

Development of Critical Thinking in Students of Elementary School through Argumentation with the Use of Computer

Yiannis VASSILIADES

**Department of Education, University of Cyprus
Nicosia, Cyprus**

and

Mary KOYTSELINI

**Department of Education, University of Cyprus
Nicosia, Cyprus**

ABSTRACT

Argumentation is an essential way of thinking as it consist a central element in problem solving process, in decision-making, in shaping ideas and beliefs [1] and it is simultaneously considered as one of the key components of critical thinking [2]. In the process of argumentation an individual has to identify and examine the various alternative perspectives, ideas and opinions, to develop and to choose the best and most logical solution and support this solution with data. Therefore, argumentation is an important skill for everyday life, where, quite often, people need to evaluate alternatives and take decisions. Many studies have shown that students are able to develop argumentation but often face difficulties associated with how they construct, organize and present their arguments [3,4]. The development of argumentation with the use of specialize software such as Rationale™ [5], which helps students to create, organize and manage argument maps, may help students overcome these difficulties.

To investigate whether argument mapping, with the use of Rationale™ software, strengthens, encourages and develops argumentation skills, and if this leads to improvement of elementary students' critical thinking, an experimental research was designed and implemented. Three sixth grade elementary classes (N=72) participated in the research for a period of four months. Two classes constituted the first and second experimental group respectively and the third class was the control group. A pre-test and a post-test was submitted to all students participated in the research in order to assess argumentation and critical thinking skills. Both tests were designed, developed and validated by the researcher. After the pre-test both teachers of the experimental groups worked on argumentation activities.

The first experimental group worked in groups of three, with one computer for each group, on argumentation activities using Rationale™ software. The second experimental group worked on the same argumentation activities and in the same way but with pencil and paper, without the use of the software. Activities used for these two groups were developed by the researcher for the purposes of the study. Students in the control group worked on argumentation activities from their Greek language books, without any specific intervention in their learning process.

The pre-test results reveal that most of the students participated in the research (66% below the base) did not acquire basic argumentation and critical thinking skills whereas the results of the post-test show that this number was decreased (47% below the base). The decrease in the amount of students that did not acquire basic argumentation and critical thinking skills was mainly due to the performance of the students of the first experimental group, which used the software. This conclusion is based on the evidence found by the comparison of pre-test and post-test means scores, which shows that there is a statistically important difference only in the first experimental group ($p = 0.001$ for $p < 0.05$), that used the software, with an increase of the mean score of this group.

The research results are rather encouraging and indicate that the use of appropriate software through carefully designed activities and quality practice may promote the development and the use of argumentation and critical thinking skills. The development of argumentation and critical thinking skills should be systematically and consciously organized, through carefully selected quality activities and must be a continuous and permanent objective of every teaching and learning process. The

results of this research revealed the need for conducting a similar research with a larger sample (N=500) and for a longer period of intervention time (one academic year). Such a research is ongoing in Cyprus elementary schools and is to be concluded by the end of this academic year.

Keywords: Critical Thinking, Argumentation, Argument Maps, Rationale™ Software.

REFERENCES

- [1] D. Kuhn, **The Skills of Argument**, Cambridge: Cambridge University Press, 1991.
- [2] T. J. van Gelder, "How to improve critical thinking using educational technology", In G. Kennedy & M. Keppell & C. McNaught & T. Petrovic (Eds.), **Meeting at the Crossroads: Proceedings of the 18th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education**, 2001, pp. 539-548. Melbourne: Biomedical Multimedia Unit, The University of Melbourne retrieved from: <http://www.philosophy.unimelb.edu.au/reason>
- [3] D. Kuhn & W. Udell, "The Development of Argument Skills", **Child Development**, 74, 2003, pp. 1245-1260.
- [4] J. Andriessen, "Arguing to learn". In R. K. Sawyer (Ed.) **Cambridge handbook of the learning sciences**, 2006. Cambridge: Cambridge University Press.
- [5] T.J. van Gelder, "The Rationale for Rationale™", **Law, Probability and Risk**, 6, 2007, pp. 23- 42.