What characterises the learners that choose to take the National Standard Science Test in Iceland?

ESERA conference 2007, Malmö, Sweden
2007-08-22
C233 10:00 - 12:00
Background

• A large increase in the number of students in higher education.
• The proportion of science and technology students has steadily decreased during the same period.
• Mathematics and physical sciences, show particularly worrying trends (OECD, 2005).
During the final three years of compulsory school (13-15 year old) children start making choices of whether they want to participate in the high stakes National Standard Science Test (NSST) or not.

Approx. 50% of the students choose to go through with the test.

Depending on schools, children usually have a choice of taking extra courses in science which serves partly as a preparation for the NSST.

This brings out individual and group differences in science education.

<table>
<thead>
<tr>
<th>Participation rates ‘07:</th>
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</thead>
<tbody>
<tr>
<td>Icelandic</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>English</td>
</tr>
<tr>
<td>Danish</td>
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<tr>
<td>Science</td>
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<td>Social studies</td>
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Aim

- To understand group differences in school achievement and educational choice.
- Offer information critical to designing educational environments that maximize each student’s learning.
Presentation outline

- **Framework**: Why do learners choose to engage in science education? (3 min)
- **Methods**: How was the research conducted? (2 min)
- **Findings**: What characterises the learners that choose to take the National Standard Science Test in Iceland? (5 min)
- **Implications**: What can we do to meet learners in different life stages as science educators? (2 min)
• “Frustrated with the number of seemingly disconnected theories…” (Eccles, 2005)
• Comprehensive theoretical model of achievement-related choices
• Draws on theoretical and empirical work associated with decision making, achievement theory and attribution theory.
• Two sets of beliefs: Expectancy and Value, hence the name Expectancy-Value Model (E-V Model)
E-V Model

Social and motivational factors that influence choices and performance

- Cultural milieu
- Socializer's beliefs and behaviors
- Stable child characteristics
- Previous achievement-related experiences
- Child's perception of:
  1. Socializer's beliefs, expectations, attitudes, and behaviors,
  2. Gender roles, and
  3. Activity stereotypes and task demands
- Child's goals and general self-schemas
- Expectation of success
- Achievement-related choices and performance
  1. Interest-enjoyment value
  2. Attainment value
  3. Utility value
  4. Relative cost
- Child's affective reactions and memories
- Child's interpretations of experience

ESERA
• **Empirical data**
  – PISA 2006 questionnaire measuring self-efficacy, value beliefs emotional factors and motivational orientations.
  – NSST 2006

• **Sample**
  – All 15 year old learners in Iceland (N=4683)

• **Data collection** was in both cases administrated by the Educational Testing Institute (ETI) following standardized procedures in data collection.

• The two sources were connected with the use of personal identification numbers.
Method

- **Independent variables:**
  - Expectations of success in Science (domain specific self-concept of ability SCA)
    - (PISA questionnaire index)
  - Subjective task value of science (interest/enjoyment/personal value/motivation)
    - (4 PISA questionnaire indices)

- **Dependent variables:**
  - Choice to take the national standard test in Science (NSST)
  - Achievement (performance in PISA 2006)

- Averages and regression (ETA, Pearson r)
Findings

- The willingness to engage in science is highly related to choice of taking the NSST
  - Those who are willing or medium high willing to engage in science in the future also take the NSST (15/85).
  - Those who are medium low willing to engage in science in the future are undecided (50/50)
  - Those are not willing to engage in science in the future most of them also do not take the NSST (70/30)
Findings

- The choice of taking the NSST
  - STV explains 19.1%–21.6% of the decision
    • Instrumental motivation and Interest 20.7% and 19.7%
    • Personal value and Enjoyment 21.6% and 19.1%
  - SCA explains 19.7% of the decision

- Achievement
  - STV explains 5.6%–14.2% of achievement
    • Instrumental motivation and Interest 5.6% and 9.2%
    • Personal value and Enjoyment 13.2% and 14.2%
  - SCA explains 22.6% of achievement
**Groups**

<table>
<thead>
<tr>
<th>Do I want to do the task?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Willingness to engage in Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32%</td>
<td>18%</td>
</tr>
<tr>
<td>No</td>
<td>14%</td>
<td>36%</td>
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<table>
<thead>
<tr>
<th>Can I do the task?</th>
<th>Yes</th>
<th>No</th>
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<td>2. Increased academic achievement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
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Conclusions

- The choice of taking the NSST in Iceland can be used as an indicator of the learners willingness to engage in science in the future.
- If it is assumed that the willingness to engage in science is a prerequisite for increased achievement in science the following can be inferred.
  - To increase the willingness to engage in science it is effective to emphasize the STV (Do I want to do the task?) as well as the SCA (Can I do the task?).
    - One part of the STV, the Instrumental value, correlates strongly with choice and weakly with achievement. Giving it a special relevance in answering the question: “Do I want to do the task?”.
  - To increase academic achievement among individuals already willing to engage in science it is effective to emphasize SCA (Can I do the task?). Proportionally less time can be devoted to the STV.
Teaching Implications
(Urdan & Turner, 2005)

- **Increased STV (Do I want to do the task?)**
  - Promote active participation and student control
  - Select topics that are authentic and meaningful
  - Visits and practical activity that aim at increasing the instrumental value of Science Education (authors).

- **Increased SCA (Can I do the task?)**
  - Provide moderately challenging tasks that help students see improvement
  - Specific feedback on progress and strategy (formative assessment)
  - Attributing performance to effort
  - Supportive and caring classroom community that makes students feel valued and safe to take academic risks.
  - Mastery oriented approach
Main references


