

## The Impact of Courseware with Brain-Based Learning Approach on Students' Cognitive Learning Levels

Elaheh Badiee\*  
Mohammad Reza Nili\*\*  
Yasamin Abedini\*\*\*  
Bibieshrat Zamani\*\*\*\*

### Introduction

With the advent of information technology in the modern era, the use of e-learning has facilitated the education. But in many courses there is a problem with a lack of efficient courseware. Brain-based learning theory has provided effective strategies for increasing efficiency in education that can be well applied in courseware development. One of the most difficult lessons is computer programming. Teachers look for ways to improve student learning in this lesson. The purpose of this study is to investigate the effect of courseware with brain-based learning approach on students' cognitive learning levels in computer programming course compared to conventional courseware.

### Method

This research is a quasi-experimental study with pre-test and post-test design with unequal control group. This study aimed to investigate the effect of courseware designed based on brain-based learning principles on the learning of eleventh grade female students in computer field in Isfahan work-knowledge vocational schools in computer programming course at each of Bloom's cognitive levels. Six 11th grade computer field classes were selected from work-knowledge vocational schools of Isfahan through cluster sampling method. Two classes were randomly assigned to each group, and 20 students were assigned to each of the Experimental 1, Experimental 2, and Control groups. In control group, training was performed in the conventional method. In Experimental1 group, in addition to the

---

\* Ph.D. Student, University of Isfahan, Isfahan, Iran.

\*\* Associate Professor, University of Isfahan, Isfahan, Iran. *Corresponding Author*:

[m.nili.a@edu.ui.ac.ir](mailto:m.nili.a@edu.ui.ac.ir)

\*\*\* Associate Professor, University of Isfahan, Isfahan, Iran.

\*\*\*\* Professor, University of Isfahan, Isfahan, Iran.

conventional method, a brain-compatible researcher-made courseware was used to learning. In Experiment2 group, in addition to the conventional method, a conventional courseware was applied that was available on the market. A researcher-made test containing the objectives of computer programming course at different levels of cognitive learning was conducted as pre-test and post-test for the three groups. The validity of this test was confirmed by a group of computer educators and the Isfahan Computer Training Department, and its reliability was calculated 0.746 by the Kuder-Richardson method. The multivariate analysis of covariance was used to analyze the data.

### **Results**

The results of data analysis showed that brain-compatible courseware significantly increased students' cognitive learning in knowledge and Comprehension levels ( $P < 0.05$ ). Also, the non-brain-compatible courseware significantly reduced students' cognitive learning at the synthesis level ( $P < 0.05$ ), and has not been able to enhance learning at other levels. In addition, brain-compatible software was significantly ( $P < 0.05$ ) more effective than non-brain-compatible courseware at knowledge, Comprehension, application and Synthesis levels of learning.

### **Discussion**

The courseware designed based on Brain-based learning strategies has been able to significantly enhance learner learning at cognitive levels of knowledge, comprehension, application, and synthesis compare to non-brain-based courseware. These findings indicate the remarkable superiority of brain-compatible courseware over non-brain-based courseware.

**Keywords:** Cognitive Learning, Brain-Based Learning, Courseware, Computer Programming

---

**Author Contributions:** Elaheh Badiie collated the data, and analyzed the empirical results and drafted the article; Dr. Nili and Dr. Abedini provided the theatrical framework of this study, and directed the overall research process. Dr. Zamani directed the process of developing the tool and its application. The manuscript was written through the contribution of all authors. All authors discussed the results, reviewed and approved the final version of the manuscript.

**Acknowledgments:** The authors thank all those who contributed to the completion of this study through critique and consultation.

**Conflicts of Interest:** The authors declare there is no conflict of interest in this article. This article extracted from the PhD thesis.

**Funding:** The authors received no financial support for the research.

---