

Analysis of variance indicated that overall significant differences ($p < 0.01$) were found due to grade level, the kind of logical principle, the negation mode, grade \times principle, grade \times negation mode, and grade \times principle \times sex. No significant difference was found due to sex or to interactions.

ABSTRACT

Conditional reasoning, being a major component of logical thinking, is very essential for mathematical thinking. Curriculum study groups have recommended the study of the growth of logical abilities in children as well as the promotion of those abilities by direct instruction. Research has dealt with the investigation of the relationship of logical abilities with the variables of grade level, sex, kind of logical principle, negation mode, test item content and general intellectual ability. The variables: kind of logical principle and negation mode seem to have a significant influence on conditional reasoning ability (CRA). Relevant research seems to reflect that a significant gain in logical abilities is gradually attained as students proceed from one grade level to another. Logical ability does not seem to appear abruptly as claimed by Piaget. Research also reveals that logical ability can be promoted by direct instruction at the upper elementary grades (grade 4-6).

The hypotheses of this study stated that there are no significant differences ($p < 0.05$) among means of scores of students on CRA test that could be attributed to grade level, sex, the kind of logical principle, and the negation mode of the conditional statement.

The population for this study consisted of all students (636 students : 325 males and 311 females) in grades seven, nine, and eleven in seven UNRWA and six private schools in Jerusalem and Ramallah areas. The sample, which was selected by the technique of systematic random sampling, consisted of 300 students (100 students from each of grades seven, nine, and eleven).

The instrument used to measure the logical reasoning abilities of students was a 64 item test constructed and developed by the writer. Each test item consisted of a major premise (conditional statement), a minor premise (the antecedent or the consequent or the negation of one or the other), and a conclusion the validity of which is to be judged. The content validity of the test was established and its split-half reliability for the different grades ranged from 0.67 to 0.91.

The dependent variable in this study was conditional reasoning ability. The independent variables were grade level, sex, kind of logical principle, and the negation mode. The design for the study was a $3 \times 2 \times 4$ factorial design. To test the effects of grade level, sex, principle, and negation mode on CRA, the three way analysis of variance with repeated measures was carried out first with the kind of logical principle as the repeated factor and second with the negation mode as the repeated factor. Whenever a significant difference was found, Newman-Keuls comparison test ($p < 0.05$) was used to locate those means which differed significantly.

Analysis of variance indicated that overall significant differences ($p < 0.01$) were found due to grade level, the kind of logical principle, the negation mode, grade x principle, grade x negation mode, and grade x principle x sex. No significant difference was found due to sex or to other interactions.

The findings of this study indicated that the growth of logical thinking from grade seven to grade nine and then to grade eleven was linearly gradual and not abrupt as claimed by Piaget. It was suggested that further research of growth of logical thinking from grade 1 to 12 is needed.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER ONE