of students showed a high level of cognition. (See Scheme 7.) (See Table 8.)

Scheme 7. Test Resultants

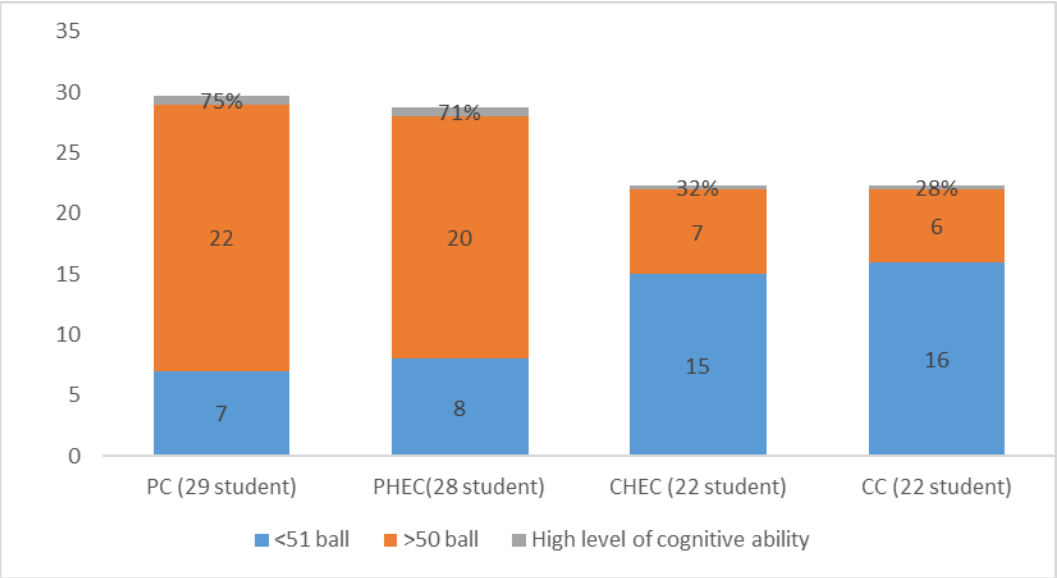

Table 8. The Level of Cognitive Ability

Level	PC (29 student)	PHEC(28 student)	CHEC (22 student)	CC (22 student)
<51 ball	7	8	15	16
>50 ball	22	20	7	6
High level of cognitive ability	75%	71%	31,8%	27,7%

Description

PC - pilot class; PHEC-pilot healthy education class; CHEC-controlled healthy education class; CC-control class

The results of the tests show that in the constructive learning environment created by the local experiment, the cognitive activity of PC and PHEC students who are trained with complete and fuzzy modeled subject programs

is very high in CHEC and CC.

The reason for this difference is that students are trained in a program based on a fuzzy model. When students create their knowledge with the logical operative actions at the heart of the program, they gradually turn it into their own thinking mechanism by building these structures in their minds in accordance with these actions. The results of the Cognitive Tests, which are used as a mechanism for measuring cognitive development, show that 73.6% of the pilot HEC and PC 57 students have high cognitive abilities. Only 29.5% of the control HEC and CC 44 students demonstrated high cognitive skills, scoring more than 50 points.

Conlusions

The following results were obtained when the Healthy Education - Healthy Nation project was implemented in the educational process for 3 academic years:

1. The automated system proposed by Professor Bazarny, mobile learning has a positive effect on maintaining the health of students, as well as a positive effect on the development of attention, which is the main cognitive process.
2. Increases the level of physical and mental abilities of students in the classroom when each student falls ergonomically (2-2.5 m2) in the classroom and when the training is moving, eliminates oxygen starvation of the body.
3. The application of HE technology, in addition to having a positive effect on the psychological stability, emotional activity and socialization of students, creates conditions for the reduction of negative attitudes in them.
4. In the experiment conducted in the local psycho-pedagogical direction, the knowledge capacity of “Complete and fuzzy Azerbaijani language programs” modeled by “ Technology of modeling of integrity and fuzzy model of knowledge – IFMK” is 30-35% more than the knowledge capacity of state programs 30-35% of the time allocated to the subject program means a decrease.
5. If fundamental subject programs are modeled with the technology of "Technology of modeling of integrity and fuzzy model of knowledge – IFMK " , then the time allocated to these subject programs in education will be reduced by 30-35%, which can give a strong impetus to the control-optimized education on a scientific basis.
6. Since the learning activities of students studying in the pilot STS are based on the principles of constructivism, in addition to learning skills, high operational mental skills: substitution, enrichment, multiplicative actions are formed in their minds. As students apply these mental skills to knowledge, these skills gradually become their personal thinking mechanism.
7. As early as the early 20th century, American scholars D. Gordon and W. Jannet, in their book The Revolution in Education [14], saw a change in education, a revolutionary turn, in the transition from the school of memory to the school of thought. According to the authors, 2-3% of thinking is used in education, and if this figure is increased to 10-15%, then there can be great changes in education. An

analysis of the work done within the framework of the project "Transition from teaching to learning", implemented at the level of local experiment, shows that the thinking activity in the classroom can be increased not even 10-15%, but even 40-50%.

8. PC and PHEC students 'high cognitive skills in the local psycho-pedagogical experiment are based on the cognitive purpose of the training structure of the programs, the constructive learning environment, the thought-provoking tasks, the structure of the students' mental and learning activities and the evaluation criteria. has arrived.

9. The results of the local multidisciplinary experiment of sustainable education conducted within the project "Healthy Education-Healthy Nation" show that the pilot HEC, along with changes in the physiological development of students, changes the purpose, technology, structure of subject programs, assessment criteria, healthy psycho-physiological development of students. Along with socialization, their high thinking skills are also developed. In a healthy learning environment, when students are mentally developing, they grow up healthy and intelligent.

10. As the project "Healthy Education-Healthy Nation" is carried out in primary school, it is possible to observe the psychological, physiological and mental development of students only until the age of 10-12. If high school students are involved in this project in the future, then research in this area will be more extensive and in-depth.

Notes

1. We thank Y.I. Karimova, former director of T. Hasanov Secondary School No. 23 in Baku, for her support and psycho-pedagogical contribution to the successful implementation of the “Transition from Teaching to Learning” project.

2. We thank the staff of the project "Transition from teaching to learning": Hasanova S., Nabiyeva T. Isgandarova Z., Mustafaeva S., Suleymanova Sh., Shukurova A., Magarramova A., Aliyeva S., B. Nuriyeva for their efforts in the successful implementation of the program.

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