

A TOOL FOR MEASURING LOGICAL THINKING OF ADOLESCENTS

By

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Abstract

The Logical Thinking Scale measures an individual's thinking abilities, focusing on deductive and inductive reasoning, pattern detection, and problem-solving. It assesses a person's ability to analyze information, reach conclusions, and make informed judgments. This technique is used in education, psychology, and organizational contexts to test cognitive reasoning abilities. The authors developed logical thinking (2024), and the scale was operationalized based on five major dimensions of rational thinking. Four experts in education and mathematics established the validity of the scale's content, and the pilot study was conducted among undergraduate arts and science students. The validity and reliability of the tool were established in addition to the internal consistency. The Spearman-Brown prophecy of the tool is 0.782. The tool thus developed to evaluate logical thinking is named PoWi's test on Logical Thinking.

Keywords: *logical thinking, reasoning, analogy, aptitude, riddles, blood relation.*

Introduction

Thinking is a mental activity in its cognitive aspect or mental activity with regards to psychological objects. It is the process that allows our minds to participate in mental tasks, including evaluating, reasoning, and reflecting on facts or experiences. It helps us make sense of the world, solve issues, and make decisions. Thinking allows us to

explore options and analyze the consequences of our actions, whether considering the pros and cons of a decision, visualizing different outcomes, or recalling past experiences. It is classified into several forms, including logical thinking for problem-solving, creative thinking for idea generation, and emotional thinking, in which feelings impact our thoughts. Thinking is an essential

ability that allows us to manage our daily lives, adjust to new obstacles, and make sound decisions.

Logical thinking

Logical thinking is a systematic method of reasoning that enables people to examine situations, solve issues, and make sound judgments. It involves breaking down significant problems into smaller, more manageable components and analysing each one step by step. By relying on data, facts, and the transparent development of ideas, logical thinking reduces the influence of biases or emotions that might impair judgment. The process begins with identifying the problem, acquiring relevant information, and evaluating the evidence. From there, logical thinkers draw reasonable conclusions that may be tested or validated. This sort of thinking is significant in different subjects, such as mathematics, science, and philosophy, but it also plays an integral part in daily decision-making and critical thinking.

Need for the tool

Logical thinking is a necessary ability that enhances many aspects of life,

education, and the job by encouraging effective problem-solving, decision-making, and critical thinking. In everyday life, logical thinking enables people to make informed judgments, manage conflicts, and approach problems rationally. Whether it's financial planning, personal problem solving, or time management, a logical approach ensures that decisions are made based on facts and clear reasoning rather than emotions or feelings. In education, rational thinking is essential for academic achievement. It teaches students to analyse material critically, understand complex ideas, and develop well-reasoned arguments. Whether in physics, mathematics, literature, or social studies, logical thinking aids in the breakdown of complex issues and promotes a deeper grasp of the subject. It also improves the analytical skills required for writing essays, conducting research, and solving mathematical difficulties. Logical thinking is essential in the workplace for effective issue solving and decision-making. Employees that reason can examine data, identify answers to complex problems, and make informed judgments that help businesses succeed. It also contributes

to effective communication, project management, and strategic planning, enabling professionals to predict issues, assess risks, and build structured solutions. Logical thinking, along with creativity, promotes innovation and increases productivity in every workplace.

Objective of the study

To develop and validate a tool for evaluating the Logical thinking of the college arts and science students.

Methodology

The sample chosen was undergraduate students of the art and science college in Tenkasi district.

Construction of the tool

The concept of logical thinking can be measured through various dimensions as applicable to the students on whom the study will be conducted. The scale was constructed based on five dimensions - Aptitude, Reasoning, Riddles, Blood relationship, and Analogy.

The items were developed based on the concept and reviews related to

logical thinking in newspapers, exam question papers, and online websites.

Initially, 50 items were framed, and the scale was designed as a questionnaire. The correct answer gets 1 point, and the wrong answer gets 0 points. The number of items under the dimensions, namely the aptitude test (10), reasoning (10), Riddles (10), Blood relationship (10), and Analogy (10) are respectively.

Dimensions of logical thinking tool

Aptitude test

A numerical aptitude exam in logical thinking assesses a person's ability to deal with numbers and solve problems using logical reasoning. It assesses individuals' ability to analyze numerical data, execute computations, and apply mathematical concepts in real-world situations, frequently under time constraints. These tests are commonly used in recruitment processes, particularly for professions involving data analysis, finance, engineering, or any other field that requires strong numerical and analytical abilities.

Reasoning

A reasoning examination in logical thinking assesses the capacity to process information and reach logical conclusions. To answer problems, one must process clues, detect patterns, and use deductive reasoning. These questions test critical thinking, allowing individuals to clearly approach complex issues and make well-informed decisions in various situations.

Riddles

Riddles in logical thinking require people to use reasoning and imagination to find solutions. These brain teasers frequently use clever wording or ambiguous settings and require lateral thinking to grasp hidden meanings. Solving riddles improves critical thinking abilities and fosters cognitive growth while also being an engaging and fun activity.

Blood relationship

In logical thinking, a blood relationship is the study and analysis of familial connections and links between individuals based on their lineage or genetic ties. This idea is frequently

used in logical reasoning problems or puzzles that test a person's ability to figure out and identify family relationships.

Analogy

Analogy in logical reasoning refers to comparing two dissimilar terms based on their similarities to grasp relationships better. It clarifies complex ideas by comparing them to everyday events. Analogies are frequently employed in reasoning examinations to improve comprehension and problem-solving abilities by fostering linkages across distinct domains or contexts.

Content validity

"Content validity is a property of the test, referring to the extent to which the test items represent the domain of content the test is intended to measure" (Messick, 1989).

Content validity is the degree to which the items or questions in a measurement instrument accurately represent the concept being measured. It ensures that the assessment addresses all relevant features of the construct and that the items are

appropriate and relevant to the intended goal. Content validity was done by four experts, two from the field of education and two from the field of mathematics. The experts reviewed the adequacy, representative, and ambiguity of the items. The tool was edited and restructured based on the suggestions made by the experts.

Pilot study

The investigator conducted the pilot study with 60 undergraduate arts and science students from the government and private colleges in the Tenkasi district. Students were instructed to select the option of the questions by marking the tick. The investigator scored each item 0 to 1 point.

Item analysis

Item analysis is a statistical technique used to select and reject test items based on their difficulty value and discriminated power. The items with r values 0.27 and above were retained to prepare the final version, which contained 30 items.

Reliability

The reliability of the test measures the degree of consistency with which the

test measures what it does to measure (Patel, 2016). The Spearman Brown prophecy formula is used for calculating reliability coefficients for survey instruments that use Likert-type responses. The coefficient of correlation between each score was calculated, and the correlation coefficient was computed to be 0.782, establishing the reliability of the tool.

PoWi's Logical Thinking Tool

I) Aptitude Test

1) $90-10=100$

$80-20=100$

$30-50=80$

$20-40=?$

a) 20 b) 60 c) 80 d) -20

2) $2+3=10$

$7+2=63$

$6+5=66$

$8+4=96$

$9+7=?$

a) 16 b) 63 c) 144 d) -144

3) $2+4=24$

$13+6=16$

$80+2=82$

$67+9=?$

a) 76 b) 69 c) 68 d) 58

a) 125 b) 200 c) 350 d) 500

4) $2 \times 3 = 11$

$5 \times 2 = 17$

$3 \times 4 = 29$

$6 \times 3 = 41$

$6 \times 8 = ?$

a) 62 b) 48 c) 14 d) 2

5) $W + W + W = 36$

$W + O + O = 28$

$O + B = 10$

$B = ?$

a) -6 b) -2 c) 2 d) 4

6) $6B + B = 30$

$CC + CC = 20$

$A + A = 8$

$B + C \times A = ?$

a) 80 b) 40 c) 20 d) 8

7) $25 - S \times 2 = 11$

$A + 3 - I = 12$

$14 + 6 - S = R$

$A + S \times R = ?$

a) 50 b) 100 c) 150 d) 225

8) $G + G + G + G + G = 1000$

$H + G + G = 500$

$G + Q = 250$

$G + H + Q = ?$

II) Reasoning

9) You have 6 eggs .you broke 2, you cooked 2 and ate 2. How many eggs are left?

a) 2 b) 4 c) 6 d) 0

10) A man buys a goat for Rs.60. Then, he sells it for Rs.70. Then he buys it back at Rs.80 but sells it again for Rs.90. How much money did he make?

a) 0 b) 10 c) 100 d) 16

11) A couple went for picnic. They have 5 sons and each son has 7 sister and each sister has 3 babies. So in total how many people went for the picnic?

a) 17 b) 15 c) 10 d) 2

12) When you was 4 years old, your sister was half of your age, now your age is 100 Years old. How old is your sister now?

a) 50 b) 95 c) 97 d) 98

13) There are 5 people in a room. Thief go in that room and kill 4 of those 5

people. How many people actually remain in that room?

- a) 1 b) 4 c) 5 d) 6

14)Four father’s two grandfathers and four sons went to watch a movie what is the minimum number of tickets they need to buy?

- a) 10 b) 6 c) 4 d) 2

III) Riddles

15)What can you hold in your left hand and not in your right?

Ans:-----

16)It Mother’s name is Mrs. Sixty two, son’s name is fifty two, and daughter’s name is forty two. What is name of father?

Ans :-----

17)Two mother’s and two daughters went out for dinner everyone ate one pizza yet only three pizza were eaten in total how is this possible?

Ans: -----

IV) Blood Relationship

18)A man said to a woman, "Your mother's husband's sister is my aunt". How is

The woman related to the man?

- a) Granddaughter b) Daughter
c) Sister d) Aunt

19)Introducing Rajesh, Neha said "His brother's father is the only son of my grandfather". How Neha is related to Rajesh?

- a) Sister b) Daughter
c) Mother d) Niece

20)A man said to a woman, " Your brother's only sister is my mother". What is the relation of the woman with the maternal grandmother of that man?

- a) Mother b) Sister
c) Niece d) Daughter

21)Introducing a man, a woman said, "His wife is the only daughter of my mother ". How is the woman related to that man?

- a) Aunt b) Wife
c) Mother-in-law d) Maternal Aunt

22) Deepak said to Nitin, "That boy playing with the football is the younger of the two brothers of the daughter of my father's wife". How is this boy playing football related to Deepak?

- a) Son b) Brother
c) Cousin d) Nephew

23) A is the mother of B, C is the father of B and C has 3 children. On the basis of the information, find out which of the following relation is correct:

- a) C has 3 daughters
b) C has three sons
c) B is the son
d) none of these

24) Mohan is son of Arun's father's sister. Prakash is son of Reva, who is mother of Vikash and grandmother of Arun. Pranab is the father of Neela and grandfather of Mohan. Reva is wife of Pranab. How is Vikash's wife related to Neela?

- a) Sister b) Niece
c) Sister-in-law d) Data inadequate

V) Analogy

25) Cup: Lip: Bird:?

- a) Fly b) Grass

- c) Forest d) Beak

26) Paw: Cat: Hoof:?

- a) Lamb b) Elephant
c) Lion d) Horse

27) Glove: Hand:

- a) Neck: Collar b) Tie: Shirt
c) Socks: Feet d) Coat: Pocket

28) Apple, Grape, Tomato

- a) Vegetables b) Fruits
c) Acid d) Stems

29) Lucknow, Patna, Bhopal, Jaipur

- a) Shimla b) Mysore
c) Pune d) Indore

30) Wheat, Barley, Rice

- a) Food b) Agricultural
c) Farm d) Gram

Conclusion

The logical thinking scale is a valuable instrument for assessing an individual's capacity to reason, analyze and solve problems rationally. The scale which assesses how well someone utilizes systematic, evidence-based thinking processes can provide

useful insights into their cognitive capacities, problem-solving ability, and decision-making. It assists in identifying areas of strength and

progress in critical thinking, which can be advantageous for academic, professional, and personal growth.

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