



"Developing argumentation(proof) skills with the help of differentiated tasks"

**Ualihanuly Sh., NIS of Physics and Mathematics in Taraz
Tashtanbekova M.N., NIS of Physics and Mathematics in Taraz**

Background of the study

Why proof skills?

- CPI analytical report on the results of the ESA
- Problems in daily activities
- University entrance exam formats

Why through differentiated tasks?

- Different abilities of class students
- Versatile, optimal, affordable tool



Statement of the problem

- “Mathematics” and “evidence” are inseparable words synonyms
of N. Bourbaki (1939) “Principles of Mathematics”
- General learning strategies for successfully developing proof skills
Chepina Rumsey and Cynthia W. Langrall «Promoting mathematical argumentation» 2016)
- High school students better understand the essence of
assignments for proof ... Talyzina N.F. (2018) "Methods of teaching mathematics. Formation of the methods
of mathematical thinking" textbook for universities. 2nd ed., Yurayt Publishing House, 193 p.
- George Paul's Strategies for Solving a Problem in Math
Lessons George Polya “How To Solve It”, 1945



Purpose of the study

Studying the development of the skill of
proof (justification) in students through
level tasks



Research questions

The main research questions

- 1. Why do students have low proof skills?*
- 2. How to develop proof skills?*

Additional research questions

- How to measure (compare) students' proof skills?*
- ???*



Site and sample selection

Where?	Taraz city Nazarbayev Intellectual School	
When?	2018, October – 2019, April	
Who?	10 students	<ul style="list-style-type: none">• 12th grade• 17-18 years old



Research progress

Data collection and analysis (2018, October)

- CPI Analytical Report
- Student's map (data taken from psychologists)

Literature review (2018, October)

Lesson observation (2018, October)

- Mutual attendance of lessons
- Trial tests
- Trial Feedback

Exchange of views with colleagues (2018, October)



Research progress

A collection of sample answers of students on trial work

(2018, November)

Sample collection rule :

- apply work with similar or gross errors
- hidden names of students
- works were checked according to the “Marking Scheme” and commented on incorrect answers

Conducted a lesson-seminar for students (2018, November)

- the collection was introduced to students
- questionnaire feedback taken



Research methods

Students were given special tasks of “1st level” (2018, December)

Tasks :

- compiled according to the format of creative competitions for teachers (ICMMO)
- conditions, solutions and answers to problems are provided to students
- there are errors in the conditions, in the decisions or in the answers

Students:

- identified all the errors in the tasks and offered their correct options
- substantiated their answers

Result :

had a positive impact on pupils' attention, search and analysis of each word in the assignment.



Research methods

Students were given special tasks of “2nd level”

(2019, January -February)

Tasks :

- 1 daily task was added to daily resources with an error or with a multiple choice of answers

Students :

- identified a “special” problem and brought the problem to the “correct” form of the variable or supplementing the conditions
- substantiated their answers

Result :

оқушылардың терең ойлауына және дәлелдеу (дәйектеу) үшін қажетті және жеткілікті шарттарды түсінуіне оң ықпал етті.



Research methods

Students were given special tasks of “3rd level”

(2019, March-April)

Tasks :

- evidence-based tasks for high-order skills
- Corresponds to the curriculum, “correct” tasks

Students :

- Solve proof problems

Result :

It positively influenced the formation of high level skills in students.



Findings

To measure the result of the study, the final test work was carried out and feedback from the students was taken.

According to the results of the ESA
, 10 students of grade 12 showed 100% academic performance, 80%
quality of knowledge in 3 components containing tasks for evidence.



Thank you

