Library Progress International *Print version ISSN 0970 1052*
Vol.45, No.2, Jul-Dec 2025: P.406-409 *Online version ISSN 2320 317X*

Original Article *Available online at www.bpasjournals.com*

" Identification Of Cognitive Styles Among Mathematics Prospective Teachers

Shunmuga Selvasivasankari., D[1], Michael J Leo., A (Dr)[2]

Research Scholar, St. Xavier's College of Education (Autonomous), Palayamkottai -627002, Tamil Nadu, India. shunshunmuga@gmail.com, 8939650892

Research Supervisor, & Associate Professor of Education, St. Xavier's College of Education (Autonomous), Palayamkottai -627002, Tamil Nadu, India. amjlsxce@gmail.com, 9994006762

How to cite this article: Shunmuga Selvasivasankari., D, Michael J Leo., A (Dr) (2025). " Identification Of Cognitive Styles Among Mathematics Prospective Teachers. *Library Progress International,* 45(2), 406-409

Abstract: Cognitive styles, an important concept in educational psychology, influence how teachers deliver instruction and how students engage with learning material. Understanding the cognitive styles of prospective teachers, especially in specialized subjects like Mathematics, is essential for developing effective teaching strategies. This study aims to identify the prevalent cognitive styles among Mathematics prospective teachers. Cognitive styles refer to individuals' preferred ways of processing information and solving problems, which significantly affect teaching methods and learning outcomes. The research classifies cognitive styles into three categories: Integrated Style, Undifferentiated Style, and Split Style. Analysis of data from 566 Mathematics prospective teachers showed that 42.6% exhibited an Integrated Style, 21.9% an Undifferentiated Style, and 35.5% a Split Style. These findings have important implications for the design of teacher education programs and instructional strategies in Mathematics education.

Keywords: *Cognitive styles, Systematic Style, Intuitive Style, Integrated Style, Undifferentiated Style and Split Style*

Introduction

Cognitive styles portray how the individual acquires knowledge and processes information. They are related to mental behaviour, which individuals apply regularly when they are solving problems. They affect the way in which information is acquired, sorted, and utilized. It is described as a stable and persistent personality dimension that influences values, attitudes, and social interaction. It is a trait of cognitive processing which is particular to a certain individual or class of individuals. Cognitive styles may affect the personality development of an individual.

According to APA Dictionary of Psychology, cognitive style refers to 'a person's characteristic mode of perceiving, thinking, remembering, and problem solving'. Cognitive style is a concept in cognitive psychology that describes how individuals think, perceive, and remember information. Cognitive style is a person's habitual, prevalent or preferred way of thinking [1] (Riding, 1997). Thinking may involve perceiving information, processing information, and applying information. The term cognitive style is used to refer to a person's habitual way of learning or teaching [2] (Sternberg, 1997). The term cognitive style is synonymous thinking style as are the terms decision-making style, problem-solving style, learning style, mind style, perceptual style, and conceptual tempo [3] (Zhang and Sternberg, 2005). Cognitive style differs from intellectual ability. Researchers believe that an individual's cognitive style is consistent over time; however, it may vary across situational contexts

Review of Related Studies

Research shows that prospective teachers often exhibit diverse cognitive styles, influencing how they approach teaching and learning tasks [1] (Riding, 1997). Martin (1998) identified five types—systematic, intuitive, integrated, undifferentiated, and split—which are useful in understanding teaching behaviour [4]. Ponce-Garcia and Kennison (2013) emphasized that individual differences in cognitive style affect classroom communication and instructional planning [5]. Sternberg (1997) categorized thinking styles as legislative, executive, and judicial, which align with cognitive preferences in teacher trainees [2]. Zhang and Sternberg

(2005) proposed that analytical and creative styles are commonly found among pre-service teachers [3]. Riding (2016) noted that wholist-analytic and verbal-imagery dimensions could predict student-teachers' instructional strategies [1]. The APA Dictionary of Psychology (n.d.) defines cognitive style as a stable mode of information processing, making it essential in teacher training programs [6]. Studies suggest female trainees often prefer systematic styles, while male counterparts may lean towards intuitive approaches [3] (Riding, 2016). IGI Global (n.d.) supports the use of inventories for identifying cognitive styles to personalize teacher education [7]. Overall, identifying cognitive styles enhances teacher effectiveness and learner outcomes [3] (Zhang & Sternberg, 2005).

Cognitive Styles

According to Martin (1998), the Cognitive Styles are classified into five. They are

a) ***Systematic Style:*** Individuals with this style approach problem-solving with a well-defined, step-by-step method. They seek an overall strategy or pragmatic approach and create a comprehensive plan to solve the problem.
b) ***Intuitive Style:*** The individual, whose style is intuitive use an unpredictable sequence of analytical steps in problem-solving. They rely on experience and hunches, exploring and discarding alternatives quickly.
c) ***Integrated Style:*** A person with an integrated style is capable to alter style quickly and easily. Such style changes seem to be unconscious and take place in a matter of seconds.
d) ***Undifferentiated Style:*** A person with such a style appears not to differentiate between the two extremes that is systematic and intuitive and therefore appears not to display a style.
e) ***Split Style****:* An individual with split style shows fairly equal degrees of systematic and intuitive specialization. People with a split style switch between systematic and intuitive processing depending on the context. [4]

Objectives

As the study aims to identify the cognitive styles among mathematics prospective teachers, the following objectives are framed

a) To identify the cognitive styles of mathematics prospective teachers.
b) To explore the types of cognitive styles of mathematics prospective teachers with respect to their gender.

Methodology

The present study employed a sample of 566 Mathematics prospective teachers from the districts of Thoothukudi, Tirunelveli, Tenkasi, and Kanyakumari in Tamil Nadu. The participants were selected using the Simple Random Sampling technique. To assess the cognitive styles of the prospective teachers, the study utilized the *Cognitive Style Inventory* developed by Praveen Kumar Jha (2010). This inventory consists of 40 statements presenting various problem-solving situations, with each statement offering five response options: Strongly Disagree (1), Disagree (2), Undecided (3), Agree (4), and Strongly Agree (5). Participants were instructed to tick one option per statement, reflecting their preferred response. Based on their responses, individuals were categorized into five types of cognitive styles. A score of 81 and above on the systematic scale and below 61 on the intuitive scale indicates a Systematic style, while a score of 81 and above on the intuitive scale and below 61 on the systematic scale indicates an Intuitive style. Individuals scoring above 81 on both scales are considered to have an integrated style, those scoring below 61 on both scales are classified as having an Undifferentiated style, and scores ranging between 61 and 81 on both scales denote a Split style. As the inventory assesses two dimensions namely Systematic and Intuitive, each comprising 20 items, the possible score for each dimension ranges from 20 to 100.

Objective 1: To identify the cognitive styles of Mathematics prospective teachers

Table 1: Identification of Cognitive Styles of Mathematics Prospective Teachers

Cognitive Style	***Frequency***	***Percentage***
Integrated Style	*241*	*42.6*
Undifferentiated	*124*	*21.9*

Split Style	*201*	*35.5*
Total	***566***	***100.0***

Among the 566 Mathematics prospective teachers, the majority (42.6%) exhibit an Integrated cognitive style, suggesting a flexible approach to problem-solving by effectively combining both systematic and intuitive methods. A significant portion (35.5%) shows a Split cognitive style, indicating the ability to alternate between systematic and intuitive strategies based on the context. Meanwhile, 21.9% of the participants fall under the Undifferentiated style, showing no strong preference towards either systematic or intuitive modes of thinking.

Objective 2: To explore the type of cognitive style of mathematics prospective teachers with respect to their gender.

Table 2: Cognitive Style of Mathematics Prospective Teachers with respect to their Gender

			Cognitive Style		
			Integrated Style	***Undifferentiated style***	***Split Style***
Gender	*Male*	*Frequency*	*15*	*15*	*14*
		Percent	*34.1*	*34.1*	*31.8*
	Female	*Frequency*	*226*	*109*	*187*
		Percent	*43.3*	*20.9*	*35.8*

Table 2 presents the distribution of cognitive styles among Mathematics prospective teachers based on gender. Among male participants, 34.1% each exhibit Integrated and Undifferentiated cognitive styles, while 31.8% show a Split style. In contrast, a majority of female participants (43.3%) demonstrate an Integrated cognitive style, followed by 35.8% with a Split style and 20.9% with an Undifferentiated style. These results suggest that Integrated cognitive style is more prevalent among females, indicating a tendency to flexibly adapt problem-solving strategies, while males are relatively equally distributed across all three cognitive styles.

Discussion

a) The findings of the present study reveal that the majority of the participants demonstrated an Integrated cognitive style. It suggests that they are capable of switching flexibly between systematic and intuitive approaches depending on the context. This finding is consistent with previous studies that emphasize the importance of cognitive flexibility in effective teaching and learning [1][3] (Riding, 1997; Zhang & Sternberg, 2005). The prevalence of the Integrated style may be attributed to the dynamic demands of teacher education programs, which encourage the development of multiple thinking strategies. A notable proportion of participants also exhibited the Split style, reflecting a balanced use of both systematic and intuitive approaches without a strong preference for either. This adaptability could be beneficial in diverse classroom scenarios, where teachers must respond to varied student needs using both structured and instinctive methods.

Interestingly, a smaller but significant group of participants showed an Undifferentiated style, indicating a lack of dominance in either cognitive dimension. This may suggest a need for further cognitive development or more tailored pedagogical interventions to enhance strategic thinking in such individuals.

When analyzed by gender, female prospective teachers were found to predominantly exhibit the Integrated style, whereas male participants were more evenly distributed across all three styles. This gender difference may reflect variations in learning experiences, cognitive development, or social expectations, aligning with previous research indicating that females tend to demonstrate higher cognitive flexibility in educational settings [5] (Ponce-Garcia & Kennison, 2013).

Educational Implications

The identification of cognitive styles among Mathematics prospective teachers has important implications for teacher education programs.

- Customised Training: Teacher education programs can be tailored to address the specific needs of different cognitive styles, providing targeted support to enhance teaching effectiveness.
- Instructional Strategies: Understanding cognitive styles can help in the development of instructional strategies that cater to the strengths and preferences of teachers, thereby improving student learning outcomes.

Conclusion

Overall, the results underscore the importance of identifying and nurturing diverse cognitive styles in teacher education programs. Recognizing individual cognitive preferences can aid in designing instructional strategies that not only enhance self-awareness among prospective teachers but also equip them with the cognitive agility required for modern classroom challenges.

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