The Relationship Between Preservice Teachers’ Computer Use and Their Beliefs About Math Literacy and Mathematical Problem Solving

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In contemporary teacher training programs, the concept of literacy is frequently emphasized either directly or indirectly. Math literacy is especially important due to the changes in today’s life conditions and qualifications expected from individuals. Due to the importance of competency on new mathematical context of the contemporary and educational life, math literacy became very important area to work on it, especially for math teachers.
Individuals who have math literacy also need to develop confidence in their abilities of reasoning and verification of mathematical thinking. Thus, self-efficacy can be said to be one of the important factors in the development of math literacy.
Self-efficacy is described by Bandura (1997) as “people’s judgements of their capabilities to organize and execute courses of action required to attain designated types of performances”. How people behave can often be better predicted by their beliefs about their capabilities than by what they are actually capable of accomplishing, for these beliefs help determine what individuals do with the knowledge and skills they have. Self-efficacy strongly influences the choices people make, the effort they expend and how long they persevere in the face of challenge.
Problem solving is an action with a wide range of mental processes and skills when reached the correct conclusion. An individual with advanced problem solving skills can effectively use knowledge and can easily solve the problems encountered.
Mathematical problem solving is a complex and recursive cognitive activity involving multiple processes. Several studies in the field of research on mathematics problem solving point to the role of different factors and the interrelated influence of these factors on the problem solving process.
For the last 20 years innovations in technology affect whole the world, and as a part of this world the field of education. Beginning from very early years, the use of technology in learning-teaching processes has been widespread. In mathematics learning processes where principles of the constructivist learning approach were adopted, technology seems to be an important component. And computers are one of the most important tools that can be used in learning and teaching processes.
Determining the actual impact of computer use on math literacy and mathematical problem solving could be one of the most interesting research challenges in the twenty-first century.
The aim of this study is to analyze the effect of computer use in mathematics on Preservice Teachers’ Beliefs about their own Math Literacy and Mathematical Problem Solving Skills. For this main purpose, answers to the following research problems will be sought:

- What are the pre-service elementary mathematics teachers’ beliefs about their own Math Literacy?
- What are the pre-service elementary mathematics teachers’ beliefs about mathematical problem solving?
Computer use

* What is the proportion of Math Preservice Teachers who use a computer for math studies?
* Do the self-efficacy beliefs about mathematical literacy of the Math Preservice Teachers differ according to the computer use?
* Does the belief in mathematical problem solving of the Math Preservice Teachers differ according to the computer use?
Participants consisted of 152 (89 women and 63 men) Elementary School Mathematic Preservice Teachers attending Istanbul University, Hasan Ali Yucel Faculty of Education, Turkey. The survey was given during the 2010-2011 educational year.
“Math Literacy Self-Efficacy Measurement Scale”, “Belief on Mathematical Problem Solving Scale” and “Personal Information Form” were used to gather data.
Self-Efficacy Scale about Mathematical Literacy Beliefs has been developed by Özgen and Bindak in 2008, on the teacher trainees that participated with the research. This scale, which has been prepared in five point likert scale, contains 25 items. It has been prepared as to contain 4 negative and 21 positive items.
The highest point that can be obtained from this scale is 125 and the lowest point is 25. The highest point that could be obtained from the scale is accepted as the mathematical literacy self-efficacy of teacher trainees being high. In addition to this, a conclusion can be reached about the mathematical literacy levels of individuals by dividing the total points obtained from the scale to the number of items.
The factor loads of 25 items that are included in the scale are arranged between .52 and .78. Internal consistency reliability coefficients have been to be .95 for the whole of the inventory and it has been calculated as .88 and .93 for sub-components. The item-total correlation values of the items that are included in the scale varied between .48 and .75. Internal consistency reliability coefficients of the scale has been calculated as .942 and the test split-half reliability coefficient as .924 through the Spearman-Brown correction.
Belief on Mathematical Problem Solving Survey

Belief on Mathematical Problem Solving Survey consisted of 39 items (17 negative and 22 positive) on a five-point Likert scale ranging from 5 to 1; 5 indicating ‘strongly agree’ and 1 indicating ‘strongly disagree.’ The overall alpha reliability of the instrument items was calculated as 0.87, indicating high consistency.
The items intended to measure the pre-service teachers’ beliefs about:

* the importance of understanding why a solution to a mathematics problem works,
* following predetermined sequence of steps while solving problems,
* time consuming problems,
* problems that have more than one way of solution,
* the type of mathematics problems emphasized in the Turkish elementary mathematics curriculum and
* the usage of technologic equipments while solving mathematics problems.
The results indicate that both Math Literacy Self-Efficacy Beliefs and Mathematical Problem Solving Beliefs of Preservice Teachers are differentiating regarding to the use of computer in studying math.
Table 1. The percentage and frequency values of Math Preservice Teachers on Computer Use for Mathematics

<table>
<thead>
<tr>
<th>Computer use for mathematics</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52</td>
<td>34,2</td>
</tr>
<tr>
<td>No</td>
<td>100</td>
<td>65,8</td>
</tr>
<tr>
<td>Total</td>
<td>152</td>
<td>100</td>
</tr>
</tbody>
</table>
As represented in Table 1, approximately 34% of the pre-service teachers (N=52) stated that they use computer for mathematic studies, whereas 66% of the participants indicated that they don’t.
Table 2. Results of independent samples t-test in relation to the differentiation of Math Literacy Self-Efficacy measures of Preservice Teachers according to computer use

<table>
<thead>
<tr>
<th>Computer use</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52</td>
<td>98.32</td>
<td>14.10</td>
<td>150</td>
<td>2.915</td>
<td>.01</td>
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<tr>
<td>No</td>
<td>100</td>
<td>92.33</td>
<td>10.81</td>
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</tbody>
</table>
There is a significant difference on math literacy self-efficacy belief points of Preservice Math Teachers regarding their computer use for math studies ($t_{(150)} = 2.915; p<.01$). Preservice teachers who use computer for math studies have better level of self-efficacy beliefs about the mathematical literacy.
Table 3. Results of independent samples t-test in relation to the differentiation on belief on mathematical problem solving measures of Preservice Teachers according to computer use

<table>
<thead>
<tr>
<th>Computer use</th>
<th>N</th>
<th>X</th>
<th>sd</th>
<th>df</th>
<th>t</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52</td>
<td>3.84</td>
<td>.35</td>
<td>150</td>
<td>3.467</td>
<td>.01</td>
</tr>
<tr>
<td>No</td>
<td>100</td>
<td>3.65</td>
<td>.31</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
There is a significant difference on the belief on mathematical problem solving points of Preservice Math Teachers regarding their computer use for math studies ($t_{(150)} = 3.467; p < .01$). Preservice teachers who use computer for math studies have higher average on the belief on mathematical problem solving.
Thanks …

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