National level test in science in Latvia for assessing how students explain phenomena scientifically

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Competency-based Education Curriculum Development and Implementation

- Validated and reliable national level tests with an objective to monitor students' skill progress
- Developing 20 diagnostic tests in order to diagnose students' skill in different ages

Problems in National Level Test

- Deep and surface student explanations are scored in the same way
- Impossible to assess student skills at different cognitive levels
- A huge gap between national mean percentage and OECD PISA results
- Variable marking of diagnostic tests

Research questions

1. What results students demonstrate in test items which are related to explaining scientific phenomena?
2. What information about students' skill to explain phenomena scientifically is given from national level test in order to improve testing system?

Methodology: Participants

- 15-16 years old students
- Test was completed by 15 403 students
- National assessment during 2016/2017 school year

Methodology: Data sources

- 230 papers from 8 schools have been analysed in depth
- Both answers and scores from 15 403 student papers were used
- Scores and answers are delivered for the National Centre for Education of the Republic of Latvia, using electronic system

Methodology: Data analysis

- 35 test elements and maximum score 35 points
- analysed using Classic Test Theory (CTT) and Item Response Theory (IRT) Rasch model

Methodology: Data analysis

- Correct percentage, discrimination index, percentage endorsing high and low performance
- Difficulty parameter with standard error

Results of Research (1)

- Mean score in national diagnostic science test 2017 is 16.7 points with standard error 5.4
- 25 % of items according to IRT Rasch analysis student ability is higher than the item difficulty
- Rasch analysis item-person plot is revealed not enough resolution to the group of students with low and high performances
- Test-items are not providing students with high cognitive demand

Results of Research (2)

- In-depth analysis of student answers, reveals that a certain percent of answers are not checked correctly by teachers
- score with full credit answers, only if one word hardly matches the explanation
- using SOLO taxonomy, reveals that less than 10 % of students were able to answer the questions using two and more science concepts

Conclusions

- Longitudinal research, which allow monitoring student progress, using data from validated and reliable diagnostic test system is priority in Latvia
- Develop diagnostic system, not only in the area of content knowledge, but also in measuring skill development

Further Research

- Few student demonstrate formulating arguments from different conceptual perspectives
- Introducing and adopting electronic testing system in order to use authentic student papers answers and solutions
- How skills are delivered in classroom and how these skills have been assessed in the classroom

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