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A Study on Cognitive Styles and Personality in Relation to Science Achievement of Rural Secondary School Students, 2016

Abstract

Every citizen of the modern world sees countless manifestations of science and students need to achieve optimally.

The objectives, content and achievements shape the cognitive levels of students. Critical thoughts, quality attitudes and learning opportunities are to be matched for personal development.

Cognitive styles encompass the higher mental processes of human beings. Science has contributed in bringing about changes in thinking attitude, aptitude, creativity and interest. Science education plays a vital role in its development.

The classroom teachers should manage differently abled children in improving their academic achievement. Human memory is not a single vessel to be filled but rather a complex set of interrelated cognitive factors. Hence the variables are considered as important factors in school guidance and counseling.

Keywords: Cognitive styles, Creativity, Intelligence, Science achievement, Differently abled children, Scientific aptitude.

Introduction

Every citizen of the modern world sees the countless manifestations of science all around him. There is no aspect of man's life today which has not been influenced by science one way or the other. Modern science is no longer confined to the surface of this globe; its sphere of achievements has reached beyond the earth.

Each and every student needs to achieve optimally in Science. Each part of the science curriculum such as physics, chemistry and biology needs careful planning. The objectives determine what students are to achieve, in addition to reading and Mathematics, which is presently being emphasized in testing student achievement.

In addition to critical, the student also needs to think creatively. Unique ideas are necessary in many cases to solve problems. The "Tried and True" may not work as solutions. Thus novelty and originality of decisions must be made. Flexibility of ideas is then needed in the decision-making arena.

Students' achievement in science is an important area of personal development. The world of science surrounds the individual with technological improvements, innovations in ideas, and the natural environment. Thus in medical practices and human health in agriculture, in transportation in communication the individual perceives what science has accomplished for the individual.

Science is the product of man's conscious effort to understand and control his environment. Since earliest times, man has been carefully observing the several natural phenomena taking place on him studying their effect and trying to understand the causes of such phenomena.

Science has contributed to bringing about changes in our ways of thinking, attitude, aptitude, creativity, interest and outlook. Hence the science education imparted in our school plays a vital role in the development of individual and in turn the nation. Nowadays, it has become very difficult to impart meaningful science education due to explosion of scientific knowledge. So it will become worse, if we fail to take into account the explosion of knowledge in this age.

Woodburn and Ogbourn consider science as that human endeavor that seeks to describe with even increasing accuracy the events and circumstances which occur or exist within our natural environment.

Science and technology has become a compulsory subject in the school curriculum because of its multifarious value to the individual as well as to the society. Intellectually, it helps us develop consciousness, sharpens our intellect, and makes us develop critical observation and reasoning. It teaches to arrive at conclusions without any emotional prejudice.

Science has played an important role in determining the culture and civilization of a country from time to time. It has a direct influence in dispelling many traditional beliefs and food habits. The report of Indian Education Commission (1968) thus sums up the cultural value of science, "If Science is to be pursued with full vigor and zest and is to become a mighty force in the Indian renaissance, it must derive its 'nourishment from our cultural and spiritual heritage and not bypass it. Science must become an integral part of our cultural and spiritual heritage."

Thus science has multifarious values and helps children to develop scientific attitude that helps them in their day-to-day life and also in different areas of national development. Science has reached a stage where it can create virtually anything including a whole human being from a cloned cell. A day is sooner approaching where science can make humans live on other planets, such as The Mars and The Moon.

The secondary education commission (1953) has recommended that every secondary school pupil should study general science as a compulsory subject so that he gains a basic quantum of scientific knowledge as a part of his general education.

Science along with being a content of knowledge is a method of acquiring knowledge. It helps to sharpen our intellect and promotes intellectual honesty. It makes us

quite systematic in reasoning, evaluation and solving problems to lead a happy, successful and satisfying life.

Need and Significance of the Study

Cognitive style encompasses higher mental processes of human beings including how people know and understand the world, process information, make judgments, decisions and describe their knowledge and understanding to others. The cognitive style includes mental activities like thinking, memory, reasoning, and intelligence.

Thinking is the manipulation of representation of information, which paves way to the formation of mental images. Reasoning is one of the cognitive processes, whereby inferences and implications are drawn from a set of assumptions and applied to specific area of cognitive style.

With the help of thinking, reasoning, and mental images, the students attempt to solve a number of problems that do occur in the process of achievement in any subject. Creativity is the ability of the individual in combining the responses or ideas in a novel way according to their personality backgrounds. The qualitative approach and cognitive styles as a matter are concerned with construction of a mental arena in order to achieve in any field.

The concept of intelligence represents a focal point for psychologists for understanding how people are able to adapt their behavior to the environment in which they live to make optimal educational and vocational choices.

Much of the previous investigations focused on the differences in cognitive styles, creativity, personality and scientific aptitude of students pursuing different majors in their secondary education; it is assumed that the cognitive style which was different than their own for more likely to change to a major which completed their cognitive style.

The need of the study was to find out the impact of cognitive styles and personality on science achievement as the above-said variables are directly correlated in fostering the achievement of science. In turn, these variables help in increasing the rate of achievement in science of all abled children such as underachievers, low achievers, average achievers and high achievers at secondary school level. It is very important that there is an attention required to students who come from rural backgrounds with less infrastructural facilities in schools.

Concept of Cognitive Style

Children vary not only in their ability to learn and their level of achievement, but also in how they learn. Every child evolves a personal way of processing information acquiring knowledge and learning concepts. That is, each child perceives, thinks and remembers according to his or her own unique style.

Cognitive style affects how pupils learn and how they interact in the classroom with peers and teachers. It also influences personality and behavior; it relates to cognitive processes, modes of problem solving, attitudes, values, and social interaction.

Cognitive styles are also viewed as the typical means of problem solving, thinking, perceiving, and remembering (Mesick 1976).

Intelligence is the ability to learn and utilize what has been learned in adjusting to new situations and solving new problems. Intelligence can be defined as the function of the brain. We are born with its growth to maturity and how it is modified by what happens to us. Thus intelligence is not something we are born with; it develops and, at every stage of development, reflects the individual's interaction with his environment.

Concept of Personality

"Personality is the sum of activities that can be discovered by actual observation over a long enough period of time"-Watson.

"Personality is the ultimate reality that organizes and controls his observable behavior. It is the sum total of all the biological innate dispositions, impulses, tendencies and appetites and instincts of the individual, and the acquired dispositions and tendencies-Marton Prince.

Science Achievement

Education plays a vital role in building a society. The modern society cannot achieve its aims of economic genetic technical development and cultural advancement without fully harvesting the talent of its citizens. Educationists thus strive to develop fully the intellectual potential of the student and make efforts to see that their potentialities are fully realized and channelized for the benefit of the individuals and that of the society.

To consider at once the factors affecting science achievement, such as the student's personality traits, general mental ability, creative talent, aptitude, socio-

economic status, locality, medium of instruction and type of school they study.

Statement of the Problem

"A Study of Cognitive Styles and Personality in Relation to Science Achievement of rural Secondary School students."

The study was limited to X standard students of Mangalore district (State syllabus) and the result in their examination had lot of significance to the individual and to the school. The students need to put up an improved performance in the public examinations.

Achievement test in science constructed by the researcher helps them for revision and preparation for their exams, for better performance. For the above reasons, the students of X standard were involved in the present study.

Objectives of the Study

- To study the significant difference between male and female students of a secondary school with respect to cognitive styles and its dimensions (i.e., embedded figure test paper folding intelligence).
- To study the significant difference between male and female students of a secondary school with respect to personality and its dimensions (psychotism, neuroticism, extroverts, lie score).
- To study the significant difference between male and female students of a secondary school with respect to achievement in science scores.

Hypotheses of the Study

- H₁: There is no significant difference between male and female students of a secondary school with respect to cognitive styles and its dimensions (i.e., embedded figure test paper folding intelligence).
- H₂: There is no significant difference between male and female students of a secondary school with respect to personality and its dimensions (psychotism, neuroticism, extroverts, lie score)
- H₃: There is no significant difference between male and female students of a secondary school with respect to achievement in science scores.

Variables Considered in the Study

The following are the variables considered for the present study:

1) Dependent Variable

- a) Achievement in science

2) Independent Variable

- a) Cognitive styles
b) Personality

3) Moderator Variable

- a) Gender (male/female)
b) Locality (rural/urban)

- c) Type of school (government-aided/unaided)

The above variables were selected based on the related literature and self-observation.

Sample of the Study

The study involved a sample of n=200 X standard students of Mangalore district in such a way as to make available all categories of schools. Stratified random sampling technique is used to select the sample for the study.

Table 1. Breakup of Sample in Terms of Variables

S. No.	Variables	Breakup	No. of Students	Total
1	Gender	Boys	100	200
		Girls	90	
2	Locality	Rural	120	200
		Urban	80	
3	Gender	Government	80	200
		Aided	60	
		Unaided	60	

Tools Used for the Study

The following tools were used for data collection:

1. Minnesota Paper Form Board Test (MPFBT)
2. Eysenck's Personality Questionnaire-R (EPQ-R)
3. Achievement Test in Science (ATS)*

Tools and Their Description

The following tools were adopted by the researcher for collecting the required data for the assessment of dependent and independent variables.

Minnesota Paper Form Board Test (MPFPB)

Minnesota paper form board test was designed to measure the cognitive style of the students. It consists of three sub-tests-embedded figures, paper folding, and card rotation tests. The testee has to identify the figure embedded in the problem; he has to imagine the folding and unfolding of pieces of paper and to see the differences in figures on rotation.

Eysenck's Personality Questionnaire-Revised (EPQ-R)

The Eysenck's personality questionnaire-revised was designed to give ready measure of the important personality dimensions, psychotism, extraversion, neuroticism and lie scores. The traits are measured by 90 questions, carefully selected after lengthy item analysis and factor analysis.

The dimensions are conceived of as being quite independent; thus all the theoretically possible combinations of scores may in fact be observed. This EPQ-R test consists of 90 items, which are distributed among four factors-psychoticism, extraversion, neuroticism, and lie scores.

Development of Achievement Test in Science

Since the available tests for the assessment of achievement in science of X standard was not found to be satisfactory in terms of its comprehensiveness and relevance, the achievement test was developed and standardized by the investigator using the standard scientific procedure.

Statistical Techniques Used

The data which were collected from pine secondary schools was analyzed with reference to the objectives stated and hypotheses formulated. The following statistical techniques were used.

- 1) Descriptive statistics such as mean and standard deviation, t-test, and ANOVA were used to study the significant difference among the mean scores of the groups.
- 2) Correlation analysis was used to investigate the relationship between independent variables and dependent variables. Kari Pearson correlation technique was applied and simple relationships were obtained.

- 3) ANOVA test and t-test were applied to investigate the significant and non-significant relationships among the variables.

Major Findings of the Study

1. There is no significant difference between male and female secondary school students in cognitive styles and embedded figure ability.
2. The female secondary school students have higher paper folding ability than male students.
3. There is no significant difference between male and female secondary school students in intelligence.
4. The female secondary school students have higher personality traits than male students.
5. The male secondary school students have higher psychotism dimension than female students.

Limitations of the Study

- The study was limited only to 6 schools in Mangalore district due to geographical constraint.
- The study was limited to the sample of 200 students of X standard due to time constraint.
- The variables chosen for the study were confined to science achievement (dependent variable personality and cognitive styles only).
- The study was limited to X standard students of state syllabus only.
- The study was limited to only the X standard students of the academic year.

Educational Implications

The findings of the present study have clear and meaningful implications for teachers, teacher educators, parents' school guidance, and counsellors and educational administrators. The classroom teachers and teacher educators should manage the differently abled children such as high achievers, average achievers, underachievers, and low achievers in improving their academic achievement, especially science achievement. Teachers should make use of different methodologies of teaching-heuristic method problem solving and project method to improve the student's achievement in science. The guidance and school counsellors should provide guidance services for different types of achievers along with follow-up services to pop up with their potential psychological imbalances and other social factors, especially the creative children are very much in need of counselling services to nurture their creative ability.

Parents must be well informed and aware of the abilities, capabilities, talents, weaknesses and strengths

of their children to provide a suitable environment for their educational nourishment at home. Educational administrators and policy makers should manage the total school system and children effectively by providing self-study materials, promote reading habits, scope for problem solving abilities, competitive spirit sense of educational and occasional aspiration among students of different levels of achievement based on the innate and hidden talents suitably. They should be encouraged and provided a platform to come up in the field of their interest and intellectual abilities, especially in science subject should be nurtured well by providing rich and varied experiences like science project works, science Olympiads, and competitive examinations at national and international levels so that we can overcome the negativities of the children.

It also helps in designing certain learning activities like maze learning techniques, reasoning ability exercises, word association tests, brain storming sessions, and puzzle problems based on convergent and divergent thinking to develop the cognitive styles of students who are at different levels of achievement.

Independent variables such as general mental ability have significant relationships on achievement of science of high school students. Hence these variables may be used on all science students. Greater and active participation of students of different levels of achievement must be ensured by teachers for quick grasping of the concepts and to improve the science achievement of students.

Human memory is not a single vessel to be filled, but rather a complex set of inter-related cognitive factors. The investigator concluded by this study that cognitive style and personality highly influences the achievement of students in science. Therefore, these variables are to be considered as important factors in school guidance and counselling.

Conclusion

Children in a given classroom may not vary only in things they know and in their capabilities of learning but also in which they approach and deal with the given task. The cognitive style can be referred specifically to a person's characteristic pattern of behavior in a particular learning field. The cognitive style represents patterns of individual variation in the mode of perceiving, remembering, and thinking which is to be reflected with consistency in a wide range of learning. Cognitive styles do play a significant role in the science achievement of rural X standard students.

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