Senior Citizens as Volunteers: New Resources for Exploration of Analytical Competence as Core Competence through Mathematics Learning and Identity

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To respect the unlimited perspective of lifelong learning, we wish to focus both on the development of analytical competence in compulsory school and on the senior citizens’ life experiences.
The goal of the study

To make an investigation into the relationship between pensioners’ performances in mathematics and their beliefs and positioning as doers of mathematics.
The research questions:

1. What is the relationship between pensioners’ beliefs and positioning as doers of mathematics related to the information gathered about their voluntary work?

2. What is the relationship between pensioners’ beliefs and positioning as doers of mathematics and performances in mathematics?

3. What is the relationship between pensioners’ beliefs and their positioning as doers of mathematics the pensioners’ education and working life?
Theoretical framework

- **Beliefs** as a *phenomenon* or as a *situated process and action* (Schoenfeld 1985 and 1992; Goldin 2002; Goldin et al. 2009; Leder et al. 2002; Kislenko et al. 2007; Maass and Schlöglmann 2009; Perrenet & Taconis 2009);

- Concept of **positioning** (Davies & Harré 1990) as a *basic component* in the understanding, describing and planning of *classroom activities and interactions* (Wagner & Herbel-Eisenmann 2009).
Theoretical framework

• ‘Analytical competence’ refers to being a doer of mathematics (Cobb, Gressalfi & Hodge 2009);

• Analytical competence can be defined as an ability to combine the old and the new in a common vision, an ability to comprehend a wide spectrum of specific information as well as perform the most effective and appropriate activities.
Research methodology
Informants

• Voluntary participants:
  - pensioners involved in voluntary work – 10;
  - pensioners involved in work – 10;
  - pensioners – 10.
Project design on the national level:

- Semi-structured interview:
  1) What is mathematics?
  2) What is mathematical thinking?
  3) How to solve a mathematical problem?

- 2 pensioners (two from each level group) were interviewed by the researchers;
- Interviews were transcribed;
- Analysis of written responses and interviews;
- Performance of external assessment.
- Beliefs and positioning of collected data were related with the marks received on mathematical performances.
Project design on the national level:

The pensioners were asked to describe to the researcher some facts about their voluntary work, which include:

- Type of voluntary work and name of organization.
- Work duration (when they started doing voluntary work – when they started this particular voluntary work – how many hours per month they were working).
- Work purpose (give reason for doing this type of voluntary work).
Research stages

• A semi-structured interview for qualitative and the performance assessment of mathematics for quantitative data collection – autumn, 2011;

• Primary and secondary qualitative and quantitative data processing - winter, 2011-12;

• Data analysis and interpretation -spring, 2012
The statements were coded according to the structural components of analytical competence:

- Code System
  - Profil Codes
    - Age
    - Gender
    - Education
    - Work Experience
    - Voluntary Work Duration
    - Voluntary Work Purpose
    - Voluntary Work Environment
    - Marks
  - Content Codes
    - Analytical Competence Components
      - Beliefs
        - A: Operating in Formal Systems
        - B: Mathematical Models
        - D: School Discipline
      - Positioning
        - C: Social Imagination
        - E: Every Day Thinker
        - F: Every Day User

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• **Primary data analysis** was done implementing **descriptive statistics** (analysis of frequencies, central tendency, variability, crosstabs).

• **Secondary data processing** was done taking into account the exact sample, **non-parametric statistical methods** were used (Spearman’s rank correlation coefficient, Kolmogorov-Smirnov Z test), etc.
Informants

Cases of the pensioners involved in voluntary work in Latvia, Denmark and Lithuania.
Results from Latvia

(n=10 volunteers/pensioners)

AGE

<table>
<thead>
<tr>
<th>Age</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-64</td>
<td>20%</td>
</tr>
<tr>
<td>65-74</td>
<td>40%</td>
</tr>
<tr>
<td>75-85</td>
<td>40%</td>
</tr>
</tbody>
</table>

GENDER

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>50%</td>
</tr>
<tr>
<td>Male</td>
<td>50%</td>
</tr>
</tbody>
</table>

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Results from Latvia

Grading system *prior to 1991*

<table>
<thead>
<tr>
<th>Marks</th>
<th>Description</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td><strong>Excellent</strong>: very good or Excellent, equal to highest distinction (best possible grade)</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td><strong>Good</strong>: represents a good knowledge of a subject (above average)</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td><strong>Satisfactory</strong>: sometimes translated into English as Fair (lowest passing grade)</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td><strong>Unsatisfactory</strong>: hardly any knowledge, below average, represents the first level of failing</td>
<td>F</td>
</tr>
<tr>
<td>1</td>
<td><strong>Poor</strong>: represents complete failure and is the lowest possible grade, very rarely used</td>
<td>F</td>
</tr>
</tbody>
</table>

MARKS

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Results from Latvia

VOLUNTARY WORK DURATION

VOLUNTARY WORK ENVIRONMENT

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EDUCATION

WORK EXPERIENCE

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VOLUNTARY WORK PURPOSE

VWP_satisfaction to help, to act
VWP_to help
VWP_the importance for Latvia
Results from Latvia

BELIEFS

Statements:
A: OPERATING IN FORMAL SYSTEMS
...Precise calculation of a solution...

B: MATHEMATICAL MODELS
...Rethinking all pros and cons, as well as to test the result ...

D: SCHOOL DISCIPLINE
...Mathematics is a subject about numbers...

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Results from Latvia

Statements:

C: SOCIAL IMAGINATION

...Mathematics should be linked with everyday life then it can be perceived more easily....

E: EVERY DAY THINKER

...It is abstract thinking....

F: EVERY DAY USER

...Mathematics is around us. We cannot do without it...

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Results from Latvia?

Is there a relationship between pensioners’ beliefs and their voluntary work duration?

Is there a relationship between pensioners’ voluntary work duration and type of voluntary work?
Results from Latvia?

Is there a relationship between pensioners’ type of voluntary work - consisting museums, movies or websites, voluntary work purpose and performances in mathematics?
Results from Latvia?

Is the difference between women’s and man’s volunteer work?
Lithuanian Case
The Participants of this Research

Ten pensioners involved in voluntary work in Caritas of Kaunas Archdiocese in Lithuania
The Situation in Caritas of Kaunas Archdiocese

✓ One of the main activities in Caritas of Kaunas Archdiocese is voluntary work.
✓ Even 95% personnel, working in Caritas are volunteers.
The Situation in Caritas of Kaunas Archdiocese

Senior volunteers in Caritas of Kaunas Archdiocese

The Participants about Mathematics

✓ Mathematics is the basis of the life.
✓ Mathematics is the calculation of the life issues. To look to the future, calculating everything mathematically.
The Participants about Mathematics

- The head of all subjects.
- School subject about numbers.
- This was difficult subject for me.
Acknowledgements

Analysis of research data has shown, that discussing about mathematics senior volunteers mentioned two main aspect: mathematics – discipline, science and operating in formal – logic systems.
About mathematical thinking

- When I count, plan and check, control, then the life is excellent.
- When you are counting in your mind, you try to calculate everything.
About mathematical thinking

✓ Memorizing of numbers and trying to put them into order.
✓ Related to mathematics, strict, exact, precise.
Thinking, making calculations. Mathematical thinking is the livelihood. To balance, to live from the pension to pension.
What is mathematical thinking?

- Counting, calculating
- Logical thought, training of your mind
discussing about mathematical thinking senior volunteers determined that it is counting, calculating and logical thought, training of one’s mind.
✓ I am counting: it is worth or not, comparing with the living standards.
✓ I like to write on the paper. I write and calculate...
About Problem Solving

✓ The mood to solve. I find the known facts, then it is easier to find unknown facts.
About Problem Solving

✓ To filter through the brain.
To understand the exercise.
✓ First to understand the problem, then to think and to solve it.
About Problem Solving

✓ To make sure that you are right, you didn’t miss anything.

✓ Deeply to think, to understand a problem in simple way.
Discussing about solving mathematical problem, it was mentioned four main aspects: making counting, choosing specific methods, logically thinking and logically doing, understanding the problem in the simple way.
Acknowledgements

The reflection about mathematics, analyzing ideas about mathematical thinking, the way of solving mathematical problems was enjoyable for the participants.
According the pensioners, senior volunteers, reflection is important in mathematics as well as in their lives.
Are Lithuanian volunteers more math-doers than math-thinkers?
• It is our hypothesis for further collaborative research -

that older volunteers can offer new and unique perspectives to analytical competences development.
Thank you for attention!

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