

Development and validation of an assessment instrument for inquiry skills

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Inquiry Based Science Education

- * Inquiry Based Science Education (IBSE) is emphasized in many national curriculums and curriculum frameworks around the world.
- * Implementing IBSE is a challenge, assessing inquiry skills in IBSE is a bigger challenge.
- * SAILS is one of the EU funded projects that aims to develop a framework for assessing inquiry skills.

Assessing inquiry skills

- * Inquiry activities require a different set of mind on the part of teachers and students and it requires new approaches in teaching and learning.
- * Implementing a new approach in education may face with obstacles which makes it even more challenging to adapt assessment strategies for this new approach.

Assessing inquiry skills

- * In our pilot studies, our teachers tried to implement various methods of assessment in the inquiry activities that they used.
- * These methods included assessment rubrics, student portfolios, short quizzes, multiple choice tests, questioning, and others.
- * While all these assessment methods have their advantages and disadvantages, time and practicality was the biggest concern in classroom use.

Assessing inquiry skills

- * The pilot phase of the SAILS project in Turkey included classroom implementations of inquiry activities to lower secondary school students.
- * Inquiry activities were implemented in an elective course called «Science Applications».
- * Our teachers noticed the influence of inquiry education on their students. They observed that those students who took the Science Applications course were more enthusiastic in the regular science courses.

Inquiry skills test

- *The idea of assessing students' inquiry skills came up during our workshops to compare students who took the Science Applications course and those who took some other course instead.
- *To do this we thought about developing a multiple choice test because of simplicity of implementation and evaluation.

Inquiry skills test

*We developed the Inquiry Skills Test (IST) for five inquiry skills that we thought could be measured by a multiple choice test.

*These skills were:

- 1) asking appropriate inquiry questions,
- 2) formulating a hypothesis,
- 3) determining variables,
- 4) recording data, and
- 5) interpreting data

Inquiry skills test

- * We developed four items for each skill.
- * The first version of the test included 16 multiple choice items and four open ended items. The open ended questions were about recording data.
- * The test was reviewed by teachers and project researchers.
- * The first version of the test was applied to 119 grade 5 students.
- * We found the reliability factor of the test as $KR20 = 0.77$.

Inquiry skills test

- * The open ended items were scored by participating teachers as correct or wrong. However, the item analysis of this scoring produced inconsistent results for the open ended items.
- * Therefore, a second version of the test was developed with some revisions and the open ended items turned into multiple choice items.
- * The revised IST was applied to 254 grade 5 and 6 students (about one third of whom took the inquiry based Science Applications course while others took other courses such as music, math applications, painting, etc.) at the beginning of the 2013 fall semester and it again produced a reliability factor value of $KR20 = 0.77$.

Inquiry skills test

- * Item analysis of IST showed that all items were usable, but some items required revisions.
- * IST was reviewed again by external experts and further changes and clarifications were made based on item analysis.
- * It was applied to the same group of students after two semesters, at the end of the 2014 spring semester.
- * This time 168 students took the test, again about one third of whom took the inquiry based Science Applications course while others took other courses.
- * In the final application of IST, we found a reliability factor of $KR = 0.83$.

Inquiry Skills Test the items

Conclusions

- * Multiple choice tests have their advantages and disadvantages. We recognize that multiple choice tests are not suitable for assessing all inquiry skills.
- * However, some inquiry skills are suitable for measuring via multiple choice items.
- * IST that we developed may provide a tool for teachers for diagnostic purposes or it can be used for formative and summative purposes.