Neuroscientific consideration of the educational effect achieved using illustrated course materials

Kiyoshi Kitahara, Kunihito Usui, Masataka Kaneko, Setsuo Takato

Abstract. It is our pedagogical challenge to introduce various mathematical concept in an educationally acceptable way and to prepare course materials that make students understand that deeply. As described in this paper, we present some of our attempts to verify the effects of using carefully prepared course materials with high-quality graphs in collegiate education of mathematics. Through our experiment, we detected the change of students' brain activity by conducting behavioral observation and neuroimaging simultaneously. In an experiment aimed at helping students understand the concept of an exponential growth comparing exponential and power functions, we prepared several graphs for that purpose. Seven students observed the graphs while we tracked their responses. Simultaneously, we monitored their brain activities using electroencephalography (EEG). Three students altered their judgments, we found, on viewing the triggering graph. Some changes in the trend of their EEG signal were recognized while they were viewing the graph. These results of our experiments show that the use of favorable graphs as course materials might promote learners' reasoning processe