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Cognitive Styles of Secondary Level School Teachers of Mathematics

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ABSTRACT

The change in human society is an indispensable phenomenon and to maintain pace with this change in society as a whole the most appropriate medium is education. Cognitive styles have been defined as the way people perceive stimuli and how they use this information to guide their behaviour i.e. thinking, feeling and actions (Hayes and Allinson, 1994). In this paper, an attempt was made to study the cognitive styles of secondary school teachers of mathematics in the Ahmedabad District of Gujarat state. Cognitive styles like thinking, intelligence, perception, remembering, problem-solving, memory, reasoning, etc, affect the teaching and training process. Some of the factors of cognitive styles which are responsible to shape the teacher's behaviour and teaching style. In the present research sample of 80 secondary school teachers of mathematics from the government, schools were taken through a simple random sampling technique. Cognitive style inventory developed and standardized by Jha, P. K. (2001) was used. To find out the significance of the difference between both groups of teachers the ‘t-test was used. Results showed that there is a significant difference between male and female secondary school teachers of mathematics with reference to systematic, intuitive and split cognitive styles.

Keywords: *Cognitive Style, Thinking, Judging, Remembering, Mathematics, Secondary School Teachers and Gender*

Learning is a shared social experience in which the educator creates an enabling atmosphere for students to acquire and apply information. Learning is also a personal and private affair, reflecting mental activity on the part of the learner; it is not something that others can do on their behalf (Pritchard, 2009). Furthermore, learning is a metacognitive process that requires learners to reflect on their diverse experiences and how they behaved in learning circumstances. Every learner has their own method for acquiring and constructing knowledge.

A person's cognitive style is their regular, prominent, or favoured method of thinking (Riding, 1997). Perceiving information, processing information, and applying information are all examples of thinking. The phrase cognitive style refers to a person's typical method of learning or teaching (Sternberg, 1997). The phrases cognitive style, decision-making style, problem-solving style, learning style, mind style, perceptual style, and conceptual pace are identical with thinking style (Zhang and Sternberg, 2005). Cognitive style and intellectual competence are not

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the same things. Cognitive style relates to one's performance style. Intellectual ability, on the other hand, relates to one's degree of performance. Researchers think that an individual's cognitive style remains stable throughout time; however, it may fluctuate depending on the environment. For example, a person may use one cognitive style most of the time yet utilise a different cognitive style to solve an issue or deal with a social setting.

Cognitive Style Dimensions Early investigations by Witkin et al. resulted in the development of cognitive style theories (1962). This research resulted in hypotheses that usually assumed a single dimension of cognitive style with two extremes defined in general terms as Systematic style and Intuitive style by Keen (1973), Mikenney and Keen (1974), and Botkin (1974). The systematic style is connected with logical, reasonable behaviour that employs a methodical, step-by-step approach to thinking, learning, problem-solving, and decision-making. The intuitive style, on the other hand, is connected with a spontaneous holistic and visual approach. These two types, however, did not represent the complete range of people's behaviour in terms of thinking, learning, and, in particular, problem-solving and decision-making. As a result, a multi-dimensional model aiming to represent the complete spectrum was proposed (Martin, 1983). This model included two axes: 1) high systematic to low systematic and 2) high intuitive to low intuitive. Ongoing observational studies, as well as attempts to build measurement techniques for assessing cognitive behaviour, have resulted in an extended version of the initial model, which has resulted in the establishment of the five styles listed below:

1. Systematic style – When tackling an issue, an individual who operates with a systematic style follows a well-defined step-by-step strategy; looks for an overall technique or pragmatic approach; and then creates an overall plan for fixing the problem.
2. Intuitive style – When addressing a problem, the intuitive person employs an unexpected sequencing of analytical stages and relies on experience patterns typified by universalized regions. A person with an integrated style may switch between styles swiftly and easily. Such style shifts appear to be unconscious and occur in a couple of seconds. This "quick fire" capability appears to produce energy and a proactive attitude to issue solving. In fact, integrated individuals are sometimes referred to as "problem hunters" since they continually seek for possible difficulties as well as opportunities in order to develop better ways of doing things.
3. Undifferentiated style – A person with such a style does not appear to recognize or differentiate between the two extremes of style, i.e. methodical and intuitive, and hence does not appear to have a style. He or she will be receptive to directions or guidance from outside sources in a problem-solving situation. Undifferentiated people are quiet, passive, and contemplative, and they frequently seek problem-solving solutions from others.
4. Split style – A person with such a style does not appear to recognize or differentiate between the two extremes of style, i.e. methodical and intuitive, and hence does not appear to have a style. He or she will be receptive to directions or guidance from outside sources in a problem-solving situation. Undifferentiated people are quiet, passive, and contemplative, and they frequently seek problem-solving solutions from others.

Katoch, K.S. and Thakur, M. (2016) highlighted that there is a significant difference between male and female secondary school teachers regarding systematic and intuitive cognitive style. Whereas there is no significant difference was found between male and female secondary school teachers regarding integrated, undifferentiated and split cognitive styles.

Khandagale (2016) discovered that the majority of teacher educators mostly used their moderate left brain. The number of instructors who used their midbrain was substantial, whereas only a handful used their right brain somewhat.

According to Srinivas and Gangadhar (2015), high school Biological Science instructors have three sorts of cognitive styles: divided cognitive style, undifferentiated cognitive style, and integrated cognitive style.

Srinivas and Nagaraju (2014) discovered that high school Mathematics teachers have three types of cognitive styles: split cognitive style, integrated cognitive style, and undifferentiated cognitive style. They also discovered that there was a significant difference in cognitive styles of teachers based on gender and school management type.

Reddy (2013) discovered that there was no significant difference in the cognitive styles of primary school teachers owing to gender variation, but there was a significant difference in the cognitive styles of primary school teachers due to age variation and location variation.

Cataloglu and Ates (2012) discovered a statistically significant difference in the degree to which FI and FD students applied the impulse hypothesis in favour of FI students. Regardless of the testing equipment used in this study, the test score discrepancy between FI and FD pupils remained nearly consistent.

According to Saroja and Amalrai (2012), Biological Science prospective teachers differ in their cognitive style and academic achievement, and there was a significant relationship between cognitive style and academic achievement of Biological Science prospective teachers with reference to personal variables.

Statement of Problem:
The exact problem of the present study is ***"Cognitive Styles of Secondary Level School Teachers of Mathematics"***

THE SIGNIFICANCE OF THE PROBLEM:

Each person has a unique cognitive learning style. Each of us has our unique learning and thinking methods. Understanding these parallels and variances is critical in teaching. Teachers' sensitivity in dealing with individual learners' diversity in cognitive style in his or her classroom may have a substantial impact on aiding learning. Following the discovery of students' relative individual variations in cognitive style in a classroom, the teacher might present a variety of tactics and approaches to determine which appears to be the most practicable in terms of class time and efficacy for children. In other words, if a student's cognitive style is comparable to that of his or her instructor, the odds of the student having a more favourable learning experience are increased. Furthermore, the study will assist school administrators, policymakers, and instructors in developing instructional techniques that will maximize student learning.

Objective:
To know the difference between male & female secondary school teachers of mathematics regarding dimensions of cognitive style i.e. systematic, intuitive, integrated, undifferentiated and split cognitive styles.

Hypotheses:

The following hypotheses were tested in this study:

$H0_1$ There will be no significant mean difference between male and female secondary school teachers of mathematics with reference to systematic cognitive style.

$H0_2$ There will be no significant mean difference between male and female secondary school teachers of mathematics with reference to intuitive cognitive style.

$H0_3$ There will be no significant mean difference between male and female secondary school teachers of mathematics with reference to integrated cognitive style.

$H0_4$ There will be no significant mean difference between male and female secondary school teachers of mathematics with reference to undifferentiated cognitive style.

$H0_5$ There will be no significant mean difference between male and female secondary school teachers of mathematics with reference to split cognitive style.

Design:

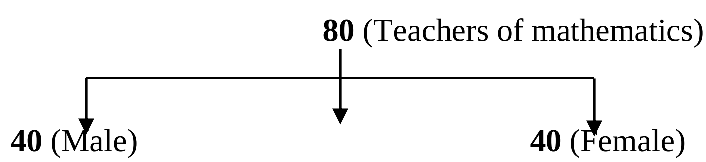
The present study is not possible experimentally because of the nature of the investigation. The researcher adopted quantitative descriptive research for gaining the objectives of the study. It is the quantitative survey research in which the event has already occurred, and the effects of the variables were studied by qualitative analysis.

Variables:

The gender of higher secondary school teachers was taken as the independent variable, i.e. male and female school teachers of mathematics, for the present research work the dimensions of cognitive styles were selected as dependent variables.

Sample:

For the present research work, the investigators have selected 80 teachers of mathematics subject with the help of a random sampling technique with an age range between 30-40 years. They were classified according to their gender groups, i.e., male teachers (40) and female teachers (40). The categorization and details of sample selection are as under:



Tool:

For the collection of the necessary information for this study, investigators used a cognitive style inventory developed and standardized by Dr. Praveen Kumar Jha (2001) measures the ways of thinking, judging, remembering, storing information, decision making and believing in interpersonal relationships. The Cognitive Style Inventory consists of 40 items which measure systematic cognitive style and intuitive cognitive style consisting of 20 items each on a five-point Likert format. Five responses were categorized as totally disagree (1), disagree (2), undecided (3), agree (4), and totally agree (5). The minimum and maximum scores on both dimensions range from 20- 100.

Procedure:
With the prior permission of the principals of secondary-level schools, the investigators personally established a good rapport with teachers of mathematics subject. Then researchers explained the importance of research work and collected the data after ensuring their confidentiality. Each subject was provided with a cognitive style questionnaire. The process was repeated for all the teachers of secondary level schools selected for the present study.

Scoring:
In the present study, scoring of the obtained data was done with the help of respective manuals available for the test. The data have been arranged in the respective tables according to the statistical test applied.

Statistical Analysis:
The present study explained the significant difference between two pairs of teachers of the secondary level school 't'-test, Mean and SD were calculated.

RESULTS AND DISCUSSION:

Table:-1 Indicates mean, SD and 't' value between male and female Secondary Level School Teachers of Mathematics for Cognitive styles.

Cognitive style traits	Groups	N	Mean	SD	't' values	Sig. Level
Systematic Style	***Male***	40	162.13	22.41	2.33	*p*<.05
	Female	40	150.22	23.26		
Intuitive Style	***Male***	40	155.46	32.44	0.26	*NS*
	Female	40	157.27	29.62		
Integrated Style	***Male***	40	145.67	14.16	2.61	*p*<.01
	Female	40	153.41	16.31		
Undifferentiated Style	***Male***	40	147.82	19.07	0.44	*NS*
	Female	40	145.96	18.47		
Split Style	***Male***	40	143.17	16.92	3.83	*p*<.01
	Female	40	156.86	14.96		

An analysis of Table 1.1 displayed that the two groups under study, i.e. male and female secondary level teachers of mathematics, differ significantly on cognitive style dimension systematic style. The significant mean difference is to be reported for the systematic cognitive style of mathematics teachers ('t'= 2.33, $p<.05$). Male teachers of mathematics subject have scored a higher mean (M = 162.13, SD = 22.41) than the female teacher of secondary level schools (M = 150.22, SD = 23.26). It may be said that male teachers of mathematics subject have a better systematic cognitive style. Thus, ***H01*** is rejected.

Table 1.2 that the insignificant difference was to be observed between male and female secondary level school teachers of mathematics subject on the intuitive style of mathematics teachers ('t' = 0.26, $p>.05$). Mean scores of male and female school teachers are 15.46 (SD = 32.44) and 157.27 (SD = 29.62), respectively. Based on this insignificant difference, one can conclude that both male and female teachers of mathematics subject have a similar level of intuitive cognitive style. Hence, ***H02*** is accepted.

Furthermore, the results summarized in Table 1.3 that 't' value for the integrated cognitive style is to be observed as significant ('t'= 2.61, *p*<01). The mean scores observed for male teachers are M = 145.67 (SD = 14.16) and for female teachers M = 153.41 (SD = 16.31). The significant mean difference shows a significant difference in the integrated styles of teachers of both groups. Female teacher's mathematics have a greater integrated cognitive style as compared to male teachers. Therefore, ***H03*** was discarded.

It is clear from Table 1.4 that a significant difference is not displayed between male and female teachers of mathematics teachers ('t' = 0.44, *p*>05). The mean value obtained by male and female school teachers is 147.82 (SD = 19.07) and 145.96 (SD = 143.17), respectively. It can be concluded that both groups of teachers have more or less equal cognitive style dimensions and undifferentiated styles. Hence. ***H04*** was sustained.

It is clear from Table 1.5 that a significant difference is to be displayed between male and female teachers of mathematics subject on the split style of teachers ('t' = 3.83, *p*<.01). The mean value obtained by male teachers of mathematics subject is 143.17 (SD = 16.92) and 156.86 (SD = 14.96), respectively. It can be concluded that female teachers of mathematics have more split cognitive style. Thus, H05 was rejected.

CONCLUSION:

The primary goal of this study is to learn about the cognitive styles of male and female mathematics teachers. The study's findings revealed a considerable difference between male and female secondary school mathematics instructors in terms of systematic, integrated, and split cognitive processes. It is critical to regard cognitive styles as the core aim of instruction; consequently, the school and government should establish an environment that fosters educators' talents and develops teachers' potential to the maximum in the teaching-learning process. As a result, they can devise numerous teaching learning tactics to improve teaching effectiveness.

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