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Title of the Thesis: A Study of the Effect of Logical Thinking Ability and Computer Based Instruction Using Active Learning Techniques on Students' Achievement of Basic concepts in Organic Reaction Mechanism

ABSTRACT

The present quasi-experimental study investigated the effect of logical thinking ability and computer-based instruction using active learning techniques on the achievement of basic-concepts in organic reaction mechanism. The study was conducted on 115 student of class XI from the science stream in the age group of 16-17 years. Students in experimental group (N=58) received computer-based instruction using active learning techniques while those present in control group (N=57) were taught by traditional method; largely based on lecture-cum-demonstration method. The investigator designed and developed computer-based instructional package using active learning techniques (e.g. conversation, leading questions, example-problems, guided examples, quizzes and pause procedure etc.) on basic-concepts in organic reaction mechanism. The instructional package was developed largely using PowerPoint format which included animation, use of hypertext, audio and video clips, user control strategy followed by linear and branched navigation techniques etc. The other features of the package were: compatibility, offline mode of functioning, assessing previous knowledge, immediate feedback, interactive example (e.g. showing static and dynamic view of problem), pause procedure after regular interval, summary after the end of each lesson, quiz and frequently asked questions etc.

Some of the major findings of the present study are as follows:

Students' profile in logical thinking ability showed that 23% students were at concrete thinking level, 22% students were at transition thinking level and remaining 55% students were at formal thinking level. Students' performance on two components of the Test of Logical Thinking namely, probabilistic reasoning (22%) and controlling variables (24%) were comparatively low than remaining other three components. On an average, overall performance of students on the five components of logical thinking ability was about 30%.

The findings of the study revealed that interaction effect between instructional methods and logical thinking ability affect the achievement of students in basic-concepts in organic reaction mechanism. For instance, concrete thinkers of Experimental Group ($M = 16.82$, $SD = 3.41$) performed significantly better than their counterpart in the Control Group ($M = 9.90$, $SD = 3.84$), $t(25) = 4.86$. Similarly, the transitional thinkers of Experimental Group ($M = 17.91$, $SD = 3.44$) performed significantly better than their counterpart in the Control Group ($M = 11.53$, $SD = 3.66$), $t(23) = 4.47$. Computer-based instruction using active learning techniques enhanced the achievement of concrete and transitional thinker more than formal thinkers on the post achievement test.

Though the instruction package was much appreciated and welcomed by students yet they suggested that receiving computer-based instruction in standalone (without teacher) for teaching chemistry cannot always be a substitute of regular classroom teaching. The findings of the study have numerous educational implications for teachers, prospective teachers, instructional designers, technology experts and others in the field of education.