Didactic Preconditions for Environmental Education in the Macedonian Secondary Schools

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Abstract

The objective of this research is to determine the basic didactic preconditions for environmental education in secondary schools in the Republic of Macedonia. This was done on the basis of subjective assessment of 972 students from 19 high schools in the Republic of Macedonia. "Knowledge of the environmental education’s goals" (78.92%) and "students’ motivation during the environmental education course" (78.34%) are on the highest level. On the other hand "students’ information about their advancement in the field of environmental education" (51.84%) and "incorporation of the new knowledge in previous one" (65.57%) are on the bottom. In general, didactic preconditions are achieved about 70% in 2002 and 66% in 2009. Almost all didactic conditions are fulfilled on a higher level in the “old” secondary schools than in the “new” ones.

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1. Introduction

Research findings in the field of environmental education in the Republic of Macedonia show that despite reforms, challenges and shortcomings still remain in certain areas. These areas include the quality of teaching programmes (Srbínovski, 2005c; Srbínovski et al., 2007, 2009; Srbínovski & Palmer, 2008; Srbínovski et al., 2010; Abazi et al., 2008, 2009a), the National Strategy for Sustainable Development (Abazi et al., 2009b), textbooks (Srbínovski, 2003b; Srbínovski, 2005c), the level of environmental awareness of students (Ismaili et al., 2009a and 2009b; Jonuzi, 2009; Srbínovski, 2003d, 2004a, 2004b, 2004c, 2005a, 2005c, 2006, Srbínovski et al., 2011), the environmental elements in the schools (Srbínovski, 2005c); the work methodology (Srbínovski, 2003a, 2003c, 2004b, 2004e; 2005b, 2005c), the classrooms and school environment (Srbínovski, 2004d, 2005c) etc.

The focus of our study is the didactic preconditions for environmental education in the new secondary schools in the Republic of Macedonia. These preconditions include the motivation and preparedness of students to study environmental content, their awareness of the goals of environmental education, the correspondence of the study
materials with the students potential, the teachers role in their education, how informed the students are about their progress and how they incorporate the new into the previous knowledge.

2. Methodology

Taking into account the current situation in the education sector, and bearing in mind the results of previous research, we assume that: (i) the new secondary school curriculum does not fulfill the basic didactic preconditions, (ii) the fulfillment of didactic preconditions is at a lower level than in the old secondary school curriculum. We tested the hypothesis through the $\chi^2$ test, while we used the contingency coefficient (C) to calculate the correlation between the old and new secondary school curricula.

We evaluated the basic didactic preconditions based on the students’ answers in a questionnaire (PU-1). The questionnaire was drafted in 1999 when the old school curriculum was in place. In 2009, the questionnaire was filled out by 972 students from the same 19 secondary schools as in 1999.

3. Results and discussion

Srbinovski M. (2005c) defined environmental education as "a process of active learning in which individuals and groups attain elementary knowledge, understanding, and skills for decisive, motivated, responsible, and collective action to achieve and maintain the dynamic environmental balance". Evidently, the definition constitutes numerous elements which can also be found in other sources (Stapp et al, 1969; IUCN, 1970; Belgrade Chapter, 1975; UNESCO, 1978; Lucas, 1980; Ramsey & Hungerford, 1989; Marcinkowski, Volk & Hungerford, 1990; NEEAC & US-EPA, 1996; IEEP etc.). Hence, the ultimate goal of environmentally responsible behavior from students can only be achieved if the aforementioned elements are fully integrated in the curriculum.

The environmentally responsible behavior is affected by numerous factors. The motivation of students to learn about the environment is an important one. According to Vucenov (1982) the motivation is closely interlinked with the understanding of the necessity as well as the purpose of educational material. This condition is a prerequisite for an efficient learning process.

There is no objective way of gauging motivation, therefore we used the answers of the students for this end. (Table 3).

<table>
<thead>
<tr>
<th></th>
<th>Very motivated</th>
<th>Motivated enough</th>
<th>Not enough motivated</th>
<th>Unmotivated</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>105</td>
<td>287</td>
<td>89</td>
<td>2</td>
<td>5</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>115</td>
<td>250</td>
<td>90</td>
<td>26</td>
<td>3</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>220</td>
<td>537</td>
<td>179</td>
<td>28</td>
<td>8</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 23.5769$  
C = 0.1545

Table 1. The students’ motivation to learn about the environment.
Most of the students stated that they are motivated enough. On one hand, the value of $\chi^2$ in the tests indicates that there is a significant margin of difference between students on the new and the old curricula. On the other hand the contingency coefficient (C) indicates that there is a small correlation.

Table 4 shows the students understanding of the goals of environmental learning.

Table 2. Do the students understand the goals of environmental learning?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Somewhat</th>
<th>No</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>330</td>
<td>137</td>
<td>18</td>
<td>3</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>264</td>
<td>200</td>
<td>17</td>
<td>3</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>594</td>
<td>337</td>
<td>35</td>
<td>6</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 19.1231$ \quad C = 0.1392

Most of the participants are of the opinion that they are completely aware of the goals of studying ecological materials. The deducted value of $\chi^2$ shows that we can state with 99 percent of probability correctness that there exists a statistically significant difference between students of the old and new high school curricula with respect to their knowledge of the goals of studying environmental topics. Nevertheless, the value of the contingency coefficient (C) shows that this is a weak correlation.

The next element which is regarded as the main precondition for successful studies is the readiness to study. In other words, does the provided material intended to be learned is in accordance with the intellectual capabilities of the student, how much effort and time does the student need to invest in order to learn the material, what level of knowledge will the student gain etc. Results are given in Table 5.

Table 3. Is the curriculum in sync with the intellectual capabilities of students

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Somewhat</th>
<th>No</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>247</td>
<td>190</td>
<td>45</td>
<td>6</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>220</td>
<td>222</td>
<td>40</td>
<td>2</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>467</td>
<td>412</td>
<td>85</td>
<td>8</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 4.3406$ \quad C = 0.0670

According to 467 survey participants this didactical requirement is completely fulfilled. $\chi^2$ shows that there is no statistically significant difference between students of the old and new secondary schools.

The next element of importance for learning environmental related topics is the “obstacle” that appears in the study process. That is in fact the knowledge about the environment that students must learn. The topics that are very difficult are not pedagogically justifiable because of the possibility of information loss and entropy (disorganization) of the communication system between the text book and the student (Nickovic, 1982). On the other hand, the very difficult obstacles cause disappointment and loss of hope in students about their capabilities and capacity. According to pedagogical rules, this knowledge should be just a little bit more difficult than the students’ abilities. Only these kinds of obstacles can cause intellectual mobility in the person who learns. Student’s opinions for the level of difficulty of the environmental learning materials are shown in Table 6.
Table 4. The difficulty of environmental contents vis a vis the intellectual capabilities of the students.

<table>
<thead>
<tr>
<th></th>
<th>Very difficult</th>
<th>More difficult</th>
<th>Same</th>
<th>Easier</th>
<th>Much easier</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>12</td>
<td>54</td>
<td>226</td>
<td>127</td>
<td>53</td>
<td>16</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>42</td>
<td>96</td>
<td>223</td>
<td>76</td>
<td>42</td>
<td>5</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>150</td>
<td>449</td>
<td>203</td>
<td>95</td>
<td>21</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 42.4840$  $C= 0.2068$

There are statistically significant differences in the evaluated difficulty of the environmental content between the students of the new and the old high school curricula. The value of $\chi^2$ (42.48) for four degrees of freedom is higher than the borderline value which is 9.488 (for 0.05) and 13.277 (for 0.01). 150 students are of the opinion that the environmental content is difficult for their intellectual capabilities. Students easily and quickly overcome the easy obstacles, but the intellectual evolution on this topic stagnates.

The help and support of the lecturers, their instructions and praise are of great importance for successfully mastering the learning material. This is particularly important in the process of independent studies of the students, that is while students search by themselves for (alternative) solutions of the given tasks and problems. Here, we also consider experimental teaching. During each study phase, students should be encouraged to think and they should not be given any ready answers. They should be asked about their thoughts and the reasons behind their thinking, what happens in the next step of the experiment and so on (Stamatovic, 1992). Table 7, shows the student’s views about how much they are encouraged by their teachers in mastering environmental topics.

Table 5. How often do teachers help, and encourage their students in mastering environmental content

<table>
<thead>
<tr>
<th>Year</th>
<th>Nearly always</th>
<th>Sometimes</th>
<th>Almost never</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>269</td>
<td>161</td>
<td>50</td>
<td>8</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>193</td>
<td>212</td>
<td>75</td>
<td>4</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>462</td>
<td>373</td>
<td>125</td>
<td>12</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 24.4754$  $C= 0.1577$

The biggest numbers of the respondents (462) answered that teachers almost always help and encourage them in mastering their environmental studies. Students of the new high school curriculum do not receive help and support as much often by their teachers. Previous studies by Srbinovski M. (2005) show that teachers value their engagement in this area more than their students do. The value of $\chi^2$ shows a considerable statistical difference between the two surveyed groups.

Next important part in mastering the learning material is the feedback. Through feedback, students learn how much of what they learnt is correct or not, and how much of it is enough or not. The results of this didactic precondition are shown in Table 8.

Table 6. How often do teachers inform their students of their progress in the area of environmental education?

<table>
<thead>
<tr>
<th></th>
<th>Regularly</th>
<th>Occasionally</th>
<th>Never</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>145</td>
<td>232</td>
<td>100</td>
<td>11</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>127</td>
<td>217</td>
<td>137</td>
<td>3</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>272</td>
<td>449</td>
<td>237</td>
<td>14</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 7.5179$  $C= 0.0876$
Around 28% of survey participants state that they are regularly informed about their progress in the area of environmental education. On the other hand, teachers are of the opinion that this percentage is around 65% (Srbinovski, 2005). Statistical difference between the opinions of the old and new high school curriculum students regarding feedback about their progress exists just on a level of significance of about 0.05.

Another significant element for successfully mastering the educational material is the process of generalization. This process is manifested through the capability of including the new material in the system of the previously gained knowledge. Included here, are primarily the formation of general opinions and terms for environmental items, deriving conclusions about processes through realizing their connectedness with regard to reason and consequence etc.

Table 7. Students level of including new knowledge into old knowledge

<table>
<thead>
<tr>
<th></th>
<th>Completely included</th>
<th>Partly included</th>
<th>No inclusion</th>
<th>No answer</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>208</td>
<td>246</td>
<td>22</td>
<td>12</td>
<td>488</td>
</tr>
<tr>
<td>2009</td>
<td>167</td>
<td>261</td>
<td>55</td>
<td>1</td>
<td>484</td>
</tr>
<tr>
<td>Total</td>
<td>375</td>
<td>507</td>
<td>77</td>
<td>13</td>
<td>972</td>
</tr>
</tbody>
</table>

$\chi^2 = 19.0192$  

Even though the contingency coefficient is low, there still exists a considerable statistical difference between students of old and new schools in regard with the estimate of this didactic condition. Around 60% of students state that they do not include the newly gained knowledge about environment into their old knowledge at all. In this direction, teaching experience shows that in our schools, students often study less important facts and phenomena, which are often memorized as isolated details. This type of unsystematic knowledge can not turn into valuable skills and capabilities.

By converting the values into scores we got the following percentage values for the fulfillment of the basic didactic conditions with respect to the realization of ecological content in high schools (Figure 1).

![Figure 1. Fulfillment of the basic didactic conditions for the realization of ecological study materials (in %).](chart.png)

Legend: 1 – Student’s motivation for studying ecology  
2 – Knowledge of the environmental education’s goals  
3 – Student’s readiness for studying ecology  
4 – The level of difficulty of ecological material in comparison with students capabilities  
5 – Encouraging students in studying ecological material  
6 – Informing students about their progress  
7 – The incorporation of new knowledge into the existing one
Almost all of these conditions were fulfilled in the old schools. An exception of this is the “level of difficulty of ecological material in comparison with student’s capabilities”. In general, the fulfillment of the investigated didactic conditions in 1999 was around 70.23% and around 66.28% in 2009. This means that there is a decline of about 4%. The biggest downfall (of around 8% and 7%) exists in the participant views about the following two didactical conditions: “the incorporation of new knowledge into the existing one” and “encouragement of the student for studying environmental material”.

4. Conclusion

According to the subjective opinion of the participant "encouraging students in studying ecological material" (78.34%). On the other hand, the conditions which are least fulfilled are: “informing students about their progress” (51.84%) and "the inclusion of new knowledge into the existing one" (65.57%). In general, the overall fulfillment of didactic conditions in 1999 was around 70.23%, and around 66.28% in 2009, which means that there was a downfall of about 4%. The biggest downfall (of around 8% and 7%) exists in the participant views about the following two didactical conditions: “the incorporation of new knowledge into the existing one” and “encouragement of the student for studying environmental material”.

Almost all of the conditions were fulfilled in old schools. An exception of this is the “level of difficulty of ecological material in comparison with student’s capabilities”. There was a considerable difference between students views about 6 didactic conditions, 5 of which were at the level of importance of 0.01 and 1 of which at a level of importance of 0.05. The only condition for which there is no statistically significant difference is the third one, namely: “student’s readiness for studying the environment

References


