

## DEVELOPING STUDENTS' SKILLS TO JUSTIFY THEIR DECISIONS THROUGH THE IMPLEMENTATION OF RESEARCH TASKS

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### KEYWORDS

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### ABSTRACT

This research describes how high school students can develop the skills to justify their decisions by completing research tasks. According to the results of the international PISA exam for several years, 15-year-old schoolchildren in Kazakhstan have low skills in analysis, synthesis and assessment according to Bloom's taxonomy. Based on this, ways were sought to develop the high skills of students of Nazarbayev Intellectual School in Aktobe. The study was carried out for one year. One of the reasons for choosing this topic is that it allows students to apply the principle of analysis in advanced mathematics classes by conducting research, deepening their knowledge and establishing interdisciplinary connections with physics. The purpose of the study is to develop the communication skills of students, teach them to solve text problems in mathematics, use knowledge in real life effectively. Methods used in the study are collection of quantitative data through questionnaires, collection of qualitative data from students' communication through observation of the lesson. First of all, the results of the international PISA study and the results of CITO monitoring were studied. At the same time, according to the results of the CITO monitoring the skills of knowledge, understanding and application showed 100% each, a comparative analysis showed 82%, synthesis skills 67%, skills assessment 48%. The survey was conducted on the Microsoft Forms platform. A total of 62 students took part. CLIL technologies, Problem-Based Learning, and the LearningApps platform were used. The results of the study were presented at the school pedagogical council.

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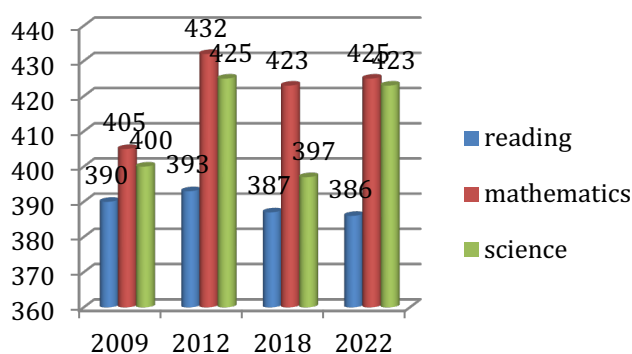
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## 1. Introduction

This research looks at how high school students can develop their decision making skills through research assignments. First of all, the results of the multi-year International PISA exam, which is held annually in different areas, for students who have reached the age of 15 in the Republic of Kazakhstan, were analyzed. Kazakhstan for the fourth time took part in the international PISA exam for assessing the educational achievements of students. Compared to previous years, the result was lower. Research shows a link between funding and education quality. Schoolchildren from 79 countries and economic regions took part in the study. 15-year-old Kazakhs took 69th place.

Since 2009, the state has shown growth, and in 2018 it decreased.

The experience of participating for the first time in 2009 was a great test for the country. After that, Kazakhstan took 59th place in the overall ranking of 69 countries. The study involved 5590 students from 200 educational institutions. [6]



**Figure 1** Trends of performance in reading, mathematics and science

In 2012, the results were slightly better. The testing involved 5,808 students from 200 schools and 18 colleges, 3,522 students studying in the Kazakh language, and 2,286 students studying in the Russian language. The overall result is 45th place in the ranking of 65 participating countries. [5]

In 2015, Kazakhstan's rating turned out to be unexpectedly high (average score - 460). But, as you know, the results of the country were not counted because of the violation of the principle of assigning marks and proportional selection. 2061 out of 5780 students of schools and colleges are students of the Nazarbayev Intellectual School.

The latest survey showed a lag behind its results in previous years, with lower scores than in the first year of participation in the program. The difference between PISA 2015 and PISA 2018 was 37 in math, 59 in science, and 40 in reading literacy.

Hence, according to the results of the international PISA exam for several years, it can be seen that 15-year-old schoolchildren in Kazakhstan have low skills in analysis, synthesis and assessment according to Bloom's taxonomy. Based on this, ways were sought to develop high-level skills among students of the Nazarbayev Intellectual School in Aktobe. The study was carried out for one year. One of the reasons for choosing this topic is that it allows students to use the principle of analysis in conducting research, deepening their knowledge and establishing interdisciplinary connections with the subject of physics.

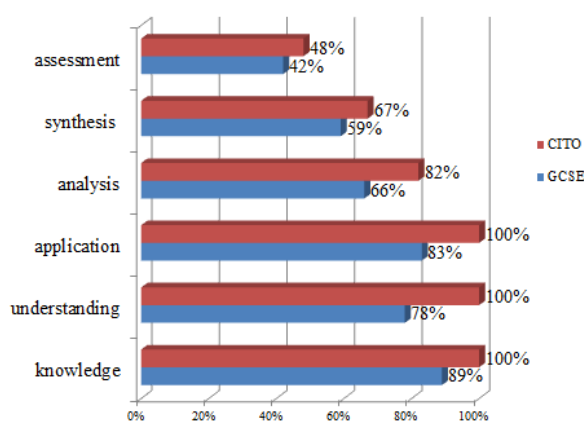
The main goal of my research is to teach the 12th grade students to be able to justify their point of view when performing tasks related to everyday life, according to the highest levels of thinking of Bloom's taxonomy, to develop the skills of formulating arguments. The study involved 62 students of 12th grade.

## 2. Methodology

First of all, the results of 12th grade students at the 10th grade GCSE were taken into account. In the final external summative assessment of the 10th grade, students completed the tasks for the skills of analysis,

synthesis and evaluation, on average by 74%.

At the same time, the Autonomous Organization of Education Nazarbayev Intellectual Schools, together with the Netherlands Research Institute CITO, monitors intermediate educational achievements of students twice a year. According to the results of the CITO monitoring organized by the Center for Pedagogical Measurements in September and January, knowledge, understanding and application skills showed 100%, analysis skills 82%, synthesis skills 67%, assessment skills 48%.



**Figure 2** CITO monitoring results and results of GCSE

After that, in order to develop students' skills of analysis, synthesis and evaluation, in the lesson I set interdisciplinary research tasks related to everyday life. Thus, students have the opportunity to formulate their own point of view, make decisions and predict their consequences, providing reliable evidence, as well as develop the ability to analyze their actions by collecting numerical data obtained as a result of conducting the necessary physical experiments.

As you know, 2 years ago the whole world switched to online learning format due to the situation with Covid-19. Taking into account the needs of my students in the

case of distance learning, I used the "Flipped Classroom" method, and my students learnt on their own, worked with different resources, exchanged opinions with each other, which led to the expected result at the end of the lesson. This method can be called the opposite of Bloom's taxonomy, and it is in line with my goal of professional development. Flipped class teaching allowed students to study independently at home, master the presented audio-video resources, discuss and analyze in the classroom with the help of a teacher and their classmates, solve more problems, and do practical work.

In accordance with the requirements of the study, I received permission from the parents for the participation of their children in the study and permission to answer the questionnaires. In the course of the study, I collected quantitative data using a questionnaire and collected qualitative data on student attitudes while observing the lesson. The purpose of modern education is to educate an intellectually developed personality striving for knowledge. Therefore, modern requirements for the lesson pose the task of systematic development of the personality by involving the teacher in active educational and cognitive activity.

A clear confirmation of the cognitive tasks of the lesson, a convincing explanation of the material, a clear structure of the lesson, the use of various creative tasks in the educational process - all this is a powerful means of developing cognitive interest. Students who organize the learning process in this way experience a number of positive emotions that contribute to the preservation and development of interest in the subject.

Like any other activity, research has its pros and cons. Research activity arouses constant interest in the subject, encourages

research activities, allows you to more deeply comprehend and creatively process information, develops analytical and predictive qualities of the personality, allows you to develop the individuality of the personality of students along the trajectory of personal education, work to educate valuable personality traits, parents are involved in the process, which strengthens the bond between school and family. The difficulties associated with the organization of research activities include low cognitive activity of students, insufficient technological effectiveness of the organization of research activities, insufficient formation of educational motivation. In addition, it is necessary to note the poor equipping of schools with practical and modern information equipment, the discrepancy between the level of the subject being studied and the existing level of development of the cognitive abilities of students, which is a "reverse effect" (intimidation of the student). At the initial stage of the study, 62 12th graders took part in a survey on the Microsoft Forms platform. The survey questions were as follows:

What types of learning and research activity would you like to use in the classroom?

1. problematic abstract study, which includes: analytical comparison of data from various literary sources in order to highlight the problem and design options for its solution;

2. analytical and systematizing research: observation, fixation, analysis, synthesis, systematization of quantitative and qualitative indicators of the studied processes and phenomena;

3. diagnostic and prognostic research is aimed at studying, tracking, explaining and predicting qualitative and quantitative

changes in the studied systems, phenomena, processes;

4. inventive and rationalization research involves the improvement, design and creation of devices, mechanisms, instruments;

5. experimental research activity includes checking the assumption about the confirmation or refutation of the result;

6. design and search activity is aimed at finding, developing and protecting the project - a special form of the new, where the target setting is the methods of activity, and not the accumulation and analysis of factual knowledge.

7. descriptive research - observation and qualitative description of a phenomenon.

### 3 Findings and Discussion

Most students chose analytical and systematizing research and experimental research activities. 65% analytical and systematizing research, i.e. 40 students; and 19%, i.e. 12 students chose an experimental study. After that, in accordance with the age characteristics of the students, I began to give many tasks for studying in pairs and groups, which included the higher thinking skills of Bloom's taxonomy. The expected result from students when performing research tasks in the classroom: improve the skills of solving text problems, improve the skills of creating a mathematical model in the form of a function or a differential equation, use the skills of solving differential equations to solve applied problems, develop the ability to justify their decisions and express their evidence-based conclusions. The assessment of the correctness or incorrectness of the performance of research tasks is carried out by a link in the Microsoft Forms system, pre-loaded on the students' tablets. A rating table

was used, which assesses the level of personal responsibility of group members according to a 3-point system. At the same time, at the end of each lesson, she gave personal constructive feedback on the actions of the student in the group. Students wrote on the Padlet what difficulties they had in achieving the goal of the lesson, recalling their interdisciplinary knowledge in mathematics, physics and chemistry, exchanging opinions with group members, and how they were able to achieve the result. I believe that the use of these assessment methods is familiar to students from the distance learning period, shows the use of ICT and is convenient for efficient use of time.

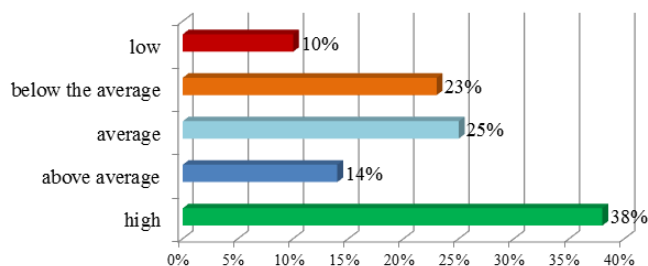
The tasks given for the study, related to real life in everyday classes, were aimed, firstly, at asking thick questions and conducting experiments aimed at developing higher mental abilities in students, and secondly, by solving applied problems, they were aimed at to prepare students for future professions and a great life in accordance with the chosen topic.

During the Action Research study, the students were given a second survey, during which the following questions were asked:

1. Has solving differential equations based on class experiments influenced your understanding of physics? Yes - 9/10

2. Have experiments in physics influenced the understanding of the meaning of differential equations? Yes - 10/10

3. Has your approach to understanding the research problem changed? Yes - 3 answers.



**Figure 3** Post-research survey

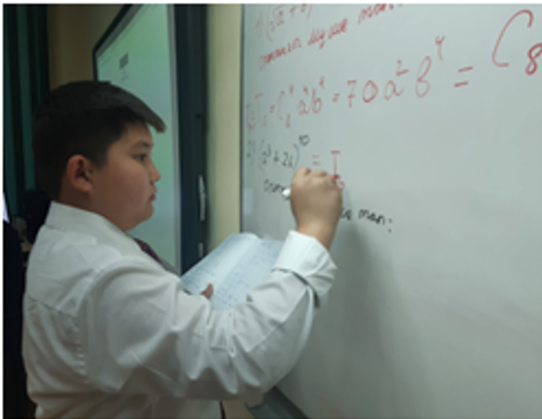
The PBL method (Problem-Based Learning) is one of the teaching methods that I often use in the classroom. This method is a successful innovative method that guides the student towards independent work. In this method, the focus of learning is shifted from the teacher to the student, that is, the student is given the main active role in solving practical problems. This method forms the student's ability to think deeply and comprehensively, to draw conclusions from what was said by the teacher during the lecture and what is written in the textbook. Due to the use of the PBL method in my classes:

1. The activity of my students to create their own works has increased. To solve an urgent problem, students had to do a lot of work, find and collect materials, compared with previous practical exercises.

2. This method has improved the thinking ability of the students. A well-posed actual problem increases the activity of students in the search for non-standard solutions. It is also important to be able to think differently and creatively in improving the quality of professional skills. It is clear that the employer requires this quality from the new specialist whom he hires.

3. The PBL method increased students' interest in science. It is important that the educational process is interesting and attractive. The more interesting you teach, the more interested the student will be.

4. The PBL method prepares students for "real life". This method allows you to connect theory with practice, thanks to which the student understands the practical aspects of his future profession.



*Solving the task*



*Creating a mathematical model*



*Identifying a problem*

**Figure 4** Student work on the table  
*FILA*

The FILA Chart (Facts, Ideas, Learning Problems, Action Plan) is an intellectual tool included in the PBL process that develops students' thinking skills. This chart provides a systematic problem solving model, making it easier to plan and monitor students. The students used this chart to organize the ideas for each item of facts that are the key to solving the problem, and to identify the problem and the corresponding actions associated with that fact. It has been found that the main purpose of using the FILA diagram is to facilitate problem solving within the group and reach consensus on complex issues. The four columns in the diagram form the basis of the problem solving process in PBL. [1]

<b><u>F</u>ACTS</b>	<b><u>I</u>DEAS</b>	<b><u>L</u>EARNI <u>N</u>G <b>ISSUES</b></b>	<b><u>A</u>CTION <u>P</u>LAN</b>
Information arising from the content of the problem	Assigned based on data  Hypotheses	Shaped like questions  Questions adapted	The action plan must be implemented in an appropriate way

atic issue. Can be grouped by topic	Accepted without discussion	to solve the problem	to solve the problem, conduct research, organize interviews. Some parts of the questions should help you create the script
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**Diagram 1** PBL: FILA table

In the last phase of Action Research, a survey was conducted to determine the extent to which students improved their research skills. The survey included the following questions:

1. "How would you like the teacher to set research tasks for you in the lesson?". In the form of a full text - 12%, in the form of figures and graphs - 16%, tasks on the topic - 30%, practical tasks - 42%.

2. "Indicate the level of validity and formulation of your opinion in the tasks proposed for the study." Medium - 33%, high - 67%.

## 1 Conclusion

In general, the proposed criteria for success, as well as the methods of

assessment provided, made it possible to draw conclusions about the achievement of students' goals.

Going forward, I will continue the Action Research towards student interpretation by solving research problems in the classroom using PISA scores and using the FILA spreadsheet to use in lower grades, in consultation with fellow linguists who teach in the same class, to help students think creatively, write and express your opinion competently. I consider it necessary to use the "Search" model, which develops communication skills. Then gradually it is necessary to pass to research tasks. For now, I think I should use the Hamburger model, which develops students' ability to identify cause and effect and write down arguments. I think that such a strategy allows not only me, but also my colleagues to achieve a comprehensive development of students' research skills, develop students' critical thinking skills, help them apply their theoretical knowledge in solving technical and engineering problems.

I have clearly noticed an increase in the ability of students to formulate their own thoughts in the external summative assessment of the 12th grade. In tasks requiring a short and full answer, students scored high, giving good reasons. The quality of education last year among the students who took part in the study ranged from 84% to 100%.

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