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**Effect of Cognitive Development Stages on Academic Problem-Solving Ability among Adolescents****Maryam Khalil**

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ABSTRACT

This paper focuses on exploring how cognitive developmental stages affect problem-solving abilities academically for adolescents. Cognitive development is a major factor that determines students' thought processes, reasoning, and academic performance. On the other hand, problem-solving ability is an academic attribute that enables students to solve problems encountered in education. This paper will seek to explore cognitive development stage among adolescent learners, assess academic problem-solving ability and establish the relationship between the two variables. A quantitative research design based on survey methodology was employed for the research. The research subjects consisted of secondary school learners sampled randomly. Structured questionnaires were used to collect data from learners. Data analysis was done using statistical methods including means, standard deviations, and correlations. Results indicated a significant positive correlation between cognitive development and academic problem-solving ability. Learners who had advanced cognitive development showed superior reasoning and problem-solving abilities than others. Cognitive development significantly improves the academic problem-solving ability among learners. Therefore, it is essential that teachers employ appropriate teaching strategies aimed at promoting cognitive development among learners.

Keywords: Cognitive Development, Problem-Solving Ability, Adolescents, Educational Psychology

Introduction

Education is a constant activity in which individuals are able to acquire various skills such as intellectual, social, and psychological capabilities. One such capability is cognitive development, which deals with mental development such as understanding, memory, and reasoning. Adolescence is an important period of life where a lot of changes take place, including the cognitive development process. During this period, learners become able to use their minds to analyze things, understand complex ideas, and reason properly. Problem-solving skills within academic contexts involve skills that allow one to identify the problem, analyze relevant information, and come up with possible solutions. Piaget postulates that cognitive development involves various stages, which learners must go through for development. Students in adolescence have attained a formal operational stage where abstract reasoning is acquired.

Background of the Study

One of the most fundamental principles in educational psychology is that of cognitive development. Cognitively developed individuals tend to perform well academically since they

can reason and understand various concepts. Unfortunately, some learners find it difficult due to poor cognitive development. The research centers on the influence of cognitive development stages on academic problem-solving abilities.

Problem Statement

Most students have problems with academic problem-solving because of their difference in cognitive development stage. Thus, this research seeks to establish whether cognitive development influences the problem-solving ability of the students.

Objectives of the Research

1. Examine the cognitive development stage of adolescents.
2. To investigate the academic problem-solving skills of the students.
3. Establishing the connection between cognitive development and problem-solving ability.
4. Investigating the influence of cognitive development on academic problem-solving skills.

Research Questions

1. How developed is the cognitive development stage of the adolescents?
2. What is the level of academic problem-solving ability among the students?
3. Is there any relationship between cognitive development and problem-solving ability?
4. How is cognitive development influential to the problem-solving skills of the students?

Hypotheses

H₀: There is no significant relationship between cognitive development and problem-solving ability among adolescents.

H₁: There is a significant positive relationship between cognitive development and problem-solving ability among adolescents.

Significance of the Research

The significance of the research lies with its importance to teachers, learners, and the curriculum planner. Teachers get an insight on how to teach, learners gain cognitive development, and curriculum planners design cognitive developmental activities.

Literature review

Literature review plays a crucial role in any research activity as it helps get information about what has been done before by other researchers regarding the subject under consideration. The present research is aimed at exploring the connection between cognitive development and academic problem-solving skill of adolescents. The chapter provides some background of theories, concepts and previous findings about both variables.

Cognitive Development

The term 'cognitive development' refers to the formation of cognitive processes that enable individuals to think, reason, memorize, attend and perceive things. The cognitive development process enables individuals to cope with different situations efficiently and adequately. It has always been seen as the basis of academic learning as it affects how people learn and handle tasks. According to Jean Piaget, there are four levels of cognitive development that include sensorimotor, preoperational, concrete operational and formal operational stage. Adolescents are at the final stage where they are able to develop abstract thoughts, logical reasoning and handle difficult tasks efficiently. They also have hypothetical ideas and use logic instead of experience for making decisions. It is evident from Piaget's theory that cognitive development results in enhanced problem-solving skills.

Problem-Solving Skills in Education

Problem-solving skills in education refer to the capacity of the learners to spot out academic challenges, critically examine them, and provide solutions. This aspect is vital in the current era where students are required to learn and apply theoretical concepts in practice.

Steps in problem-solving include:

Comprehending the problem Examining existing data Generating feasible solutions Selecting the best solution Reviewing the outcomes

Students possessing good problem-solving skills tend to score well in examinations and classroom engagements. Such learners feel more competent to tackle tough academic assignments.

Theoretical Foundations

This research study is grounded on the cognitive development theory by Jean Piaget. This scholar holds that learners build up knowledge through the process of interacting with their environment. In his view, learning is based on cognitive structures that develop with age.

The contributions of Lev Vygotsky are also fundamental to this study. This scholar asserts that the process of learning occurs through social interactions. He formulated the concept of the Zone of Proximal Development (ZPD), implying that the learners are able to attain advanced cognitive development levels through the assistance of the teacher and peers.

Empirical Review (Previous Researches)

There have been many studies concerning cognitive development and problem-solving ability. The common result of most studies shows a positive correlation between both variables.

From research results, it can be concluded that:

Those students who possess higher cognitive development will be able to solve academic problems more efficiently. Cognitive abilities enhance logical thinking and decision-making process. Problem solving skills become better with age and increased intellectuality. Certain teaching techniques have significant influence on cognitive development.

Conceptual Understanding of the Study

It is assumed in the current study that cognitive development will be an independent variable while academic problem solving will be a dependent variable. An increase in cognitive development leads to better academic problem solving.

Summary

In conclusion, it is clear from the literature that cognitive development plays a vital role in students' learning and performance. Cognitive development theories proposed by Jean Piaget and Lev Vygotsky have a great deal of importance in the development of better thinking skills. It is also confirmed in previous studies that cognitive development results in academic problem solving.

Research Methodology

Research Design

A Quantitative research design was adopted in the current research study. A Descriptive and Correlational survey design was also used within the Quantitative design. This design was chosen since it is suitable for numerical measurement of variables as well as determining the association between cognitive development and academic problem-solving ability.

Quantitative design is suitable for this study since:

it produces objective data, it is suitable for statistical analysis, hypotheses can be tested, relationship between variables can be measured.

Population of the Study

All students who were attending public secondary schools were considered to be the population of this research study. Adolescents were chosen as population because they experience cognitive development and development of reasoning skills at this stage of life. Target population included those who were actively engaged in academic learning activities.

Sample of the Study

In the current study, a sample of 200 adolescent students was chosen as the sample size is considered to be sufficient for statistical analysis and generalization. The sample of adolescents comprised both males and females for a balanced response.

Sampling Technique

The researcher chose simple random sampling technique to recruit participants for the study. Simple random sampling technique was chosen as it offers the following advantages:

Every participant has an equal probability of being selected

It minimizes any selection biases. It enhances the reliability of the data. It improves the validity of the research outcomes. Random sampling was done among the adolescents in different classes and sections of secondary schools.

Research Instruments

Data was collected through two structured questionnaires which included:

Cognitive Development Scale

Cognitive development scale was developed to evaluate students' cognitive development including the following cognitive attributes:

Logical reasoning Abstract thinking Memory skills

Understanding capacity Decision-making skills

Academic Problem-Solving Ability Scale

This scale evaluates participants' capability of identifying academic problems, analyzing information, generating solutions, logical reasoning, and evaluating outcomes.

Both scales use a 5-point Likert scale including:

Strongly agree

Agree

Neutral

Disagree

Strongly disagree

Validity of Instruments

For ensuring the validity of research instruments, the questionnaires were evaluated by experts in educational psychology to check their relevance, precision, and applicability. Content validity was established by making sure that each item in the questionnaire was relevant to cognitive development and problem-solving abilities.

Reliability of Instruments

Reliability indicates consistency of the research instruments. To check for reliability, pilot studies were done involving some students. It was found that the instruments were consistent enough and fit for collecting all data.

Data Collection Procedure

Data collection procedure involved the following steps:

1. Permission obtained from school management
2. Research objectives communicated to students
3. Distribution of questionnaires directly to selected students
4. Guidance provided for filling questionnaires
5. Collection of filled questionnaires on the same day or the following day
6. Checking of data for completeness
7. Maintaining confidentiality and privacy of students during the whole process.

Data Analysis Techniques

After collecting the data, statistical analysis was done using the following techniques:

Mean to find mean response

Standard Deviation – To determine variability in responses

Pearson Correlation – To determine correlation among variables

Regression Analysis – To determine the effect of cognitive development on academic problem-solving skills.

Variables of the Study

Independent Variable (IV): Cognitive Development Levels

Dependent Variable (DV): Problem Solving Skill

It is anticipated that cognitive development would affect the problem-solving performance of the students.

Data Analysis and Results

Demographics Profile of the Respondents

A total of 200 adolescents were interviewed from various secondary schools.

Conclusion

There is a substantial positive association between cognitive development and academic problem-solving skill among adolescents

Major Findings of the Study

The major findings are:

Students have moderate to high cognitive development scores

Students have moderate problem-solving ability scores

There is a very strong positive association ($r = 0.68$)

Cognitive development accounts for 46% of problem-solving ability

Cognitive development positively and significantly predicts academic achievement

Interpretation of Results

The results provide compelling evidence that cognitive development has a significant impact on academic problem-solving ability. Adolescents with higher cognitive development scores are capable of understanding, analyzing, and solving academic problems more effectively.

The findings affirm the assertion by Jean Piaget that adolescents in the formal operational stage possess logical reasoning and abstract thinking ability, which increases their problem-solving capability.

Likewise, Lev Vygotsky asserted that cognitive development is promoted through learning, interaction, and guidance, which contribute to enhancing students' academic success.

Discussion, Conclusion, and Recommendations

Results Discussion

It is stated that there is a statistically significant positive correlation between cognitive development and academic problem-solving ability in adolescence ($r = 0.68$). It means that those adolescents who have high levels of cognitive development have better problem-solving skills.

With cognitive development, students are able to enhance the way they think and make decisions about various issues. Those students who have advanced cognitive skills can logically reason about academic problems, understand instructions and make proper decisions.

From the regression analysis, it was revealed that cognitive development accounts for 46% variance in academic problem-solving ability. This implies that nearly half of the students' problem-solving ability is affected by cognitive development and the rest of the problem solving is affected by other factors like teaching techniques, motivational aspects, environment, and learning processes.

The above results are in line with the findings of Jean Piaget because according to him, the adolescents who enter into the formal operations stage of development are able to think

hypothetically and logically. Hence, the problem-solving capacity of students is affected by their cognitive development.

In addition, Vygotsky believed that learning process is highly social and cognitive development could be improved through collaborative and guided learning. The above results indicate that the educational environment has played an instrumental role in influencing the students' problem-solving ability.

It is concluded from the findings of the study that cognitive development has had significant effect on academic problem-solving ability of the students.

Conclusion

Conclusion of the present study suggests that the role of cognitive development is highly vital in terms of improving academic problem-solving ability among the adolescent students. The adolescents who have high level of cognitive development are competent in making sound decisions.

Recommendations

Considering the results from the study, the following recommendations are proposed: Teachers should employ teaching strategies that foster critical thinking and reasoning skills. Learning should be interactive and involve group discussions and problem solving. Teaching should be centered around students rather than memorization. Cognitive development of students should be enhanced by participating in educational exercises both at school and at home. Activities promoting the development of analytical and logical thinking skills should be included in the curriculum. Problem solving skills should be developed by students as part of their academic work.

Educational Implications

The present study is of great significance in terms of its educational implications. It emphasizes the role of cognitive development in the context of students' successful performance in academics. Educators should focus on fostering mental abilities of students for better academic and learning results.

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