LEARNING STYLES AND COGNITIVE EQUIVALENCE AMONG ELEMENTARY SCHOOL CHILDREN: A STUDY FROM ANTHRO-PEDAGOGICAL PERSPECTIVE

A THESIS SUBMITTED TO
THE DEPARTMENT OF EDUCATION, JADAVPUR UNIVERSITY,
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ARTS (EDUCATION)

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2024

This Thesis is Dedicated to my Beloved Parents

Mrs. Najira Bibi Khan

&

Mr. Kausar Ali Khan

CERTIFICATE

Certified that the thesis entitled **"Learning Styles and Cognitive Equivalence among Elementary School Children: A Study from Anthro-Pedagogical Perspective"**, submitted by me for the Degree of Doctor of Philosophy in Arts (Education) at Jadavpur University is based upon my work carried out under the supervision of Dr. Lalit Lalitav Mohakud, Associate Professor, Department of Education, Jadavpur University, and that neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere/elsewhere.

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Date: 20.11.2024 Date: 20.11.2024

ACKNOWLEDGEMENTS

First of all, the researcher bows his head to Allah Subna Tala, the omnipotent, omniscient, omnipresent creator and the destructor of everything who created humans and gave the ability to learn, and also teach everything.

The researcher expresses a deep sense of respect and thanks to his loving mother, Mrs. Najira Bibi Khan, and father, Mr. Kausar Khan, who brought him into this world. Their unwavering support, encouragement, and belief in the researcher's potential have been the foundation of his journey. They have sacrificed immensely to provide the researcher with the education and opportunities necessary to reach this point. Their patience, guidance, and love have been a constant source of strength and motivation, especially during the most challenging times. Therefore, the researcher forever grateful for everything they have done and continue to do for him.

The researcher expresses his respect from the core of his heart to his teacher and research supervisor, Dr. Lalit Lalitav Mohakud, Associate Professor, Department of Education, Jadavpur University, Kolkata, India, for his teachings, guidance in all academic, professional, and personal life as well as about teaching research process from his master's degree to date by holding his hands, and supervising this PhD work. The research area first came to his mind, and later on, he inspired the researcher to start working on this area at M. Phil. He is the source of motivation and energy for the researcher. Therefore, the researcher thanks him for everything he has done for him.

The researcher expresses his sincere gratitude to the RAC members, Professor Muktipada Sinha, Professor, and the former HOD, Department of Education, Jadavpur University, Kolkata; Prof. Sridipa Sinha, Professor, Department of Education, University of Calcutta, and Dr. Tausif Biswas, Assistant Professor, Department of Education, Jadavpur University, Kolkata, for their valuable guidance and encouragement throughout this research journey. The researcher extends his heartfelt thanks to Prof. Muktipada Sinha, not only a RAC member but also a cherished teacher from his master's degree program. His teachings, academic guidance, and unwavering support have been invaluable throughout this journey.

The researcher also extends his gratitude to the DRC members Prof. Debjani Sengupta, Former Professor, Department of Education, University of Calcutta and Prof. Jayanti Das,

Professor, Department of Education, University of Calcutta, for their insights, guidance, and support have been invaluable to this work.

The researcher also extends his gratitude to the officials of Jadavpur University, Prof. Suranjan Das, the former Hon'ble vice chancellor; Prof. Prof. Bhaskar Gupta, the Hon'ble Vice Chancellor; Prof. Amitava Datta, the Hon'ble Pro-Vice-Chancellor; Dr. Snehamanju Basu, the Registrar, for allowing pursuing PhD., while working as an Assistant Professor of the university and providing leave while required. Therefore, the researcher gives special thanks to them.

The researcher also extends his thanks to the other university officials, all the librarians, including departmental, central and digital library, and other non-teaching staffs of Jadavpur University, whose direct and indirect help made this research work possible.

The researcher is also deeply grateful to Mr. Sudhan Mondal, TIC, Singhajuly F.P. School, and Mr. Naba Kumar Kar, TIC, Nasipur F.P. School, for permitting to conduct the study, and also to the other teachers of the schools and their cooperation and support in collecting the necessary data.

The researcher extends heartfelt thanks to the students and their parents for their willingness to voluntarily participate in this study. Their cooperation, openness, and commitment have been essential to the success of this research, providing insights that form the core of this work. The research would not have been possible without their valuable contributions and trust in this process. The researcher deeply appreciates the time and effort they dedicated, which has enriched this study and made a meaningful impact on its findings.

The researcher expresses his gratitude to his elder brother, Amir Ali Khan, he has done many things for him, including taking financial responsibility for his studies. The researcher also grateful to his elder sister, Kulsen Begom; younger brother, Nayeem Khan; sister-in-law, Asmani Khan; father and mother-in-law, Mr. Ajijul Seikh and Mrs. Imtiyaj Begom; brothers-in-law, Mr. Shaidul Haque and Mr. Ariyan Seikh; nephew Motin and Aman; niece Sarha and all other family members, including those who have left this world, for their inspirations, moral and emotional supports, which helped him a lot to pursue this degree. The researcher is thankful to his family again for staying with him, giving unconditional support throughout his career, and always blessing him.

The researcher especially conveys his heartfelt thanks to Mrs. Aeysa Khatun, his beloved wife, for being with him for the last three years, giving him emotional support and love in all situations, and helping him with PhD work by assisting with data collection and data entry.

The researcher also expresses profound gratitude and heartfelt thanks to his extended family members in Kolkata and Odisha, especially Dr. Lalit Lalitav Mohakud (LLM Sir), Associate Professor, Department of Education, Jadavpur University, Kolkata; Mrs Ananya Mukhopadhyay, the wife of the supervisor of the researcher, who is also an Assistant Professor of Education at Panihati Mahavidyalays; Uncles and Aunts, Mr. Parshuram Mohakud and Mrs. Sukanti Mohakud, the father and mother of the supervisor of the researcher, and Dr. Dipak Mukherji, and Mrs. Jyoti Mujherjee, the father-and-mother-in-law of the supervisor of the researcher, whose unwavering love and support have been a constant source of strength throughout this journey. A special thanks and love goes to Babu, Karmit Karan Mohakud, the only son of the supervisor of the researcher. He is the first participant in this research work. While developing the CET, the researcher first trialled the research instrument on him. His quiet sacrifice and motivating presence added a soft and loving touch to this work.

The researcher expresses his sincere gratitude and thanks to all the subject experts, who gave valuable inputs in the research. Dr. Dipak Mukherji, Former Reader of Anthropology, N.D. College, Howrah, have given suggestions regarding anthropometric measures. The researcher took some suggestions regarding statistical analysis from Prof. Kamal Krishna Dey, Former professor of Education and Dr. B.N. Pal, Former Associate Scientist. Prof. Vishal Shood, Professor, School of Education, Central University of Himachal Pradesh, suggested including time as a variable in the study. Dr. Mousumi Mukherjee (MBBS), a child specialist, provided important information about children's characteristics. The researcher got help regarding thesis structuring and research design from Prof. T. K. Basantia, Professor of Education, Central University of Jharkhand. Therefore, the researcher thanks them for their valuable suggestions and scholarly input in the study.

The researcher also extends his gratitude to his well-wishers, Prof. N. C. Maiti, Former Professor, Department of Education, University of Calcutta; Prof. Gaynendra Kumar Routh, Professor, Department of Education, and Dean, School of Education, IGNTU; Dr. R. L. Mahapatra, Assistant Professor, Department of Education, University of Burdwan;

Prof. S. K. Behera, Professor, Department of Education, Kazi Nazrul University; Mrs. Keya Chattopadhyay, Associate Professor, Department of Education, Fakir Chand College; Dr. Parthasarathi Mallick, Professor, GM University, Odisha. The researcher has learnt many thigs from them, therefore, he gives a thanks to all of them.

The researcher also expresses his sincere gratitude and thanks to his school, college, and university teachers and private tutors who have shaped his academic path from the beginning to the present.

The researcher gives a special thanks to his senior fellow researcher, Mr. Kamalesh Naskar, for his continuous help, unwavering confidence in the researcher and selfless support. The researcher also extends his special thanks to the other senior and junior fellow researchers, Dr. Md Sahanaj Alam, Mr. Partha Das, Mr. Bikash Chandra Ghorai, Ms. Moumita Ghosh, Mr. Swarup Adhikary, Mr. Subrata Khan, who are the Ph.D. scholar under the same supervisor. They helped the researcher in gathering research related information and proof reading of this thesis. A special thanks also goes to Mr. Khokan Bhowmik, Md. Ahasan Ullah, Mr. Mohaddes Seikh, Mr. Madhu Mangal Nayak. They have stayed with researcher in his house for a week and assisted him in data collection and also assisted in data entry. The researcher also gives thanks to his fellow Ph.D. scholars under the same supervisor: Mrs. Suchitra Ray, Mrs. Fahima Farid, Mr. Anirban Kisku, Mrs. Jhuma Das, Ms. Anjuyara Khatun, Mr. Prahlad Kirtania, Mrs. Jhilik Pakira, Dr. Sankar Sing, Mr. Kalyan Ghorai, and Mrs. Biswajta Mohanty. Their invaluable research discussions, fostering a collaborative environment that has been both inspiring and supportive.

The researcher extends special thanks to his dedicated students, Harun Ansary, Santosh Mahato, for assisting with checking the numerical values in the analysis and interpretations, and preparing the bibliography, and proofreading. The research also thanks his other students, Nabaraj, Kaushik, Pradwip, Prasanta, Prabin, and Saddam, for their assistance with data entry. Their commitment, hard work, and willingness to support this research have been truly instrumental, and the researcher deeply appreciates their contributions to making this study possible.

The researcher also expresses his heartfelt thanks to his colleagues-cum senior and junior brothers and sisters at Jadavpur University, Dr. Mita Howladar, Dr. Tausif Biswas, Dr. Dipty Subba, Mrs. Suparna Mandal Dr. Manikanta Paria, Dr. Bijor Krishna Panda and the other well-wishers, both known and unknown.

The researcher also expresses his heartfelt thanks to his colleagues-cum senior and junior brothers and sisters at Fakir Chand College, Mrs. Monihar Khatu, Dr. MMS Ahamed, Dr. Somnath Roy, Dr. Malyaban Chattopadhyay, Dr. MM Amin, Mrs. Simu Majumder, Mrs. Mousumi Kanjilal and the other well-wishers, both known and unknown.

The researcher extends heartfelt thanks to his dear friends, Mr. Firoj Khan, SACT at Purbasthali College, and Mr. Shyamal Debnath, SACT at Barrackpore Rastraguru Surendranath College, for their unwavering motivation and support throughout this journey. Their encouragements have been invaluable in bringing this research to fruition. The researcher deeply appreciates their friendship, and the positive impact they've had on this work.

The researcher extends his heartfelt thanks to his villagers, whose encouragement has been invaluable.

The researcher also thanks to the thesis binders, whose meticulous work and attention to detail have given this document a professional finish, allowing it to be presented with care and pride.

Finally, the researcher thanks the thesis examiners and sincerely appreciates their insightful feedback.

Date: 20.11.2024 SHARIF KHAN

Place: Jadavpur

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Abbreviations Used

AC:	Abstract Conceptualization
AE:	Affective Equivalence
ALS:	Auditory Learning Style
ANOVA:	Analysis of Variance
Asymp. Sig.:	Asymptotic Signification/Probability Value
BMI:	Body-Mass Index
CE:	Cognitive Equivalence
CET:	cognitive equivalence tests
df:	Degrees of freedom
ECE:	Early Childhood Education
F:	ANOVA
FE:	Functional Equivalence
FEQ:	Father's Educational Qualification
FiE:	Fiat Equivalence
H.M:	Headmasters
IQ:	Intelligence Quotient
KLS:	Kinaesthetic Learning Style
KLSI:	Kolb Learning Styles Inventory
Ku:	Kurtosis
K-W test:	Kruskal-Wallis Test
LS:	Learning Style
LSs:	Learning Styles
LSS:	Learning Style Scale
LSQ:	Learning Style Questionnaire
LASSI:	Learning and Study Strategies Inventory
LSD:	Least Significant Difference

LSI:	Learning Style Inventory
MBTI:	Myers-Briggs Type Indicator
MCE:	Model-based Cognitive Equivalence
MCET:	Model-based Cognitive Equivalence Test
MEQ:	Mother's Educational Qualification
MKO:	More Knowledgeable Others
MMLS:	Multi-Modal Learning Style
N:	Total Number of Participation
NE:	Nominal Equivalence
OCE:	Overall Cognitive Equivalence
PCE:	Picture-based Cognitive Equivalence
PCET:	Picture-based cognitive equivalence test
PE:	Perceptible Equivalence
PP:	Pre-Primary
P:	Probability Value
R:	Multiple Correlation
RAC	Research Advisory Committee
RWLS:	Read/Write Learning Style
RO:	Reflective Observation
RW:	Read/Write
Sk:	Skewness
SD:	Standard Deviation
Sig.:	Significance
Std. Error:	Standard Error
t:	t-test
TSs:	Teaching Strategies/Styles
U:	Mann-Whitney U test statistics
VAK:	Visual, Auditory, and Kinaesthetic

VARK:	Visual, Auditory, Read/Write and Kinaesthetic
VLS:	Visual Learning Style
WBBPE:	West Bengal Board of Primary Education
WCE:	Word-based Cognitive Equivalence
WCET:	Word-based cognitive equivalence test
$X^{2:}$	Chi-square Statistics
YY;MM:	Years and Months
ZPD:	Zone of Proximal Development

Preface

This thesis is submitted to the Faculty of Arts, Jadavpur University for the degree of Doctor of Philosophy in Arts (Education). I have completed this study under the supervision of Dr. Lalit Lalitav Mohakud, Associate Professor in the Department of Education at Jadavpur University. Submitting this thesis under his guidance is a great pleasure for me. Through this study, I have learnt a lot of fascinating new things, which I have incorporated into this thesis. I have tried to make this thesis appealing and straightforward to grasp. Through this study, I have explored the effects of various Anthro-pedagogical factors on learning style (LS) and cognitive equivalence (CE), which are important aspects of cognitive development. In this study, I included Muslim elementary school children as they are an ethnic community. In this thesis, I have also discussed various facts about the influences of LS on CE and the moderating effects of some selected anthro-pedagogical variables among Muslim elementary school children. To make it easily understandable, I have presented the different sections of this study in six chapters. In Chapter I, 'Introduction', I have discussed the concepts and theoretical perspectives of cognitive development, cognitive equivalence, and learning styles. I also highlighted the links among those theories to build a theoretical background for this present study. I have summarized the previous research in Chapter II, 'Review of Related Literature'. In Chapter III, 'Problem Statement', I presented the rationale for conducting this study, introduced the research problem, specifically mentioned the research objectives and hypotheses, and mentioned the area where this study was delimited. Chapter IV, 'The Methodology of the Study', presents the research design, the study's locale, participants, variables under consideration, data collection and analysis methods, and ethical considerations. In Chapter V, 'Analysis and Interpretation of the Data', I have presented the analysis results and interpretations. Finally, in Chapter VI, 'Major Findings and Conclusions, I have presented the significant findings and discussed those findings in light of the previous research results to draw insights. I also presented the educational implications, limitations, and suggestions for further studies.

SHARIF KHAN

(Research Scholar)

Abstract

The elementary school stage is a significant phase for the human child. It is the initial developmental stage in life, at which various developments occur. The development of cognitive aspects is crucial at this stage. Cognitive Equivalence (CE) and Learning (LS) are two fundamental aspects of human cognition. CE is the logical explanation of similarity. It is an ability that includes other abilities like identifying and classifying. It is the ability to classify stimuli (pictures, models or words) based on commonness and the logical explanation of similarity. CE have a significant role in teaching-learning in the school context. LSs are the ways or, patterns or preferences in learning or processing information. Each individual prefers to learn, process information, memorize and retrieve information in their ways. Therefore, knowing LSs is crucial for the individual as well as for teachers. Like all other cognitive abilities, CE and LSs are also not limited to a particular individual, group, or culture; these are universal. It changes with age and varies person to person, culture to culture. So, it is important to have knowledge about the variations and causes of variations in CE and LSs among different individuals, groups and cultures. The present study is an attempt to study CE and LSs of Muslim elementary school children in West Bengal, India. This study specifically measured the number of stimuli taken to form groups by the participants in each class and the time taken to complete all their CE test. It also measured the influence of Anthro-Pedagogical variables like- age, class, gender, birth type, birth order, BMI, number of siblings, parental educational qualification, family type and family monthly income on CE and LS. Further, it also assessed the influence of LS on CE, and the moderating role of selected anthro-pedagogical variables. For this study, the researcher followed quantitative, Descriptive, observational method with a cross-sectional design. The study included randomly selected 172 Muslim elementary school children studying in Class I, II, III, IV and V. Participants were selected from two government-aided primary schools in Purba Bardhaman District in the state of West Bengal. LS was measured through a Learning Style Inventory translated and adopted into Bengali by Khan and Mohakud (2023). Students were categorized as Visual, Auditory, Read/Write, Kinaesthetic and Multi-Modal Learners. Cognitive equivalence was measured through three cognitive equivalence tests (Picture, Model and Word-based Tests) developed by Mohakud and Khan (2023). The researcher counted the number of stimuli taken to form groups and the time to complete the CE tests. Scores were assigned for overall, test-wise and dimensions-wise CE. The specific dimensions were perceptible equivalence (PE), functional equivalence (FE), nominal equivalence (NE), affective

equivalence (AE) and fiat equivalence (FiE). Data normality was checked through Kolmogrov-Smirnov, Shapiro-Wilk test and Skewness and Kurtosis statistics. Accordingly, data were analyzed using mean, SD, frequency, percentage, t-test, Mann-Whitney U test, ANOVA, Kruskal-Wallis test, and regression analysis in SPSS. Results revealed that most students preferred the read/write learning style overall and class-wise. Compared to lower class students (Class I, II, III), on average, higher class students (Class IV and V) formed groups with more stimuli and took more time to complete the cognitive equivalence tests (CETs). The model and picture test were easier than the word test. Further, the hypothesis testing results showed that except picture based cognitive equivalence (PCE) and PE and NE dimensions, all other aspects of CE significantly increased with age. Except for PE, the trend was similar in terms of class. Further, gender, birth type, birth order, number of siblings, family type, and family income do not significantly influence overall, task-wise, or dimensions-wise CE. In the case of parental educational qualification, no significant variation was found in all the aspects of CE except NE for the mother's educational qualification. Concerning BMI, a significant variation was observed in model-based cognitive equivalence (MCE) and in the AE and FiE dimensions. In the case of LSs, except gender, no other anthro-pedagogical variables significantly influenced LS preferences of Muslim elementary school children. Finally, the result also revealed significant variations in overall cognitive equivalence (OCE), PCE and FE; however, other aspects of CE do not vary significantly concerning LS preferences of Muslim elementary school children. Findings also revealed that selected anthro-pedagogical factors like number stimuli taken to form groups, time taken to complete the CESs, age, BMI and family monthly income do not significantly moderate the relationship between LSs and OCE. The study's findings highlight the importance of understanding individual LSs and CE variations in early schooling. Educators must modify their teaching strategies to address different learning preferences, with particular emphasis on read/write learners, the predominant style recognized. The escalating intricacy of cognitive engagement tasks with age indicates the need for age-appropriate, more challenging activities to facilitate cognitive development. The little impact of socio-demographic characteristics underscores that cognitive equivalence and learning styles are universal, necessitating educators prioritizing task-specific support over external demographic influences.

CHAPTER-I

INTRODUCTION

Chapter-I
Introduction

1.0. Introduction

Education plays an important role in influencing the paths of human existence and the advancement of society. Education is the process by which individuals gain knowledge, attitudes, values, and skills essential for understanding and dealing with their life's challenges and making positive contributions to society (Lamichhane, 2018). It is the key to developing concepts and fostering critical thinking, problem-solving, and creativity (Bailin, 1987). Education is not bound to formal institutionalised education, but it is much more. However, formal education plays a vital role in children's life. There are various stages of formal education, and the elementary school level is vital. It is the early formative stage of life where rapid physical, cognitive, social, emotional, and moral development occurs. It is considered the fundamental years where teaching and learning initially focus on the fundamentals of literacy and numeracy (Muhammadin & Pamungkas, 2024). However, the most significant developmental aspect of this stage is cognitive development. According to Piaget, cognitive development is the change in the cognitive structure and its functions (Cerovac & Keane, 2024). It encompasses modifications in mental abilities and functions. Various aspects of human cognition/cognitive development include thinking, reasoning, memorising, problem-solving, conservation, and cognitive equivalence.

Cognitive equivalence (CE) is a fundamental aspect of human cognition, which refers to the logical explains of similarity. It encompasses skills like recognising and categorising (Chen et al., 2024). CE plays a crucial role in the teaching-learning process within school contexts. Like other cognitive abilities, CE also varies from person to person based on various contexts, which parents and teachers should understand to ensure optimum development. Learning style (LS) is another significant aspect of human cognition that refers to the ways, patterns, or preferences in learning or processing information. Each individual prefers to learn, process, memorise, and retrieve information in their own way (Peña-Escalona, González-Garduño, & Cruz-Tamayo, 2024). Therefore, knowing LSs is crucial for students and teachers. Students can easily choose alternatives if they know their LS, and teachers can design their teaching strategies/styles (TSs) accordingly. It has empirically been proven that learning takes its optimum level when TSs match with the LSs. Interestingly, it enhances cognitive development when pedagogy is aligned with students' LSs (Muñoz-Pinargote & Alcívar-Castro, 2022). The stronger the relationship

between LSs and pedagogy, the more students' interest in learning will be enhanced, resulting in improved cognitive development.

Like all other cognitive abilities, LSs and CE are also not limited to a particular individual, group, or culture; these are universal. Further, these two aspects of cognitive development may be influenced by various factors like individuals' age, gender, physical growth pattern, education, schooling, and family dynamics, including education, culture, etc., collectively called anthro-pedagogical factors. The development and variations observed in LSs and CE are not exceptions for the Muslim children. Like their peers from other cultural backgrounds, Muslim community children also influenced by factors like family dynamics, educational practices, and cultural values whcih shape their cognitive development, highlighting the need for a nuanced understanding of how cultural contexts intersect with cognitive growth. We can gain insights into their learning and educational needs and developmental challenges by examining how these Anthro-pedagogical elements interact and manifest in Muslim children's cognitive growth, i.e. LSs and CE. This exploration is very significance, as it not only contributes to the broader discourse on cognitive development but also aims to foster a deeper understanding of the specific experiences of Muslim children.

The aim of this present chapter (Chapter-I: Introduction) is to orient the readers about different concepts and contexts of the study. It delves into various aspects of cognitive development, discussing the intricate interplay between individual and cultural factors and highlighting the implications for education and policy. This chapter highlights the significance and concept of the elementary school stage, cognitive development of elementary school children, especially of Muslim elementary school children, concept development, conservation, cognitive equivalence (CE), learning styles (LSs), Anthro-pedagogical and theoretical perspectives of the study.

1.1. Elementary School Stage- A Significant Stage of Human Development and Learning

The elementary stage is the most important among the different stages of formal education. It is the beginning of late childhood, marked by the child's entrance into first grade, which is a milestone in every child's life (Mohakud, 2017). Different names know elementary schooling across the globe; however, the age levels are more or less similar. In Western countries, it covers six years (from six to twelve years) after two years of pre-primary schooling. In India, the elementary school stage covers six to fourteen years of age (from

Class I to Class III), which is free, compulsory, and considered a fundamental right of every Indian (Majumdar, 2009). The primary aim of the initial years at this stage is to develop fundamental literacy and numeracy, i.e. reading, writing, and arithmetic (NEP, 2020). The essential cognitive and behavioural functioning elements are set down during this period (Mohakud, 2017), and the child is expected to acquire the rudiments of knowledge for successful adjustments to adult life (Hurlock, 2004). It is one of the most vital stages of human development because a child's future personality and developmental manifestation are greatly earmarked during this stage (Mohakud, 2017). From Piaget's perspective, the elementary school stage begins at the end of the pre-operational stage and lasts until the initial formal operational thoughts. Therefore, the initial ages are the transition years from pre-operational thoughts to concrete operational thoughts and later years from concrete-operational thoughts to formal operational thoughts (Santrock, 2011). That means their thought shifts from intuitive to abstract, egocentric thinking to others' feelings and thinking. At this stage, Piaget also believed children develop conservation, master hierarchical classification and segregation. Children aged 7–14 show increased use of logic or reasoning. According to Vygotsky's theory, it is also the transition phase of egocentric speech to inner speech (Oakley, 2004). Erikson's life-span development theory says it is the fourth psychological stage, starting at six years of age and lasting until puberty, where children direct their energy towards mastering knowledge and intellectual skills. Still, industry versus inferiority is their primary crisis (Santrock, 2011). Erikson proposed that educators should encourage students to discover their hidden abilities. He believed that children could be guided to achieve tasks they initially thought were beyond their capabilities, leading to personal growth and increased self-confidence (Santrock, 2011). At this stage, children learn basic rules and standards for developing reasoning, judgement, and conduct required for social interaction (Ranganathan, 2006).

1.2. Cognitive Development of Elementary School Children

The aim of education is holistic development (NEP, 2020), including cognitive, affective, physical, social, spiritual, moral, and national aspects (Kapur, 2015). Cognitive development is vital in holistic development, involving knowledge acquisition, organisation, processing, memory, problem-solving, reasoning, and executive functioning (Wilson, 2018). It is cognition that differentiates humans from other species. Like humans, other species also possess cognition; however, humans use it more effectively than others. 'Cognition' refers to all our mental activities, thoughts, and thinking (Taylor, 2005). It is

the process of obtaining knowledge, including perceiving, recognising, reasoning, as well as judging (Bransford & Cocking, 2000). According to Piaget, Schema is the smallest unit and structure of cognition, and cognitive development involves changes in this structure and its functions (Taylor, 2005). The early years of human life are the formation stages, where various cognitive abilities and skills are acquired. Children spend much time in school learning multiple cognitive abilities. Therefore, studying cognitive development at this stage is vital because it helps teachers and parents understand children's mental or intellectual abilities to form strategies for enhancing the teaching-learning process and improving output. When teachers can match the lessons to what students can understand, they make sure learning is just right, not too hard, not too easy (Allana, 2012). Cognitive development changes as children age; younger ones do best with hands-on activities and focus, but older children thrive when teachers get those abstract concepts and push higher-order thinking. Teachers should tweak their teaching methods (Ranganatahan, 2006). It helps children get ready intellectually in an environment that boosts academic success. It also fosters critical thinking, creativity and problem-solving skills (Pressley & Harris, 2009). When teachers know how the mind grows, they can make lessons fit each kid's unique needs. That means every student can feel confident and succeed no matter how fast or slow they learn (Gibson, 2005). Moreover, cognitive growth is closely tied to social and emotional development. As children's brains mature, they better understand others' perspectives and manage emotions and social conflicts (Guhn et al., 2016), preparing them for success in school and personal life. Cognitive development helps individuals to categorise and abstract information, facilitating higher-order thinking and problem-solving abilities essential for understanding complex concepts (Hanfmann & Kasanin, 1937). While cognitive development encompasses a broad range of mental processes, one of the central aspects driving childrens ability to understand their world is concept development.

1.3. Concept Development: A Core Process of Cognitive Development

Concept, essential to the evolution of ideas, is the process of obtaining, improving, and implementing ideas (Waxman, 1991). The word 'concept' refers to those attributes that make up one's notion of the object (Baweja, 2017). Concepts act as mental representations that help individuals categorise objects and events, facilitating communication and predictions about the world (Goldstone et al., 2003). Concepts are psychological representations of categories, distinct from meanings, which are contextualised understandings of linguistic expressions (Barsalou et al., 1993). Concepts are vital in

organising memory and facilitating cognitive processes such as identifying objects, forming analogies, making inferences, and expressing theories critical for school performance. Concepts are cognitive frameworks that classify objects, events, or ideas based on common features. A concept is an abstraction, demonstrating its achievement through its use in classification, communication, and problem-solving according to cultural standards.

Concept development is vital for cognitive growth, shaping knowledge organisation, memory reorganisation, understanding and problem-solving abilities while influencing how children understand and interact with their environment (Fisher, 1991; Olson, 1996). It underpins human intelligence, enhancing structured understanding, learning, and effective knowledge application while facilitating communication and knowledge acquisition (Fowler, 1931; Yao, 2004). Concept development helps children organise, understand, interpret, and give meaning to their experiences, forming a foundation for complex thinking, problem-solving, and learning across scientific and social domains through structured representations (Case & Griffin, 1990). Concept development facilitates cognitive operations by grouping object attributes, enhancing expertise, and enabling automatic processing, ultimately shaping our perception and interaction with the environment throughout life (Snyder, Bossomaier & Mitchell, 2004). It reflects children's ability to categorise, define, and understand relationships among objects, indicating their cognitive maturity and adaptability (Reichard, Schneider & Rapaport, 1944). Vygotsky emphasised that concept development significantly influences cognition, perception, emotions, and aesthetics (Van Der Veer, 1994). Therefore, understanding 'concept development' is important for parents and teachers in supporting children's cognitive development and educational improvement.

1.3.1. Process of Concept Development

Psychologists use the phrase concept formation or concept learning to describe the process of acquiring the ability to recognise shared characteristics among groups of objects or occurrences (Boden, 2008). The concept development process involves reasoning, abstract thinking, vocabulary (Gelman, 1998; Frazer, 1994), logical thinking, language expression, model or image interpretation (Tang, 2023), sensory perception, invariant detection, clustering features, and language use (Moore, 2009; Gärdenfors, 2019; Taylor, 1972) across various content areas. Piaget argues that children acquire concepts through schemata to adjust to the environment through assimilation, accommodation, and organisation (Kagan, 2013). The concept development process involves distinct stages and thought

organisation patterns, from bodily sensations to verbal communication, enabling children to analyse complex information, consider diverse perspectives, and develop a robust concept of self and surroundings (Tamashiro, 1979). Vygotsky (1931) emphasised language's role in cognitive development, as it facilitates communication, organisation, and understanding of concepts and bridges personal understanding with cultural knowledge. He viewed concept development as a social process driven by language, where spontaneous everyday concepts interact with scientific concepts, promoting cognitive growth and comprehension of the world. Hilda Taba (1966) identified three essential tasks, i.e., concept formation, data interpretation, and applying principles that develop sophisticated cognition like concept development. Bruner emphasised that learners create new concepts by utilising their prior knowledge through inactive, iconic, and symbolic modes of representations and guiding principles (Takaya, 2013), emphasising that learning is an active social process involving classification and engagement with existing knowledge. Children develop concepts by detecting stable sensory properties and recognising patterns, leading to organised mental representations of categories (Gärdenfors, 2019). In concept acquisition, an individual can differentiate, articulate attributes, utilise language, and apply acquired information (Baweja, 2017). Bruner's research on cognitive development focuses on concept formation and conservation. These two processes are complementary to each other. Concept formation includes rules, prototypes, and exemplars, to create efficient mental representations (Goldstone et al., 2003). He argues that intellectual growth is primarily driven by the development of equivalence or conservation, with the former being more internal and the latter more external (Greenfield & Bruner, 1966).

According to Flavell (2013), the concept development process involves stages like observation, abstraction, generalisations, and differentiation. Observation is the awareness stage which involves noticing events, objects, or experiences. Abstraction discovers common elements through categorisation and pattern recognition. Generalisation applies knowledge to similar situations, noting similarities. Differentiation involves distinguishing or discriminating between them. However, in concept development, categorisation or classification is a fundamental and cohesive force that holds our cognitive realm, allowing us to understand and make sense of our environment (Murphy, 2002 in Power, 2017). It systematically classifies entities into distinct, exclusive classes based on defined rules and their inherent organisation (Farradane, 1955). Breaking down complex concepts into smaller categories fosters effective communication. Harnad (2017) argued that it

reduces the complexity of the perceived environment by assigning identical information to multiple elements while retaining important information and eliminating unnecessary information (Brasselet & Arleo, 2018).

Categorisation is the orderly classification of the universe into related things, while stimuli are segregated into specific groups (Jacob, 2004; Ashby & Maddox, 2005 in Hong & Wang, 2023). Category representations require abstraction to organise and define groups or distributions of information within a mental framework, allowing individuals to classify and differentiate concepts or objects meaningfully (Shepard, 1987; Anderson, 1991 in Hong & Wang, 2023). Category learning is a cognitive process in which humans arrange objects based on common characteristics. As individuals age maturer, they develop preferences for arranging stimuli along specific dimensions (Hong & Wang, 2023; Smith, 1989; Sanborn et al., 2009 in Hong & Wang, 2023). Children and adults discriminately group and treat different things as ‘the same’ or ‘alike’ or ‘equivalent’ (Olver et al., 1966). Equivalence-making is largely a learned achievement, which evolves with cognitive development. Equivalence is essential in the realms of classification and concept creation. It helps in identifying how various examples or representations within a category are seen as equivalent or comparable despite their evident disparities. It is central to organising knowledge. It helps to recognize similarities and differences and facilitates more complex cognitive processes like analogy, classification, and abstraction. Understanding equivalence is key in understanding how individuals group and differentiate concepts. With this in mind, let us now explore the concept of cognitive equivalence and its significance in development.

1.4. Cognitive Equivalence

Rooted in Piaget’s and Bruner’s work, equivalence is crucial in categorisation as the foundation for developing schemas or cognitive structures. Individuals can group and categorise information in more flexible, generalised, and abstract ways by recognising that different objects or concepts share essential properties despite surface differences. This ability to perceive equivalence enables the brain to build organised mental models or schemas that guide further learning and problem-solving. Equivalence is fundamental to developing logical thinking and abstract reasoning, as children learn to categorise objects by invariant attributes rather than perceptual features. The concept of equivalency acts as a link between perceptual comprehension and abstract thinking, allowing more intricate

categorisation and conceptualisation processes. Comprehending cognitive equivalency is essential for assessing the development of logical reasoning and abstract thinking in children, shaped by cultural, educational, and experiential influences. It helps explain how we perceive the world through commonalities, enabling concept generalisation and knowledge application in different contexts. It aids categorisation, which underpins concept formation, abstract reasoning, and cognitive growth. By recognising equivalence, individuals build mental models that reflect invariant properties, enhancing cognitive abilities and conceptual understanding.

Piaget's conservation principles underpin the concept of equivalence, which refers to understanding that quantities remain constant when nothing is added or taken away from something, despite changes in form, appearance, or place (Lambert & Spinath, 2017; Pulaski, 1980; Lefrancois, 1966). Piaget's work showed that equivalence—recognising constancy despite changes—emerges around age seven during the concrete operational stage (7–11 years) (Rothenberg, 1969). Before this, children struggle with conservation due to a limited understanding of compensation and reversibility, relying on pragmatic thinking and developing classification skills (Oakley, 2004; Santrock, 2018). Children develop reversible mental operations and identify various conservation types, including mass, weight, liquid, volume, number, length, and area. Mass and weight remain constant despite changes in shape, form or size, water quantity despite container changes, number despite arrangement, length despite appearance, and area despite shape alterations (Ayaz, Tabassum & Farooq, 2017). Piaget and neo-Piagetian researchers designed tasks to assess the development and sequence of conservation abilities. Success in these tasks signals the concrete-operational stage, where logical thinking emerges for concrete situations, though abstract reasoning is still limited. This stage relies on equivalence, recognising equality despite differing appearances (Babakr, Mohamedamin, & Kakamad, 2019; Fuson, Secada & Hall, 1983). The ability to conserve reflects cognitive development, with its absence indicating immature logical thinking (Flavell, 1963). It involves distinguishing reality from appearance and relevant from irrelevant attributes, fostering trust in reasoning over perception (Shantz & Sigel, 1967).

Bruner's theory of mental representation emphasises the internal cognitive models we use to understand the world. These models allow individuals to categorise experiences and phenomena into coherent systems, shifting from 'narrative thought' (focused on details and sequences) to 'paradigmatic thought' (focused on abstract categorisation and recognising systematic relationships). Cognitive equivalence aligns closely with

paradigmatic thought, enabling individuals to categorise objects or concepts by abstract qualities despite differences in appearance or form. The categorisation process is very important in concept development, enabling individuals to classify comparable items into categories, which is required for advanced cognitive tasks like problem-solving and generalisation. Bruner's focus on mental representations and Piaget's conservation principle highlight the cognitive processes enabling individuals to move beyond apparent differences and recognise deeper, enduring similarity. Cognitive equivalence thus bridges the ability to represent and manipulate internal mental models (Bruner) and the recognition of invariant properties across different contexts (Piaget).

Equivalence-making is, in large measure, a learned achievement, and it may change with growth and development in a manner consistent with more general changes in cognitive development. In a general sense, equivalence is nothing but the similarity or likeness. For example, a child may say that mango and banana are the same because they both are whether green or yellow or both are fruits, or we can make shake from both or both are something to eat. Here, both mango and banana are the same, but the explanation is different/ is given from different perspectives. That means the logical explanation of similarity is different. We called these logical explanations of similarity as 'Cognitive Equivalence'.Cognitive equivalence refers to the ability to recognise that two or more different representations, objects, ideas, or phenomena are equivalent in some way despite differences in appearance, form, or other surface features. It involves understanding that attributes, like quantity, mass, or number, remain unchanged even when visual or spatial apparences changes. Cognitive equivalence involves identifying underlying relationships and patterns across diverse contexts, enabling individuals to recognise similarities and make sense of the world. This process fosters the ability to generalise, categorise, and apply knowledge abstractly, playing a pivotal role in cognitive development.

Cognitive equivalence is the logical explanation of similarity or justification of similarity. These judgements of justifications are based on grouping some words or objects (Khan & Mohakud, 2017; 2018). Collins Dictionary of English (1991: 526) defines equivalence broadly as having the same or similar effect or meaning in value, quantity, significance, etc. The term "equivalence" can be found in fields like mathematics or logic, linguistics, and psychology. Equivalence in mathematics is "a relation which is reflexive, symmetrical, and transitive" (Collins English Dictionary, 1991: 526). Translation studies, a branch of linguistics, examines equivalence in three major areas such as semantic, syntactic, and pragmatic equivalence. Equivalence in translation studies refers to comparing a source text

and its translated version. (Baker, 2011, cited in Bram Vanroy, Arda Tezcan and Lieve Macken, 2019). Generally, semantic equivalence encompasses the entire translation process, from the initial word-level correspondence to the final product. It represents a profound similarity in semantics and gives rise to surface similarities such as form, sound, grammatical structure, features of speech, etc (Linyan Fu, 2017). In the world of computer metadata, there's this thing called semantic equivalence. It's basically about saying that data bits from different vocabulary hold meanings that are pretty much the same. Syntactic equivalence quantifies two approaches; the first is based on word alignment, whereas the second focuses on the alignment of sequences of words (Bram Vanroy, Arda Tezcan & Lieve Macken, 2019). Pragmatic equivalence considers how language is used to achieve specific communicative goals in particular contexts (Ilkhomovich & Muhtasar, 2024).

1.4.1. Bases or Syntax of Grouping

There are different bases for grouping. The basis for these groupings varies chronologically. After the formation of the group, the justification for the formation of the grouping is provided. These justifications of similarity are the equivalence. Five distinct types of logical explanations can be found as similarity judgments. These are the dimensions of equivalence judgement: perceptible, functional, effective, nominal, and fiat equivalence.

Perceptible equivalence: The child can match objects based on unique immediate features such as colour, shape and size based on time or space. The ground of this is the perception that is structural in nature. Its main focus is on the external world, which is concrete in nature. Petrovic et al. (2010) revealed that difficulties in visual functioning determined cognitive functioning. Perceptible responses were classified into two types: perceptible intrinsic and perceptible extrinsic. For example, the perceptible intrinsic response is yellow or green (adjective), and the perceptible extrinsic response is that they are all in the house (preposition-position in time or space).

Functional equivalence: Based on objects or activities, children can balance and assess what they do or what they can do. The ground of this type of response is functional in nature. Its main focus is on the internal thought process, which is abstract in nature. Mandlers (2010) showed that basic language and naming skills might not be sufficient for the prompt emergence of stimulus equivalence and proposed that multiple exemplar training could enhance the equivalence concept. Functional responses were of two types:

functional intrinsic and functional extrinsic. Functional intrinsic response, for example, makes noise (verb). Functional extrinsic response, for example, can be turned on or off (Verb).

Affective equivalence: The child may render the items equivalent based on the emotion they arouse or his evaluation of them. For example, you may like them, or they are very important to us.

Nominal equivalence: The child may group the items by giving a name that is ready-made in the language, for example, both and fruit.

Fiat equivalence: The child may merely state that the items are alike or the same without giving any further information on the basis of his grouping, even when he is prodded, for example- they are the same thing.

1.4.2. Structure or Syntax of Grouping

The bases are more complex at young ages, and with age, they shift towards superordinates. If the attributes used in the grouping are perceptible, then the grouping is likely to be complex. If attributes are functional, on the other hand, the chances are greater that they will be grouped superordinately. Considering the structure or syntax, Olver and Hornsby (1966) distinguished three broader categories of grouping: Superordinate, Complexive, and Thematic.

1. **Superordinate:** Superordinate groupings are put together based on a shared feature or characteristic. For instance, they may all be food, or they might all create noise (and so on). There are two types of these groupings: General superordinate and Itemised superordinate. General superordinate means identifying a common trait among the items in the group. For example, bells and horns, they are ‘both things that make noise’. Itemised superordinate refers to items sharing a broad property where the qualification of each item is clearly stated. For example, ‘a bell makes noise, and so does a horn; the bell goes ding-dong, while the horn goes doo-doo.’
2. **Complexive:** Complexive groupings are formed by using attributes based on local rules rather than universal ones. Based on local rules, various category groupings may be formed with objects. These categories include collections, associations, keyrings, and multiple groupings.

Collections: The grouping of different objects/picture of objects like boat, ruler, doll, bicycle, scissors, saw, shoe, gloves, candle, nails, "some are red, some are gold, and some are yellow. One is white, some are brown, and some are blue.

Edge matchings: "Candle and clock are on a table and this (lamp) is around and this (clock) is…"

Associations: The grouping of boots, cow and gloves as, "These could be leather gloves and leather boots, and you get leather from cows."

Key rings: You built a house with a hammer, nails, screw, the barn is next to the house. By the house you have a tree. You eat the carrots, pie, apple, pumpkin in the house. And you have clock, bird, faucet in the house."

Multiple groupings: Screw, ruler, nails, candle, hammer, taxi, coat, scissors, sword, and bicycle are alike because, "They have a part that you get dressed with, or they have holes in them, or you use them for tools, taxi goes with bicycle."

3. **Thematic:** Thematic groupings are formed based on how the items fit in a sentence, a story, or a theme. This thematic grouping, in fact, most often depends on a sentence for typing items together. The sentence carries a story or thematic lines: "The little boy was eating a banana on the way to the store to buy some peaches and potatoes".

1.5. Learning Styles

The concept of individual difference is now well established and has significant implications in educational contexts. It stated that each individual differs from one another. One of the vital area of these differences lies in persons thinking and learning process. Different persons process, learn and retain information in different ways, which is known as learning styles (LSs). The concept of LSs is rooted in the premise that individuals possess distinct preferences for acquiring and organising knowledge. The term' learning style' refers to an individual's preferred approach to acquiring, processing, and organising information (Gunawan, 2007 cited by Syofyan, 2017; Syukur and Misu, 2014). It is the preferred method for gathering, processing, and analysing information (Kharb et al., 2013). It is not an ability; rather, it is the preference or way of learning. While there have been many attempts to define learning styles, before 1970s, the term 'learning styles' did not exist. At that time, the term cognitive style was widely used to describe the different methods that individuals employed to perceive, think about, and solve problems (Claxton & Murrell, 1987; Griggs, 1991). Researchers later coined the term' learning style' to

identify combined course material and presentations that coincided with particular cognitive styles (Kirby, 1979). There is no agreed-upon single, unifying definition of the term ‘learning styles’ (Claxton & Murrell, 1987, cited in Moussa, 2014). Terms such as ‘cognitive style’, ‘learning style’, and ‘conceptual style’ are interconnected and describe the consistent methods individuals use to process information (Tennant, 2002). Till then, Keefe’s definition was quite popular. It splits learning styles into cognitive, affective, and physiological factors. These factors showed how learners see, interact with, and react to a learning environment (Keefe, 1979). As time went by, psychologists came up with their own ideas. In more times, David Kolb became well-known; he thought the learning style covered all human activities like feeling, reflecting, thinking, and doing (Kolb, 1984). Scarpaci and Fradd (1985) saw learning styles as ways people perceive, organise, and remember information around them. Later on, Stewart and Felicetti (1992) described learning styles as the educational conditions that learners prefer for studying. Nowadays, LSs are understood as the various techniques that students prefer to use to perceive and process information and interact with the learning environment. Therefore, based on the above definitions, LSs can be simply understood as varied ways of processing, learning, and retaining information, which refers to the preferences of learning conditions, situations, or methods.

Understanding learning styles is important in the teaching-learning process because it enables teachers to design strategies that align with students' preferences, which fosters engagement and improve academic achievement (Felder, 1998). Learning styles encompass consistent methods individuals use to perceive and process information, influenced by cognitive, physiological, and environmental factors, making them adaptable rather than rigid (Kharb et al., 2013; Vygotsky, 1978). Research suggests that tailoring instructional strategies to match students’ learning preferences enhances comprehension, retention, and educational outcomes (Freedman, 2015; Chiu et al., 2019, cited in Johnson et al., 2022). Additionally, educators who identify and address diverse learning styles can create inclusive environments that support all learners effectively, as students grasp information in various ways, requiring teachers to adopt flexible methods (Lohri-Posey, 2003; Moussa, 2014). Integrating a variety of teaching strategies promotes deeper understanding and improves academic performance, making the study of learning styles a vital dimension of education (Claxton & Murrell, 1987; Johnson et al., 2022).

Learning styles can be broken down into several components, including sensory preferences, cognitive strategies, and contextual influences. Sensory preferences determine whether learners respond better to visual, auditory, or kinesthetic stimuli, while cognitive strategies encompass how they organise and process information. An analysis of the definitions of LSs reveals some important factors of LSs such as, perceiving; interacting with and responding to learning environments; organisation or processing information; learning; Retaining; and Reproducing. Cognitive, perceptual, psychosocial, and behavioral characteristics are the key elements that a learner should display, interact with, and reciprocate to the learning environment (Keefe, 1979; cited in Johnson et al., 2022). It reveals three primary concepts that constitute learning styles: (1) information processing; (2) instructional preference; and (3) learning strategies (Cassidy, 2004 cited in Nahla M. Moussa, 2014). The factors of LSs may be categorised as external and Internal. External factors are the learning environments from which the information come to us and the ways information presented to us. Internal factors are, how we feel, reflect, think, and act or process with those environments/information.

1.5.1. Types of Learning Styles

Various learning style models have been proposed to describe how individuals prefer to learn, accordingly, individuals are identified with different learning styles. Kagan (1965a) introduced the impulsive and reflective type. He labelled the fast responders as impulsive and the slow as reflective. Witkin (1962) labelled individuals who were influenced by their surroundings as ‘field-dependent’ and those who were less so as ‘field-independent’. Generally, field-independents perform better on cognitive tasks than dependents. There is evidence that some individuals tend to lessen differences between perceived objects while others magnify them, and subjects have been categorised as ‘levellers’ and ‘sharpeners’, respectively (see, for example, Holzman & Klein, 1954). The view that some individuals tend to a verbal way of representing information in memory during learning and thinking, while others use mental imagery, may be traced to the early days of scientific psychology (e.g. Galton, 1883; James, 1890). The terms’ verbaliser’ and ‘imager’ were used to denote individuals at the two extremes of the representational continuum (Cited in R. J. Riding & V. A. Dyer, 1983). Verbal-imagery learning style has been found to be related to performance on a variety of aspects of cognitive tasks in children: initial reading (Riding & Anstey, 1982), mode of presentation (Riding & Ashmore, 1980), type of learning material (Riding & Taylor, 1976; Riding & Calvey, 1981; Riding & Dyer, 1980).

Generally, performance is best on a task when the learning material and mode of presentation match the learning style of the pupil (Cited in R. J. Riding & V. A. Dyer (1983). Kolb's (1984) presented the classical model of learning style, which focuses on how individuals cycle through concrete experiences, abstract conceptualisation, reflective observation, and active experimentation. Based on these, he identifies four primary learning styles: Diverger, Assimilator, Converger, and Accommodator, later revised to include nine new types, such as Initiating, Experiencing, and Reflecting. Gardner's multiple intelligences (1993) further underscores this diversity, proposing at least seven ways individuals process information, linguistic, spatial, musical, logical-mathematical, bodily-kinesthetic, interpersonal, and intrapersonal intelligences. Further, Dunn and Dunn's model (1975) expands learning styles into five stimuli, Environmental, Emotional, Sociological, Physiological, and Psychological Processing. These stimuli include various factors like light, motivation, or perceptual preferences. Later, Gregorc (1979) introduced concrete-sequential, abstract-sequential, abstract-random, and concrete-random as four learning styles. The Felder-Silverman model (1988) proposes five bipolar continua, including the Active-Reflective, the Sensing-Intuitive, the Verbal-Visual, the Sequential-Global, and the Intuitive-Deductive. Additionally, another model defines learning style as a composite of cognitive, affective, and psychological factors, offering scales for deep, surface, and strategic learning approaches (Duff, 2004). Similarly, Fleming's (2001) VARK model identifies visual, auditory, reading/writing, and kinesthetic as primary learning modalities/styles. Visual learners are those, who prefer to learn through visual sensory modes . Auditory learners learn best by listening, learning from speech. Read/write learners learn from reading and writing. Kinaesthetic learners learn best through movement. Ibrahim (2014) categorised students into four learning style groups that consisted of visual, kinesthetic, hearing, and read/write. A student who prefers a particular style in most situations is termed unimodal, while in different conditions, preferring more than one LS is termed a multimodal learner (Hamidon, 2015; Leasa et al., 2018).

1.6. Muslim Children and Their Cognition: Exploring from an Anthro-pedagogical Perspective

Culture is crucial in shaping cognitive development, influencing how individuals perceive, process, and respond to their environment. Learning, reasoning, and problem-solving are deeply rooted in a community's values, beliefs, and practices. Cultural practices and social

interactions influence how children organise their thoughts, ideas, and minds to make sense of the world around them (Gauvain & Richert, 2023). Maccoby and Modiano (1966) argued that children's process of establishing equivalences is shaped by societal norms, with cultures determining similarities beyond physical properties. For instance, while Christians may view beef and pork as similar, Orthodox Jews, Muslims, and Hindus classify them differently due to religious taboos. In industrialised societies, children associate abstract ideas such as time and money. Conversely, rural children concentrate on tangible activities such as agriculture, emphasising perceptual characteristics rather than abstract reasoning, as evidenced by their grouping behaviours. Language influences cognition by incorporating cultural perspectives and classification systems, as Greenfield, Reich, and Olver (1966) observed that linguistic structures affect children's understanding of equivalency.

In industrialised societies, education emphasises hierarchical classification based on abstract similarities, while traditional settings focus on categorisation tied to visible, immediate functions (Bruner, 1966). Environmental and cultural factors also significantly shape learning styles, with cultural background influencing how individuals approach and adapt to learning in diverse contexts (Richardson, 1994; Gardner, 1993; Tsui, 1996; Sauceda-Castillo, 2001; Dunn et al., 1990). Culture (Bruner, 1987) shapes how learners perceive and adapt to new environments (de Vries, 2005). With different cultural symbols and learning tools, students' learning preferences are influenced by their cultural experiences. Educators emphasise the need to address these cultural differences in diverse classrooms (Diaz & Cartnal, 1999; Anderson & Adams, 1992; Hodges, 1988; Torres & Cano, 1994). The family, school, and community environments can change child development in the context of their lives (Wadham & Mansir, 2022). Religion is a primary identity marker that profoundly influences children's moral and cognitive development (Hasan, 2017).

In this light, with its rich traditions and holistic approach, Muslim culture highlights the interplay of culture and cognition. The cognitive development of Muslim children, especially elementary school children, is intricately tied to their cultural, religious, and educational contexts (Yahbani, Akbar, & Sonni, 2024; Masithoh, 2019; Mohammad, Abbasi-Shavazi., Gavin, & Jones, 2001; Abdul, 2012). Islamic education emphasises both spiritual and intellectual growth, fostering a balance between faith and reasoning. Practices like Qur'anic memorisation enhance cognitive skills such as memory, attention, and retention while studying ethical reasoning and jurisprudence (fiqh) strengthens abstract

and logical thinking. Parental involvement and Islamic teachings also shape their thinking and communication from an early age (Sulaiman, Jamsari & Noh, 2014). In many Muslim communities, early childhood education often incorporates religious teachings, such as memorising the Quran, understanding Islamic values, and learning Arabic (Masithoh, 2019), which enhance cognitive skills like memory, attention, and language acquisition (Rosser, 1994). Combined with familial and communal interactions, these practices align with the Anthro-pedagogical perspective, positioning education within the child's cultural and social realities.

The anthropological perspective of cognitive development blends anthropological insights with pedagogical strategies to understand how anthropological factors like- culture and social settings, birth type, BMI, instruction and training influence learning and development (Gabdulchakov & Zakirova, 2020). It also highlights how social interactions and cultural practices in different cultural communities influence cognitive development. From an Anthro-pedagogical standpoint, the education of Muslim children integrates cultural heritage and developmental needs, shaping their cognitive growth. This perspective emphasises the role of family, education, and community in fostering culturally-friendly learning environments that promote cognitive flexibility and innovation. Culturally sensitive teaching methods nurture cognitive development while preserving cultural and spiritual identity. Effective teaching enhances skills like memory, problem-solving, and reasoning while aligning strategies with cultural norms boosts learning outcomes (Nnorom et al., 2020; Muñoz-Pinargote & Alcívar-Castro, 2022). Multicultural and responsive approaches provide frameworks to address diverse needs (Banks, 2006; de Vries, 2005; Ogbu, 1992; Wang et al., 1997). Recognising the diverse experiences of Muslim children across regions, socioeconomic backgrounds, and educational systems is essential for crafting equitable learning opportunities. By comprehending anthropedagogical viewpoints on children's cognition, teachers can provide directions that promote cultural authenticity while providing children with the abilities required to address present day difficulties. This harmonious integration of culture, cognition, and education exemplifies the essence of Anthro-pedagogy.

1.7. Theoretical Perspectives

This theoretical framework explains the existing theories of cognitive development and learning styles that contribute to the present study. The following theories of Jean Piaget,

Lev Vygotsky, Jerome Brunner, Olver and Hurnsby, David Kolb, Neil Fleming and Urie Bronfenbrenner, significantly contribute to the present study. A brief description of the relevance of these theories is presented in the following section.

1.7.1. Theoretical Perspectives of Cognitive Equivalence

Piaget's Theory of Cognitive Development

The German-born American psychologist, Jean Piaget, left a significant mark on the field of developmental psychology in the 20th century. His theory of cognitive development, known as 'Genetic Epistemology,' is a cornerstone of our understanding of how people think, rather than what they think. Piaget's theory, which is applicable to all societies and cultures, considers both nature and nurture (Lefton, 1964). Cognitive development, the changes in the cognitive structure, is a small unit of cognition. Piaget's theory is characterised by two major aspects: the process of cognitive development and the stages of cognitive development.

Piaget's theory describes cognitive development through interaction and adjustment to the environment using schema (Campbell, 2006). When a new situation occurs, the child's mental state of equilibration is disturbed, and they interact with the environment through assimilation or accommodation (Piaget, 1952). This active process restores equilibration (Ghuman, 1989) and organises information to maintain balance in the mental state.

Piaget divided the human life span into four distinct developmental stages: sensorimotor, pre-operational, concrete-operational, and formal-operational (Piaget & Inhelder, 1941). The Sensory-Motor Stage, lasting from birth to 24 months. Infants make sense of the world through physical actions, constructing understanding through sensory experiences and object permanence, which initiates memorisation. The Pre-Operational Stage, which lasts from 2 to 7 years of age. This stage is symbolic and involves children representing the world with words and images. It is characterised by egocentrism, realism, animism, artificialism, and transductive reasoning. The Concrete-Operational Stage, lasting from 7 to 11 years, replaces intuitive thoughts with logical reasoning and allows children to think from concrete situations. It is marked by conservation, classification, seriation, and transitivity. The Formal Operational Stage, occurring from 11 to 15 years, is the final stage, where individuals move beyond concrete experiences and think in abstract and logical ways.

Jerome Brunner's Theory of Cognitive Development

Jerome Seymour Bruner (1915-2016) was an American psychologist who significantly contributed to cognitive and educational psychology. Bruner (1987) recognised three modes of representation: enactive representation (action-based), iconic representation (image-based), and symbolic representation (language-based), which must be present at all stages of development. These three modes of representation (enactive, iconic, and symbolic) are not necessarily hierarchical, but some learning can only be achieved by passing through each type in a specific developmental order. Enactive representation can only demonstrate the past through appropriate motor experiences, while iconic representation uses images or tangible symbols to represent past experiences. Symbolic representation uses design features that can include remoteness or arbitrariness, and language is the most common tool for this type of representation. Enactive mode representation involves judging similarity of things based on their common role in an action or motor experiences. Iconic representation uses images or symbols like maps or diagrams to represent past experiences, replacing actions with images and grouping items based on perceptual likeness. Symbolic mode uses language to represent meaning through writing, scripts, notation, dance, and imaginative play and equivalence is governed by grammatical principles like synonym, super ordination, or syntactic substitutability, allowing analogies to refer to past experiences.

Bruner (1960) postulated that internal representations could be combined to produce different types of thought processes such as 'narrative thought', which is temporally/causally sequential, focused on details and action, and 'paradigmatic thought', which involves mental categorisation by recognising abstract, systematic similarities of unrelated phenomena. These process are the foundation of cognitive equivalence or logical explanation of similarity focusing on the logic given for similarity judgment, not the objects or words. His theory of cognitive development was distinct from other stage-based theories of cognition. Bruner's cognitive development theory suggests that even young children can comprehend complex ideas with proper teaching assistance and any subject can be taught intellectually honestly to any child, regardless of their developmental stage. Early years educators should provide opportunities for all modes of representation to develop these skills within the individual. Bruner advocated for dialogues with children to enable a richer understanding of the child and established the term "spiral curriculum" to revisit and explore various subjects and interests at any stage of development.

Olver and Hornsby's Theory of Equivalence

While many researchers studied human cognition, few focused directly on cognitive equivalence. Rose R. Olver and Joan Rigney Hornsby explored this concept at Harvard's Centre for Cognitive Studies. Their work, featured in the book *Studies in Cognitive Growth* edited by Jerome Bruner, stemmed from their theses: Olver's doctoral dissertation, *A Developmental Study of Cognitive Equivalence*, and Rigney's honors thesis, *"A Developmental Study of Cognitive Equivalence Transformations and Their Use in the Acquisition and Processing of Information*", both submitted to Harvard's Department of Social Relations.

According to them, "cognitive development varies across age groups, and adults thinking more clearly than young people". This is due to cognitive development, helping them to think and think differently. That's why Olver et al. (1956) reasoned that child and adults' group discriminately different things and treat them as 'the same' or 'alike.' Such Equivalence-making is, in large measure, a learned achievement, and it may be expected to change with growth and development in a manner consistent with more general changes in cognitive development. Their studies, spanning ages six to nineteen, trace the development of equivalence from early schooling to college. The materials used allow children to show both the criteria or basis or semantics for equivalence and the syntax or structure of the groups they form.

In a general sense, equivalence is nothing but similarity or likeness. For example, a child may say that mango and banana are the same because they both are green or yellow, or both are fruits, or we can make a shake from both, or both are something to eat. Here, both mango and banana are the same, but the explanation is different/ is given from different perspectives. That means the logical explanation of similarity is different. They called these logical explanations of similarity 'Cognitive Equivalence.'

Young children initially "know" through actions (enactive representation), later develop the ability to depict knowledge through images (ikonic representation), and eventually articulate their understanding using language (symbolic representation). These modes of knowing influence how they establish equivalence: enactive representation emphasises common roles in actions, ikonic representation relies on perceptual similarity, and symbolic representation employs linguistic principles like synonymy and hierarchy. The progression from enactive to symbolic representation, spanning ages six to nineteen, reveals changes in both the semantics (criteria for equivalence) and syntax (organisation of equivalence groups). For instance, enactive groupings may reflect action sequences, ikonic groupings perceptual attributes, and symbolic groupings hierarchical categories.

This developmental trajectory highlights the evolving structure of thought and its underlying organisation.

Cognitive equivalence is the ability to analyse critically and form complexes (groups) and the justification behind grouping. It is the logical explanation of similarity, which can be found among different objects or words. Cognitive equivalence is categorised into two distinct forms: equivalence that can be perceived and equivalence that serves a specific function. Cognitive equivalence is governed by grammatical principles such as synonyms, superordination, or syntactic substitutability. The basis of grouping varies chronologically, with more complex bases at young ages and a striking relation between syntax and semantics. Grouping can be distinguished into three broader categories: Superordinate, Complexive, and Thematic. After group formation, the justification for group formation is provided, which is the cognitive equivalence. There are five distinct types of logical explanations for similarity judgments: perceptible, functional, effective, nominal, and fiat equivalence.

1.7.2. Theoretical Perspectives of Cognitive Equivalence

David. A. Kolb's Experiential Learning Theory

David A. Kolb's Experiential Learning Theory (ELT) is a widely accepted learning style model that focuses on six propositions: learning is a process, learning is never-ending, and learning is a holistic adaptation process (Manolis, 2013). Kolb defines learning as knowledge creation through the transformation of experience (Kolb & Kolb, 2006). The ELT model consists of four learning modes: Concrete Experience (CE), Reflective Observation (RO), Active Experimentation (AE), and Abstract Conceptualization (AC). On the basis of these four components, individuals are categorised into Converger, Diverger, Assimilator, and Accommodator (Kolb, 1984). Convergers prefer to deal with technical issues and are successful in problem-solving, while Divergers review many aspects of concrete situations and organise relationships meaningfully. Assimilators focus on abstract concepts and ideas, preferring research, observation, and discussion as usual strategies or techniques in the learning process. Accommodators are open-minded and adaptable, often preferring creative writing, reading, brainstorming, and station technique (Demir, 2021).

According to ELT, a person's learning style is a dynamic condition that emerges from mutually reinforcing interactions with their surroundings. The resolution of the creative tension between these four learning modalities produces learning. KLSI 4.0 introduced nine new styles: Initiating, Experiencing, Imagining, Reflecting, Analysing, Thinking,

Deciding, Acting, and Balancing (Kolb & Kolb 2011, 2013). These nine KLSI 4.0 learning styles help better characterise the experiential learning cycle, an eight-stage learning cycle with balancing at its centre. The Imagining style favours introspective conceptual learning, while the Deciding style focuses on one optimal course of action.

Neil Fleming's VAK/VARK Model

Neil Fleming's VARK/VAK Model identifies four learning modes: visual, auditory, read/write, and kinesthetic. According to this model (VARK), sensory learning modes are available to student learners, according to this paradigm. However, as every person has a different choice or combination of preferences, one mode is frequently dominant. (Coffield et al., 2004). Learners with a single learning style preference are referred to as unimodal, whereas others preferring a variety of styles are known as multimodal. For multimodal learners, there are sub-classifications for bi-, tri-, and quadmodal learners, who prefer to use two, three, or four styles, respectively (Nasution et al., 2019**).** Visual learners prefer visual stimuli, such as pictures, graphs, maps, and images, and learn best through looking, observing, and writing. Auditory learners benefit from listening and learning from speech; the lecture method is the most suitable method for them. Read/write learners prefer reading and writing, understanding better and remembering information longer when presented in written form (Setiawan, 2019). They enjoy reading books and writing articles, essays, or reports. Kinaesthetic learners prefer moving and learn best by engaging in physical activity. They prefer to play games or juggle things with their hands, and absorb knowledge most effectively in settings where they can participate physically. For them, learner-centred activity, cooperative learning, and project methods are suitable (Heinich et al., 1999; Dunn, 1993; Zapalska & Dabb, 2002; Moussa, 2014).

1.7.3. Theoretical Perspectives of Anthro-Pedagogical Context

Lev Vygotsky's Soci-cultural Theory of Cognitive Development

Lev Vygotsky (1996-1934), a Russian psychologist, is considered one of the major theories of cognitive development. His theory focused upon three key factors, viz. Language, Culture, and Zone of Proximal Development (ZPD). Culture is crucial in a child's cognitive development, as it influences their social and cultural environment (Oakley, 2004). Vygotsky believes children construct knowledge actively through interactions with parents, caregivers, extended family, and other children (Huitt, 2000).

Vygotsky emphasised the significance of language in developing thinking and abstract thought, including the labelling process attached to emerging concepts (Oakley, 2004). He

explored three different types of speech: social, private, and internal. Social speech is the instructions given by adults to children, while private speech allows children to process what the adult has said and apply it to similar situations. Thought is the result of social speech becoming private speech that has been internalised. Finally, inner speech is silent and used to direct behaviour or thought. It is the own thought process and is sometimes known as adult-like speech. In this stage, individuals can engage in higher mental functions.

The Zone of Proximal Development (ZPD) is a key concept in Vygotsky's theory. It refers to the gap between a child's potential on their own and their potential with the help of More Knowledgeable Others (MKO), such as parents, teachers, and peers. Vygotsky believed that the ability to learn from others is more important than how much knowledge is acquired. Play, and the imagination were vehicles for learning and holistic development. The Zone of Proximal Development (ZPD) is linked with "scaffolding" in educational texts, even though Vygotsky himself didn't use that word. Wood, Bruner, & Ross came up with it in 1976. It's all about giving support to students by their teachers or others who know more. This approach is structured based on the student's pace and needs.

Urie Bronbrenner's Theory of Developmental Contexts

Urie Bronfenbrenner came to the United States at age six and was born in Moscow in 1917. He introduced his perspectives on child development in a pivotal work, "The Ecology of Human Development," published in 1979. Bronfenbrenner co-founded the Head Start programme and is perhaps best known for his Ecological Systems Model, now redefined as the Bioecological Model. The main idea behind this theory is to understand how complex social relationships affect a child's development. This approach examines influences like family, peers, society, culture, and customs rather than focusing on stages or intimacy in isolation. According to Bronfenbrenner, children are impacted by various settings (ecological systems) that interact with one another in different ways. According to this theory of child development, a kid is affected by five different Ecological Systems. In the micro-system, the child's immediate environment encompasses their direct interactions with various individuals, including parents, siblings, friends, classmates, teachers, and other community members with whom the child interacts directly. The meso-system is the interaction of various microsystems in a child's life, for example, connections between home and school, friends and family, and the wider community. The exo-system comprises societal frameworks that influence various microsystems, which in turn have an indirect

effect on a kid. Parental work, neighbourhoods, popular media, and peer microsystems are examples of this. The macro-system covers the social and cultural elements that may have an effect on a child's development. Examples of such factors are geography, socioeconomic level, and ethnicity, while the chrono-system encompasses the environmental changes that take place during a child's life, including major life transitions and historical events.

CHAPTER-II

REVIEW OF RELATED LITERATURE

Chapter-II
Review of Related Literature

2.0. Introduction

Literature review is a process of evaluating previously conducted research by collecting, analyzing, and synthesizing more or less systematically to get an overview of the field, to keep up with state-of-the-art research, to be at the forefront, to describe research insights, existing gaps, and future research directions (Baumeister & Leary, 1997; Tranfield et al., 2003; Snyder, 2019). Literature review is crucial for any academic research to advance knowledge and theory development and highlight areas needing further investigation (Webster & Watson, 2002). It gives essential direction and necessary resource for the study under consideration (Mohakud, 2017). As the focus of the present research was to study the cognitive development of elementary school children, therefore, before entering to the actual research process, the researcher reviewed the available research literature in the mentioned area. The literature review, revealed vast area of research on cognitive development, which helped the researcher entering into the research field. This chapter presents the objectives of the present literature review and methods of the literature review followed by the present researcher. It also presents a brief overview of a wide range of related studies on cognitive development, conservation, equivalence, learning styles, and the relationship between learning styles and cognitive development among school children. Finally, this chapter presents the trends of the reviewed research literature.

2.1. Objectives of the Present Literature Review

The objectives of the present literature review were-

1. To gain adequate baseline knowledge for this investigation and identify the research gaps in the existing literature;
2. To formulate research questions, state the research problem, objectives, and hypotheses, as well as to identify the most appropriate research methods for the present study;
3. To prepare a guideline for the entire research process and to identify essential components and determine the key variables for the present study;

4. To get empirical evidence for validating the present research findings and drawing conclusions.

2.2. Methodology of the Present Literature Review

While planning this study, the researcher followed the semi-systematic and integrative literature review approach. Semi-systematic literature review follows systematic procedure like identifying search terms and setting inclusion exclusion criteria, but it is not so much strict like systematic literature review (Wong et al., 2013). The semi-systematic review helps to conceptualize research topic, within diverse disciplines that hinder a full systematic review process (Wong et al., 2013). It also helps to identify research gaps. Similar to semi-systematic review, integrative literature review is a research approach that integrates related literature followed diverse methods and conducted in diverse disciplines and cohesively reviews, critiques, and synthesizes to producing new frameworks and perspectives on the subject (Cronin et al., 2008; Torraco, 2005). In the present literature review, the researcher first identified a few search terms, keywords, and phrases related to the selected research area and specified some online research databases to find out the available research literature (Wong et al., 2013). Then, started gathering literature on those databases through the identified search terms. At the same time, the researcher also gathered research literature from printed journals, books. The detailed procedure is presented in Table 2.1 and Fig. 2.1.

Table 2.1. The procedure followed for the Literature Review

Phases	Procedure	Description
Phase-1	Identification of Search terms (Keywords and Phrases)	"Cognitive development", "Learning Styles", "Cognitive Equivalence", "Equivalence", "Elementary School", "Elementary School Children", "Cognitive Development among Elementary School Children", "Pattern of Cognitive Development among Elementary School Children", "Influential Factors of Cognitive Development among Elementary School Children", "Demographic Perspective of Cognitive Development", "Teaching-learning Perspective of Cognitive Development", "Schooling and Cognitive Development", "Culture and Cognitive Development", "Concept development", "Concept Development among Elementary School Children", "Equivalence Judgement among Elementary School Children", "Similarity Judgement among Elementary School Children", "Conservation", "Classification", "Categorisation", "Learning Styles", "Learning Styles Preferences", "Learning Styles Preferences among School Children", "Demographic Perspective of Learning Style", "Teaching-learning Perspective of Learning Style".
Phase-2	Selection of Searched Databases	Online- Scopus, ScienceDirect, Google Scholar, ReaearchGate, ProQuest, and Shodhganga
		Printed- Journals, Edited Books
Phase-3	Inclusion Criteria	i. Studies were conducted on elementary school students aged 6 to 14 years. ii. Published between 2003 to 2023 (1966 to 2023 for the studies on equivalence) iii. Studies should provide sufficient information regarding the location of the study, participants, purpose, methodology, data collection tools and findings.
	Exclusion Criteria	i. Not available in the English language. ii. Unavailability of full texts. iii. Insufficient data.
Phase-4	Literature Selection	The detailed literature selection process is presented in Fig. 2.1.

2.2.1. Literature Selection Process

After that, all the identified search terms, keywords, and phrases were searched on the mentioned databases, and many studies (Articles and thesis) were found. However, only some of the studies were relevant to the present topic. Then, the researcher read the titles of the studies and downloaded only the studies related to the researcher's field. In the second phase, the researcher reviewed the abstract of the studies and excluded some more irrelevant studies. Finally, the researcher included the most related studies (N=66) for the full-paper review.

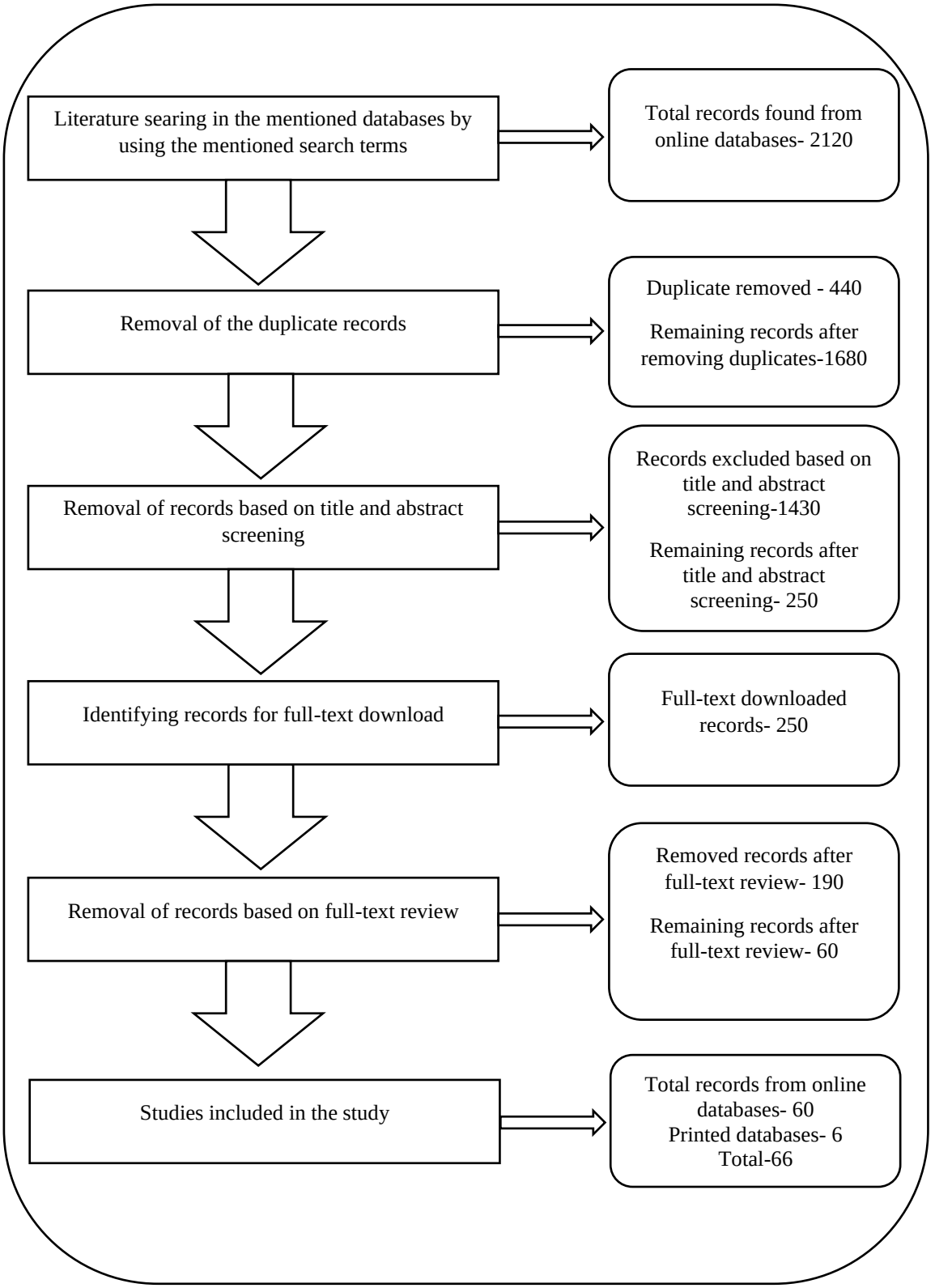

Fig. 2.1. Literature Selection Process

2.2.2. Preparation of the Review Matrix

While carefully reviewing the full text of the included studies, the researcher prepared a review matrix side by side (the basic structure of the matrix is presented in Table 2.2). Subsequent paragraphs present a brief summary of the reviewed studies (see 2.3). Finally, based on the review matrix, the researcher analyzed the research trends presented at the end of this chapter.

Table 2.2. Structure of the Review Matrix

Author/s (Year) Location	Major Objectives/ Key Theme	Methodology			Result Summary
		Participants	Method/Design	Instruments/ Measures	
Khan and Mohakud (2018) *West Bengal, India*	*To examine the age-related changes in cognitive equivalence*	*Grade one, three and five elementary school students*	*Survey and task-based observation*	*cognitive equivalence measuring pictorial task developed by Khan and Mohakud (2017)*	*Cognitive equivalence significantly improves with age.*

2.3. Review of Related Literature

This section presents a brief summary of the research literature. All the studies are presented here under the major headings: studies on cognitive development, studies on conservation, studies on equivalence, studies on learning styles, and studies on the relationship between learning styles and cognitive development.

2.3.1. Studies on Cognitive Development

Several researchers have explored the influence of factors like the nature of birth, time of birth, weight, nutritional status, socioeconomic status, and early childhood development intervention on children's cognitive development. For example, through a longitudinal survey conducted on 4 to 9 years old children, Polidano, Zhu, and Bornstein (2017) reported that cesarean-born Australian children perform significantly below normally-born children in cognitive performance. The case-control study of Oliveira et al. (2011) revealed that 5-6–year–old Brazilian children born preterm and with very low birth weight were more vulnerable to motor and cognitive impairments than those born full-term. By conducting a narrative literature review of 17 articles, Oudgenoeg-Paz et al. (2017) reported that children born preterm with low birth weight showed a connection between the level and quality of motor development during their first year of life and their

subsequent cognitive skills. Based on a systematic review, Adane et al. (2016) reported that exposure to maternal pre-pregnancy obesity in the intrauterine environment harms four months to eleven years of age group American and European children's cognitive development. Based on a longitudinal study on five to six years old children, Peyre et al. (2016) concluded that certain modifiable aspects of the early environment, like parental education, breastfeeding duration, birth weight, household income and number of older and younger siblings, are linked to the cognitive development may have a stronger association with their verbal skills than their nonverbal skills. Parui (2017) studied the verbal short-term memory capacity of Bengali elementary school children in Class II, IV and VII and revealed that short-term memory capacity significantly increases with age. Gender, gender, and caste also had a significant influence. Ajayi et al. (2017) studied the cognitive performance of six to eight years age-group children of KwaZulu-Natal, South Africa. The study revealed that preschool education, age, height-for-age and mothers' education were significantly associated with their cognitive score; however, site, gender, HIV status, SES, fathers' education, and haemoglobin level were insignificant. Nutritional status also directly predicts cognitive performance. Kesari et al. (2010) revealed that seven to ten years undernourished school-going children from Allahabad district, U.P. (India) are deficient in most cognitive development, such as attention, executive function, calculation, visuo-perceptual ability, long-term learning and memory, and intelligence. González et al. (2020) reported that socioeconomic factors significantly influence the cognitive development of five to six years old Spanish children, with maternal education and parental social class being the most vital determinants. Watanabe et al. (2005) studied the effects of early childhood development intervention added to a nutrition intervention on cognitive development among 6.5 to 8.5 years, first and second grades in communes of Thanh Hoa province in rural Vietnam and reported lasting effects on cognitive development. Whaley et al. (2003) reported that Dietary Intervention (supplementation with animal-source food) positively affects Kenyan School children's cognitive performance.

Some researchers studied elementary school children's cognitive development from schooling or education perspectives. For example, Malmberg et al. (2011) reported that Madrasa Resource Center, a child-centred intervention program, benefited East African (Kenya, Zanzibar, and Uganda) children's cognitive gains. Rao et al. (2019) reported that participation, intensity (hours per week), duration (months attended), and total dosage (total hours attended) in early childhood education (ECE) is beneficial for three to six years in Cambodia, China, Mongolia, and Vanuatu children's cognitive, language, and socio-

emotional development. Based on their experiment on twenty-four, thirty-five and thirty-six month-old children in Turkey, Berument et al. (2011) revealed that by increasing the quality of care in children's homes, infants and young children's language and cognitive development could be enhanced. Ajayi et al. (2017) revealed that family influence, preschool education, and disadvantages in geographical location indirectly influence children's cognitive outcome and development. In another study, Delgoshaei and Delaware (2012) revealed that a multiple-intelligence approach in the classroom as an educational method increases preschool children's cognitive development. Burger (2010) also reported that most recent early education and care programs had considerable positive short-term effects and somewhat smaller long-term effects on cognitive development. Mohakud (2017) studied the effects of a stimulating package on the cognition of primary school students and revealed that the stimulating package is a significantly better teacher-centric approach to teaching for overall and dimension-wise cognitive, creative, and social development in environmental studies. Mishra and Dasen (2004) conducted a review-based study to explore the influence of schooling on cognitive development among Indian children and reported the significant influence of schooling on cognitive development. Fink and Rockers (2014) explored childhood growth, schooling, and cognitive development among eight and fifteen years old children in developing countries like Ethiopia, India, Peru, and Vietnam. Results of the study showed that child growth in both early and late childhood is an essential predictor of developmental and educational outcomes. Ready (2010) examines the relationship between socioeconomic status (SES), school attendance, and cognitive development among kindergarten and first-graders. It reports that lower-SES children benefit more from schooling in cognitive development, particularly when they maintain good attendance. Brouwers, Mishra, and Van de Vijver (2006) conducted a study on schooling and everyday cognitive development among 6 to 9-yers-old, both schooled and unschooled Kharwar children in India and reported that school-attended children performed better than unschooled children in cognitive performance. Nghiem, Nguyen, Khanam, and Connelly (2015) conducted a longitudinal study that explored how the type of primary school affects Australian children's cognitive and non-cognitive development and found no significant difference between attending Catholic or independent schools and public schools. Bohlmann and Weinstein (2013) studied the teacher expectations and classroom practices among 193 first-grade children and their teachers to explore the relationship between teacher expectations and cognitive levels in shaping these self-perceptions. It was revealed that self-ratings were more associated with teachers' expectations, and children with higher cognitive skills rated their

math abilities lower. Golsteyn and Schils (2014) compared the performance of eleven to twelve years old Dutch elementary school children and reported that in elementary school, girls outperform boys in languages, and boys typically outperform girls in math and are better equipped with resources. They also reported that boys and girls employ their skills differently.

2.3.2. Studies on Conservation

A few research studies focused on age-related changes in conservation abilities. For example, Badakar et al. (2017) experimentally assessed the relevance of Piaget's cognitive principles among four to seven years old parented and orphan Indian children and revealed that parented children's performance was significantly better compared to orphan children. Jehan and Butt (2016) measured Piagetian conservation attainment ability among primary school children studying in grades IV and V in both urban and rural areas of District Kohat, Pakistan. Results of the study revealed that rural children performed slightly better than urban students, and female students outperformed males. Watanabe (2017) conducted a study to address the issues of "fixity" and "reliability" for the concept of conservation by observing a four-year-old child and revealed that the child developed and maintained the concept of conservation at that age level. Finally, the researcher concluded that younger children have higher intelligence than those in previous generations. Another single-subject case study by Watanabe (2019) measured the conservation of substance, weight, and volume of three years old children through an intentional environmental change in the form of a quiz game. The findings of the study revealed that three years old children might obtain the conservation concept, and he concluded that play related to conservation accompanied by attachment with a parent influences the early development of the conservation concepts of substance, weight, and volume. Asante and Hanson (2018) measured Piaget's number conservation among Ghanaian kindergarten and lower primary school children and revealed that older children performed better than younger ones. Further, this study revealed no significant difference between public and private school children. Yenikalayci et al. (2018) conducted a task-based observation among elementary school children of Canik, Samsun, and reported that liquid conversation has yet to develop among first, second, third and fourth grade primary school students. Mukunthan (2021) experimented on seventy-five Sri Lankan children aged six to seven years to assess the Piagetian number and liquid conservation and revealed that Piaget's conservation task applies to Sri Lankan children. Asante and Hanson (2018) examined Piaget's number of conservation concepts among fifty-four kindergarten and lower primary school children

from three public and two private schools in the Winneba Municipality of Ghana. Findings show that seven to eight year-olds conserved the number, but three to six years old age groups did not. They also revealed no significant difference in the number conservation tasks between public and private school children. Lambert and Spinath (2018) conducted a focus group study among German elementary school children from second to fourth graders to examine the associations of conservation-of-liquid abilities, visuospatial skills, and numerosity processing speed (NPS) with math achievement and math difficulties. Results of the study revealed significant contributions of numerosity processing speed and visuospatial skills to math achievement beyond I.Q. The study also revealed that children with math difficulties showed lower visuospatial and conservation abilities than children with normal achievement levels and children with reading or spelling difficulties. Ekawati et al. (2019) explored the area conservation between one high and one low-achiever seventh-grade German student and revealed that both students used cyclic processes during problem-solving. The high achiever showed more cognitive processes than the low achiever. Regarding area conservation, students initially used area formulas but eventually turned to strategies like "cut-rotate-paste" for curved shapes without direct formulas. Houdé et al. (2011) investigated the cognitive transition from visuospatial intuition to number conservation among preschool and school-age children through functional magnetic resonance imaging (fMRI) study to explore the neural mechanisms behind Piaget's conservation-of-number task. Results of the study revealed that number conservation was associated with the activation of a bilateral parietofrontal network, which is involved in numerical reasoning, executive functions and inhibition.

2.3.3. Studies on Equivalence

While reviewing the literature, the researcher found few studies on categorization and equivalence judgment. Okonji (1970) examined how extra instruction affected the classificatory behaviour of 40 boys aged 11-12 from primary school classes 5 and 6 in rural Ibusa and Ogwashi-Uku, Nigeria. The investigation included two sorting tasks: colour-form-size sorting of plywood pieces and plastic animal models classified by various criteria. Results revealed that trained children employed more superordinate concepts and performed better at animal sorting. By adjusting group cognitive differences, Joseph, Joseph and Stone (1982) experimented with pictures and words to study group formation in 57 sixth-graders, 66 first-year college students, and 48 junior- and senior college students and found that college students performed better cognitive transformations, subsumption, and word and picture proficiency than sixth graders. Fahrmeier and Medin

(1977) examined the dimensional processing of kindergarten and third graders in New York City to compare unidimensional processing with stimuli of different colours, shapes, and sizes. Three sets of six figures (colour, shape, and size) were presented in six similarity judgment tasks. The results of the study revealed age differences in the colour set. Older children were more consistent and similar to their peers. Also, older children had more good-fitting scaling solutions. Colour relational processing develops slower than size or shape, which may affect relational processing tasks. Through a developmental study, Hughley (1989) examined how structural factors affect similarity/dissimilarity judgments in painting categorization among 120 central Illinois children from grades 1, 3, 5, and 7. Twenty sets of 2" x 2" 35 mm slides of Renaissance, Baroque, and Impressionist paintings were utilized for a similarity challenge. For first-graders, similarity category and degree of realism were not significant main effects, but their interaction was. In third and fifth grade, the similarity category and interaction were significant, with mean response levels for similarity/dissimilarity and realism varying between categories and degrees of realism. Sherman and Bisanz (2009) studied Grade-2 children's understanding of equivalence in symbolic and non-symbolic contexts and found that children performed better on non-symbolic problems than symbolic ones. Experience with non-symbolic problems helped children apply successful concepts and strategies to symbolic equivalence problems. Olver and Hornsby (1966) conducted two experiments on first, fourth, and sixth-grade students in Boston to measure equivalence formation with verbal (Words) and non-verbal (pictures) tasks of telling how different items are alike. They reported that at an early stage, students find similarities based on perceptible attributes, which go towards functional attributes. They also found that equivalence formation with verbal materials is more functionally based than with pictures. Wiviott (1970) examined the classification of geometric concepts among children in grades five, eight, and eleven. It involved administering two tasks: a sequential presentation of eight cards and a simultaneous picture array of geometric concepts. Responses were categorized as Perceptible, Attribute, Nominal, and Subject-fiat. Results showed a decrease in Perceptible classification at each grade level, with high achievers using less Perceptible categories and more Attribute and Nominal categories. No significant sex differences were found. A few years later, Gordon (1971) examined the impact of presentation method, grade level, achievement, and sex on the classification of geometric concepts of fifth-, eighth-, and eleventh-grade students from low socioeconomic backgrounds. The study employed an equivalence task consisting of verbal or pictorial presentations of geometric concepts, and a free sorting exercise involved selecting cards based on similarities and groupings. Results showed that class five, eight and eleven

students did not significantly vary on the basis of classifying geometric shapes, and achievement, method of presentation, and sex were not significantly influenced by the bases of classification. Khan (2017) examined the influence of factors such as age, grade, gender, habitat, family type, number of siblings, and formal schooling generation on cognitive equivalence abilities among school-going children studying in classes I, III and V in West Bengal, India. Cognitive equivalence ability was measured using the "Cognitive Equivalence Measuring Pictorial Task" by Khan and Mohakud (2017). The results indicated that children's cognitive equivalence ability increased with age. However, no significant variations in cognitive equivalence ability were observed concerning gender, habitat, family type, number of siblings, or formal schooling generation. Additionally, the study found that perceptible equivalence ability decreased while functional equivalence ability increased with age. Another study by Khan and Mohakud (2018) examined the age-related changes in cognitive equivalence among elementary school children in West Bengal, India. They assessed cognitive equivalence through a cognitive equivalence measuring pictorial task developed by Khan and Mohakud (2017). The findings of the study revealed a clear age-related improvement in cognitive equivalence among primary school children in West Bengal, India. Similarly, Samanta (2018) also studied cognitive equivalence and creativity among primary school children in grades one, three, and five in South 24 Parganas, West Bengal, India, and revealed that children's cognitive equivalence ability increases with age. The same study also reported that perceptible equivalence ability decreases and functional equivalence ability increases with age; however, the study revealed no significant difference in children's cognitive equivalence ability concerning their gender, grade, type of family, number of siblings, and formal schooling generation. In another similar cross-sectional study, Bera (2018) explored the influence of demographic factors like age, grade, gender, habitat, family type, number of siblings, and formal schooling generation on cognitive equivalence among school-going children studying in classes II, IV, and VI. Cognitive equivalence ability was assessed using the "Cognitive Equivalence Measuring Pictorial Task" developed by Khan and Mohakud (2017) and a verbal cognitive equivalence scale developed by Bera and Mohakud (2018). The results indicated that cognitive equivalence increases with age and grade. However, except for the number of siblings, no significant variations were found concerning gender, habitat, family type, private tuition status, or formal schooling generation. Furthermore, the study revealed that non-verbal perceptible equivalence was higher than verbal perceptible equivalence, while verbal functional equivalence was higher than non-verbal functional equivalence.

2.3.4. Studies on Learning Styles

Singh et al. (2015) examined the relationship between preferred learning styles and certain demographic variables like gender, place of living, religion and parents' educational level among Aligarh District, India secondary school students. The findings of the study revealed that most of the secondary school students in the Aligarh District were visual learners. Further, the study also revealed that mothers' educational levels significantly influence the preferred learning styles; however, gender, location, religion, and father education level had no significant impact on the preferred learning styles. While studying cultural differences in learning style preferences, Rayneri et al. (2003) compared the learning styles of high and low-achieving gifted sixth, seventh, and eighth-graders from a southwest Georgia school district and found differences in learning style preferences between achieving and under-achieving students. Amran, Desiani and Hasibuan (2017) studied the learning style preferences of Indonesian junior high school level children who had attended school before and reported that most out-of-school children preferred a kinaesthetic learning style. Some of the studies also focused on identifying different influential factors of LSs. Likewise, Honigsfeld and Dunn (2003) examined the similarities and differences in learning styles among seventh-grade male and female students from Bermuda, Brunei, Hungary, Sweden, and New Zealand. The results of the study revealed statistically significant effects for both gender and country. Kim (2009) compared the visual, auditory, and kinesthetic learning styles with the ability to imagine the future, ideal L2 self, and motivated behaviour among Korean elementary school students and found that Korean elementary school students' ideal L2 selves and motivated behaviours significantly correlated with their visual and auditory learning styles. Hamidon (2015) conducted a review to explore the gender differences in learning styles among students and revealed that gender is significantly related to learning style preference, particularly with sensory learning style. He also stated that most students can learn effectively if the lecture provides a blend of the VARK System.

2.3.5. Studies on the Relationship between LSs and Cognitive Development

Concentrating on cognitive aspects like critical thinking, emotional intelligence, and problem-solving, Leasa (2018) studied the relationship between emotional intelligence and critical thinking skills of fifth-grade students in Ambon City with different learning styles and revealed that the learning model is more influential in improving emotional intelligence and critical thinking skills. Tsai (2014) explored the possible linkages between

creativity, creative personality, and learning preferences among fifth and sixth-grade Taiwanese children and reported that learning styles are not good predictors of creativity among elementary school students in Taiwanese. Ishabu, Budayasa and Siswono (2019) explored the role of the creative thinking process in solving mathematical problems among Indonesian fifth-grade female elementary school students with a visual learning style and revealed that the process of creative thinking of elementary school students in mathematical problem-solving is measured through reading and examining images in the question to identify already known information, to employ different approaches for problem solving, and to produce innovative products. In another study, Elevera (2021) revealed that the student's learning styles (visual, auditory, and tactile) significantly impact their metacognitive awareness in terms of knowledge about cognition and regulation of cognition. However, Leasa et al. (2020) examined the effect of learning styles on critical thinking skillsof fifth-grade elementary school students in Ambon-Maluku and reported that learning styles did not significantly affect critical thinking skills. Through a quasi-experiment on Indonesian seventh graders, Yuliati et al. (2018) revealed that visual, auditory, and kinesthetic learning styles do not interact with the student's natural science learning outcomes. On the other hand, Yildirim et al. (2008) investigated the relationships between teachers' perceived leadership style, students' learning style, and academic achievement of eighth-grade students in Istanbul, Turkey. They reported that academic performance was unrelated to the learning style. Rayneri and Wiley (2006) studied the learning styles of gifted sixth, seventh, and eighth-graders in southwest Georgia to explore the perceptions of the classroom environment, and possible connections between learning style, classroom environment, and achievement levels. They reported that most students preferred tactile and kinaesthetic modalities and found a positive correlation between learning styles and achievement levels. Stojanovska et al. (2015) explored personality traits, learning style, satisfaction and their correlation to educational outcomes among Macedonian sixth graders. They found that with personality traits and satisfaction, learning style significantly predicts academic performance and skill levels in a blended learning environment with game-based learning, flip teaching, and video conferencing. On the other hand, Wilson (2011) examined North-West South Carolina fourth-grade elementary school students' learning style preferences and teachers' instructional practices in various academic content and reported no significant relationship between learning styles, teaching processes, and academic achievement in ELA, mathematics, science, and social studies of elementary school students. In another study, Leasa et al. (2018) revealed no significant effect of learning styles on critical thinking skills among Indonesian fifth-grade elementary

school students. Sholahuddin (2020) examined the effectiveness of the cognitive style-based learning strategy in improving Indonesian elementary students' science process skills and reported that cognitive style-based learning strategy accommodates Indonesian elementary school students' cognitive development and cognitive styles (e.g., field-dependent and field-independent) to optimally improve their science process skills.

2.4. Research Trends

As mentioned earlier, while reviewing the included studies side by side, the researcher prepared a review matrix based on which the research trend analysis was conducted. The trend analysis results, based on 66 included studies, are presented in this section.

2.4.1. Theme-wise Distribution of the Included Studies

The theme-wise distribution (see Fig. 2.2.) of the studies revealed that out of 66 included studies, 25 (38%) studies were found in the area of cognitive development, 11 (17%) studies were on conservation, 12 (18%) studies were on equivalence, and 6 (9%) studies were on Learning Styles, and 12 studies were on the relationship between learning styles and cognitive development.

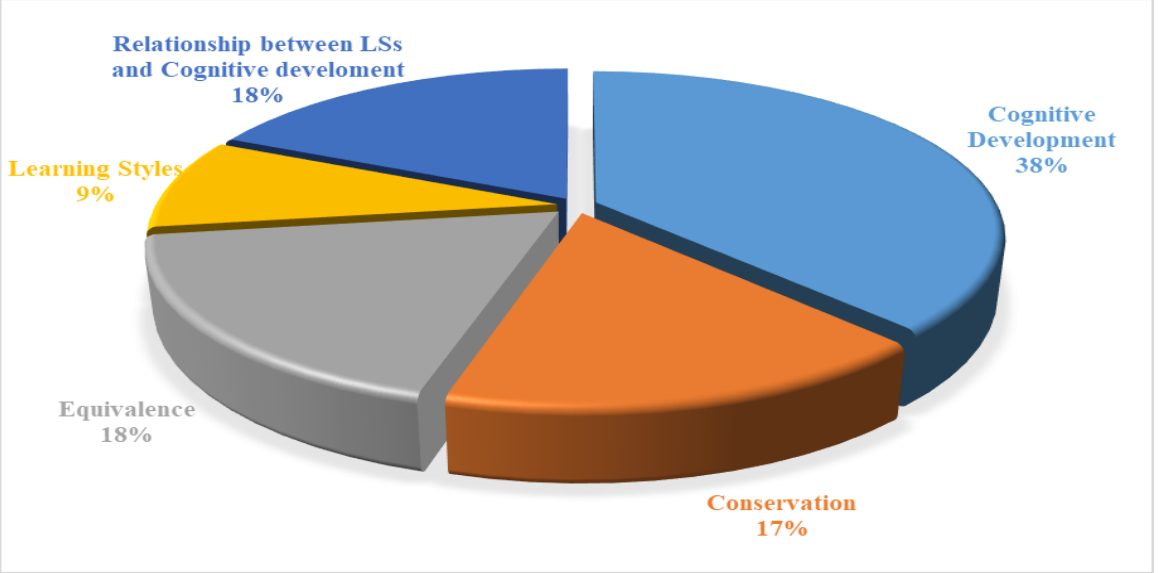

Fig. 2.2. Theme-wise Distribution of the Included Studies

2.4.2. Year-wise, Location-wise and Method-wise Distribution of the Studies on Cognitive Development

Year-wise Distribution

A Year-wise trend analysis of the 25 studies on the area of cognitive development of elementary school children was conducted from 2003 to 2023 (see Fig 2.3.). The analysis shows that the highest number of studies were conducted in 2017 (n=6), an equal number of studies were found in 2010 and 2011 (n-3), and 2014 and 2016 (n=2), and only one study was found in each of the years 2003, 2004, 2005, 2006, 2012, 2013, 2015, 2019 and 2020. No study was found in 2008, 2009, 2018, 2021, 2022 and 2023. The absence of studies in the last three years shows that the focus has shifted from this area.

Fig. 2.3. Year-wise Distribution of the Studies on Cognitive Development

Location-wise Distribution

A location-wise trend analysis (see Fig. 2.4) of the 25 studies on the cognitive development of elementary school children was also conducted. The analysis showed that five studies were conducted in India, while the remaining 20 were conducted in different countries abroad. This means Indian researchers are showing interest in this field.

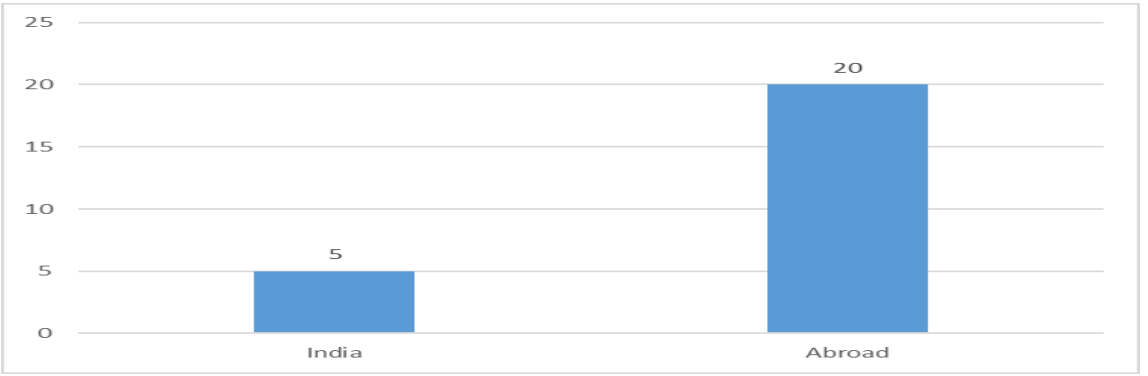

Fig. 2.4. Location-wise Distribution of the Studies on Cognitive Development

Method-wise Distribution

A method-wise trend analysis (see Fig. 2.5) of the 25 studies on the cognitive development of elementary school children shows that twelve studies employed a cross-sectional survey method, five studies employed a true/quasi experimental design, four studies employed a longitudinal survey, three studies employed a review approach, and only one study employed a case-control study. This means that survey design (whether cross-sectional or longitudinal) is the best suited for studying cognitive development.

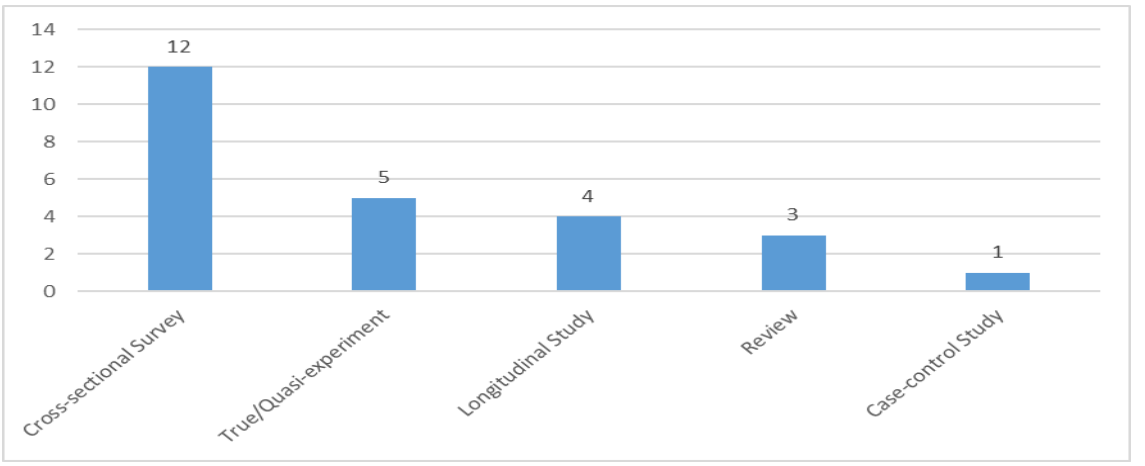

Fig. 2.5. Method-wise Distribution of the Studies on Cognitive Development

2.4.3. Year-wise, Location-wise and Method-wise Distribution of the Studies on Conservation

Year-wise Distribution

A Year-wise trend analysis (see Fig. 2.6.) of the 11 studies conducted on conservation development among elementary school children from 2003 to 2023. The analysis shows that the highest number of studies were conducted in 2018 (n=4), an equal number of studies were found in 2017 and 2019 (n=2), and only one was found in 2011, 2016 and 2021. Not a single study was found in the rest of the years. This means that studies have been absent in the last two decades, showing that the development of conservation among elementary school children is not an area of focus for researchers.

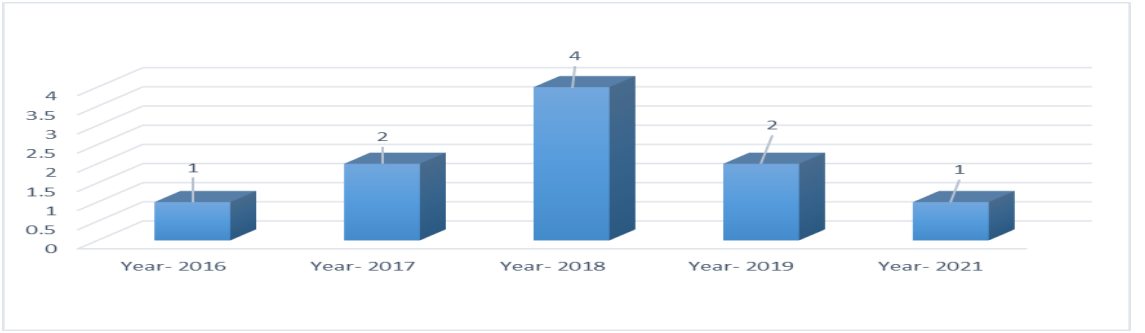

Fig. 2.6. Year-wise Distribution of the Studies on Conservation

Location-wise Distribution

A location-wise trend analysis (see Fig. 2.7) of the 11 studies conducted on the conservation development of elementary school children was also conducted. The analysis showed that only one study was conducted in India, while the remaining ten were conducted in different countries abroad. This means that conservation development of elementary school children is not a focus area for Indian researchers.

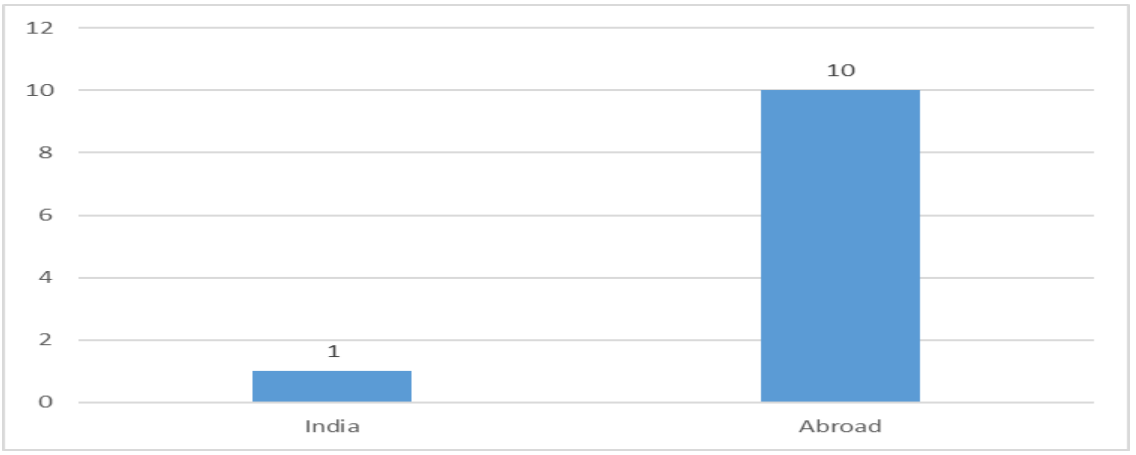

Fig.2.7. Location-wise Distribution of the Studies on Conservation

Method-wise Distribution

A method-wise trend analysis (see Fig. 2.8) of the 11 studies on the conservation development of elementary school children shows that five studies employed experimental design, three employed task-based observations, two employed case study design, and only one employed focus-group study design. This means that an experiment (true/quasi) is the best suited for studying conservation development among elementary school students.

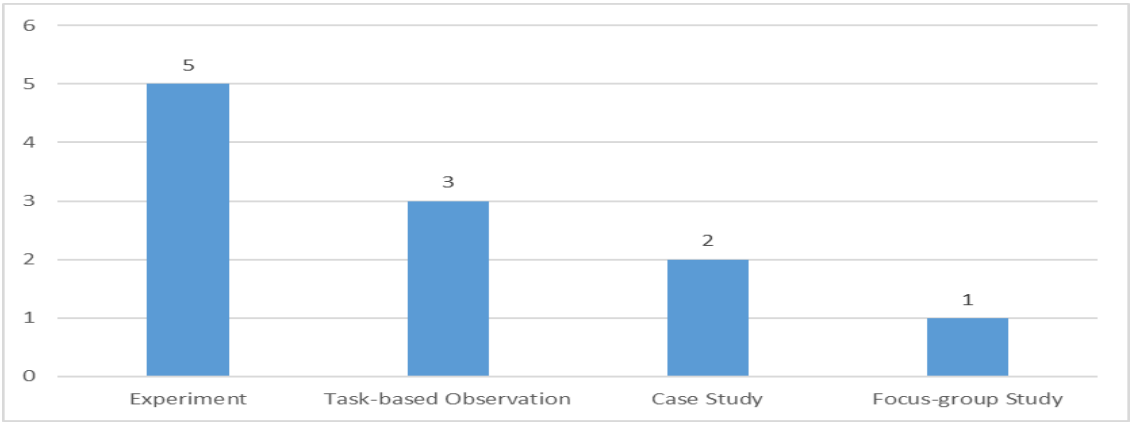

Fig. 2.8. Method-wise Distribution of the Studies on Conservation

2.4.4. Year-wise, Location-wise and Method-wise Distribution of the Studies on Equivalence

Year-wise Distribution

A Year-wise trend analysis of the 12 studies conducted on the area of equivalence among elementary school children for the period from 1966 to 2023 (see Fig. 2.9.). The analysis shows that the highest number of studies were conducted in 2018 (n=3), two studies were found in 1970, and only one study was found in each of the years 1966, 1971, 1977, 1982, 1989, and 2009. Not a single study was found in the rest of the years. That means that studying the concept of equivalence among elementary school students is an area of interest to researchers.

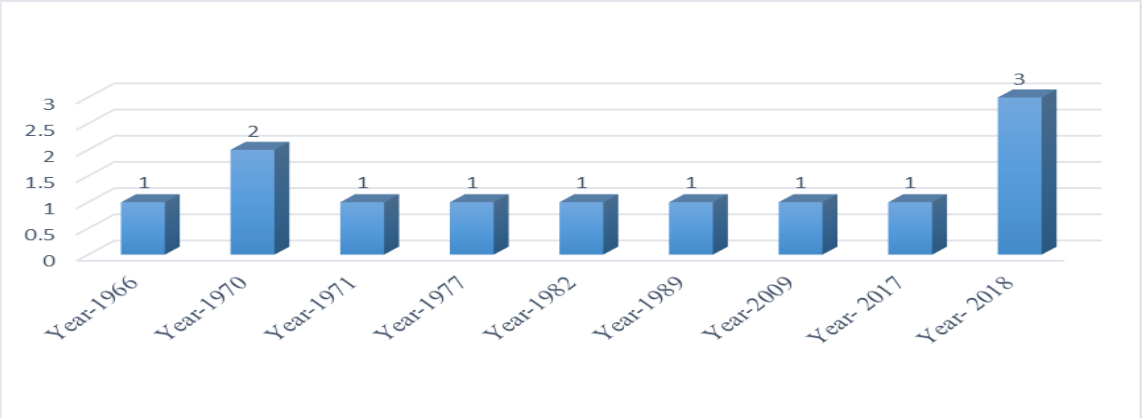

Fig. 2.9. Year-wise Distribution of the Studies on Equivalence

Location-wise Distribution

A location-wise trend analysis of the 12 studies on the area of equivalence judgment among elementary school children was also conducted (see Fig. 2.10). The analysis shows that out of the total twelve studies, four were conducted in India, two of which were conducted by the present researcher himself. The remaining eight studies were conducted in different countries abroad. Though very few studies have been conducted in India, this needs more attention from researchers.

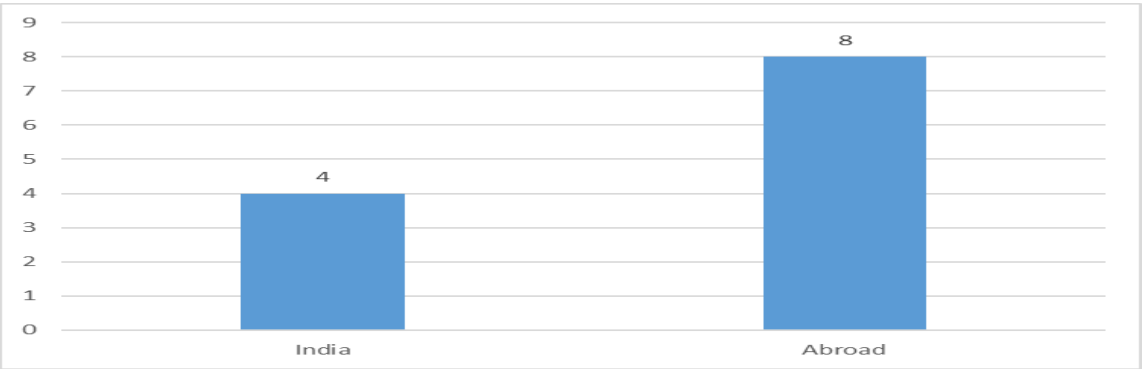

Fig. 2.10. Location-wise Distribution of the Studies on Equivalence

Method-wise Distribution

A method-wise trend analysis (see Fig. 2.11) of the 12 studies on the cognitive development of elementary school children shows that seven studies employed experimental design, four employed cross-sectional surveys with task-based observation design, and only one employed developmental study design. That means experiments or cross-sectional surveys with task-based observation methods are the best suited for studying equivalence judgement among elementary school students.

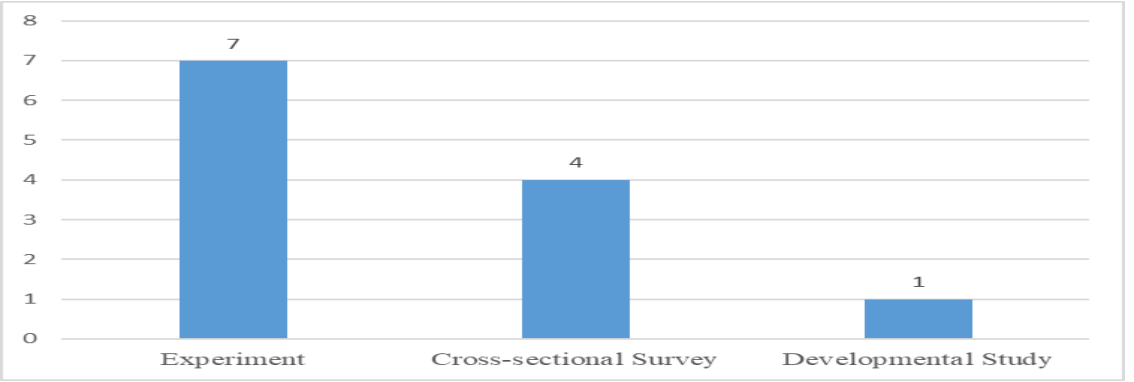

Fig. 2.11. Method-wise Distribution of the Studies on Equivalence

2.4.5. Year-wise, Location-wise and Method-wise Distribution of the Studies on Learning Styles

Year-wise Distribution

A year-wise trend analysis of the six studies on the area of learning styles of elementary school children was conducted for the period from 2003 to 2023 (see Fig. 2.12.). The analysis shows that two studies were conducted in 2003 and two studies in 2015, and only one study was found in each of the years 2009 and 2017. Not a single study was found in the rest of the years. That means studying learning styles among elementary school students has not been an area of interest for researchers in the last two decades.

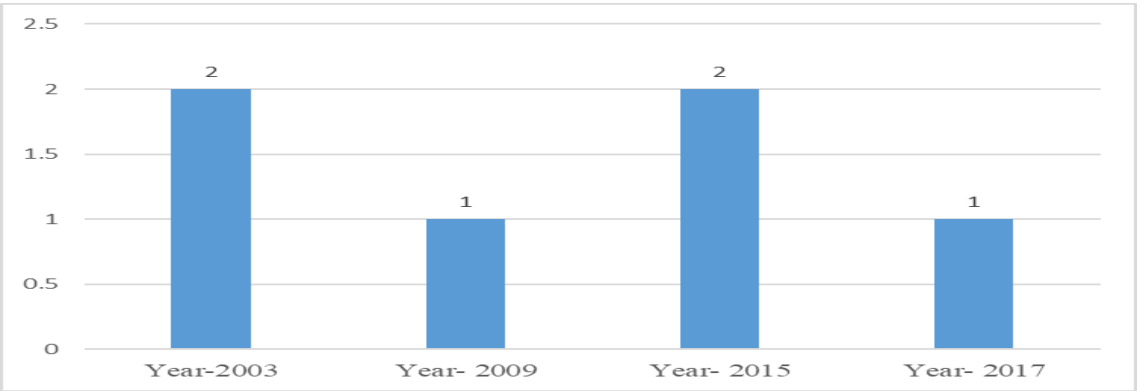

Fig. 2.12. Year-wise Distribution of the Studies on Learning Styles

Location-wise Distribution

A location-wise trend analysis of the six studies on learning styles of elementary school children was also conducted (see Fig. 2.13). The analysis shows that only one of the six studies was conducted in India, while the remaining five were conducted in different countries abroad. This means Indian researchers and researchers abroad are not interested in this field.

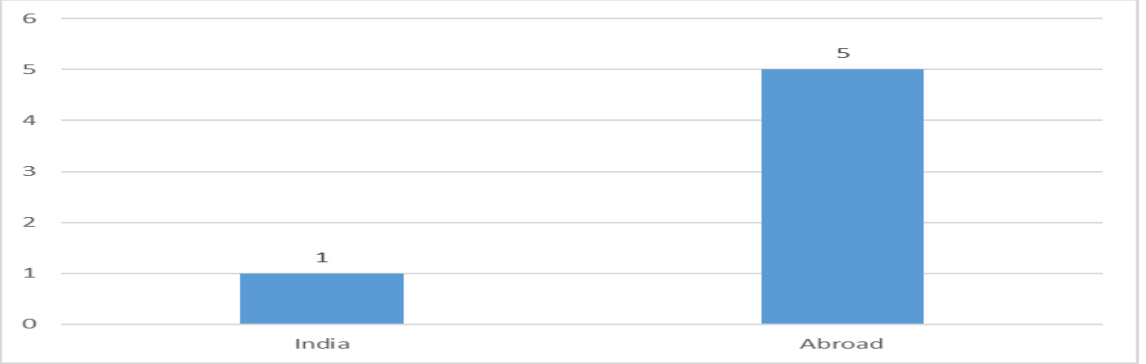

Fig. 2.13. Location-wise Distribution of the Studies on Learning Styles

Method-wise Distribution

A method-wise trend analysis (see Fig. 2.14) of the six studies on the learning styles of elementary school children showed that five studies employed a cross-sectional survey design, and only one study followed the review approach. That means the cross-sectional survey design is best suited for studying the learning styles of elementary school students.

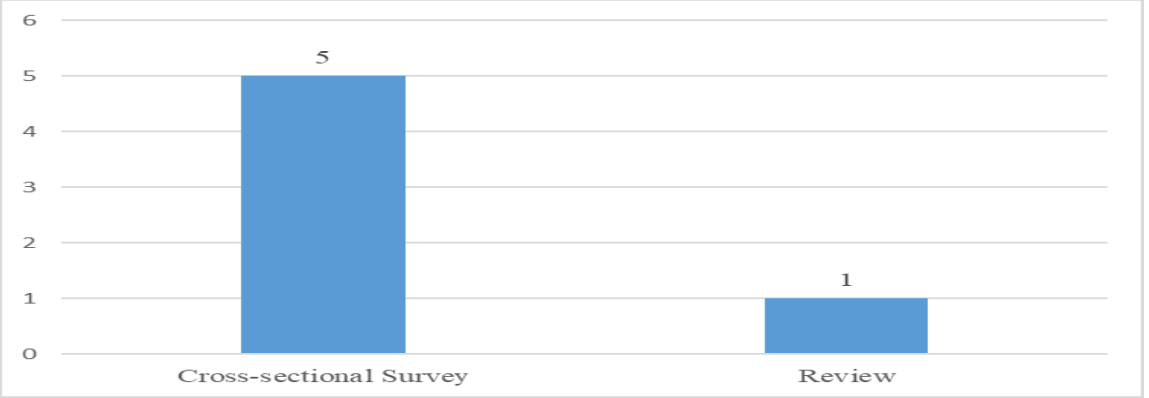

Fig. 2.14. Method-wise Distribution of the Studies on Learning Styles

2.4.6. Year-wise, Location-wise and Method-wise Distribution of the Studies on the Relationship between LSs and Cognitive Development

Year-wise Distribution

A year-wise trend analysis (see Fig. 2.15.) of the 12 studies on the relationship between learning styles and cognitive development of elementary school children was conducted from 2003 to 2023. The analysis shows that most studies were conducted in 2018 (n=3),

two in 2020, and only one in 2006, 2008, 2011, 2014, 2015, 2019 and 2021. Only a few studies were conducted during the rest of the years. That means the highest number of studies were conducted in 2018, followed by 2020. This indicates that recent researchers have yet to pay attention to this area.

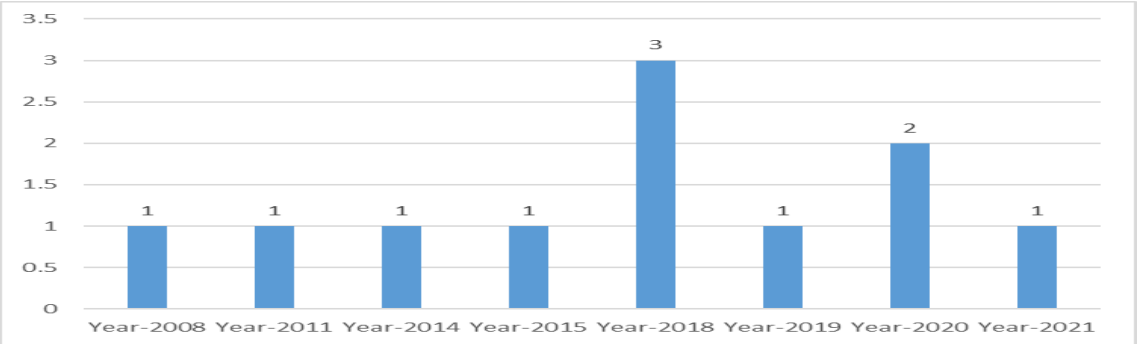

Fig. 2.1.5. Year-wise Distribution of the Studies on the Relationship between LSs and Cognitive Development

Location-wise Distribution

A location-wise trend analysis of the 12 studies on the relationship between learning styles and the cognitive development of elementary school children was also conducted (see Fig. 2.16). The analysis shows that all the studies were conducted abroad, and no study was found in India. This means that in the last two decades, Indian researchers have not shown any interest in exploring the relationship between LSs and the cognitive development of elementary school children.

Fig. 2.16. Location-wise Distribution of the Studies on the Relationship between LSs and Cognitive Development

Method-wise Distribution

A method-wise trend analysis of the 12 studies on the relationship between learning styles and cognitive development of elementary school children (see Fig. 2.17) shows that the highest number of studies employed an experiment/quasi-experimental design (n=5), followed by a cross-sectional survey design (n=4), and three studies employed a

correlational design. This means an experiment/quasi-experimental design is the best suited for studying cognitive development. However, survey designs are also preferable.

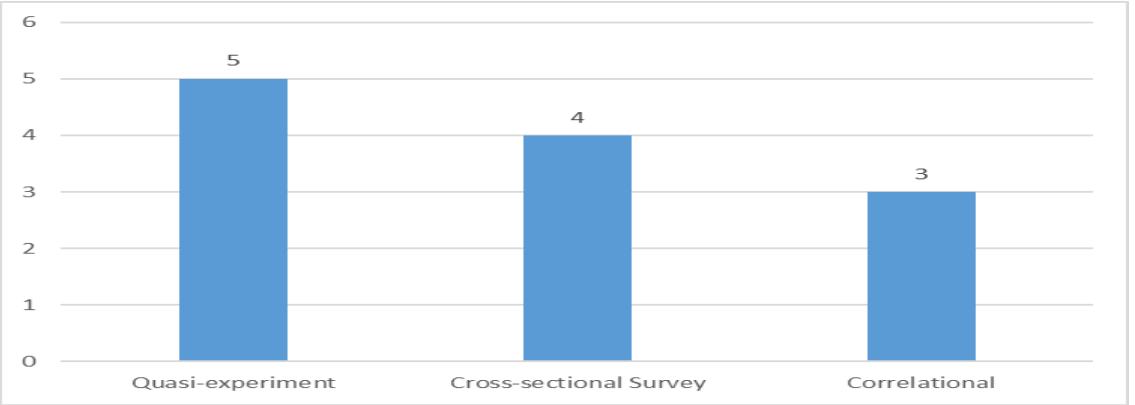

Fig. 2.17. Method-wise Distribution of the Studies on the Relationship between LSs and Cognitive Development

2.5. Summary of the Trend Analysis

The trend analysis of the included sixty-six studies conducted between 2003 and 2023 (1966 to 2023 for studies on equivalence), revealed that thematically the highest number of studies were conducted on the cognitive development of elementary school children and the rest of the themes, like conservation, equivalence, and studies on LSs, were given less importance. A few studies were conducted on equivalence judgment. However, those studies were conducted long back in the 1970s or 1980s. Year-wise distribution of the studies on other themes showed unequal distribution. Location-wise analysis showed that most of the studies were conducted abroad, and only a few were conducted in Indian contexts. While research method/design was the concern, the analysis showed that a survey (cross-sectional or longitudinal) is the best suited for studying cognitive development and learning styles; experimental design is best suited for studying conservation and equivalence and the relationship between learning styles and cognitive development.

CHAPTER-III

PROBLEM STATEMENT

Chapter-III

Problem Statement

3.0. Introduction

The primary purpose of this chapter is to describe the research problem and the procedure followed to identify it. It focuses on the researcher's assumptions, background, positionality, the rationale behind the present study, research questions, statement of the problem, and operational definition of the major terms, objectives, hypotheses, delimitations, and the conceptual framework of the present study. The previous chapter is the basis for this chapter. The specific methodology of the study is presented in detail in the subsequent chapter.

3.1. Assumptions, Background, and Positionality of the Researcher in the Study

The researcher has a special connection with school children. After completing higher secondary education, he worked as a private tutor. He taught elementary school children studying in Class I to VIII, and while pursuing an undergraduate degree in education, he also started teaching secondary and higher secondary level students. While doing a Master's degree in Education, the researcher researched activity-based (project-based) learning among higher secondary level students. After that, in M. Phil, he studied the 'study of cognitive psychology' as his area of specialisation, and he did his dissertation on elementary school students' cognitive equivalence. Currently, the researcher works as an Assistant Professor of Education at Jadavpur University, where he teaches students with an M.A. in education and teachers' pedagogy to B.Ed. Trainees are directly linked with school students. The researcher has already studied the cognitive equivalence of elementary school students in general in the M.Phil. As a scholar of education, the researcher had some idea that culture can influence cognition, so he thought of extending his M.Phil. level research and working on a specific cultural community. The researcher belongs to the Muslim community. In the Indian context, Muslims are the largest minority community. They have specific cultural, educational, and religious beliefs and value systems. From socio-cultural, socio-economic and educational perspectives, they are marginalised in society. So, it was assumed that the cognitive development of

Muslim children may not be in the same line with the other community children. So, it is vital to know their level of cognitive development. Therefore, as a scholar of education, he intended to study the cognitive development process of Muslim community students more extensively.

3.2. Rationale of the Study

Human development is a lifelong process that starts from conception and continues until death (Hurlock, 1997, p. 23). The rate of development is speedy in the mother's womb and in the early years of life (Hurlock, 1997; Santrock, 2011). A child spends most of their early years in school, where the elementary school level is a vital stage. It is the foundational/ formative years. Among various types of development, like physical, social, emotional and moral, cognitive development is an essential aspect of this stage. The primary cognitive and behavioural functioning elements are set down during this period (Mohakud, 2017). The term 'cognitive' comes from 'cognition', which is an umbrella term that refers to the process of obtaining knowledge, including perceiving, recognising, reasoning as well as judging (Bransford & Cocking, 2000). According to Taylor (2005), cognition is all our mental activities, thoughts, and thinking. Accordingly, 'cognitive development' refers to changes in mental abilities and functions like perception, thinking, reasoning, concept formation, intelligence, creativity, problem-solving, etc. Cognitive development plays a vital role in teaching-learning and daily life situations. Primarily, it helps humans deal with diversified environments effectively. Among the various aspects of cognitive development, conservation is an important one. Conservation refers to the knowledge about the invariance of quantities despite transformations in form, shape, or apparent size (Lambert & Spinath, 2017).

While studying the cognitive development of human children, researchers give importance to each aspect which may influence cognitive development. Therefore, they started their study from the early pregnancy period to age-related changes and the influence of external factors. They consider that maternal pregnancy and birth-related issues such as type of birth (Polidano, Zhu, & Bornstein, 2017), birth time and birth weight (Oliveira et al., 2011), family environment and care (Morais et al., 2021; Ajayi et al., 2017; Peyre et al., 2016) has a significant impact on child's cognitive development. Nutritional status in the initial years (Ajayi et al., 2017; Kesari et al., 2010) and dietary

intervention (Whaley et al., 2003; Watanabe, 2005) also impact children's cognitive development. Maternal education is also a vital determinant (González et al., 2020). Some of the researchers revealed that age plays a significant role in the development of conservation (Watanabe, 2019; Ahmad et al., 2018; Yenikalayci et al., 2018; Asante & Hanson, 2018; Ahmad et al., 2017; Lautrey et al., 1989), seriation and classification (Gakhar & Kaur, 1990). With age, children grow and start going to school and taking other educational interventions, which further impacts their cognitive growth (Parui, 2017). Early education or schooling (Ajayi et al., 2017; Burger, 2010), educational intervention programme (Malmberg et al., 2011), training (Rothenberg, 1969; Beridze, 2018; Dash & Dash, 1984; Asante & Hanson, 2018), pedagogical practices in the classroom like- use of stimulating package and multiple-intelligence approach (Mohakud, 2017; Delgoshaei & Delaware, 2012) helps in better cognitive development. Culture is also an essential factor in cognitive development. Some researchers reported culture's significant influence on conservation (Mukunthan, 2021; Goldschmid,1973). For example, considerable differences present in conservation between Canadian-Indian children and a group of Whites (Bowd (1975), between Indian and British children (Sharma, 1976), and between tribal and non-tribal children (Sinha & Jha, 1989; Dash & Dash, 1984). Like culture, gender is another influential factor in cognitive development in general (Bart & Schils, 2014; Mierdel, 2019) and conservation in specific (Zarour, 1971; Omotoso & Shapiro, 1976). However, some researchers reported no significant gender differences in conservation (Riley, 1989; Sinha & Jha, 1989). Some other influential factors of conservation are residence (Uddinet et al., 2019) and socio-economic status (González et al., 2020; Bevli et al., 1989).

Like conservation, equivalence is another crucial aspect of cognitive development, which has two forms, identity and equivalence, and the former is the prerequisite for the latter (Piaget, 1968; Elkind & Schoenfeld, 1972). Identity refers to the ability to identify different attributes of objects or situations. Equivalence refers to the cognitive process by which individuals recognise that two or more objects or situations are equal or identical in some specific way despite possible differences in other respects. In the last decade, the term 'cognitive equivalence' (CE) was introduced to the ability to explain or justify grouping logically. It logically explains the similarity among objects or things (Khan, 2017; Khan & Mohakud, 2018). Olver and Hornsby's (1966) experimental studies are the initial and unique ones in equivalence judgment. They firmly stated that children and adults group discriminately different things and treat them as equivalent, and this

equivalence judgement is a learned achievement (Olver & Hornsby, 1966). Group formation/categorisation is fundamental in equivalence judgment, which refers to the process of grouping objects, pictures, attributes, and so on based on similarity followed by some local or global rules (Harnad, 2017 cited in Brasselet & Arleo, 2018; Brasselet & Arleo, 2018). According to Bruner (1966), children represent their world through enactive, iconic and symbolic modes of representation and impose equivalence accordingly. Consequently, there are different bases of group formation or categorisation. It helps in finding patterns, which consequently helps in concept formation/development. Therefore, equivalence judgment is crucial in learning. Despite its so much importance, this aspect of cognitive development is overwhelming. Very few studies were conducted on equivalence judgement. A few studies reported that children performed better in equivalence judgment with non-symbolic problems than symbolic ones (Sherman & Bisanz, 2009). Their equivalence with verbal materials is more functionally based than pictures (Olver & Hornsby, 1966). It is also evident that pictorial stimuli have more perceptible responses than verbal stimuli (Wiviott, 1970). Early studies by Olver and Hornsby (1966) established that students find similarities based on perceptible attributes, which go towards functional attributes at an early stage. The use of the perceptible basis of classification decreased, and attribute and nominal bases increased with grade levels, and high achievers used less perceptible categories and more attribute and nominal categories (Wiviott, 1970). Relational processing of colour develops more slowly than size or shape (Fahrmeier & Medin, 1977). The ability to discern numerical equivalence across different sets develops gradually with age (Mix, 1999). Carpentier and Smeets (2003) also stated that equivalence-equivalence is an age-related performance similar to classical analogies. Compared to sixth graders, college students tended to employ more abstract representational reasons for groupings, aligning with Piagetian assumptions of cognitive growth from concrete to formal thought (Fahrmeier & Medin, 1977). More recent studies on cognitive equivalence confirmed a consistent increase in cognitive equivalence abilities with age, perceptible equivalence decreased, and functional equivalence increased (Khan, 2017; Samanta, 2018; Khan & Mohakud, 2018; Bera, 2018). Age and grade levels, as well as learning, experience, and training, are significant factors in equivalence judgment. For example, experience with non-symbolic problems facilitates children's ability to apply successful concepts and strategies to symbolic equivalence problems (Sherman & Bisanz, 2009). Similarly, learning to read influences written word processing and affects optical object recognition among children (Caffarra et al., 2017). Okonji (1970) also reported that training on classificatory behaviour helps

children to perform better in the animal-sorting task and utilise significantly more superordinate concepts than untrained children. Categorisation experience with colour and texture improves texture perception. Object perception differs based on categorisation background, with participants more sensitive to changes in objects learned at a subordinate level (Archambault, 1999). Markman (1992) revealed a significant role of analogical mapping during similarity judgments across mapping conditions. While similarity/ dissimilarity judgments in categorising paintings (Hughley, 1989) reported that similarity category and degree of realism were insignificant, similarity category and interaction were significant. However, socio-economic status (Gordon, 1971), sex/gender has no significant influence based on classification (Wiviott, 1970; Gordon, 1971), cognitive equivalence (Khan, 2017; Samanta, 2018; Khan & Mohakud, 2018; Bera, 2018). Similarly, other factors like habitat, family type, number of siblings, and schooling generation also have no significant influence (Khan, 2017; Samanta, 2018; Khan & Mohakud, 2018; Bera, 2018).

Learning Style (LS) is another critical aspect of cognition. LS refers to a person's natural, habitual and preferred ways of learning. Kolb (1981) sees learning style as "the way we process the possibilities of each new emerging event [which] determines the range of choices and decisions we see, the choices and decisions we make, to some extent determine the events we live through, and these events influence our future choices". It is a component of the broader concept of personality (Hawk & Shah, 2007), which varies from culture to culture (Yamazaki, 2005). LS play a significant role in the teaching-learning context and has many implications for students and educators. For example, the same kind of instruction is not helpful in all contexts and with all learners. It is most effective when matched to the learner's preferences (Pashler et al., 2009). Students grasp information in various ways; therefore, as facilitators of learning, teachers must employ the best teaching methods to match the student's learning styles (Johnson et al., 2022). Implementing various teaching strategies by identifying and applying students' learning styles would enhance information retention and depth of understanding (Chiu et al., 2019; Johnson et al., 2022). Identifying learning styles and providing a suitable learning environment aligned with students' preferences can foster their creative thinking and potential development (Demir, 2021; Yi et al., 2011). Students' achievement can be improved by matching each student's learning style with interactive learning methods (Adriana, 2011). Hamidon (2015) stated that most students can learn effectively if the

lecture provides a blend of visual, auditory reading or writing and kinaesthetic activities. Therefore, it is essential to identify the learning style preferences of students.

While LSs are significantly influenced by some factors, LS itself also significantly influences some other cognitive abilities academic achievement (Ha, 2021; Bosman & Schulze, 2018; Stojanovska et al., 2015; Vaishnav, 2013; Rayneri & Wiley, 2006; Yoon, 2000), language achievement (Khodabakhshzadeh et al., 2017), spelling abilities (Olsson, 2010), childhood gross motor skills (Hayati, 2017). However, some studies reported that LSs and academic performance are unrelated (Yuliati et al., 2018; Yildirim et al., 2007; Dams, Kenneth Mark, 1994; Deanna Greene (1984). LS models also improve emotional intelligence and problem-solving (Leasa, 2018), metacognitive awareness (Elevera, 2021), social arithmetic problem-solving (Soebagyo et al., 2022), and creativity (Puri, 2017). However, contradictory results are also present (Tsai, 2014). Learning style preferences vary across cultures, ethnicities, and locations, including variations between native and non-native speakers (Leasa et al., 2018; Widharyanto & Binawan, 2020; Mulalic et al., 2009; Rayneri et al., 2003; Honigsfeld & Dunn, 2003; Reid, 1987; Vaishnav, 2013; Singh et al., 2015; Ewing & Yong, 1992; Massachi, 2000). Gender is another significant factor of LS (Mulalic et al., 2009; Honigsfeld & Dunn, 2003; Hamidon, 2015; Massachi, 2000; Ewing & Yong, 1992; Khodabakhshzadeh et al., 2017), though studies in Indonesia and India found no significant gender differences (Park, 2000; Nasution et al., 2019; Singh et al., 2015). Similarly, factors like religion, father education level (Singh et al., 2015), teaching processes and academic achievement (Wilson, 2011) also reported no significant impact on LS preferences.

Based on the above discussion, the extensive literature review and the trend analysis on different areas of cognitive development (presented in Chapter II), it is evident that many studies have been conducted in the field of cognitive development in general, conservation, equivalence judgement and learning styles. The studies on cognitive development explored the influence of prenatal and birth-related factors like type of birth (e.g., natural vs. caesarean) and birth conditions, such as birth weight and timing, prenatal environment and maternal health, including factors like maternal education on cognitive development. Some of the researchers explored the role of family structure, caregiving practices, home environment, nutritional status in the early years, dietary interventions, early education, including pre-schooling, interventions and training programs, pedagogical methods, cultural context, gender, the socio-economic background also found to be a significant factor in cognitive development.

The studies on equivalence judgement showed age-related changes, shifting from identity recognition to complex grouping abilities, from perceptual to functional and abstract. The studies also explored the nature of equivalence judgments with symbolic and non-symbolic stimuli, verbal vs. pictorial materials and the role of analogical mapping. Some studies reported some influential factors of equivalence judgement, such as socio-economic status, gender, and family background factors. Some studies also explored the role of teaching practices and training on categorisation abilities and equivalence judgement.

Though many studies have been conducted, there are potential research gaps that need special attention from researchers. The studies conducted on children's cognitive development are in different areas of mental performance, such as gross-motor skills, language achievement, and academic achievement in various subject areas and conservation; however, very few studies were found that focused on equivalence judgement. Further, most of the studies on equivalence judgement considered mathematical or logical equivalence but not categorisation and cognitive equivalence. They also used different methods and tools/techniques to measure equivalence. Most of the studies on equivalence were from various cultures and locations, mostly abroad; a few were conducted in the Indian context. However, those studies have explored varied types of equivalence, such as perceptible, functional, nominal, attributional, affective, and fiat equivalence. However, a rare research analysed all of these types of equivalence in a single study. Limited studies focus on how family and community practices unique to specific cultural backgrounds affect cognitive equivalence in young children. Apart from rarely, research examines cognitive equivalence in ethnically or linguistically diverse elementary classrooms.

Some of the LS researchers explored the preferences of learning styles and cultural and demographic variability in learning styles. Interestingly, most LS research focuses on older students. A few studies reported the influence of LSs on cognitive abilities like emotional intelligence, problem-solving, critical thinking, creativity, language development, gross motor development, concept development, critical thinking, problem-solving and creativity. Researchers also established the relationship between LSs and pedagogical practices and educational outcomes. Though many studies have been conducted on LSs, there are potential research gaps in this field, which also need researchers' attention. While some researchers explore demographic influences on LSs, few studies examine how parental education or socio-economic status might affect LS

preferences. While parental education levels affect cognitive outcomes, research rarely investigates if and how they influence cognitive equivalence and LSs among young children. Interestingly, no study measured the influence of learning styles on equivalence. No study explored all aspects of CE in a particular cultural group by considering LSs and various anthropological and pedagogical factors. Moreover, mixed results in gender and cultural studies suggest a need for more nuanced analyses of how LS preferences relate to intersecting identities, such as religion and gender, better to understand the role of social identity in learning preferences.

These identified research gaps and the researcher's personal experience raise the following questions-

1. What is the status of the development of cognitive equivalence among elementary school children?
2. Are there any anthropological or Pedagogical factors that can influence CE among elementary school children?
3. Do all elementary school children prefer the same learning style or differ in their LS preferences?
4. Do CE and LSs change with age?
5. Are there any anthropological or Pedagogical factors that can influence LS preferences among elementary school children?
6. Is there any association between learning style preferences and cognitive equivalence among elementary school students?
7. Are there any potential anthro-pedagogical factors that can moderate the relationship between LSs and CE among elementary school students?

The insights underscore the importance of examining the development of equivalence within a specific ethnic and education-related backdrop of Muslim elementary school children in West Bengal, who may present unique developmental patterns due to their distinct cultural influences.

3.3. Statement of the Problem

In light of the rationale, the identified research gaps, and the above-raised questions, the problem for the present study can be stated as "**Learning Styles and Cognitive Equivalence among Elementary School Children: A Study from Anthro-Pedagogical Perspective**".

3.4. Operational Definition of the Major Terms Used

An operational definition in research outlines the specific processes or criteria employed to measure or identify a particular variable . It converts abstract concepts into measurable variables, ensuring they are accurately and consistently stated. The key terms or concepts used in this study are operationally defined by the researcher as given below:

Cognitive Equivalence (CE): It refers to the ability to find similar characteristics among different objects/things/situations, or it is the logical explanation of how different things/ objects are alike. The grounds for similarity explanations may be perceptible, functional, nominal, affective, and fiat. In the present study, we referred to these as perceptible equivalence (PE), functional equivalence (FE), nominal equivalence (NE), affective equivalence (AE), and fiat equivalence (FiE), respectively. CE can be measured by presenting different types of objects/stimuli. In this study, three different types of stimuli, viz. pictures, models and words, were used, and the respective measured abilities were considered as picture-based cognitive equivalence (PCE), model-based cognitive equivalence (MCE), and word-based cognitive equivalence (WCE).

PE refers to the logical explanation of similarity from perceptible or structural viewpoints. One may determine the items equivalent based on immediate phenomenal qualities such as colour, size, shape, position in time or space, etc. For example, a cycle, bike, and car are the same because they are red and all have wheels.

FE refers to the logical explanation of similarity based on functions or uses. One may draw equivalence by considering what they do or what can be done to them. For example, a cycle, bike, and car are the same because we use them for travelling.

NE refers to the logical explanation of similarity based on common names. One may draw equivalence based on a general identity or common name. For example, cycle, bike, and car are the same because they are vehicles.

AE refers to the logical explanation of similarity involving affections or emotions. One may draw equivalence by relating their emotions with objects/attributes. For example, rose, lotus and marigold are beautiful flowers, and I love those.

FiE refers to a child's inability to give justification after forming groups. For example, cycle, bike, and car all are similar, but I can't say how, or the child may stay silent after forming the group.

PCE refers to the logical explanation of similarity on picture-based tasks. The explanations may be perceptible, functional, nominal, affective or fiat type.

MCE refers to the logical explanation of similarity on model-based tasks. The explanations may be perceptible, functional, nominal, affective or fiat type.

WCE refers to the logical explanation of similarity on word-based tasks. The explanations may be perceptible, functional, nominal, affective or fiat type.

Learning Styles (LSs): Generally, learning styles refer to the preferred ways to learn, understand, and process information. There are various LS models and, consequently, different LSs. One of the most preferred models is Neil Fleming's VARK model. Where 'V' represents Visual Learning Style (VLS), 'A' represents 'Auditory Learning Style' (ALS), 'R' represents 'Read/Write Learning Style' (RWLS), and 'K' represents 'Kinaesthetic Learning Style' (KLS). In the present study, LSs refer to participants' preferences from one or a combination of two or three from the Fleming's VARK model. The preference of one style, for example, V or K, is considered unimodal LS, and the preference of a combination of two or more styles is considered multimodal LS.

VLS refers to individual's preference to process, understand and retain information more effectively through visuals like images or pictures, diagrams, charts, and videos, and the persons who prefer this model are known as visual learners.

ALS refers to individual's preference to process, understand and retain information more effectively through auditory inputs like verbal explanations or lectures, discussions, listening to recordings, and the persons who prefer this model are known as auditory learners.

RWLS refers to individual's preference to process, understand and retain information more effectively through textual information like reading and writing tasks, such as taking notes, reading books, completing worksheets, and writing essays, and the persons who prefer this model are known as read/write learners.

KLS refers to individual's preference to process, understand and retain information more effectively through hands-on experiences and physical activities that involve movement, touching and doing, such as experiments, simulations, and role-playing, and the persons who prefer this model are known as kinaesthetic learners.

Elementary School Children: In India, the elementary school level refers to Class-I to Class-VIII, which covers the six-to fourteen-year-old age group. In the present study, elementary school children refer to the students studying in Class I to class VIII in different schools in India.

Muslim Elementary School Children: Muslim elementary school children refer to elementary school children (as defined earlier), who belong to the Muslim ethnic community.

Anthro-Pedagogical Perspective: In the present study, the term Anthro-Pedagogical Perspective refers to the integration of anthropological variables such as type of birth, birth order, BMI and pedagogical variables such as class level and parental educational qualifications.

3.5. Objectives of the Study

The present study was undertaken to meet the following objectives:

1.0 To develop and standardise an instrument to measure CE among Muslim elementary school children;

2.0 To measure the average number of stimuli and total time taken for forming groups of concepts by each class of Muslim elementary school children;

- 2.1 To measure the average number of stimuli taken by each class of Muslim elementary school children to form groups of concepts in the context of CET, PCET, MCET, and WCET;
- 2.2 To measure the average time taken by each class of Muslim elementary school children for completion of CET, PCET, MCET, and WCET to form groups of concepts;

3.0 To analyse the variations in CE among Muslim elementary school children caused by Anthro-pedagogical factors (Age, class, gender, birth type, birth order, BMI, number of siblings, parental educational qualification, family type, and family monthly income);

- 3.1 To analyse the variations in overall CE among Muslim elementary school children caused by anthro-pedagogical factors;

3.2 To analyse the variations in test-wise CE among Muslim elementary school children caused by anthro-pedagogical factors;

3.3 To analyse the variations in dimension-wise CE among Muslim elementary school children caused by anthro-pedagogical factors;

4.0 To identify the preferred LSs among Muslim elementary school children;

5.0 To find out the association between anthro-pedagogical factors (Age, class, gender, birth type, birth order, BMI, number of siblings, parental educational qualification, family type, and family monthly income) and LSs preference among Muslim elementary school children;

6.0 To assess the influence of LSs on CE among Muslim elementary school children;

6.1 To assess the influence of LSs on OCE among Muslim elementary school children;

6.2 To assess the influence of LSs on test-wise CE among Muslim elementary school children;

6.3 To assess the influence of LSs on dimension-wise CE among Muslim elementary school children;

7.0 To explore the moderating effect of selected anthro-pedagogical factors, i.e. number of stimuli taken, total time taken, age, BMI and family monthly income in the relationship between LS preference and CE among Muslim elementary school children.

3.6. Hypotheses of the Study

Keeping in mind the research questions and the stated objectives, the researcher formulated the following null hypotheses:

- $H_0$1: The variations in OCE among Muslim elementary school children are not significantly caused by anthro-pedagogical factors, i.e. age, class, gender, birth type, birth order, BMI, number of siblings, parental educational qualification, family type, and family monthly income.
- $H_0$2: Variations in the selected anthro-pedagogical factors do not significantly cause variations in test-wise CE (i.e. PCE, MCE and WCE) among Muslim elementary school children.

- $H_0$3: Dimension-wise CE (i.e. PE, FE, NE, AE and FiE) do not significantly vary due to variations in the selected anthro-pedagogical factors among Muslim elementary school children.
- $H_0$4: There are no significant associations between anthro-pedagogical factors and LS preference among Muslim elementary school children;
- $H_0$5: OCE does not vary significantly across various LS preferences of the Muslim elementary school children.
- $H_0$6: Test-wise, CE does not vary significantly across various LS preferences of Muslim elementary school children.
- $H_0$7: Dimension-wise, CE does not vary significantly across various LS preferences among Muslim elementary school children.
- $H_0$8: Selected Anthro-pedagogical factors (i.e. number of stimuli taken, total time taken, age, BMI and family monthly income) have no significant moderation effects in the relationship between LS preference and CE among Muslim elementary school children.

3.7. Delimitations of the Study

To clearly define the scope of the study and to specify the research objectives, the present study is delimited to the following areas:

1. Only elementary school students studying in Class-I, II, III, IV and V in Rural area of Purba Bardhaman district in the state of West Bengal, India, were considered;
2. Only two Bengali Medium schools affiliated to WBBPE were considered for this study;
3. As the present study concerns the Anthropological viewpoints, consequently to give a culture-specific perspective, only 175 Muslim students are included in the present study;
4. To identify the LS preferences of the participants, only one LS inventory is used (the VARK Model);
5. The cognitive equivalence test (CET) was used to measure the CE of Muslim elementary school children;
6. In the present study, OCE, PCE, MCE, WCE, PE, FE, NE, AE, and FiE were considered as dependent variables;

7. The anthro-pedagogical factors like age, class, gender, birth type, birth order, BMI, number of siblings, parental educational qualification, family type, and family monthly income were considered in the present study, which further considered as independent and moderating variables;
8. In the present study, class, gender, birth type, birth order, number of siblings, parental educational qualification and family type were considered independent variables;
9. In the present study, LS was considered as both dependent and independent variable;
10. In the present study, the number of stimuli taken to form groups and time taken to complete the CETs were considered as both dependent and moderating variables;
11. In the present study, age, BMI and family monthly income were considered as both independent and moderating variables.

3.8. Significance of the Study

The present study holds significant importance in education and related fields as it explores the associations between LSs and CE among Muslim elementary school children through an anthro-pedagogical perspective, addressing a critical gap in educational research. By focusing on a specific ethnic and educational context, it seeks to understand unique cognitive developmental patterns influenced by culture and pedagogy-related factors. The study's outcomes can contribute to the field of education in many ways. The research provides insights into the status and development of CE among elementary school children, examining how various anthropological and pedagogical factors influence its growth. By identifying the preferred LSs of Muslim elementary school children, the study can guide educators in designing instructional strategies to accommodate diverse learning needs, enhancing student engagement and performance. The findings on the relationship between LS preferences and CE will contribute to the theoretical understanding of how children process and organise knowledge, which can inform classroom practices and curriculum development. By analysing the moderating effects of anthro-pedagogical factors, the study sheds light on how these variables can influence the relationship between LS preferences and CE, providing a holistic view of the learning process. The insights gained can inform policymakers to design educational interventions and support systems tailored to Muslim elementary school children's socio-

cultural and developmental needs, promoting equity and inclusivity in education. Ultimately, this study seeks to bridge the gap between anthropology and pedagogy in the educational context, offering a comprehensive framework to understand and enhance children's cognitive and learning processes.

3.9. Conceptual Framework

Based on the theoretical and conceptual perspectives discussed in chapter I, the researcher developed a conceptual framework which represents the associations between LSs, CE and Anthro-pedagogical factors. The conceptual framework for the study can be presented as:

A. Variables:

	Independent Variable/s	Moderating variables	Dependent Variable/s
1.	Anthro-pedagogical Factors	-	Cognitive equivalence and Learning Styles
2.	Learning Styles	-	Cognitive Equivalence
3.	Learning Styles	Number of Stimuli taken, Time taken, age, BMI and family monthly income	Cognitive Equivalence

B. Theoretical Links:

Bruner and Olver & Hornsby's equivalence judgement model states that children represent their world through different modes (enactive, iconic and symbolic) consequently categorise objects of their world differently and impose equivalence on them accordingly. This categorisation and equivalence judgement of children differ from adults.

Fleming's learning style model (VARK) classifies learners as Visual, Auditory, Read/Write and Kinaesthetic Learners states that students learn bets by their preferred ways of learning, which further excel their cognitive performance.

Bronfenbrenner's ecological systems theory states that the environment/society/culture (the ecological systems) where a child born and brought up have significant influence on their development and learning.

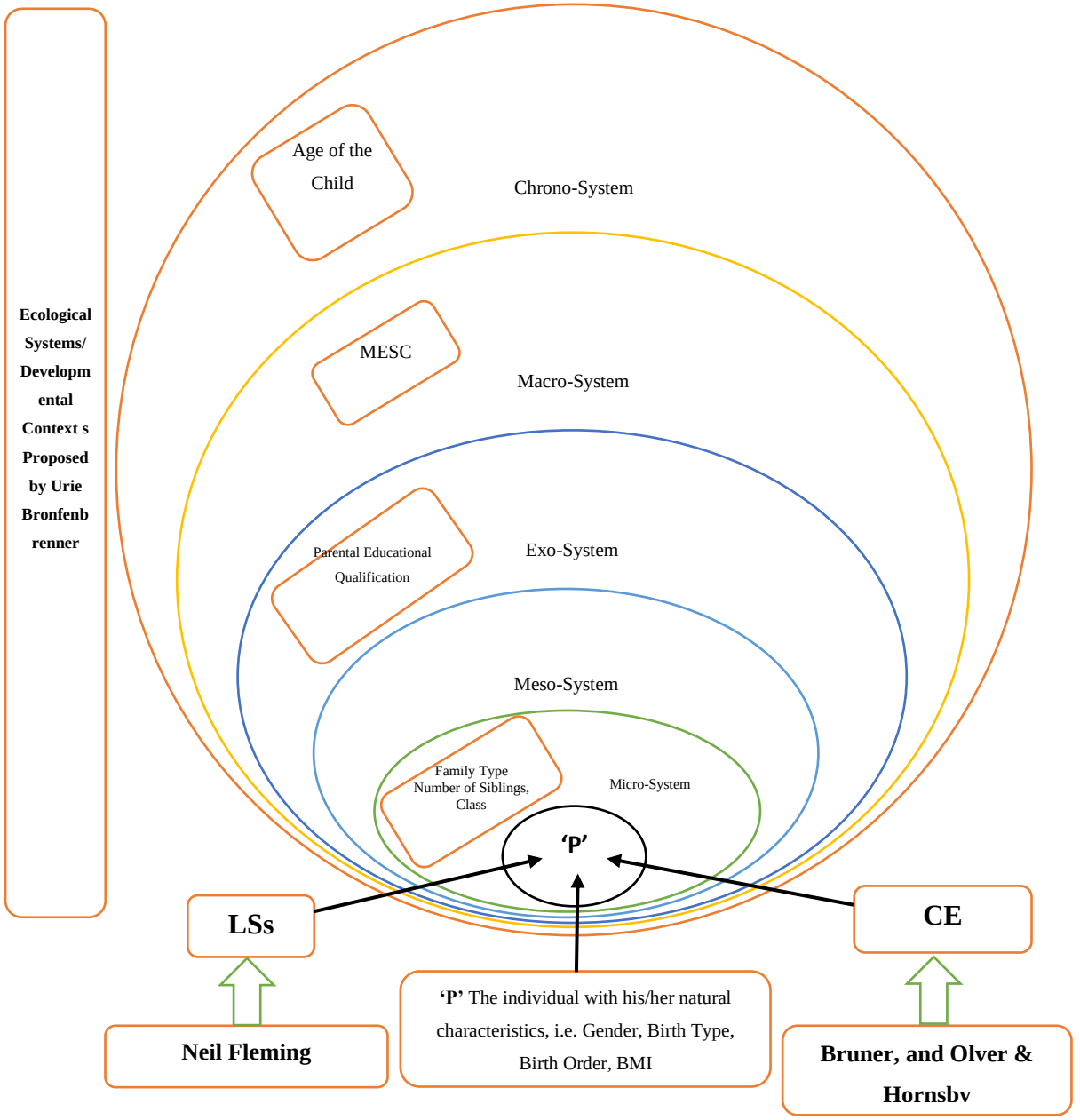

Fig. 3.1. Theoretical Framework

C. Hypothesised Relationships:

Anthro-pedagogical factors → CE: Anthro-pedagogical factors influence CE and LSs

LSs → CE: LSs influence CE

LSs→ [Selected Anthro-pedagogical factors]→CE: The selected Anthro-pedagogical variables (Number of Stimuli taken, Time taken, Age, BMI and family monthly income) potentially moderate the relationship between LSs influence CE

D. Visual Representations:

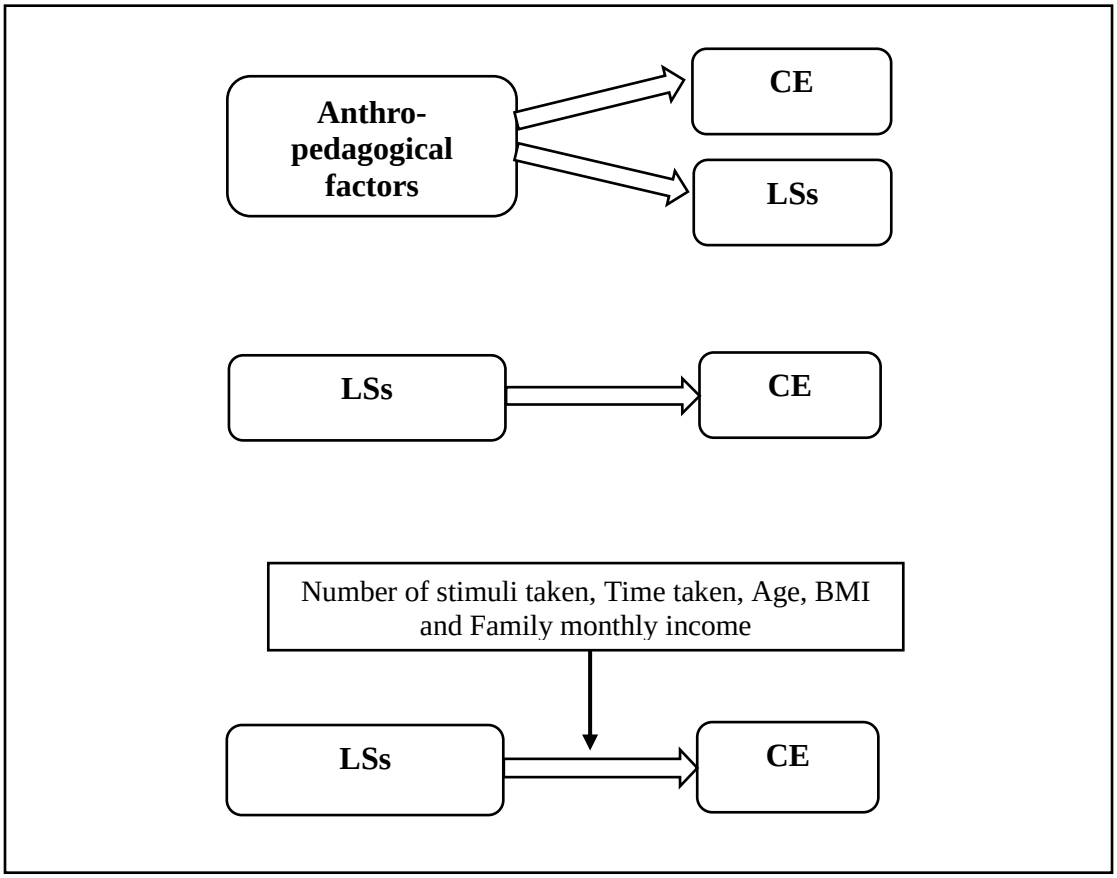

Fig. 3.2. Conceptual Framework

CHAPTER-IV

METHODOLOGY OF THE STUDY

Chapter-IV

Methodology of the Study

4.0. Introduction

The success and quality of any research are determined by the methodology used to conduct it (Sahu, 2013). A correctly identified and implemented method could increase the genuenity and predictability of the research findings (Blackford, 2017). The primary purpose of this chapter is to describe the research design, locale of the study, participants of the study, description of the variables, method and procedure, tools and techniques of data collection and analysis, ethical considerations and analysis designs.

4.1. Research Design

The present study is a quantitative, descriptive, observational study with a cross-sectional design. For this study, the researcher collected numerical data regarding the cognitive equivalence of the participants and measured its relationship with learning styles and other anthro-pedagogical variables using statistical techniques. Quantitative researchers often collect numerical data and try to establish relationships between variables through statistical techniques (Gay, Mills & Airasian, 2014; Creswell, 2012). This study also provides a description of participants' performance with the help of descriptive and inferential statistics without manipulating any variable. A descriptive study simply describes data on a variable of interest without manipulating the variables (Cohen, Manion & Morrison, 2007). It is also an observational study because the researcher administered the cognitive equivalence test (CET) to the participants, observed their engagement with the CETs and noted their performance. In this study, the researcher included different age groups of children studying in Class I, II, III, IV and V in the academic year 2023, gathered data about their learning styles and cognitive equivalence, and compared concerning Anthro-pedagogical factors. Cross-sectional studies use a snapshot of participants' beliefs, behaviours, or other variables of interest of a study population at a specified point in time (Maier et al., 2023; Mertens, 2010; Olsen & George, 2004). The specific research design is given in Fig. 4.2. in the last section of this chapter.

4.2. Locale of the Study

The present study was conducted in Purba Bardhaman District in West Bengal, India. Purba Bardhaman district is one of the important districts of the Burdwan Division in West Bengal. It is situated between Latitude 23o53′ N to 22o56′ N and Longitude 88o25′ E to 87o56′ E. The principal town and administrative headquarters is Burdwan. As per the census of 2011, the district covers an area of 5432.69 km^2. Purba Bardhaman district was recast from Bardhaman district in 2017. The district had a total population of 4,835,532, with 51% males and 49% females. Most (84.98%) of the people of this district live in rural areas. By religion, 73.75% are Hindus and 25.14% are Muslims; rest are other religious people (Census report, Govt. of India, 2011). About 58 per cent of the total population depends on agriculture. The undivided Burdwan district was known as the rice bowl of Bengal because it was the largest producer of rice in West Bengal, and the bulk of it was produced in the Purba Bardhaman district. As per the census 2011, the total literacy rate of the district is 75.48%. The district constitutes four subdivisions [Bardhaman Sadar (North), Bardhaman Sadar (South), Katwa and Kalna], twenty-three blocks and six municipalities (Govt. of West Bengal, 2024). There are six blocks under the Kalna subdivision (Purbasthali-I, Purbasthali-II, Kalna-I, Kalna-II, Kalna (M) and Monteswar). The specific location of the study is Purbasthali-I Block, which is the rural part of the district. The total area of the block is 148.44 km^2. The total population of the block is 206,977, where 74.7% are Hindus and 24.95% are Muslims; rest are the followers of other religions. The total literacy rate of the block is 77.59 per cent, where the male literacy rate is 74.41%, and the female literacy rate is 64.05%. By occupation, the block is dominated by agriculture, but weaving and bidi factories are also present. Besides household work, a great proportion of women are engaged in bidi making and weaving. This study was conducted in two primary schools, namely, Nasipur Free Primary School and Singhajuly Free Primary School. Both the schools are government-sponsored, Bengali-medium schools affiliated with WBBPE and located in a Muslim-populated area. The location where the study was conducted is shown in Fig. 4.1.

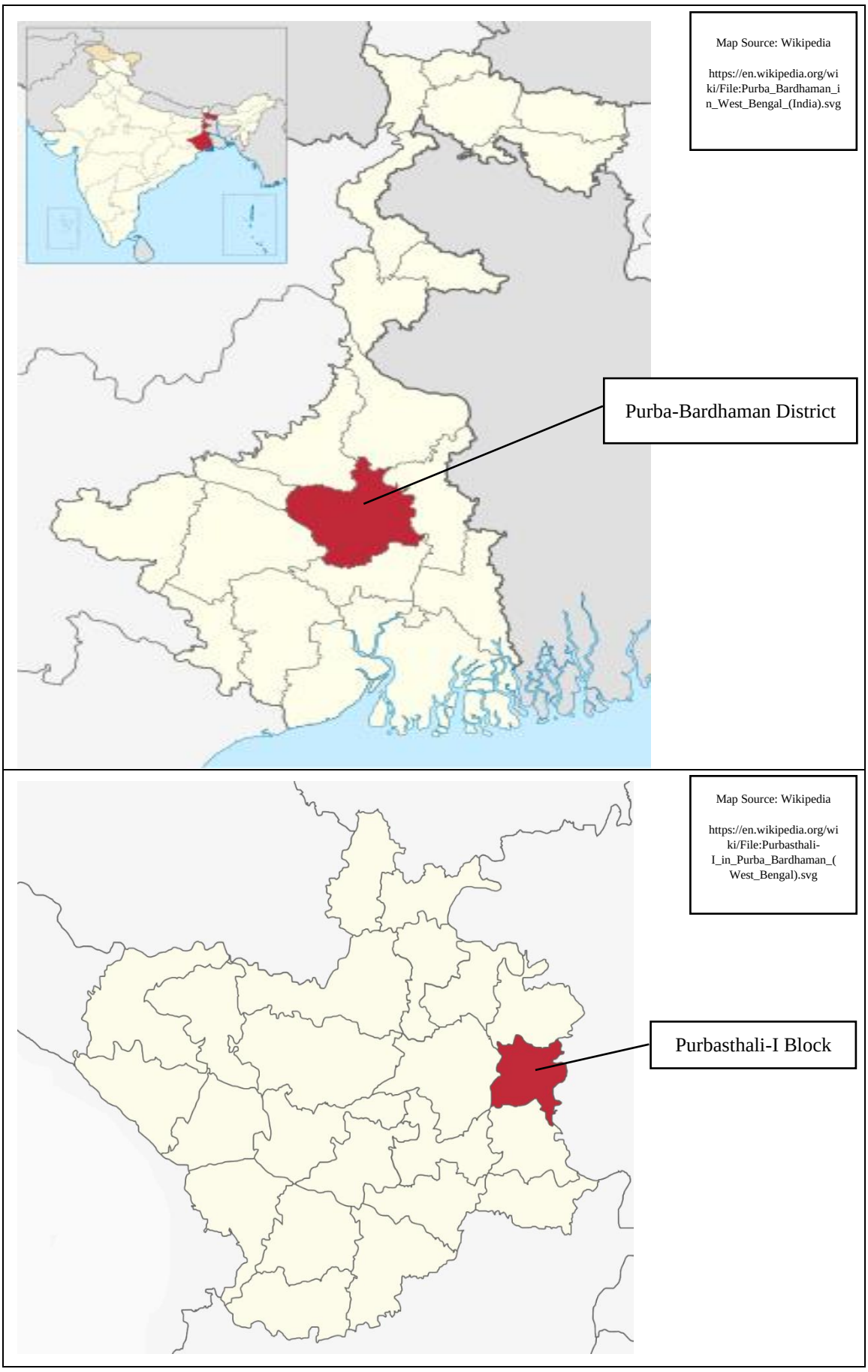

Fig. 4.1. Geographical Location of the Study

4.3. Participants of the Study

4.3.1. Population

The Muslim elementary school-going children (studying in Class I to VIII) of West Bengal, India, aged six to fourteen years, constitute the target population for the present study. In West Bengal, elementary schools are divided into lower primary levels (Class I to IV) and upper primary levels (Class V to VIII) (Government of West Bengal, 2012). In the last few years, the school education department of West Bengal started shifting Class V to the lower primary level (Government of West Bengal, 2019). Therefore, few lower primary schools offer education up to Class V (For government-aided/or sponsored schools). As of 2023, in West Bengal, there are 58110 elementary schools. Of these, 31379 lower primary schools offer education from Class I to IV, and 17996 schools offer Class I to V. Further, 8735 (as of 2021) schools offer upper primary education (Class V to VIII). In the academic year 2023, there were 7195728 students in the lower primary level (Class I to V) (Govt. of West Bengal, 2023). The researcher could not identify the data concerning the exact number of students, and Muslim students in particular in Class I to V level under WBBPE. The estimated percentage of the Muslim population in West Bengal in 2023 is about 27% of the total population (Hussain et al., 2012). So, the assumed number of Muslim students studying in Class-I to V is 1942846 [27% of 7195728].

4.3.2. Determination of Sample Size

As of 2023, there were 3111 elementary schools (Class-I to VIII) and 967 lower primary schools (Class-I to V) in the Purba Bardhaman district, and the total number of students in elementary level was 58029, and at the lower primary level (Class-I to IV) the number is 44179. At upper primary level (Class V to VIII) it is 13850 *(Govt. of West Bengal, 2023*). The researcher could not identify the data concerning the exact number of students, and Muslim students in particular in Purba Bardhaman district, who are studying in Class I to V level under WBBPE. The number was assumed to be around 47641 [44179 at Class I to IV level, plus, for Class V, 25% of the upper-primary level, i.e. 13850/4=3462]. The estimated number of Muslim students studying in Class-I to V is 12863 [27% of 47641] (Hussain et al., 2012). As per Morgan's table, when the population size is more than ten lacs, the suitable sample size in questionnaire-based survey research is 384 or more (Krejcie & Morgan, 1970). However, the present study is not questionnaire-based, rather the researcher used an interview schedule, and task-based observation. On average, data collection took about an hour per participant, making the process time-consuming and

challenging to conduct with a large sample size. So, the researcher included 175 Muslim elementary school children and their respective parents/guardians as participants in this study.

4.3.3. Sampling Procedure and Sample of the Study

For selecting sample for the present study, the researcher employed both purposive and random sampling techniques. A purposive sample is one whose characteristics are defined for a purpose that is relevant to the study (Andrade, 2021). On the other hand, the random sampling method ensures the probability of each population unit being selected as representative (Rahman, 2022; 2020; Jawale, 2012). As the present study was delimited to Muslim elementary school children studying in Class I to V, therefore, the researcher purposively selected the mentioned two schools because both the schools were located in Muslim-populated areas and offered lower primary education from Class I to V. In Nasipur Free Primary School, there were 60 students, and all are Muslims. In Singhajuly Free Primary School, there were 197 students, out of which only one student was non-Muslim. As the target population of the study is Muslim students, therefore, that particular student was eliminated from this study. After that, participants were selected randomly from each Class. However, at the data cleaning stage, three participants were excluded from the final consideration because of unavailability some anthro-pedagogical information. Therefore, finally, the sample constituted 172 Muslim elementary school children [Class I (n=28), Class II (n=34), Class III (n=30), Class IV (n=38) and Class V (n=42)] and their respective parents/guardians. The parents/guardians were included in this study because the students were too young to provide some of the Anthro-pedagogical information like- birth type, birth order, family type, and family monthly income. Therefore, for accuracy and reliability, the information was collected from their parents/guardians through an interview schedule. The detailed distribution of the sample has been presented in Table 4.1.

Table. 4.1. Anthro-pedagogical Profile of the Participants

Variables	Labels	N	Percent
Class	Class-I (7;4)	28	16.3
	Class II (8;6)	34	19.8
	Class-III (9;4)	30	17.4
	Class-IV (10;55)	38	22.1
	Class-V (11;55)	42	24.4
	Total (9;75)	172	100.0
Gender	Male	77	44.8
	Female	95	55.2
Birth Type	Normal Delivery	95	55.2
	Caesarean Delivery	77	44.8
Birth Order	1st	87	50.6
	2nd	67	39.0
	3rd	18	10.5
BMI Level	Underweight	147	85.5
	Normal Weight	20	11.6
	Over Weight	5	2.9
Number of Siblings	Single Child	25	14.5
	Having One Siblings	112	65.1
	Having More than One Siblings	35	20.3
Father's Educational Qualification	Illiterate	16	9.3
	Up to Class-IV	29	16.9
	Class-V to VIII	86	50.0
	Class-IX to X	20	11.6
	Class-XI and Above	21	12.2
Mother's Educational Qualification	Illiterate	13	7.6
	Up to Class-IV	29	16.9
	Class-V to VIII	67	39.0
	Class-IX to X	42	24.4
	Class-XI and Above	21	12.2
Family Type	Joint Family	42	24.4
	Nuclear family	130	75.6
Family Monthly Income	Up to 6174	70	40.7
	6175 to 18496	91	52.9
	18497 to 30830	11	6.4

Note: The mean age of the participants is given in parenthesis in years and months (YY;MM) for each Class

4.4. Description of the Variables Under Consideration

A variable is something that varies in value. These are observable features of something that can take on several different values or can be put into several discrete categories (Lewis-Beck et al., 2003). Variables may be independent, dependent, mediating, or moderating, depending on how they are employed in a research study (Bhattacherjee, 2012). Based on the identified research problem and objectives, two types of variables

were considered in this study and categorized into two broad heads: Anthro-Pedagogical variables and measured variables (see Table 4.2).

Table. 4.2. Variables Under Consideration

Measured Variables	Anthro-Pedagogical Variables
1. Overall Cognitive Equivalence (OCE) 2. Picture-based Cognitive Equivalence (PCE) 3. Model-based Cognitive Equivalence (MCE) 4. Word-based Cognitive Equivalence (WCE) 5. Perceptible Equivalence (PE) 6. Functional Equivalence (FE) 7. Nominal Equivalence (NE) 8. Affective Equivalence (AE) 9. Fiat Equivalence (FiE) 10. Number of Stimuli Taken to Form Groups 11. Time Taken for Completing the CE Tests 12. Learning Styles	1. Age 2. Class 3. Gender 4. Birth Type 5. Birth Order 6. BMI 7. Number of Siblings 8. Parental Educational Qualification 9. Family Type 10. Family Monthly Income

Further, based on the hypothesis, these variables were considered as truly dependent variables (OCE, PCE, MCE, WCE, PE, FE, NE, AE, and FiE), truly independent variables (class, gender, birth type, birth order, number of siblings, parental educational qualification and family type), both dependent and independent variables (LSs), both dependent and moderating variables (Number of stimuli taken to form groups, Time taken to complete the CE tests), and both independent and moderating variables (age, BMI and family monthly income).

4.4.1. Measured Variables

In this study, the researcher considered OCE, Task-based CE (PCE, MCE and WCE), dimension-based CE (PE, FE, NE, AE and FiE), number of stimuli taken to form groups, Time taken to complete the CE tests, and LSs as measured. Though there was no highest limit of the scores in CE, a high score in these variables indicates higher cognitive ability, and vice versa.

- **Overall Cognitive Equivalence (OCE):** It is the sum of the scores a student gets in all the three cognitive equivalence tests (CETs).
- **Picture-based Cognitive Equivalence (PCE)**: It is the sum of the scores a student gets in all the five dimensions of CE in the PCET.
- **Model-based Cognitive Equivalence (MCE)**: The sum of a student's score in all the five dimensions of CE in the MCET.
- **Word-based Cognitive Equivalence (WCE)**: The sum of scores a student got in all the five dimensions of CE in the WCET.

- **Perceptible Equivalence (PE):** The total of a student's scores for his/her perceptible responses in all eighteen trials under all sub-tests of CET [6x3=18].
- **Functional Equivalence:** The total of a student's scores for his/her functional responses in all eighteen trials under all sub-tests of CET.
- **Nominal Equivalence (NE):** The total of a student's scores for his/her nominal responses in all eighteen trials under all sub-tests of CET.
- **Affective Equivalence (AE):** The total of a student's scores for his/her nominal responses in all eighteen trials under all sub-tests of CET.
- **Fiat Equivalence (FiE):** The total of a student's scores for his/her inability to explain similarity after group formation with stimuli in all eighteen trials under all sub-tests of CET.
- **Number of stimuli taken to form groups:** The mean/average of the number of stimuli a student takes to form a group in all eighteen trials under all sub-tests of CET. Though the minimum number is 2, students can take as many stimuli as they want from the given stimuli.
- **Time taken for completing the CET:** The sum of time each student takes to complete all eighteen trials under all sub-tests of CETs [6x3=18].
- **Learning Styles:** These are the preferences for LSs. This study followed the VARK model, and students were labelled as unimodal-visual, auditory, read/write, or kinaesthetic learners. Further, based on multiple preferences, they were also labelled as multimodal learners.

4.4.2. Anthro-Pedagogical Variables

In the present study, the considered Anthro-Pedagogical variables were age, class, gender, birth type, birth order, BMI, number of siblings, parental educational qualification, family type and family monthly income as discussed below:

- **Age:** In this study, age refers to biological or chronological age, and this variable was measured in years and months (YY;MM).
- **Class:** It refers to the grade or class in which the child studies in school. This study includes Class I, II, III, IV, and V students.
- **Gender:** Gender represents a person's social identity, unlike sex, which is biological. It was a dichotomous variable, with two major categories: male and female.

- **Birth Type:** Birth type refers to the type of delivery in which a child is born. It was a dichotomous variable; the two major categories were normal delivery(normally born) and caesarean delivery (caesarean-born).
- **Birth Order:** Birth Order refers to the order in which a child is born. For example, if someone has two children, the elder child's birth order is first, and the younger child is second. It is discrete, and in the present study, the researcher found children's birth order up to third.
- **Body Mass Index (BMI)**: BMI is a quantitative measure derived from an individual's weight and height. It is calculated as weight in kilos divided by height in square meters. It serves as a criterion to classify individuals into several weight categories: Underweight (BMI < 18.5), Normal weight (BMI=18.5 to 24.9), Overweight (BMI=25.0 to 29.9), and Obesity (BMI ≥ 30.0).
- **Number of Siblings:** The number of Siblings is a discrete variable. In this study, the researcher found that some participants were single children, some had one sibling, some had two siblings, and only five participants had three siblings. Therefore, to get a well distribution, the researcher categorised the participants into groups and merged the participants having two and three siblings into more than one sibling group. Therefore, in this study, the number of sibling variables has three categories: single child, having one sibling, and having more than one sibling.
- **Parental Educational Qualification:** Parental educational qualification refers to the highest educational qualification of the father or mother of the participants. The researcher categorised this variable into the father's and mother's educational qualification groups, viz. 1. Illiterate, 2. Up to Class-IV, 3. Class-V to VIII, 4. Class-IX to X, 5. Class-XI and Above.
- **Family Type:** It refers to the type of family or the structure of the family a child belongs to. In Indian contexts, different types of families are found. For example, joint family, nuclear or broken family, separated family, and a few single mothers or single fathers. In this study, the researcher found that the participants belonged to a joint or nuclear family. Joint family refers to a family where children live with their mother and/or father, siblings (if any), grandmother and grandfather (if alive), paternal uncle and aunty (if any), and their cousins (if any). A nuclear family is a family where a child lives with his/her mother and/or father and the sibling (if any).
- **Family Monthly Income:** It refers to a family's average monthly income (including all the sources). It was measured as a family's average monthly earning in Indian rupee (including all the sources). Though it was a continuous variable,

the familial income was divided into familial income groups following the modified Kuppuswamy SES scale (Saleem & Jan, 2021). The specific income categories used in this study were: 1. Up to 6174, 2. 6175 to 18496, and 3. 18497 to 30830. Only a few students who belong to a family with a monthly income of more than Rs. 30830 were found.

4.5. Methods of Data Collection

4.5.1. Tools and Techniques Used for Data Collection

Data collection tools/instruments are vital in any research (Heath et al., 2018, cited in Mwita, 2022). The data quality and reliability depend mostly on the instrument (Sadan, 2017). Therefore, it is a vital task for every researcher to select and use appropriate data collection method(s), tool(s), and technique(s) (Mwita, 2022). To collect appropriate data for the present study, the researcher used three tools viz. 1. An Interview Schedule (Containing Anthro-pedagogical Information), 2. A Learning Style Inventory, and 3. A Cognitive Equivalence Test (see table 4.3) (copy attached in Appendix-B, C & D), and observation technique.

4.5.1.1. The Interview Schedule

The researcher prepared this interview schedule. The primary purpose of this instrument was to collect and record participants' anthro-pedagogical information like their age, gender, habitat, birth type, birth order, present height and weight, number of siblings, Class, parental educational qualification, family type, and family monthly income.

4.5.1.2. Cognitive Equivalence Test (CET)

The CET was developed and standardised by Mohakud and Khan (2023). The concept of this instrument was taken from the ‘Equivalence Task with Pictorial Material’ (Olver & Hornsby, 1966) and the ‘Cognitive Equivalence Measuring Pictorial Task’ (Khan & Mohakud, 2017). The primary purpose of this test is to measure the Cognitive Equivalence ability of school children aged six to fourteen years. The CET consists of three sub-tests viz. Picture-based Cognitive Equivalence Test (PCET), Model-based Cognitive Equivalence Test (MCET) and Word-based Cognitive Equivalence Test (WCET). The PCET comprises 35 (Thirty-five) pictures such as locally available fruits and vegetables. The MCET comprises 30 (Thirty) models such as animals, vehicles, numbers, and letters.

The WCET comprises 40 (Forty) naming words such as different animals, human body parts, and national figures.

4.5.1.2.1. Development and Description of the CET

While conceptualising and developing the CET, the curriculum of Class-I to V of WBBPE was first analysed to identify different concepts given in the curriculum and syllabus. For this purpose, a detailed review and critical analysis of the curriculum and syllabus in each Class was done. The analysis identified the core concepts for each Class. Then, the core concepts were compared among the classes to find the common concepts, and 24/25 common concepts were found, and those common concepts were distributed into three sub-tests of the CET. Then the initial draft of the CET was prepared by adding contents (stimuli-pictures, models and words) to the three sub-tests (PCET, MCET and WCET) based on the identified concepts. At this stage, 60 stimuli were added to each sub-test. In the next stage, the initial draft was send to five experts, to judge whether the added stimuli represent the included concepts or not. Experts gave their opinion through a 1 to 5 rating points, where 1 stands for very low representation and 5 stands for very high representation. After that, based on the experts rating, those stimuli had an average rating point of below four were excluded from each sub-test. After excluding 18, 22 and 12 stimuli from the PCET, MCET and WCET respectively, the second draft of the CET was prepared with remaining 42, 38 and 48 stimuli for each sub-test respectively. Then a pilot study was conducted on a small sample of 40 elementary school students (five from each class I to VIII) [The administration procedure was same as described in point no. 4.5. of this chapter]. Based on the pilot study results, 7, 8 and 8 stimuli were excluded from PCET, MCET and WCET respectively. The exclusion criteria were rarely picked stimuli and mean scores. Finally, the final draft of the CET contained 35 pictures, 30 models and 40 words. Finally, to standardized the CET, a pilot study was conducted with the final version of the CET by administering on 75 participants (15 students from each class I to V). The procedure followed to develop the CET is given in Table 4.3.

Table 4.3. The procedure followed to Develop the CET

Phases (Description)	Results/Outcomes			
1st Phase (Critical analysis of Curriculum and Syllabus of Class I to V recommended by WBBPE)	**Class-I:** My Self, My Family, My Body Parts, Animals, Colors, Shapes, Numbers, Letters, Houses, Trees, Water, Our Food, Flowers, Cleanliness, Vegetables, Fruits, Birds, Transportation, Community Helper, Clothes, Seasons, Cultures and Festivals, Health, Safety, Nationalism, Values, Health Education, Good Habits, Education Kits, Home Kits. **Class II:** My Family, My Body Parts, Animals, Colors, Shapes, Numbers, Letters, Houses, Trees, Food, Flowers, Vegetables, Fruits, Birds, Transportation, Community Helper, Clothes, Seasons, Cultures and Festivals, Materials in Everyday Life, Health, Safety, Nationalism, Play, Values, Health Education, Education Kits and Home Kits. **Class III:** My Family, Human Body, Animals, Colors, Geometric Shapes, Numbers, Letters, Houses or Shelters, Food (Vegetables and Animal Foods), Flowers, Transportation, Clothes, Sky, Health, Safety, Nationalism, National Heroes, Play, Values, Health Education, Education Kits and Home Kits. **Class IV:** Human Body, Animals, Colors, Shapes, Numbers, Letters, Houses or Shelters, Trees, Food, Flowers, Vegetables, Fruits, Birds, Transport, Clothes, Sky, Health, Safety, Nationalism, Play, Environment, Profession and Resources, Family and Society, Values, Health Education, Education Kits, and Home Kits. **Class V:** Human Body, Animals, Colors, Shapes, Numbers, Letters, Habitat, Trees, Food, Flowers, Vegetables, Fruits, Birds, Transport, Clothes, Sky, Health, Safety, Nationalism, Play, Environment and Resources, Values, Physical World, Health Education, Peace Education, Education Kits, and Home Kits.			
2nd Phase (Identification of common concepts)	The identified common concepts were the Human body, Animals, Colors, Shapes, Numbers, Letters, Habitat, Trees, Food, Flowers, Vegetables, Fruits, Birds, Transport, Clothes, Sky, Health, Safety, Play, Values, Health education, Common Education kits, and Common home kits			
3rd Phase (Distribution of the common concepts)		**PCET**	**MCET**	**WCET**
	(Sub-test-wise distribution of the identified common concepts)	Animals, Food (Vegetables and Fruits), Flowers, Clothes, Home kits, and Health education.	Animals, Shapes, Numbers and Letters, Transportation, Educational and home kits	Animals, Birds, Human body, Habitat, Trees, Food, Vegetables and Fruits, Play, Sky, and Nationalism.
4th Phase (Preparation of the initial draft of the CET)	(Sub-test-wise selection of contents for each of the included concepts)	Selected number of pictures- 60	Selected number of models- 60	Selected number of words- 60
5th Phase (Exclusion of stimuli based	Criteria- Low Mean Rating scores	Excluded number of pictures- 18	Excluded number of models- 22	Excluded number of words- 12

on experts' opinion)	(Ratings were done on a 1 to 5-point scale)	Remaining number of pictures- 42	Remaining number of models- 38	Remaining number of words- 48
6th Phase (Exclusion of stimuli based on pilot study results)	Criteria- 1. rarely picked stimuli 2. mean score	Excluded number of pictures- 7 Remaining number of pictures- 35	Excluded number of models- 8 Remaining number of models- 30	Excluded number of words- 8 Remaining number of words- 40
7th Phase (Preparation of the final draft)	Remaining number of stimuli in the final draft	A hen, a dog, a bee, a pigeon, a parrot, fish, Potato, tomato, carrot, red pumpkin, parwal, a cucumber, banana, guava, apple, pineapple, lotus, rose, marigold, t-shirt, sweater, a pair of socks, a pair of black shoes, gas-oven, gas cylinder, kadai, hata and khunti, plate, knife, first-aid box, a bottle of Dettol, a bottle of hand wash, banded, and a surgical mask	Elephant, Lion, Camel, Goat, Zebra, cow, Circle, Rectangle, Triangle, Square, 1 to 5 numbers, A to E letters, Toy car, aeroplane, motorbike, Pencil, Eraser, Sharpener, Stapler, Scissor, Chimta, Needle and Threat.	Crow (কাক), Monkey (হনুমান), Mosquito (মশা), Butterfly (প্রজাপতি), Egret (বক), Crab (কাঁকড়া), Eye (চোখ), Ear (কান), Hair (চুল), Hand (হাত), Leg (পা), Nail (নখ), Pond (পুকুর), School (স্কুল), House (বাড়ি), Brick (ইট), Wood (কাঠ), Sand (বালি), Pakka Road (পাকা রাস্তা), Mango tree (আমগাছ), Bamboo (বাঁশ), Sugarcane (আখ), Palm (তাল), Dates (খেজুর), Green coconut (ডাব), Cashew nut (কাজুবাদাম), Egg (ডিম), Rabindranath (রবীন্দ্রনাথ), Gandhiji (গান্ধীজি), Subhas Chandra Bose (সুভাষ চন্দ্র বসু), National Flag (জাতীয় পতাকা), National anthem (জন গন মন), Football (ফুটবল), Bat (ব্যাট), Kabadi (কবাডি), Moon (চাঁদ), Star (তারা), Sun (সূর্য), Rainbow (রামধনু), Sky (আকাশ)

Note: A copy of the final version of the CET is attached in Appendix D

4.5.1.2.2. Contents of the CET

The final version of the CET contained the following-

1. Thirty-five pictures, each printed on a small and thick rectangle-shaped paper (3×2 inches).
2. Thirty models.
3. Forty naming words, each printed on a small and thick rectangle-shaped paper (3×2 inches).
4. A plastic tray (18×12 inches).
5. A square-shaped wooden board (10×10 inches).
6. A response sheet (Nine A4 size pages).

4.5.1.2.3. Scoring Procedure

Cognitive Equivalence scores were assigned based on the group formation with stimuli followed by the similarity explanations given by the participants. There were no such fixed grouping or similarity explanations; therefore, no right or wrong similarity explanations. Each of the CE sub-tests was administered one by one in the following order- PCET, MCET and WCET. In each sub-test students were given six chances (trials) to form group and give similarity explanation. For each grouping, students can give as many similarity explanations as they can. These explanations may be from perceptible, functional, nominal, affective or fiat perspectives. One (1) score was assigned for each similarity explanation. In all the three sub-tests, each student got 18 trials (six trials*three sub-tests=18) to form group and give similarity explanation. The final score of all the variables are as follows:

1. The PE score is the sum of all the scores a student got for his/her perceptible explanation of similarity in all 18 trials.
2. The FE score is the sum of all the scores a student got for his/her functional explanation of similarity in all 18 trials.
3. The NE score is the sum of all the scores a student got for his/her nominal explanation of similarity in all 18 trials.
4. The AE score is the sum of all the scores a student got for his/her affective explanation of similarity in all 18 trials.
5. The FiE score is the sum of all the scores a student received for his/her inability to explain similarity in all 18 trials.
6. The PCE score is the sum of all the scores a student got for his/her similarity explanation (it may be perceptible, functional, nominal, affective, or fiat) in all six trials in the PCET.

7. The MCE score is the sum of all the scores a student got for his/her similarity explanation (it may be perceptible, functional, nominal, affective or fiat) in all six trials in the MCET.
8. The WCE score is the sum of all the scores a student got for his/her similarity explanation (it may be perceptible, functional, nominal, affective, or fiat) in all six trials of the WCET.
9. The OCE score is the sum of all the scores for all three tasks (PCET, MCET, and WCET).
10. Number of stimuli taken to form groups is the average number of stimuli taken by the students to form groups in all 18 trials in three CE sub-tests.
11. Time taken to complete the CET is the time taken by a student to complete each trials in three sub-tests of CE. The total time is the sum of all the time taken to complete 18 trials. The time was measured in minutes.

4.5.1.2.4. Technical Information about the CET

Validity: The construct and content validity of the CE measure was ensured experts opinion. For ensuring the content validity of the CET, the test developers ensuring that 6 to 14-years age group children are familiar with the stimuli (pictures, models, words). Then, the included concepts and respective stimuli were sent for experts' opinions. Experts rated which of the stimuli best represented the concepts on a 1 to 5-point rating scale, and the highly rated stimuli were included in the pilot study. Finally, based on the pilot study results, a few stimuli were excluded to form the final draft (detailed description given in Table 4.3).

Reliability: To ensure the reliability of the CET, the developers checked the Test-retest and interrater reliability coefficients. The test-retest and interrater reliability coefficients were found to be .85 and .92, respectively, which is quite high for this type of subjective measure.

4.5.1.3. The Learning Style Inventory (LSI)

The LSI purports to identify the learning styles of young children. This instrument consists of ten (10) items. Each item consists of four alternative choices. The four choices were given under options A, B, C and D, and the options represent the attributes of Visual, Auditory, Read/Write and Kinaesthetic learning styles respectively. It categorises children as Visual, Auditory, Read/Write, and Kinaesthetic learners. It is the translation and cultural adaptation of the Kids Learning Style Survey (Meleen, 2019). The original version was in

English. The Bengali translation and cultural adaptation was done by Khan and Mohakud (2023).

4.5.1.3.1. Translation and Cultural Adaptation of the LSI

For the translation and cultural adaptation, first of all, the researcher and the supervisor translated the ten LSI items into Bengali. For some items, a few alternatives were not appropriate (available/practised) in the local culture. Therefore, those alternatives were replaced with similar (locally available/practised) alternatives. Then, the Bengali translations were sent to a language expert for blind retranslation into English. Further, the blind retranslated version was sent to another language expert for translating it again into Bengali. Finally, this Bengali version was compared with the original English version by the researcher, the research supervisor and the other RAC members. With some modifications, the final draft was prepared and used in the pilot study.

4.5.1.3.2. Scoring Procedure

The scoring procedure of this instrument is straightforward. In all the ten LSI items, the alternative choices were given under four options, where option ‘A’ represents the Visual, ‘B’ represents the Auditory, ‘C’ represents the Read/Write and ‘D' represents the Kinaesthetic learners' attributes. For example,

My favorite kind of project is-

A. An art project
B. A music project
C. A book report
D. A science experiment

While scoring the responses, the scorer has to count the frequency of A, B, C, and D responses. The highest frequency option represents the participant's preferred learning style. If any students’ responses are tied, then his/her LS is the combines those two LSs, which may be considered a multimodal LS.

4.5.1.3.3. Technical Information about the LSI

Validity: This instrument is a Bengali-translated version, so the instrument's content and construct validity was ensured through experts' opinions (the detailed procedure is given in point 4.7.3.1.).

Reliability: The reliability of the LSI was ensured through a pilot study, and the Test-Retest reliability was found to be .92.

4.6. Procedure of Data Collection

After getting consent from the school heads, the researcher first went to the classroom and established a good rapport with all the students in each Class. To do so, the researcher introduced himself to the students, asked their names, and did some introductory conversation. The researcher then told them the purpose of his visit and then randomly selected students as representatives for the study. Then, the researcher contacted the parents/guardians and took consent for their children to participate in the study. At that time, the researcher also collected the anthro-pedagogical information of their children through an interview schedule (anthro-pedagogical information sheet). After that, the researcher visited the school again and started collecting data from the selected students. The researcher asked the students to come to a quiet, separate room and told them to sit in a chair in front of him and look. There was a small table between them, and the Learning Style Inventory (LSI) was first administered. The researcher told the participant, "I will tell you some situations and give you four choices. You have to tell me which of the four choices best suits you/apply for you. Do not think much because there is no right or wrong answer. It only indicates which you mostly prefer". After that, the researcher read out the LSI items and the alternative choices (explanations were given if required). When the participant confirms their choice, the researcher puts a tick mark on their chosen alternative in the response sheet and then reads out the next item. This procedure was repeated for all the ten LSI items. When the LSI items were completed, the researcher then administered the CETs one after one. At first, the PCET was presented, followed by the MCET and WCET. Before presenting the PCET, the researcher told the participants, "I will play a game with you. I will show you some pictures; you just have to find out similar pictures". Then, the researcher presented the 35 pictures (stimuli) in a plastic tray in front of the participants. Then, they were asked to arrange the pictures in rows and columns individually. The researcher also helped the participants to arrange the pictures. When the pictures were arranged, the researcher told them to see each picture minutely. They minutely saw each picture in the tray and confirmed whether they were familiar with the pictures or not. If any participants were unfamiliar with any of the pictures, the researcher explained the picture to them. Then, they were asked to select the pictures that are similar/alike in any way and put those selected pictures/stimuli on a different square-shaped wooden board placed aside. Then, the researcher started the stopwatch to count the time. They could take as many pictures/stimuli as they wanted and as much time as needed. The only condition was to form one group at a time. After that, they were asked to explain

why the pictures were similar/alike (which means giving similarity justifying their grouping). They could provide as many justifications as they could for their grouping. There was a response sheet, where all the pictures were printed and next to it was a blank space where similarity explanations could be written. The researcher maintained the response sheet, the task was to mark each picture they took to form a group and note down the similarity explanations in the given space. The researcher motivated the participants to give more and more justification. When they stopped giving justification, the researcher counted time and wrote it on the response sheet. Then, the selected stimuli were replaced in their original place. Afterwards, the researcher asked the participant to form a new group with the stimuli. They could also take those stimuli they had already used in the previous grouping, but they had to give new/separate justifications for their newly formed group. The researcher again marked the new group and noted their justification and the time taken in the given space. The procedure was repeated six times (six trials). When all six trials were completed, then the researcher presented the MCET. The procedure for MCET was similar to PCET. The only difference was the set of stimuli (i.e., the models). Finally, the WCET was administered, and the procedure for this test was the same as that for the PCET and MCET. The only difference was the set of stimuli (i.e. words). The researcher counted the time for each trial in each task. On average, each student took 40 to 45 minutes to complete the whole procedure. When the total procedure was completed, the researcher gave a token of appreciation to the participants. The whole data collection was done under the supervision of the researcher. In some cases, the researcher took some assistance from his co-researchers and students. However, the researcher gave proper training to the assistants beforehand. The total data collection was done between October 2023 and December 2023. At that time, students had completed their overall syllabus and were preparing for their final examination.

4.7. Data Cleaning and Tabulation

Participant responses were first evaluated to ensure the full completion of the personal information sheets, all the items of the LS measure, and all the trials in the CET. For data genuenity, some personal information, such as the participant's date of birth, was confirmed from the school records. The researcher himself did the coding and scoring. Due to the unavailability of some anthro-pedagogical information, 3 participants were excluded from the final consideration. After data cleaning and scoring, the researcher entered all the

collected data into an MS Excel worksheet with some assistance from co-researchers. The raw data collected from 172 participants were systematically and sequentially tabulated for further analysis. The stored data were accessible to the present researcher only.

4.8. Data Analysis Techniques

The researcher used different tools and techniques to analyze the data. The researcher manually coded the responses into PE, FE, NE, AE and FiE. The quantitative analysis was done in MS Excel and SPSS. The data normality was checked through Skewness, Kurtosis, Kolmogorov-Smirnov, and the Shapiro-Wilk test (Hatem et al., 2022; Okeniyi et al., 2020). Descriptive statistics like mean score, SD, mean rank, frequency, percentage analysis, and graphical representation. These statistics are used to describe the student's performance (Witte & Witte, 2017, cited in Dong, 2023; Sutanapong & Louangrath, 2015). Further, inferential statistics like the chi-square test, Pearson's Correlation, independent samples t-test, one-way ANOVA, Mann-Whitney-U test, Kruskal-Wallis test, and moderator analysis were done through regression analysis in Process Macro in SPSS. These statistics are used for testing hypothesis (Sutanapong, & Louangrath, 2015; Barnes, & Lewin, 2005; Connolly, 2007).

4.9. Ethical Considerations

Like other sciences, ethical considerations are also vital in social science research and must be taken care of (De Wet, 2010; Broom, 2006). In the present study, the researcher was concerned about that. The purpose, methods and procedures, and consequences of the study were transparent to all, the school heads, parents and students. First of all, permission was obtained from the Research Advisory Committee (RAC) and the research supervisor to collect data for the study (copy attached in appendix A). Written consent was taken from the school heads and the parents/guardians of the participants (copy attached in appendix-F_1, F_2 & A). In all regards, the participation was voluntary. Participants could exit from the study at any point in time. The researcher did not use any method or treatment that could physically or psychologically harm the participants. The researcher gave some incentives (viz. Chocolate, a piece of cake, a banana, and an educational kit containing a document organizing file, a notebook, a pen, a pencil and an eraser) to the students to appreciate their participation in the research.

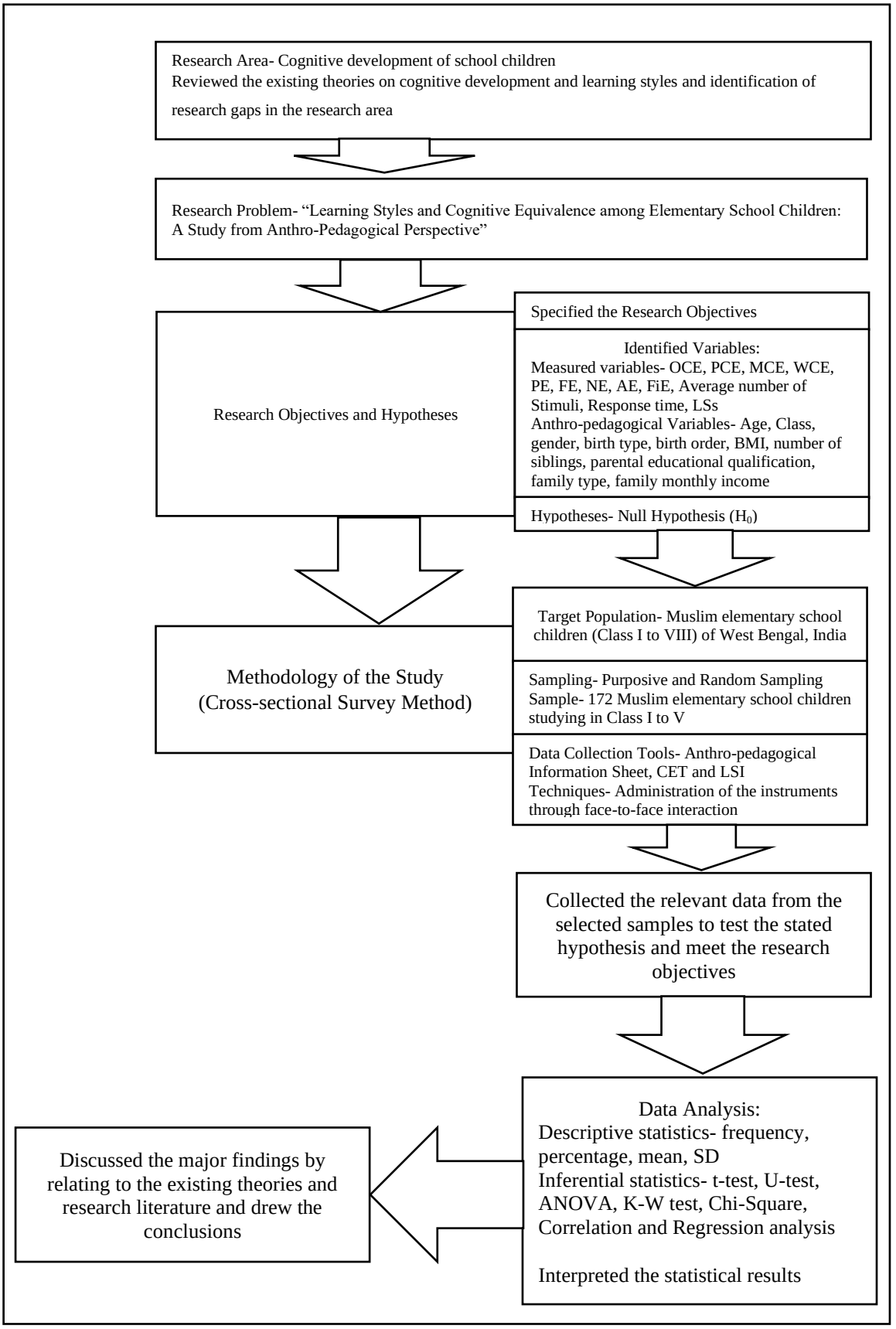

Fig. 4.2. Research Design

4.10. Analysis Designs

4.10.1. Factorial Analysis Design Relating to Objective-2

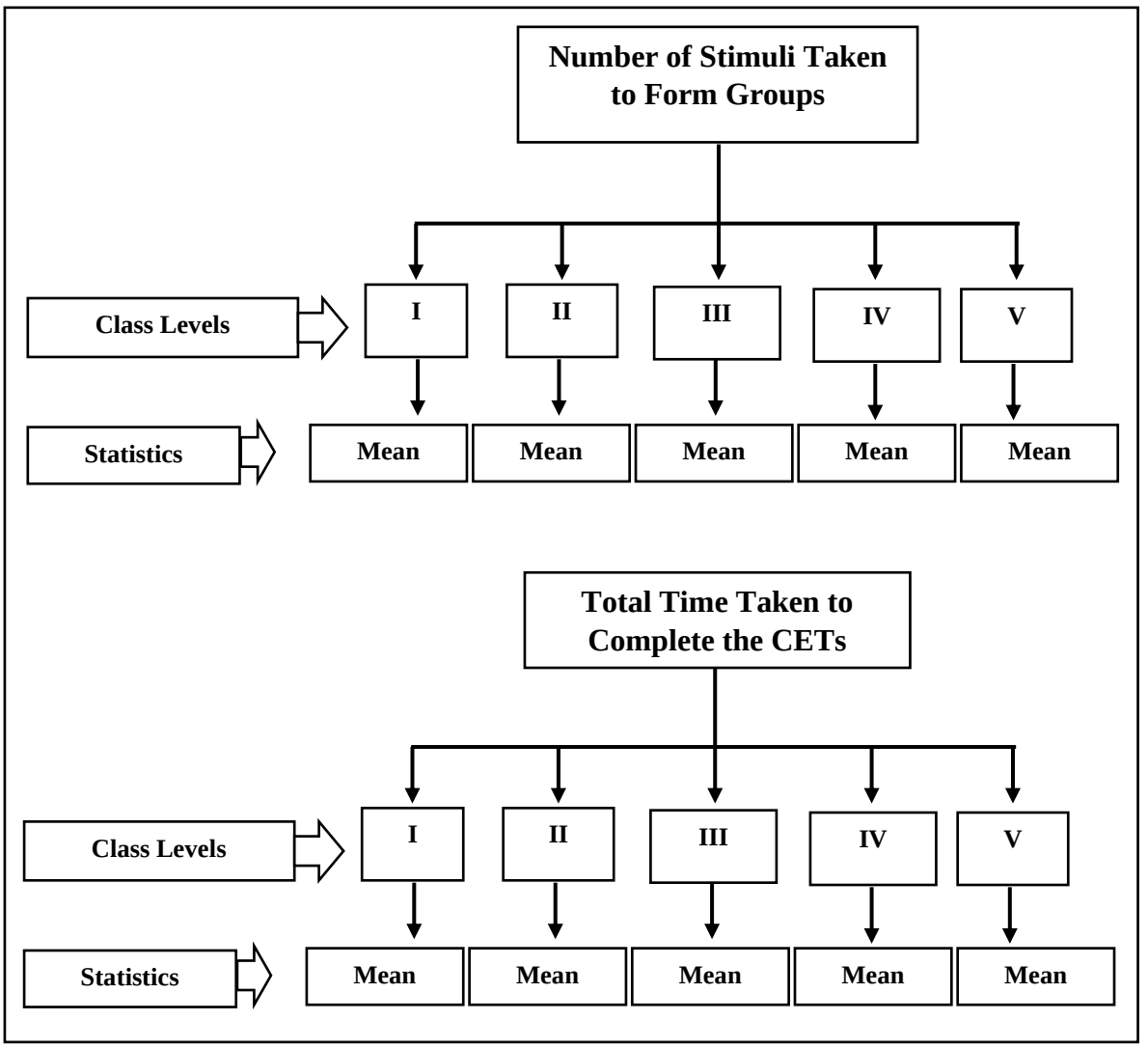

Fig. 4.3. Analysis Design for Number of Stimuli and Total Time Taken

4.10.2. Factorial Analysis Design Relating to Objective-3

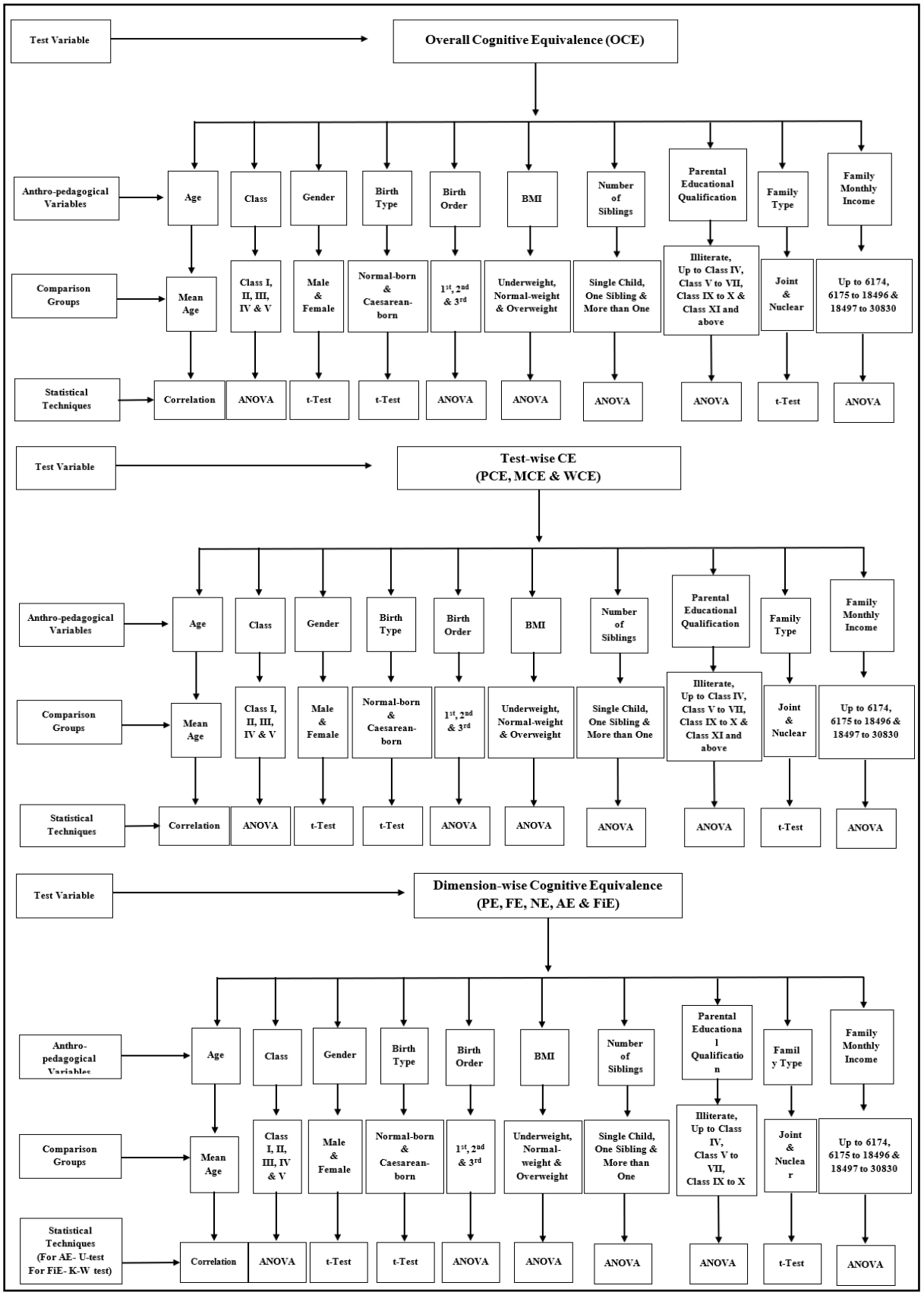

Fig. 4.4. Analysis Design Relating to Variations in Overall, Test-wise and Dimension-wise CE Concerning Anthro-pedagogical Variables

4.10.3. Factorial Analysis Design Relating to Objective-5

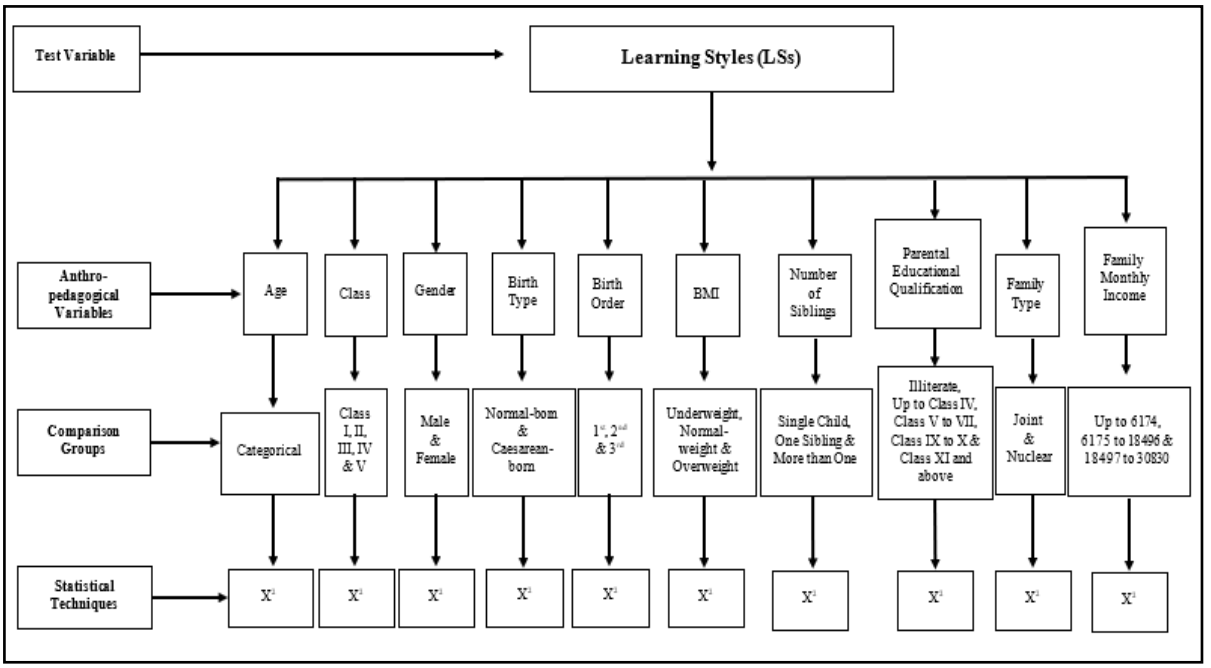

Fig. 4.5. Analysis Design Relating to Associations between LSs and Anthro-pedagogical Variables

4.10.4. Factorial Analysis Design Relating to Objective-6

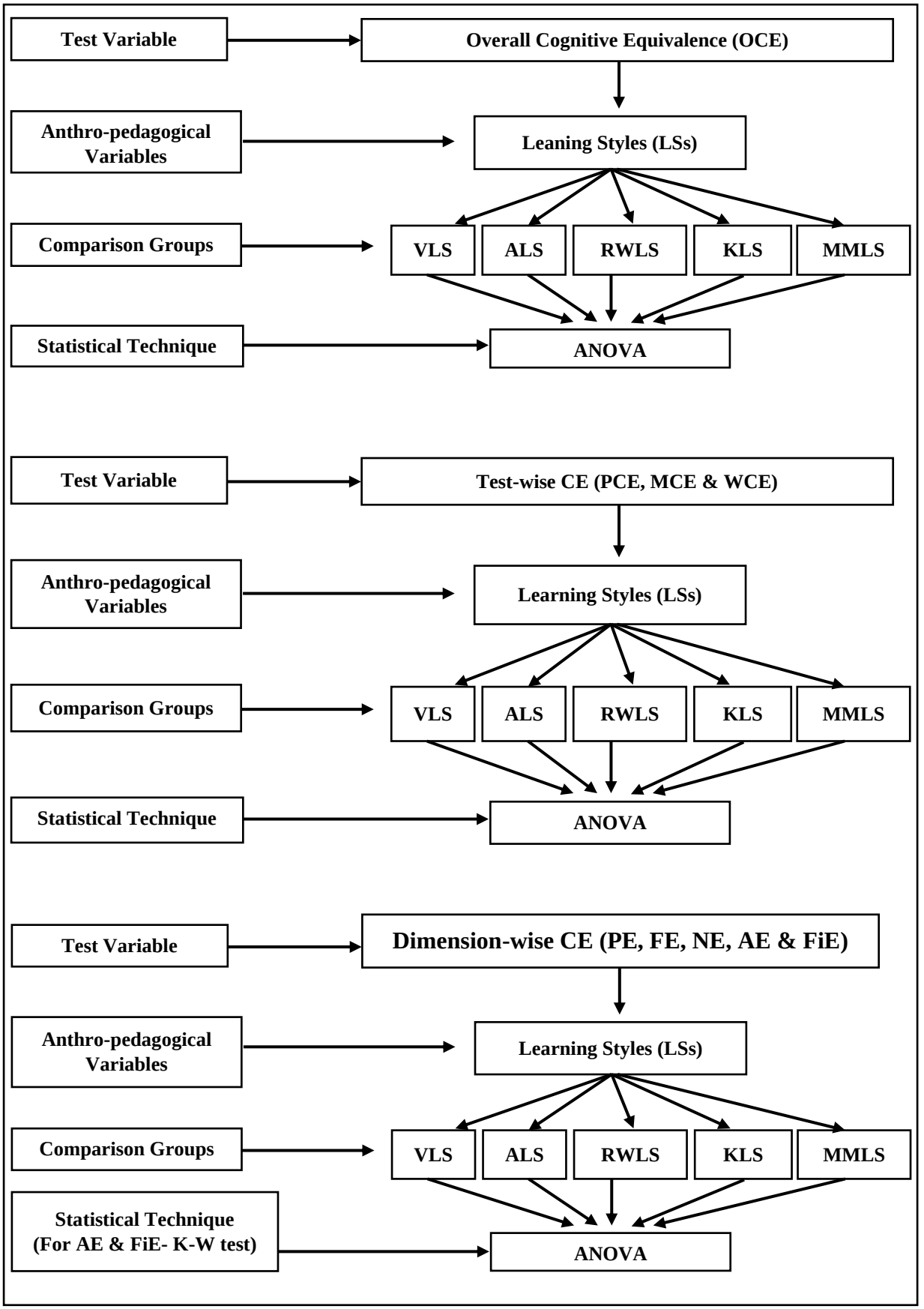

Fig. 4.6. Analysis Design Relating to Influence of LSs on Overall, Test-wise and Dimension-wise CE

4.10.5. Factorial Analysis Design Relating to Objective-7

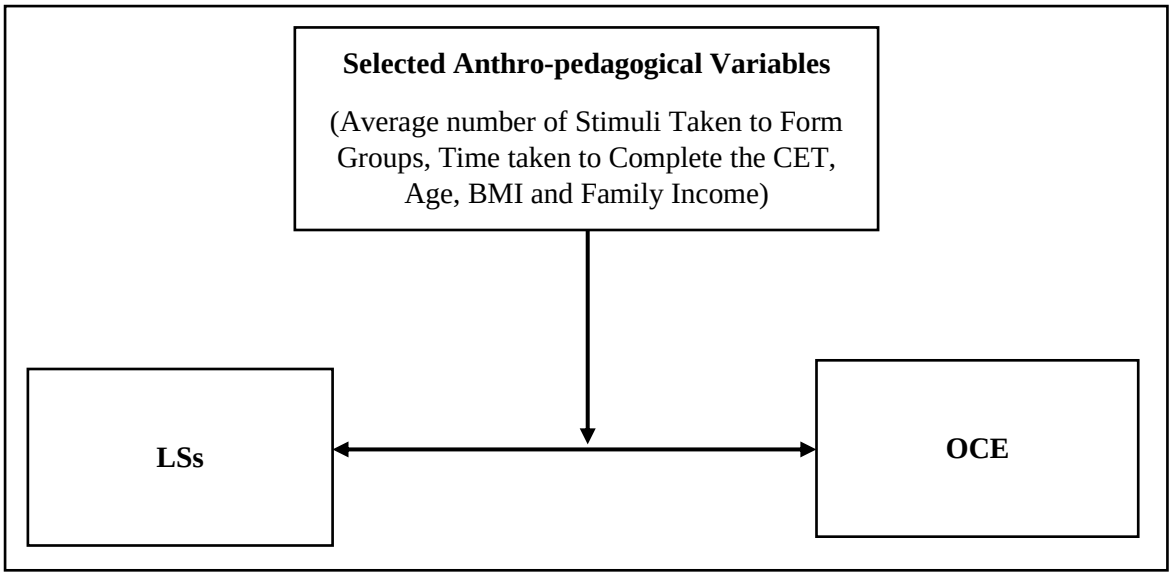

Fig. 4.7. Analysis Design Relating to Moderating Effects of Anthro-pedagogical Variables in the Relationship between LSs and OCE

CHAPTER-V

ANALYSIS AND INTERPRETATION OF DATA

Chapter-V
Analysis and Interpretation of Data

5.0. Introduction

This chapter presents the analysis and interpretations of the data collected from the participants. The primary purpose was to understand the relationships among the variables comprehensively. To achieve this, both descriptive and inferential statistics were employed. These type of statistics are used to summarise participants' data and to estimate the parameters from the statistics (Cooksey, & Cooksey, 2020; Nick, 2007). The chapter begins with descriptive statistics and an overview of the observed cognitive equivalence and learning styles, followed by inferential statistical techniques to identify significant relationships and patterns among the variables.

5.1. Analysis and Interpretations

5.1.1. Data Normality

Before starting the hypothesis testing, data normality was checked using the Kolmogorov-Smirnov (K-S) and Shapiro-Wilk (S-W) tests. The basic assumption of these tests is data is normally distributed among the sample units (Okeniyi, Okeniyi & Atayero, 2020; Drezner, Turel & Zerom, 2010; Steinskog, Tjøstheim, & Kvamstø, 2007). A significant result in these tests rejects the assumptions of normality. Further, Skewness (Sk) and Kurtosis (Ku) also checked (Hatem et al., 2022; Bai, & Ng, 2005; Blanca, Arnau, López-Montiel, Bono, & Bendayan, 2013). Results are presented in Table 5.3. The K-S test and S-W test statistics show that the data of the present study were non-normal, as the P-value (Sig.) is less than 0.05 for overall, test-wise, and dimension-wise CE. That is why the researcher further calculated the Skewness (Sk) and Kurtosis (Ku) statistics. In the Sk and Ku tests, data is considered normal when the Sk statistic is zero and the Ku statistic is .263. Literally, the deviation in these values indicates the non-normality of data. But, in social sciences, some empirical evidence is also present where a deviation up to 1.96 in the value (Sk or Ku statistics divided by Std. Err.) is considered normal or near normal. However, in this connection, Curran et al. (1996) considered up to a variation of 2 for Sk and 7 for Ku. Similarly, Kline (2005) considered the variation up to 3 and 10 for Sk and Ku. In this study, the researcher followed Curran et al. (1996) and Kline (2005) and considered the

distribution normal among the representatives as the Sk and Ku statistics for overall, testk-wise CE, and PE, FE, and NE dimensions were within the variation range considered. However, the variations in Sk are more than 10 for AE (10.37) and FiE (10.978); in Ku, the variation in AE is 10.20, and for FiE, it is 9.95. Therefore, AE and FiE are not normally distributed among the participants. Consequently, parametric statistics were used for overall and test-wise CE and its PE, FE, and NE dimensions. However, non-parametric tests were used for the AE and FiE dimensions.

Table 5.1. Test Statistics for Data Normality

				Skewness		Kurtosis		K-S	S-W
	N	Mean	SD	Statistic	Std. Error	Statistic	Std. Error	*P*	*P*
OCE	172	31.58	10.279	.334	.185	-.164	.368	.037	.035
PCE	172	11.59	3.939	.727		.517		.000	.000
MCE	172	11.31	3.722	.366		.258		.005	.012
WCE	172	8.90	5.119	.153		-.350		.000	.000
PE	172	6.38	3.906	1.272		2.611		.000	.000
FE	172	19.15	7.853	.024		-.440		.200*	.553
NE	172	4.51	2.846	.227		-.664		.001	.000
AE	172	1.20	1.740	1.919		3.754		.000	.000
FiE	172	.35	.680	2.031		3.663		.000	.000
*. This is a lower bound of the true significance.									
a. Lilliefors Significance Correction									

5.1.2. Average Number of Stimuli and Total Time Taken for Forming Groups of Concepts by Each Class of Muslim Elementary School Children

5.1.2.1. Average Number of Stimuli Taken to Form Groups

Table 5.2. Class-wise Comparison of Average Number of Stimuli taken to form Groups

		Age (Years;Months)	N	Mean	SD
CET	Class-I	7;4	28	3.0694	.83321
	Class-II	8;6	34	3.1160	.78178
	Class-III	9;4	30	3.5000	.60349
	Class-IV	10;55	38	3.2155	.72531
	Class-V	11;55	42	3.7222	.70700
	Total	9;75	172	3.3454	.76730
PCET	Class-I	7;4	28	3.4524	.91945
	Class-II	8;6	34	3.5686	.81559
	Class-III	9;4	30	3.6833	.65704
	Class-IV	10;55	38	3.4263	.99383
	Class-V	11;55	42	4.1151	.96306
	Total	9;75	172	3.6717	.91806
MCET	Class-I	7;4	28	3.6667	1.10554
	Class-II	8;6	34	3.6765	1.00583
	Class-III	9;4	30	3.9167	.85964
	Class-IV	10;55	38	3.4781	1.08786
	Class-V	11;55	42	4.0278	.84658
	Total	9;75	172	3.7587	.99189
WCET	Class-I	7;4	28	2.0893	1.47857
	Class-II	8;6	34	2.1029	1.32193
	Class-III	9;4	30	2.9000	1.07086
	Class-IV	10;55	38	2.7421	.91814
	Class-V	11;55	42	3.0238	1.05767
	Total	9;75	172	2.6058	1.21808

Interpretation

Table 5.2. represents class-wise changes in the mean or average number of stimuli (picture, model, or word) taken to forming groups in the CETs (total 18 trials) and in each of the three tests (with six trials for each test). The descriptive analysis revealed that in the CET, the average number of stimuli taken by Class-I, II, III, IV, and V students are 3.0694, 3.1160, 3.5000, 3.2155, and 3.7222. This means that, on average, lower-class students take less stimuli in Overall CE than students studying in higher classes.

In the case of PCET, the average number of stimuli taken by Class-I, II, III, IV, and V students is 3.4524, 3.5686, 3.6833, 3.4263, and 4.1151. There are a few variations in the mean scores. Means, on average, lower-class students take fewer pictures than students studying in higher classes.

In the MCET, the average number of stimuli taken by Class-I, II, III, IV, and V students are 3.6667, 3.6765, 3.9167, 3.4781, and 4.0278. There are some variations in the mean scores. This means that, on average, lower class students take fewer Models in comparison to students studying in higher classes.

In the WCET, the average number of stimuli taken by Class-I, II, III, IV and V students are 2.0893, 2.1029, 2.9000, 2.7421 and 3.0238. There are some variations in the mean scores. Which means in an average lower class students taken less number of words in comparison to students studying in higher classes.

The average number of stimuli taken by Class-I students in PCET, MCET and WCET are 3.4524, 3.6667, and 2.0893, respectively. This means Class-I students have formed groups with more pictures than models and words.

The average number of stimuli taken by Class-II students in PCET, MCET and WCET are 3.5686, 3.6765 and 2.1029 respectively. Which means Class-II students have formed groups highest with models, and lowest with words.

The average number of stimuli taken by Class-III students in PCET, MCET and WCET are 3.6833, 3.9167 and 2.9000 respectively. Which means Class-III students have formed groups with highest models and lowest words.

The average number of stimuli taken by Class-IV students in PCET, MCET and WCET are 3.4263, 3.4781 and 2.7421 respectively. Which means Class-IV students have formed groups with highest number of models, and lowest with words.

The average number of stimuli taken by Class-V students in PCET, MCET and WCET are 4.1151, 4.0278 and 3.0238 respectively. Which means Class-V students have formed groups with highest with pictures and lowest with words.

The average number of stimuli taken by all the 172 students in in PCET, MCET and WCET are 3.6717, 3.7587 and 2.6058 respectively. Which means overall students have formed groups highest with models and lowest with words.

5.1.2.2. Time Taken to Complete the CET

Table 5.3. Class-wise Comparison of Total Time Taken to Complete the CETs

		Age (Years;Months)	N	Average Time (Minutes)	SD
CET	Class-I	7;4	28	25.2446	6.57653
	Class-II	8;6	34	23.8167	6.79656
	Class-III	9;4	30	25.2183	5.38544
	Class-IV	10;55	38	28.4482	10.63773
	Class-V	11;55	42	35.6159	11.97551
	Total	9;75	172	28.1981	9.99321
PCET	Class-I	7;4	28	9.4804	2.98441
	Class-II	8;6	34	8.6936	2.65786
	Class-III	9;4	30	9.4650	2.63248
	Class-IV	10;55	38	10.0259	5.36151
	Class-V	11;55	42	12.1738	6.01242
	Total	9;75	172	10.1004	4.51846
MCET	Class-I	7;4	28	9.2351	3.09412
	Class-II	8;6	34	8.2230	3.17139
	Class-III	9;4	30	8.0889	2.15115
	Class-IV	10;55	38	9.1820	4.36137
	Class-V	11;55	42	11.3905	4.85583
	Total	9;75	172	9.3497	3.94578
WCET	Class-I	7;4	28	6.5292	5.28132
	Class-II	8;6	34	6.9000	4.66331
	Class-III	9;4	30	7.6644	3.44078
	Class-IV	10;55	38	9.2404	4.66692
	Class-V	11;55	42	12.0516	5.01843
	Total	9;75	172	8.7480	5.07791

Interpretation

Table 5.3. shows the mean for total time (minutes) taken by the students in each class to complete all three CETs. The descriptive analysis revealed that the mean time taken by Class-I, II, III, IV, and V students are 25.2446, 23.8167, 25.2183, 28.4482, and 35.6159 minutes, respectively. This means that compared to Class I, II, and III students, Class IV and V students took more time to complete all three CETs.

To complete the PCET, the mean time taken by Class-I, II, III, IV and V students are 9.4804, 8.6936, 9.4650, 10.0259 and 12.1738 minutes respectively. It means in comparison to Class-I, II, and III students, Class-IV and V students taken more time to complete the PCET.

In the MCET, the mean time taken by Class-I, II, III, IV, and V students is 9.2351, 8.2230, 8.0889, 9.1820, and 11.3905 minutes, respectively. This means that in comparison to Class I, II, III, and IV, Class V students took more time to complete the MCET.

In the WCET, the mean time taken by Class-I, II, III, IV and V students are 6.5292, 6.9000, 7.6644, 9.2404 and 12.0516 minutes respectively. It indicated a clear cut increase in time taken by the students to complete the WCET.

The mean time taken by Class-I students in PCET, MCET and WCET are 9.4804, 9.2351 and 6.5292 respectively. Which means the students studying in Class-I have taken more time for completing the PCET, and less time to complete the WCET.

The mean time taken by Class-II students in PCET, MCET and WCET are 8.6936, 8.2230 and 6.9000 respectively. Which means the students studying in Class-II also have taken more time for completing the PCET, and less time to complete the WCET.

The mean time taken by Class-III students in PCET, MCET and WCET are 9.4650, 8.0889 and 7.6644 respectively. Which means the students studying in Class-III also have taken more time for completing the PCET, and less time to complete the WCET.

The mean time taken by Class-IV students in PCET, MCET and WCET are 10.0259, 9.1820 and 9.2404 respectively. Which means the students studying in Class-IV also have taken more time for completing the PCET, and less and almost same time to complete the MCET and WCET.

The mean time taken by Class-V students in PCET, MCET and WCET are 12.1738, 11.3905 and 12.0516 respectively. Which means the students studying in Class-V have taken more time to completed the PCET, and less time to complete the MCET.

The mean time taken by all the students (N=172) in PCET, MCET and WCET are 10.1004, 9.3497 and 8.7480 respectively. Which means students have taken highest time for the PCET, and less time to complete the WCET.

5.1.3. Variations in Overall, Test-wise and Dimension-wise CE

$H_0$1: The variations in OCE among Muslim elementary school children are not significantly caused by anthro-pedagogical factors i.e. age, class, gender, birth type, Birth order, BMI, number of siblings, parental educational qualification, family type, and family monthly income.

$H_0$2: Variations in the selected anthro-pedagogical factors do not significantly cause variations in test-wise CE (i.e. PCE, MCE and WCE) among Muslim elementary school children.

$H_0$3: Dimension-wise CE (i.e. PE, FE, NE, AE and FiE) do not significantly vary due to variations in the selected anthro-pedagogical factors among Muslim elementary school children.

5.1.3.1. Relationship between Age and Overall, Test-Wise and Dimensions-Wise CE

Table 5.4. Relationship Between Age and overall, Test-wise, and Dimension-wise CE

	OCE	PCE	MCE	WCE	PE	FE	NE	AE	FiE
Age	.277** (.000)	.027 (.723)	.239** (.002)	.389** (.000)	-.120 (.118)	.348** (.000)	.129 (.091)	.223** (.003)	-.243** (.001)

Note: r value is given first, followed by the P value within parenthesis, i.e., r(*p*) / **Correlation is significant at the 0.01 level (2-tailed).

Interpretation

The Pearson correlation was run to test the relationship between age of the Muslim elementary school children and their overall, test-wise, and dimension-wise CE. The result shows a low positive and significant correlation between age of the participants and overall CE (r=.277, *p*=.000), MCE (r=.239, *p*=.002), WCE (r=.389, *p*=.000), FE (r=.348, *p*=.000), AE (r=.223, *p*=.003), and a negative and significant correlated with FiE (r=-.243, *p*=.001). PE is also negatively correlated with age, but the relationship is statistically not significant. No significant relationship exists between age and PCE and NE dimensions also.

5.1.3.2. Variations in CE Concerning Class

Table 5.5. Class-wise Comparison of Overall, Test-wise and Dimension-wise CE

		Age	N	Mean	SD	Std. Error	df	F	*p*
OCE	Class-I	7;4	28	27.04	7.767	1.468	4/ 167	4.353**	.002
	Class-II	8;6	34	28.15	9.973	1.710			
	Class-III	9;4	30	31.70	8.643	1.578			
	Class-IV	10;55	38	34.39	10.711	1.738			
	Class-V	11;55	42	34.76	11.085	1.710			
	Total	9;75	172	31.58	10.279	.784			
PCE	Class-I	7;4	28	11.21	3.625	.685		.354	.841
	Class-II	8;6	34	11.29	3.371	.578			
	Class-III	9;4	30	11.67	3.651	.667			
	Class-IV	10;55	38	12.21	4.604	.747			
	Class-V	11;55	42	11.48	4.221	.651			
	Total	9;75	172	11.59	3.939	.300			
MCE	Class-I	7;4	28	10.18	2.982	.564		2.619*	.037
	Class-II	8;6	34	10.21	3.540	.607			
	Class-III	9;4	30	11.27	3.300	.603			
	Class-IV	10;55	38	12.08	4.050	.657			
	Class-V	11;55	42	12.29	3.990	.616			
	Total	9;75	172	11.31	3.722	.284			
WCE	Class-I	7;4	28	5.64	3.946	.746		9.631**	.000
	Class-II	8;6	34	6.65	4.478	.768			
	Class-III	9;4	30	8.77	3.812	.696			
	Class-IV	10;55	38	11.08	5.435	.882			
	Class-V	11;55	42	11.02	5.048	.779			
	Total	9;75	172	8.90	5.119	.390			
PE	Class-I	7;4	28	8.43	5.245	.991		2.752*	.030
	Class-II	8;6	34	5.41	4.120	.707			
	Class-III	9;4	30	5.77	2.861	.522			
	Class-IV	10;55	38	6.34	2.674	.434			
	Class-V	11;55	42	6.26	3.957	.611			
	Total	9;75	172	6.38	3.906	.298			
FE	Class-I	7;4	28	13.25	6.496	1.228		7.782**	.000
	Class-II	8;6	34	17.06	7.726	1.325			
	Class-III	9;4	30	20.57	5.946	1.086			
	Class-IV	10;55	38	21.24	7.228	1.172			
	Class-V	11;55	42	21.86	8.295	1.280			
	Total	9;75	172	19.15	7.853	.599			
NE	Class-I	7;4	28	4.18	2.554	.483		.629	.642
	Class-II	8;6	34	4.24	2.829	.485			
	Class-III	9;4	30	4.13	2.515	.459			
	Class-IV	10;55	38	4.87	2.849	.462			
	Class-V	11;55	42	4.88	3.277	.506			

	Total	9;75	172	4.51	2.846	.217			
			N	Mean	SD	Mean Rank		X^2	*p*
AE	Class-I	7;4	28	.36	.621	66.82	4	29.883**	.000
	Class-II	8;6	34	1.03	1.834	71.54			
	Class-III	9;4	30	1.03	1.273	73.95			
	Class-IV	10;55	38	1.76	2.283	100.00			
	Class-V	11;55	42	1.52	1.700	108.48			
	Total	9;75	172	1.20	1.740				
FiE	Class-I	7;4	28	.82	.945	101.27	4	11.196*	.024
	Class-II	8;6	34	.41	.609	91.07			
	Class-III	9;4	30	.20	.551	85.50			
	Class-IV	10;55	38	.18	.652	77.89			
	Class-V	11;55	42	.24	.484	81.45			
	Total	9;75	172	.35	.680				

Mean age is presented within parenthesis in Years and Months (Years;Months). The result is significant at the *0.05 level and **0.01 level (2-tailed).

Interpretation

Table 5.5. shows the mean score of overall, Test-wise, and dimension-wise CE of the Muslim elementary school children studying in Classes I, II, III, IV, and V. In the case of overall CE, the mean scores for each are 27.04, 28.15, 31.70, 34.39, and 34.76, respectively. That indicates a clear-cut increase in OCE from Class-I to Class-V. One-way ANOVA results revealed that these variations in the mean scores are significant (F=4.353, *p*=.002). Further, the Least Significant Difference (LSD) test revealed that the actual differences are lie between Class-I and IV *(p*=.003), Class-I and V (*p*=.002), Class-II and IV (*p*=.008*)*, and Class-II and V (*p*=.004*)*.

The same table also shows that the mean scores for PCE for each class are 11.21, 11.29, 11.67, 12.21, and 11.48, respectively. In comparison to all the classes, the mean score of PCE is highest for class IV students and lowest for class I students. However, the one-way ANOVA result revealed that these mean variations among the classes are not significant (F=.354, *p*=.841).

The above table also shows that each class's mean scores for MCE are 10.18, 10.21, 11.27, 12.08, and 12.29, respectively. That means MCE is also increasing consistently from Class-I to Class-V. The one-way ANOVA result indicates a significant variation (F=2.619, *p*=.037). Further, the LSD test revealed that the actual differences are lie between Class-I and IV *(p*=.038), Class-I and V (*p*=.019), Class-II and IV (*p*=.031), and Class-II and V (*p*=.015).

The same table also presents that the mean scores for WCE for each class are 5.64, 6.65, 8.77, 11.08, and 11.02, respectively. The mean scores for WCE in class IV is highest,

compared to classes V, III, and II, and lowest for class I. The one-way ANOVA result showed that these variations are significant (F=9.631, *p*=.000). Further, the LSD test showed that there are actual differences are lie between Class-I and III *(P*=.012), Class-I and IV (*p*=.000), Class-I and V (*p*=.000), Class-II and IV *(p*=.000), Class-III and V (*p*=.045), Class-III and II *(p*=.072), Class-III and IV (*p*=.044), and Class-V and II (*p*=.000). In the case of PE, the mean scores for Class I, II, III, IV, and V are 8.43, 5.41, 5.77, 6.34, and 6.26, respectively. It indicates that PE is highest in Class IV and lowest in Class I. The one-way ANOVA result showed that these variations in mean scores are significant (F=2.752, *p*=.030). Further, the LSD test showed that the actual differences lie between Class-I and II *(p*=.002), Class-I and III *(p*=.009), Class-I and IV *(p*=.030), and Class-I and V *(p*=.022).

The same table also shows that the mean scores for FE for Class I, II, III, IV, and V are 13.25, 17.06, 20.57, 21.24, and 21.86, respectively. It indicates a consistent increase in FE from Class I to Class V. The one-way ANOVA result showed that these variations in mean scores are significant (F=7.782, *p*=.000). Further, the LSD test result revealed the actual differences lie between Class- I and II *(p*=.042), Class-I and III (*p*=.000), Class-I and IV *(p*=.000), Class-I and V *(p*=.000), Class-II and IV *(p*=.016), and Class-II and V *(p*=.005).

The above table also shows that the mean scores for NE for Class I, II, III, IV, and V are 4.18, 4.24, 4.13, 4.87, and 4.88, respectively. It indicates NE is highest in class V and lowest in class III. However, the one-way ANOVA result revealed that these variations are statistically not significant (F =.629, *p*=.642).

In the case of AE, the data were not normally distributed among the participants. Therefore, the non-parametric Kruskal-Wallis test was used. The test result revealed that the mean rank in AE for Class-I, II, III, IV, and V students are 66.82, 71.54, 73.95, 100.00, and 108.48, respectively. It indicates that the mean rank is highest in Class V and lowest in Class I. Further, the Kruskal-Wallis (K-W) test results revealed that the variations in mean ranks are significant (x^2=29.883, *p*=.000).

The same table also shows that in the case of FiE, the data were also not normally distributed among the students. The Kruskal-Wallis test result revealed that the mean rank in FiE for Class-I, II, III, IV, and V students is 101.27, 91.07, 85.50, 77.89, and 81.45, respectively. It indicates that the mean rank is highest in Class I and lowest in Class IV. Further, the K-W test result indicated that the variations in mean ranks are significant (X^2=11.196, *p*=.024).

5.1.3.3. Variations in CE Concerning Gender

Table 5.6. Gender-wise Comparison of Overall, Test-wise and Dimension-wise CE

	Gender	N	Mean	SD	df	t	*p*
OCE	Male	77	31.70	10.097	170	.137	.891
	Female	95	31.48	10.476			
PCE	Male	77	11.48	3.754		-.336	.737
	Female	95	11.68	4.101			
MCE	Male	77	11.69	3.689		1.208	.229
	Female	95	11.00	3.739			
WCE	Male	77	8.74	5.207		-.370	.712
	Female	95	9.03	5.071			
PE	Male	77	6.99	4.067		1.854	.065
	Female	95	5.88	3.718			
FE	Male	77	18.81	7.881		-.510	.610
	Female	95	19.42	7.861			
NE	Male	77	4.42	2.867		-.373	.709
	Female	95	4.58	2.842			
			Mean Rank	Sum of Ranks		U	*p*
AE	Male	77	86.51	6661.50		3656.50	.997
	Female	95	86.49	8216.50			
FiE	Male	77	84.00	6468.00		3465.00	.434
	Female	95	88.53	8410.00			

Interpretation

Table 5.6 shows the mean and SD of the overall, Test-wise, and dimension-wise CE for both male and female Muslim elementary school children. It indicates that the mean OCE for male children is 31.70, while the mean for females is 31.48. This indicates that male students scored slightly higher than females, however, the independent samples t-test result shows that the difference is not significant (t=.137, *p*=.891).

The mean PCE for male and female children are 11.48 and 11.68, respectively, that means female students have scored slightly higher than males. However, the independent samples t-test result revealed that this difference is not significant (t= -.336, *p*=.737).

The mean MCE is higher for male children (11.69) than females (11.00). However, the independent samples t-test result indicated no significant difference between them (t = 1.208, *p*=.229).

The mean WCE for male and female children are 8.74 and 9.03, it indicating that female students scored are higher than males. The independent samples t-test result revealed that this difference is not statistically significant (t =-.370, *p*=.712).

The mean PE for male and female Muslim elementary school children is 6.99 and 5.88. This indicates that the male student has higher PE than the females, however, the mean difference is not significant (t=1.854, *p*=.065*)*.

The mean scores of FE for the male and female children are 18.81 and 19.42. It means females FE is slightly higher than males, but the difference is not significant (t=-510, *p*=.610).

The mean scores in NE for females is higher (4.58) than males (4.42), but, they do not differ significantly (t=-.373, *p*=.709).

The mean rank in AE for male and female students is 86.51 and 86.49. That means both groups have an almost similar level of AE. However, the Mann-Whitney U test result revealed that they do not differ significantly (U=3656.50, *p=.997*).

In the case of FiE, the mean rank of male and females is 84.00 and 88.53, indicating that females' FiE is higher than that of male students. However, they do not differ significantly (U=3465.00, *p*=.434).

5.1.3.4. Variations in CE concerning Birth Type

Table 5.7. Birth Type-wise Comparison of Overall, Test-wise and Dimension-wise CE

	Birth Type	N	Mean	SD	df	t	*p*
OCE	Normal Born	95	31.82	9.717	170	.339	.735
	Caesarean Born	77	31.29	10.989			
PCE	Normal Born	95	11.60	4.059		.026	.980
	Caesarean Born	77	11.58	3.813			
MCE	Normal Born	95	11.35	3.536		.153	.878
	Caesarean Born	77	11.26	3.962			
WCE	Normal Born	95	9.05	5.123		.430	.668
	Caesarean Born	77	8.71	5.142			
PE	Normal Born	95	6.65	4.361		1.025	.307
	Caesarean Born	77	6.04	3.254			
FE	Normal Born	95	19.00	7.695		-.269	.788
	Caesarean Born	77	19.32	8.091			
NE	Normal Born	95	4.63	2.903		.643	.521
	Caesarean Born	77	4.35	2.785			
			Mean Rank	Sum of Ranks		U	*p*
AE	Normal Born	95	87.82	8343.00		3532.000	.678
	Caesarean Born	77	84.87	6535.00			
FiE	Normal Born	95	86.79	8245.00		3630.000	.911
	Caesarean Born	77	86.14	6633.00			

Interpretation

Table 5.7 shows the mean score of overall, test-wise, and dimension-wise CE for normally born and caesarean born Muslim elementary school children. The mean OCE for normally born and caesarean born children are 31.82 and 31.29. However, there is a low mean

difference, and the independent samples t-test results showed that this difference is not significant (t =.339, *p*=.735).

In the case of PCE, the mean scores for normally and caesarean born children are 11.60 and 11.58. The difference is very low and is not significant (t=.026, *p*=.980).

The mean MCE for normally and caesarean born children are 11.35 and 11.26. There is also a slight mean difference, and the independent samples t-test results show that this difference is not significant (t=.153, *p*=.878).

For WCE, the mean scores are 9.05 for normally born and 8.71 for caesarean born children, and only a slight difference present, which is not significant (t=0.430, *p*=0.668).

The mean scores for PE is 6.65 for normally born children and 6.04 for caesarean born children. The independent samples t-test result showed that this difference is not significant (t=1.025, *p*=.307).

In the case of FE, the mean score for caesarean born children is 19.00 and for normally born children is 19.32. The mean difference is very low, which is not significant (t =-0.269, *p*=.788).

For NE, the mean scores of normally born and caesarean born children are 4.63 and 4.35, respectively. There is a slight mean difference, and the independent samples t-test results showed that this difference is not significant (t=.643, *p*=.521).

In the case of AE, the mean rank of normally born and caesarean born children are 87.82 and 84.87. This means normally born have a higher mean rank than caesarean born. The Mann-Whitney U test showed that this difference is not significant (U=3532.00, *p*=.678).

Regarding FiE, both normally and caesarean born children have almost the same mean rank, i.e. 86.79 and 86.14, and they do not differ significantly (U=3630.00, *p*=.911).

5.1.3.5. Variations in CE concerning Birth Order

Table 5.8. Birth Order-wise Comparison of Overall, Test-wise and Dimension-wise CE

		N	Mean	SD	Std. Error	df	F	***p***
OCE	First	87	30.72	10.598	1.136		1.102	.335
	Second	67	33.03	9.965	1.217			
	Third	18	30.33	9.762	2.301			
	Total	172	31.58	10.279	.784			
PCE	First	87	11.24	3.782	.405		.785	.458
	Second	67	12.04	3.894	.476			
	Third	18	11.61	4.840	1.141			
	Total	172	11.59	3.939	.300			
MCE	First	87	11.05	3.965	.425		1.845	.161
	Second	67	11.93	3.457	.422			

	Third	18	10.28	3.232	.762	2/169		
	Total	172	11.31	3.722	.284			
WCE	First	87	8.61	4.785	.513		.435	.648
	Second	67	9.36	5.348	.653			
	Third	18	8.61	5.952	1.403			
	Total	172	8.90	5.119	.390			
PE	First	87	6.13	3.757	.403		1.879	.156
	Second	67	7.01	4.165	.509			
	Third	18	5.22	3.370	.794			
	Total	172	6.38	3.906	.298			
FE	First	87	18.79	7.755	.831		.176	.839
	Second	67	19.49	8.599	1.051			
	Third	18	19.56	5.261	1.240			
	Total	172	19.15	7.853	.599			
NE	First	87	4.28	2.975	.319		1.478	.231
	Second	67	4.96	2.777	.339			
	Third	18	3.94	2.313	.545			
	Total	172	4.51	2.846	.217			
		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	First	87	1.21	1.564	85.34	2	.386	.057
	Second	67	1.19	2.054	86.54			
	Third	18	1.22	1.309	91.94			
	Total	172	1.20	1.740				
FiE	First	87	.32	.673	86.28		.824	.972
	Second	67	.37	.648	86.35			
	Third	18	.39	.850	88.14			
	Total	172	.35	.680				

Interpretation

Table 5.8. shows the mean score and SD of overall, test-wise and dimension-wise CE concerning birth order of the Muslim elementary school children.

In the case of OCE, the mean scores for the first, second and third born children are 30.72, 33.03, and 30.33, respectively. That means there are some variations in mean scores, and second born children have higher mean score than first and third born children. However, the One-Way ANOVA result revealed that these mean score variations are not significant (F=1.102, p=.335).

The same table also shows that the mean scores of PCE for the first, second and third born children are 11.24, 12.04, and 11.61, respectively. That means there are some variations in mean scores, and second born children have higher mean score than first and third born children. However, these variations are not significant (F=.785, p=.458).

The same table also shows that the mean scores of MCE for the 1st, 2nd, and 3rd born children are 11.05, 11.93, and 10.28, respectively. That means MCE also indicates that second-born children score highest compared to first and third-born children. However, these mean score variations are not significant (F=1.845, p=.161).

The mean WCE for the first, second, and third born children are 8.61, 9.36, and 8.61, respectively. That means there are some variations in mean scores, and second born children have higher WCE than first and third born children. However, these variations are not significant (F=.435, p=.648).

The mean scores of PE for the first, second, and third born children are 6.13, 7.01, and 5.22, respectively. That means there are some variations in mean scores, and second born children have higher PE than first and third born children. However, these variations are not significant (F= 1.879, p=.156).

The mean scores of FE for the first, second, and third born children are 18.79, 19.49, and 19.56 respectively. That means there are some variations in mean scores, and third born children have higher FE than first and second-born children. However, these variations are not significant (F=.176, p=.839).

In the case of NE, the mean score for the 1st, 2nd, and 3rd born children are 4.28, 4.96, and 3.94, respectively. That means there are some variations in mean scores, and second born children have higher NE than first and third born children. However, these variations are not significant (F=1.478, p=.231).

In the case of AE, the Kruskal-Wallis Test result revealed that the mean rank in AE for the first, second, and third born children are 85.34, 86.54, and 91.94, respectively, and these variations in mean ranks are not significant (X^2=.386, p=.057).

In the case of FiE, the mean rank for the first, second, and third born children are 86.28, 86.35 and 88.14 respectively. However, the differences in mean ranks are not significant (X^2=.824, p=.972).

5.1.3.6. Variations in CE concerning BMI

Table 5.9. BMI-wise Comparison of Overall, Test-wise and Dimension-wise CE

		N	Mean	SD	Std. Error	df	F	*p*
OCE	Underweight	147	30.90	10.002	.825	2/169	2.589	.078
	Normal Weight	20	34.70	11.743	2.626			
	Overweight	5	39.00	8.689	3.886			
	Total	172	31.58	10.279	.784			
PCE	Underweight	147	11.52	3.952	.326		.163	.850
	Normal Weight	20	11.95	3.734	.835			
	Overweight	5	12.20	5.070	2.267			
	Total	172	11.59	3.939	.300			
MCE	Underweight	147	10.99	3.475	.287		3.837*	.023
	Normal Weight	20	13.00	5.005	1.119			
	Overweight	5	13.80	2.588	1.158			
	Total	172	11.31	3.722	.284			
WCE	Underweight	147	8.59	4.990	.412		2.956	.055
	Normal Weight	20	10.05	5.753	1.287			
	Overweight	5	13.60	4.037	1.806			
	Total	172	8.90	5.119	.390			
PE	Underweight	147	6.44	3.995	.330		.536	.586
	Normal Weight	20	5.65	3.588	.802			
	Overweight	5	7.40	2.074	.927			
	Total	172	6.38	3.906	.298			
FE	Underweight	147	18.63	7.901	.652		2.185	.116
	Normal Weight	20	22.15	7.264	1.624			
	Overweight	5	22.20	6.380	2.853			
	Total	172	19.15	7.853	.599			
NE	Underweight	147	4.37	2.773	.229		1.287	.279
	Normal Weight	20	5.10	3.463	.774			
	Overweight	5	6.00	1.871	.837			
	Total	172	4.51	2.846	.217			
		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	Underweight	147	1.07	1.582	83.67	2	7.478*	.024
	Normal Weight	20	1.65	2.059	96.43			
	Overweight	5	3.40	3.209	130.00			
	Total	172	1.20	1.740				
FiE	Underweight	147	.39	.716	88.71		5.157	.076
	Normal Weight	20	.15	.366	73.50			
	Overweight	5	.00	.000	73.50			
	Total	172	.35	.680				

*Result is statistically significant at 0.05 level.

Interpretation

Table 5.9 represents the mean of overall, test-wise and dimension-wise CE concerning BMI of the Muslim elementary school children. It shows that the mean OCE for

underweight, normal weight and overweight children are 30.90, 34.70 and 39.00 respectively. That indicates a variation in OCE among the BMI groups, and compared to underweight children, normal weight and overweight children performed better. However, the variations in the mean scores are not significant (F=2.589, *p*=.078).

The mean PCE for the underweight, normal weight, and overweight children are 11.52, 11.95, and 12.20, respectively. That indicates a variation in PCE among the BMI groups, and compared to underweight children, normal weight and overweight children performed better, however, these variations in the PCE are not significant (F=.163, *p*=.850).

The mean score for MCE for the underweight, normal weight, and overweight children are 10.99, 13.00, and 13.80 respectively. That indicates a variation in MCE among the BMI groups, and compared to underweight children, normal weight and overweight children performed better, and, these variations in the MCE are significant (F=3.837, *p*=.023). Further, the multiple comparisons through the LSD test revealed that the actual difference lies between normal weight and underweight children (*p*=.023).

The mean score of WCE for the underweight, normal weight, and overweight children are 8.59, 10.05, and 13.60, respectively. It shows some variations in the WCE concerning BMI. However, these variations are not significant (F=2.956, *p*=.055).

The mean scores of PE for the underweight, normal weight, and overweight children are 6.44, 5.65, and 7.40. That means there are variations in mean scores. However, these variations are not significant (F=.536, *p*=.586).

In the case of FE, the mean score for underweight, normal weight, and overweight children are 18.63, 22.15, and 22.20, respectively. That means there are variations in mean scores. However, these variations are not significant (F=2.185, *p*=.116).

In the case of NE, the mean score for underweight, normal weight, and overweight children are 4.37, 5.10, and 6.00. That means there are variations in mean scores. However, these variations are not significant (F=1.287, *p*=.279).

In the case of AE, the mean rank for underweight, normal weight, and overweight children are 83.67, 96.43, and 130.00, which indicated variations in mean ranks. Further, the K-W test results revealed that these variations in mean ranks are significant (X^2=7.478, *p*=.024).

The mean ranks in FiE for underweight, normal weight, and overweight children are 88.71, 73.50, and 73.50 respectively. Further, the K-W test result revealed that the variations in the mean ranks are not significant (X^2=5.157, *p*=.076).

5.1.3.7. Variations in CE Concerning Number of Siblings

Table 5.10. Number of Siblings-wise Comparison of Overall, Test-wise and Dimension-wise CE

		N	Mean	SD	Std. Error	df	F	*p*
OCE	Single Child	25	30.72	9.965	1.993	2/169	1.088	.339
	Having One Siblings	112	32.39	10.632	1.005			
	Having More than One Sibling	35	29.60	9.246	1.563			
	Total	172	31.58	10.279	.784			
PCE	Single Child	25	11.20	3.291	.658		.681	.508
	Having One Siblings	112	11.85	4.056	.383			
	Having More than One Sibling	35	11.06	4.007	.677			
	Total	172	11.59	3.939	.300			
MCE	Single Child	25	10.80	3.948	.790		.916	.402
	Having One Siblings	112	11.59	3.833	.362			
	Having More than One Sibling	35	10.77	3.154	.533			
	Total	172	11.31	3.722	.284			
WCE	Single Child	25	8.84	4.793	.959		.775	.462
	Having One Siblings	112	9.21	5.126	.484			
	Having More than One Sibling	35	7.97	5.349	.904			
	Total	172	8.90	5.119	.390			
PE	Single Child	25	6.28	3.985	.797		.241	.786
	Having One Siblings	112	6.52	3.913	.370			
	Having More than One Sibling	35	6.00	3.911	.661			
	Total	172	6.38	3.906	.298			
FE	Single Child	25	17.64	6.775	1.355		1.076	.343
	Having One Siblings	112	19.78	8.336	.788			
	Having More than One Sibling	35	18.20	6.855	1.159			
	Total	172	19.15	7.853	.599			
NE	Single Child	25	5.20	3.476	.695		1.301	.275
	Having One Siblings	112	4.51	2.764	.261			
	Having More than One Sibling	35	4.00	2.578	.436			
	Total	172	4.51	2.846	.217			
		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	Single Child	25	1.28	1.671	93.90	2	.975	.614
	Having One Siblings	112	1.26	1.911	85.54			
	Having More than One Sibling	35	.97	1.124	84.29			
	Total	172	1.20	1.740				
FiE	Single Child	25	.32	.627	87.38		.185	.912
	Having One Siblings	112	.33	.635	85.78			
	Having More than One Sibling	35	.43	.850	88.19			
	Total	172	.35	.680				

Interpretation

Table 5.10 shows the mean score for overall, test-wise and dimension-wise CE for the Muslim elementary school children who are single child, having one sibling, and having

more than one sibling. The mean OCE for the single child, having one sibling, and having more than one sibling groups are 30.72, 32.39, and 29.60 respectively. Means students with one sibling have higher OCE than other groups. The One-Way ANOVA results revealed that these variations are not significant (F=1.088, *p*=.339).

The above table also shows that the mean scores of PCE for the single child, having one sibling, and having more than one sibling are 11.20, 11.85, and 11.06 respectively. That means there are some variations in the mean scores, and who have one Sibling have higher PCE than other groups. However, these variations are not significant (F=.681, *p*=.508).

The mean scores of MCE for the single child, having one sibling, and having more than one sibling are 10.80, 11.59, and 10.77 respectively. Means children with one sibling have higher MCE than the other categories. However, these variations are not significant (F=.916, *p*=.402).

The above table also shows that the mean scores of WCE for the single child, having one sibling, and having more than one sibling are 8.84, 9.21, and 7.97 respectively. Means, children with having one sibling have a higher WCE than the other categories. However, these variations are not significant (F=.775, *p*=.462).

The table also shows that the mean score of PE for the single child, having one sibling, and having more than one sibling are 6.28, 6.52, and 6.00 respectively. This means students with one sibling have higher PE than others. However, these variations are not significant (F=.241, *p*=.786).

The mean scores of FE for the single child, having one sibling, and having more than one sibling are 17.64, 19.78, and 18.20 respectively. Means, students with one sibling have higher PE than other groups. However, these variations in the mean scores are not significant (F=1.076, *p*=.343).

The mean scores of NE for the single child, having one sibling, and having more than one sibling are 5.20, 4.51, and 4.00, respectively. That indicates a clear-cut decrease in NE for single children to having one sibling and more than one sibling. However, these variations in the mean scores are not significant (F=1.301, *p*=.275).

The mean rank in AE for the single child, having one sibling, and having more than one sibling are 93.90, 85.54, and 84.29, respectively. However, the K-W test results showed the variations in mean ranks are not significant (X^2=.975, *p*=.614).

The mean rank in FiE for the single child, having one sibling, and having more than one sibling are 87.38, 85.78, and 88.19, respectively. However, the K-W test result revealed that the mean rank variations are not significant (X^2=.185, *p*=.912).

5.1.3.8. Variations in CE Concerning Parental Educational Qualification

5.1.3.8.1. Variations in CE concerning Father's Educational Qualification (FEQ)

Table 5.11. FEQ-wise Comparison of Overall, Test-wise and Dimension-wise CE

		N	Mean	SD	Std. Error	df	F	*p*
OCE	Illiterate	16	31.00	10.991	2.748	4/ 167	1.062	.377
	Up to Class-IV	29	28.97	8.283	1.538			
	Class-V to VIII	86	31.47	10.430	1.125			
	Class-IX to X	20	33.15	10.122	2.263			
	Class-XI and Above	21	34.62	11.599	2.531			
	Total	172	31.58	10.279	.784			
PCE	Illiterate	16	11.88	4.884	1.221		.864	.487
	Up to Class-IV	29	11.69	2.904	.539			
	Class-V to VIII	86	11.13	3.846	.415			
	Class-IX to X	20	11.95	3.804	.851			
	Class-XI and Above	21	12.81	4.864	1.061			
	Total	172	11.59	3.939	.300			
MCE	Illiterate	16	11.13	3.538	.884		.892	.470
	Up to Class-IV	29	10.69	3.219	.598			
	Class-V to VIII	86	11.16	3.807	.410			
	Class-IX to X	20	12.60	3.899	.872			
	Class-XI and Above	21	11.67	4.004	.874			
	Total	172	11.31	3.722	.284			
WCE	Illiterate	16	8.50	5.586	1.396		1.972	.101
	Up to Class-IV	29	6.76	4.688	.871			
	Class-V to VIII	86	9.35	5.410	.583			
	Class-IX to X	20	8.80	3.942	.881			
	Class-XI and Above	21	10.43	4.545	.992			
	Total	172	8.90	5.119	.390			
PE	Illiterate	16	6.44	2.804	.701		.743	.564
	Up to Class-IV	29	6.76	4.214	.783			
	Class-V to VIII	86	5.98	3.862	.416			
	Class-IX to X	20	7.55	3.886	.869			
	Class-XI and Above	21	6.33	4.431	.967			
	Total	172	6.38	3.906	.298			
FE	Illiterate	16	19.31	7.640	1.910		.533	.711
	Up to Class-IV	29	17.21	7.821	1.452			
	Class-V to VIII	86	19.57	7.461	.804			
	Class-IX to X	20	19.40	8.035	1.797			
	Class-XI and Above	21	19.71	9.660	2.108			
	Total	172	19.15	7.853	.599			
NE	Illiterate	16	3.94	3.108	.777		2.197	.071
	Up to Class-IV	29	4.03	2.946	.547			
	Class-V to VIII	86	4.38	2.919	.315			
	Class-IX to X	20	4.45	1.761	.394			
	Class-XI and Above	21	6.14	2.689	.587			
	Total	172	4.51	2.846	.217			

		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	Illiterate	16	1.19	1.974	83.78	4	7.289	.121
	Up to Class-IV	29	.62	.820	73.00			
	Class-V to VIII	86	1.21	1.674	89.20			
	Class-IX to X	20	1.20	1.542	79.85			
	Class-XI and Above	21	2.00	2.588	102.50			
	Total	172	1.20	1.740				
FiE	Illiterate	16	.13	.342	73.50		3.543	.471
	Up to Class-IV	29	.34	.614	88.34			
	Class-V to VIII	86	.33	.676	87.40			
	Class-IX to X	20	.55	.826	91.50			
	Class-XI and Above	21	.43	.811	85.43			
	Total	172	.35	.680				

Interpretation

Table 5.11 shows the mean score of the overall, test-wise, and dimension-wise CE among the Muslim elementary school children concerning their FAQ. The mean score of OCE for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 31.00, 28.97, 31.47, 33.15, and 34.62, respectively. Means, students whose fathers have an educational qualification level of Class-XI and above, have a higher OCE than students whose fathers are Illiterate, or having education Up to Class-IV, Class-V to VIII, and Class-IX to X. However, the One-Way ANOVA result showed that these variations in the mean OCE are not significance (F=1.062, *p*=.377).

In the case of PCE, the mean score for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 11.88, 11.69, 11.13, 11.95 and 12.81, respectively. Means, students whose father have an education level of Class-XI and above, have a higher OCE than students whose fathers are Illiterate, or having education Up to Class-IV, Class-V to VIII, and Class-IX to X. However, these variations in the PCE are not significance (F=.864, *p*=.487).

In the case of MCE, the mean score for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 11.13, 10.69, 11.16, 12.60, and 11.67, respectively. Means, students whose father have an education level of Class-IX to X and above have a higher MCE than students whose fathers are Illiterate, or having education Up to Class-IV, Class-V to VIII. However, these variations in the mean MCE are not significance (F=.892, *p*=.470).

In the case of WCE, the mean score for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are

8.50, 6.76, 9.35, 8.80, and 10.43, respectively. Means, students whose father have an education level of Class-XI and above have a higher WCE than students whose fathers are Illiterate, or having education Up to Class-IV, Class-V to VIII, and Class-IX to X. However, these variations in the mean WCE are not significance (F=1.972, *p*=.101).

The mean PE for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 6.44, 6.76, 5.98, 7.55, and 6.33, respectively. Means, students whose father have an education level of Class-IX to X and above have a higher PE than students whose fathers are Illiterate, or having education Up to Class-IV, Class-V to VIII, and Class-XI and above. However, these variations in the mean PE are not significance (F=.743, *p*=.564).

The mean FE for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 19.31, 17.21, 19.57, 19.40, and 19.71 respectively. That means students whose father's educational qualifications is Class-XI and Above have higher FE than others. However, these variations in the mean FE are not significant (F=.533, *p*=.711).

The mean NE for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 3.94, 4.03, 4.38, 4.45, and 6.14, respectively. That means students whose father's educational qualifications is Class-XI and Above have higher NE than others. However, these variations in the mean NE are not significant (F=2.197, *p*=.071).

The mean ranks in AE for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 83.78, 73.00, 89.20, 79.85, and 102.50 respectively. That means students whose father's educational qualifications is Class-XI and Above have higher AE than others. However, the K-W test result revealed that the mean rank variations are not significant (X^2=7.289, *p*=.121).

The mean ranks in FiE for the children whose fathers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 73.50, 88.34, 87.40, 91.50, and 85.43, respectively. That means students whose father's educational qualifications is Class-IX to X have higher FiE than others. Further, the K-W test result revealed that the mean rank variations are not significant (X^2=3.543, *p*=.471).

5.1.3.8.2. Variations in CE concerning Mother's Educational Qualification (MEQ)

Table 5.12. MEQ-wise Comparison of Overall, Test-wise and Dimension-wise CE

		N	Mean	SD	Std. Error	df	F	*p*
OCE	Illiterate	13	29.38	7.578	2.102	4/167	.204	.936
	Up to Class-IV	29	31.07	10.443	1.939			
	Class-V to VIII	67	32.06	10.851	1.326			
	Class-IX to X	42	31.79	9.901	1.528			
	Class-XI and Above	21	31.71	11.055	2.412			
	Total	172	31.58	10.279	.784			
PCE	Illiterate	13	10.62	3.280	.910		.268	.898
	Up to Class-IV	29	11.59	3.785	.703			
	Class-V to VIII	67	11.55	3.909	.478			
	Class-IX to X	42	11.90	4.095	.632			
	Class-XI and Above	21	11.71	4.529	.988			
	Total	172	11.59	3.939	.300			
MCE	Illiterate	13	10.69	2.720	.754		.361	.836
	Up to Class-IV	29	10.72	2.827	.525			
	Class-V to VIII	67	11.57	4.236	.518			
	Class-IX to X	42	11.45	3.240	.500			
	Class-XI and Above	21	11.38	4.588	1.001			
	Total	172	11.31	3.722	.284			
WCE	Illiterate	13	8.08	4.030	1.118		.156	.960
	Up to Class-IV	29	9.03	5.679	1.055			
	Class-V to VIII	67	9.12	5.261	.643			
	Class-IX to X	42	8.62	5.212	.804			
	Class-XI and Above	21	9.10	4.614	1.007			
	Total	172	8.90	5.119	.390			
PE	Illiterate	13	5.69	2.626	.728		1.639	.167
	Up to Class-IV	29	5.17	2.753	.511			
	Class-V to VIII	67	7.06	4.086	.499			
	Class-IX to X	42	6.74	4.824	.744			
	Class-XI and Above	21	5.57	2.821	.616			
	Total	172	6.38	3.906	.298			
FE	Illiterate	13	18.77	7.373	2.045		.186	.945
	Up to Class-IV	29	19.90	8.508	1.580			
	Class-V to VIII	67	19.39	7.410	.905			
	Class-IX to X	42	18.86	8.360	1.290			
	Class-XI and Above	21	18.14	8.157	1.780			
	Total	172	19.15	7.853	.599			
NE	Illiterate	13	3.92	2.465	.684		2.541*	.042
	Up to Class-IV	29	4.48	3.007	.558			
	Class-V to VIII	67	3.97	2.944	.360			
	Class-IX to X	42	4.76	2.676	.413			
	Class-XI and Above	21	6.10	2.385	.521			
	Total	172	4.51	2.846	.217			
		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	Illiterate	13	.77	1.481	83.04			

	Up to Class-IV	29	1.07	1.811	82.72	4	1.765	.779
	Class-V to VIII	67	1.36	1.630	91.27			
	Class-IX to X	42	.98	1.506	82.69			
	Class-XI and Above	21	1.62	2.459	86.26			
	Total	172	1.20	1.740				
FiE	Illiterate	13	.23	.439	79.92	4	1.604	.808
	Up to Class-IV	29	.45	.827	85.02			
	Class-V to VIII	67	.28	.670	89.04			
	Class-IX to X	42	.45	.705	88.04			
	Class-XI and Above	21	.29	.561	81.45			
	Total	172	.35	.680				

*Result is statistically significant at 0.05 level.

Interpretation

Table 5.12 shows the mean score of overall, test-wise, and dimension-wise CE among the Muslim elementary school children concerning their MEQ. The mean score of OCE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 29.38, 31.07, 32.06, 31.79, and 31.71, respectively. This means students whose mother's educational qualification is Class V to VIII have higher OCE than the other MEQ groups. Further, the One-Way ANOVA result revealed that these variations are not significant (F=.204, p=.936).

The mean score of PCE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 10.62, 11.59, 11.55, 11.90, and 11.71, respectively. This means students whose mother's educational qualification is Class-IX to X have higher PCE than the other MEQ groups, however, these variations are not significant (F=.268, p=.898).

The mean score of MCE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 10.69, 10.72, 11.57, 11.45, and 11.38, respectively. This means students whose mothers' educational qualification is Class-V to VIII have higher MCE than the other MEQ groups, however, these variations are not significant (F=.361, p=.836).

The mean score of WCE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 8.08, 9.03, 9.12, 8.62, and 9.10, respectively. It indicates that students whose mothers' educational qualifications are Class-V to VIII have higher WCE than the other MEQ groups, however, these variations are not significant (F=.156, p=.960).

The mean score of PE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 5.69, 5.17, 7.06, 6.74 and 5.57, respectively. It indicates that students whose mother's education qualification is Class V to VIII have higher PE than the other MEQ groups, however, these variations are not significant (F=1.639, p=.167).

The mean score of FE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 18.77, 19.90, 19.39, 18.86, and 18.14, respectively. This indicates that students whose mothers' education qualification is up to Class IV have higher FE than other MEQ groups, however, these variations are not significant (F=.186, p=.945).

The mean score of NE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 3.92, 4.48, 3.97, 4.76, and 6.10, respectively. It indicates that students whose mother's education qualification is Class-XI and Above have higher NE than other MEQ groups. The ANOVA result revealed that these variations are significant (F=2.541, p=.042). Further, the LSD test revealed that the actual differences lie between illiterate and Class-XI and Above (p=.029), Up to Class-IV and Class-XI and Above (p=.046), and Class-V to VIII and Class-XI and Above (p=.003).

The mean rank of AE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 83.04, 82.72,91.27,82.69, and 86.26, respectively. Though there are some variations in the mean ranks, however, the K-W test result revealed that these mean rank variations are not significant (X^2=1.765, p=.779).

Similarly, the mean rank of FiE for the children whose mothers are Illiterate, completed education Up to Class-IV, Class-V to VIII, Class-IX to X, and Class-XI and Above are 79.92, 85.02, 89.04, 88.04 and 81.45 respectively. Though, there are some variations in the mean ranks, however, the K-W test result revealed that these variations in mean ranks are not significant (X^2=1.765, p=.808).

5.1.3.9. Variations in CE Concerning Family Type

Table 5.13. Family Type-wise Comparison of Overall, Test-wise and Dimension-wise CE

	Type of Family	N	Mean	SD	df	t	*p*
OCE	Joint Family	42	32.21	10.545	170	.458	.648
	Nuclear Family	130	31.38	10.224			
PCE	Joint Family	42	11.79	3.646		.364	.717
	Nuclear Family	130	11.53	4.041			
MCE	Joint Family	42	11.50	3.795		.383	.702
	Nuclear Family	130	11.25	3.711			
WCE	Joint Family	42	8.98	5.663		.109	.913
	Nuclear Family	130	8.88	4.954			
PE	Joint Family	42	6.76	4.047		.732	.465
	Nuclear Family	130	6.25	3.867			
FE	Joint Family	42	19.24	7.895		.088	.930
	Nuclear Family	130	19.12	7.870			
NE	Joint Family	42	4.40	3.100		-.264	.792
	Nuclear Family	130	4.54	2.771			
			Mean Rank	Sum of Ranks		U	*p*
AE	Joint Family	42	95.49	4010.50		2352.500	.149
	Nuclear Family	130	83.60	10867.5			
FiE	Joint Family	42	82.12	3449.00		2546.000	.386
	Nuclear Family	130	87.92	11429.0			

Interpretation

Table 5.13. shows the mean score and SD of overall, test-wise, and dimension-wise CE of the Muslim elementary school children belong to the joint family and nuclear family.

In the OCE, the mean scores for the students belong to joint and nuclear family are 32.21 and 31.38. That indicates children belong to joint family has a higher OCE than the nuclear family. Further, the independent sample t-test result revealed that the mean difference is not significant (t =.458, p=.648).

In the case of PCE, the mean scores for the children belong to joint and nuclear family are 11.79 and 11.53. That indicates children belong to joint family has a higher PCE than the nuclear family. However, the mean difference is not significant (t=.364, p=.717).

In the case of MCE, the mean scores for the children belong to joint and nuclear family are 11.50 and 11.25. It also shows that children belong to joint family has slightly higher MCE. However, this mean difference is not significant (t=.383, p=.702).

The table also shows that in the case of WCE, the mean scores for the children belong to joint and nuclear family are 8.98 and 8.88. It also shows that children belong to joint family has slightly higher WCE. However, this mean difference is not significant (t=.109, p=.913).

The table also indicates that in the mean PE for the children belong to joint and nuclear family are 6.76 and 6.25. It also shows that children belong to joint family has slightly higher PE. However, this mean difference is not significant (t=.732, *p*=.465).

The mean FE for the children belong to joint and nuclear family are 19.24 and 19.12. It also shows that children belong to joint family has slightly higher FE. However, this mean difference is not significant (t=.088, *p*=.930).

The mean NE for the children belong to joint and nuclear family are 4.40 and 4.54. It also shows that children belong to nuclear family has slightly higher NE. However, this mean difference is not significant (t=-.264, *p*=.792).

The mean rank of AE for the children belong to joint and nuclear family are 95.49 and 83.60. It means that the children belong to joint family has slightly higher AE. However, this mean rank difference is not significant (U=2352.500, *p*=.149).

The mean rank of FiE for the children belong to joint and nuclear family are 82.12 and 87.92, respectively. It means that the children belong to nuclear family has slightly higher FiE. However, this mean rank difference is not significant (U=2546.000, *p*=.386).

5.1.3.10. Variations in CE Concerning Family Monthly Income

Table 5.14. Family Monthly Income-wise Comparison of Overall, Test-wise and Dimension-wise CE

		N	Mean	SD	Std. Error	df	F	***p***
OCE	Up to 6174	70	30.33	9.760	1.167	2/169	.892	.412
	6175 to 18496	91	32.51	10.473	1.098			
	18497 to 30830	11	31.91	11.970	3.609			
	Total	172	31.58	10.279	.784			
PCE	Up to 6174	70	11.44	4.067	.486		.329	.720
	6175 to 18496	91	11.79	3.892	.408			
	18497 to 30830	11	10.91	3.727	1.124			
	Total	172	11.59	3.939	.300			
MCE	Up to 6174	70	10.86	3.316	.396		1.116	.330
	6175 to 18496	91	11.53	3.917	.411			
	18497 to 30830	11	12.36	4.456	1.343			
	Total	172	11.31	3.722	.284			
WCE	Up to 6174	70	8.27	5.373	.642		.893	.411
	6175 to 18496	91	9.34	4.996	.524			
	18497 to 30830	11	9.27	4.429	1.335			
	Total	172	8.90	5.119	.390			
PE	Up to 6174	70	5.96	4.109	.491		.688	.504
	6175 to 18496	91	6.68	3.720	.390			
	18497 to 30830	11	6.55	4.204	1.268			

	Total	172	6.38	3.906	.298			
FE	Up to 6174	70	18.39	7.447	.890		.594	.553
	6175 to 18496	91	19.75	8.213	.861			
	18497 to 30830	11	19.00	7.576	2.284			
	Total	172	19.15	7.853	.599			
NE	Up to 6174	70	4.33	2.817	.337		.234	.791
	6175 to 18496	91	4.62	2.863	.300			
	18497 to 30830	11	4.73	3.101	.935			
	Total	172	4.51	2.846	.217			
		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	Up to 6174	70	1.23	1.795	86.70	2	1.096	.578
	6175 to 18496	91	1.23	1.700	87.84			
	18497 to 30830	11	.82	1.834	74.14			
	Total	172	1.20	1.740				
FiE	Up to 6174	70	.43	.772	89.56		3.349	.187
	6175 to 18496	91	.23	.496	82.82			
	18497 to 30830	11	.82	1.079	97.45			
	Total	172	.35	.680				

Interpretation

The results in Table 5.14 shows the mean score for overall, test-wise and dimensions-wise CE for the Muslim elementary school children, concerning their family monthly income. The family income groups are up to 6174, 6175 to 18496, and from 18497 to 30,830 INR. In the case of OCE, the mean scores for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 30.33, 32.51, and 31.91, respectively. This means that children belong to 6175 to 18496 family income group have a higher OCE than the other groups. However, the variations in OCE among the groups are not significant (F=.892, *p*=.412).

The mean scores of PCE for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 11.44, 11.79, and 10.91, respectively. This suggests that students from 6175 to 18496 family income group have a higher PCE than the other groups. However, the variations in PCE among the groups are not significant (F=.329, *p*=.720).

The mean scores of MCE for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 10.86, 11.53, and 12.36, respectively. This suggests that students from 18497 to 30830 family income group have a higher MCE than the other groups. However, the variations in MCE among the groups are not significant (F=1.116, *p*=.330).

The mean scores of WCE for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 8.27, 9.34, and 9.27, respectively. This suggests that students from 6175

to 18496 family income group have a higher WCE than the other groups. However, the variations in WCE among the groups are not significant (F=.893, *p*=.411).

The mean PE for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 5.96, 6.68, and 6.55, respectively. This suggests that students from 6175 to 18496 family income group have a higher PE than the other groups. However, the variations in PE among the groups are not significant (F=.688, *p*=.504).

The mean FE for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 18.39, 19.75, and 19.00, respectively. This suggests that students from 6175 to 18496 family income group have a higher FE than the other groups. However, the variations in FE among the groups are not significant (F=.594, *p*=.553).

The mean rank in NE for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 4.33, 4.62, and 4.73, respectively. This suggests that students from 18497 to 30,830 family income groups have a higher NE than the other groups. However, the variations in NE among the groups are not significant (F =.234, *p*=.791).

In the case of AE, the mean ranks for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 86.70, 87.84, and 74.14, respectively. This suggests that children belong to 6175 to 18496 family income groups have higher AE than the other groups. urther, the K-W test result showed that the mean rank variations in AE are not significant (X^2= 1.096, *p*=.578).

In the case of FiE, the mean ranks for up to 6174, 6175 to 18496, and from 18497 to 30,830 family income groups are 89.56, 82.82, and 97.45 respectively. Further, the K-W test result showed that the mean rank variations in FiE are not significant (X^2=3.349, *p*=.187).

5.1.4. Associations between Anthro-pedagogical Factors and LS Preferences

$H_0$4: There are no significant associations between anthro-pedagogical factors and LS preferences among Muslim elementary school children.

5.1.4.1. Associations between Age and LS Preferences

Table 5.15. Associations between Age and LS Preferences

Age Group * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
7;00 to 9;00 Years	Count	5	5	37	8	11	66
	% within Age Group	7.6%	7.6%	56.1%	12.1%	16.7%	100.0%
	% of Total	2.9%	2.9%	21.5%	4.7%	6.4%	38.4%
9;01 to 11;00 Years	Count	8	0	46	5	9	68
	% within Age Group	11.8%	0.0%	67.6%	7.4%	13.2%	100.0%
	% of Total	4.7%	0.0%	26.7%	2.9%	5.2%	39.5%
11;01 to 12;02 Years	Count	2	3	22	6	5	38
	% within Age Group	5.3%	7.9%	57.9%	15.8%	13.2%	100.0%
	% of Total	1.2%	1.7%	12.8%	3.5%	2.9%	22.1%
Total	Count	15	8	105	19	25	172
	% within Age Group	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.412[a]	8	.309
N of Valid Cases	172		

a. 5 cells (33.3%) have an expected count of less than 5. The minimum expected count is 1.77.

Interpretation

Table 5.15. shows the LS preferences for Muslim elementary school children based on their age. Out of 172 children, 66 (38.4%) are in the 7;00 to 9;00 Years age group, 68 (39.5%) are in the 9;01 to 11;00 Years age group, and 38 (22.1%) are in the 11;01 to 12;02 Years age group. Considering all the 172 participants, most of the students preferred RWLS (61.0%) followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%).

In 7;00 to 9;00 Years age group, 7.6% of students preferred the Visual Learning Style (VLS), 7.6% the Auditory Learning Style (ALS), 56.1% the Read/Write Learning Style (RWLS), 12.1% the Kinaesthetic Learning Style (KLS), and 16.7% the Multi-modal Learning Style (MMLS). This means that the majority of 7;00 to 9;00 age group children preferred the RWLS.

In the 9;01 to 11;00 years age group, the preferences for VLS, ALS, RWLS, KLS, and MMLS are 11.8%, 0.0%, 67.6%, 7.4%, and 13.2%, respectively. This means that most of the 9;01 to 11;00 Years age group children also preferred the RWLS.

In the 11;01 to 12;02 Years age group, the preferences for VLS, ALS, RWLS, KLS, and MMLS are 5.3%, 7.9%, 57.9%, 15.8%, and 13.2%, respectively. This means that most of the 11;01 to 12;02 Years age group children also preferred the RWLS.

Further, it was also revealed that compared to 7;00 to 9;00 Years and 11;01 to 12;02 years age group children, the preference for VLS is highest for 9;01 to 11;00 years age group children. The preference for ALS is highest for 11;01 to 12;02 years age group children. The preference for RWLS is highest for 9;01 to 11;00 years age group children. The preference for KLS is highest for 9;01 to 11;00 and 11;01 to 12;02 years age group children. The preference for MMLS is highest for 7;00 to 9;00 years age group children. However, the Chi-square results revealed no significant association between age and LS preferences (X2=9.412, df=8, p=.309).

5.1.4.2. Associations between Class and LS Preferences

Table 5.16. Associations between Class and LS Preferences

Class of Study * LSs Crosstabulation								
			LSs					Total
			VLS	ALS	R/WLS	KLS	MMLS	
	Class I	Count	2	0	15	5	6	28
		Expected Count	2.4	1.3	17.1	3.1	4.1	28.0
		% within Class	7.1%	0.0%	53.6%	17.9%	21.4%	100.0%
		% of Total	1.2%	0.0%	8.7%	2.9%	3.5%	16.3%
	Class II	Count	3	5	20	3	3	34
		Expected Count	3.0	1.6	20.8	3.8	4.9	34.0
		% within Class	8.8%	14.7%	58.8%	8.8%	8.8%	100.0%
		% of Total	1.7%	2.9%	11.6%	1.7%	1.7%	19.8%
	Class III	Count	2	0	21	2	5	30
		Expected Count	2.6	1.4	18.3	3.3	4.4	30.0
		% within Class	6.7%	0.0%	70.0%	6.7%	16.7%	100.0%
		% of Total	1.2%	0.0%	12.2%	1.2%	2.9%	17.4%
	Class IV	Count	6	0	24	2	6	38
		Expected Count	3.3	1.8	23.2	4.2	5.5	38.0
		% within Class	15.8%	0.0%	63.2%	5.3%	15.8%	100.0%
		% of Total	3.5%	0.0%	14.0%	1.2%	3.5%	22.1%
	Class V	Count	2	3	25	7	5	42
		Expected Count	3.7	2.0	25.6	4.6	6.1	42.0
		% within Class	4.8%	7.1%	59.5%	16.7%	11.9%	100.0%
		% of Total	1.2%	1.7%	14.5%	4.1%	2.9%	24.4%

Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within Class	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.509[a]	16	.128
N of Valid Cases	172		

a. 18 cells (72.0%) have an expected count of less than 5. The minimum expected count is 1.30.

Interpretation

Table 5.16. represents the LS preferences for the participants studying in Class I, II, III, IV, and V. It shows that out of 172 students, 28 (16.3%) are studying in Class I, 34 (19.8%) are in Class II, 30 (17.4%) are in Class III, 38 (22.1%) are in Class IV, and 42 (24.4%) are in Class V. Concerning all 172 participants, it is observed that most of the students preferred RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%).

Within Class I, 7.1% of students preferred VLS, not a single student preferred ALS, 53.6% preferred RWLS, 17.9% preferred KLS, and 21.4% preferred MMLS. This means most of the Class I students preferred the RWLS.

In Class II, the preference for VLS, ALS, RWLS, KLS, and MMLS is 8.8%, 14.7%, 58.8%, 8.8%, and 8.8%, respectively. This means most of the Class II students also preferred the RWLS.

In Class III, the preference for VLS, ALS, RWLS, KLS, and MMLS are 6.7%, 0.0%, 70.0%, 6.7% and 16.7%, respectively. This means most Class III students also preferred the RWLS.

In Class IV, the preference for VLS, ALS, RWLS, KLS, and MMLS is 15.8%, 0.0%, 63.2%, 5.3% and 15.8%, respectively. This means most Class IV students also preferred the RWLS.

In Class V, the preference for VLS, ALS, RWLS, KLS, and MMLS is 4.8%, 7.1%, 59.5%, 16.7%, and 11.9%, respectively. Means most Class V students also preferred the RWLS.

Among all the classes, the preference for VLS is highest for Class IV students (15.8%) preferred VLS and the lowest was for Class V (4.8%). The preference for ALS is highest for Class II students (14.7%) and the lowest for Class I, II, and IV (00%). The preference for RWLS is highest for Class III students (70%) and the lowest was for Class I (53.6%).

The preference for KLS was highest for Class I and Lowest for Class IV. The preference for MMLS is highest for Class I students (21.4%) and the lowest was for Class II (8.8%).

Finally, the Chi-square results revealed that class and LS preferences are not significantly associated (X^2=22.509, df=16, *p*=.128).

5.1.4.3. Associations between Gender and LS Preferences

Table 5.17. Associations between Gender and LS Preferences

Gender * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	R/WLS	KLS	MMLS	
Male	Count	4	2	42	16	13	77
	Expected Count	6.7	3.6	47.0	8.5	11.2	77.0
	% within Gender	5.2%	2.6%	54.5%	20.8%	16.9%	100.0%
	% of Total	2.3%	1.2%	24.4%	9.3%	7.6%	44.8%
Female	Count	11	6	63	3	12	95
	Expected Count	8.3	4.4	58.0	10.5	13.8	95.0
	% within Gender	11.6%	6.3%	66.3%	3.2%	12.6%	100.0%
	% of Total	6.4%	3.5%	36.6%	1.7%	7.0%	55.2%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within Gender	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.701[a**]	4	.002
N of Valid Cases	172		

a. 2 cells (20.0%) have an expected count of less than 5. The minimum expected count is 3.58.

Result is statistically significant at 0.01 level of significance.

Interpretation

The above table shows the LS preferences concerning gender of the Muslim elementary school children. Concerning all the Muslim elementary school children (N=172), most of them preferred RWLS followed by MMLS, KLS, VLS, and ALS, and the respective percentages are 61.0%, 14.5%, 11.0%, 8.7%, and 4.7%. That means most students prefer RWLSs, and the least prefer LS is ALS. It is observed that out of 172 children, 77 (44.8%) were male, and 95(55.25%) were female.

The VLS, ALS, RWLS, KL Sand MMLS preferences for male children are 5.2%, 2.6%, 54.5%, 20.8%, and 16.9% respectively. It suggests that the majority of male children preferred RWLS. On the other hand, the preference for female children are 11.6%, 6.3%,

66.3%, only 3.2%, and 12.6% respectively. This result shows that the majority of female children also prefer RWLS.

The preference for VLS is higher for females (11.6%) than males (5.2%). Similarly, the preference for ALS is also higher females (6.3%) than that of males (2.6%). The preference for RWLS is also higher for females (66.3%) than males (54.5%). However, male children (20.8%) preferred KLS more than females (3.2%). Male children also preferred MMLS (16.9%) more than females (12.6%).

Finally, the Chi-square results revealed no significant association between gender and LS preferences (X^2=16.701, df=4, p=.002).

5.1.4.4. Associations between Birth Type and LS Preferences

Table 5.18. Associations between Birth Type and LS Preferences

Birth Type * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	R/WLS	KLS	MMLS	
Normally Born	Count	10	5	55	11	14	95
	Expected Count	8.3	4.4	58.0	10.5	13.8	95.0
	% within Type Birth	10.5%	5.3%	57.9%	11.6%	14.7%	100.0%
	% of Total	5.8%	2.9%	32.0%	6.4%	8.1%	55.2%
Caesarean Born	Count	5	3	50	8	11	77
	Expected Count	6.7	3.6	47.0	8.5	11.2	77.0
	% within Birth Type	6.5%	3.9%	64.9%	10.4%	14.3%	100.0%
	% of Total	2.9%	1.7%	29.1%	4.7%	6.4%	44.8%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within Birth Type	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.370[a]	4	.849
N of Valid Cases	172		

a. 2 cells (20.0%) have an expected count of less than 5. The minimum expected count is 3.58.

Interpretation

Table 5.18. shows the LS preferences of the Muslim elementary school children concerning their birth type. Concerning all the Muslim elementary school children (N=172), most of the children preferred RWLS followed by MMLS, KLS, VLS, and ALS, and the respective percentages are 61.0%, 14.5%, 11.0%, 8.7%, and 4.7%. That means that the majority of the Muslim elementary school children prefer RWLS, while they least

preferred ALS. Further, it was observed that out of 172 children, 95(55.2%) were normally born, and 77(44.8%) were caesarean born children.

The preferences of the normally born children for VLS, ALS, RWLS, KLS, and MMLS are 10.5%, 5.3%, 57.9%, 11.6%, and 14.7%, respectively, which means most of the normally born children preferred RWLS. On the other hand, the LS preferences of the caesarean born children for VLS, ALS, RWLS, KLS, and MMLS are 6.5%, 3.9 %, 64.9%, 10.4%, 14.3%. Means most of the caesarean born children also preferred RWLS.

The preference for VLS is higher for normally born children (10.5%) than those of caesarean born (6.5%). The preference for ALS is higher for normally born children (5.3%) than caesarean born children (3.9%). The preference for RWLS is lower for normally born children (57.9%) than caesarean born children (64.9%). Normal born children preferred KLS more (11.6%) than caesarean born children (10.4%). The preference for MMLS is almost same for normally born (14.7%) and caesarean born children (14.3%).

Finally, the Chi-Square test results showed that the variations in LS preference concerning birth type of the Muslim elementary school children is not significant (X^2=1.370, df=4, p=.849).

5.1.4.5. Associations between Birth Order and LS Preferences

Table 5.19. Associations between Birth Order and LS Preferences

Birth Order * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
First-born	Count	7	5	51	11	13	87
	Expected Count	7.6	4.0	53.1	9.6	12.6	87.0
	% within Birth Order	8.0%	5.7%	58.6%	12.6%	14.9%	100.0%
	% of Total	4.1%	2.9%	29.7%	6.4%	7.6%	50.6%
Second-born	Count	4	3	44	8	8	67
	Expected Count	5.8	3.1	40.9	7.4	9.7	67.0
	% within Birth Order	6.0%	4.5%	65.7%	11.9%	11.9%	100.0%
	% of Total	2.3%	1.7%	25.6%	4.7%	4.7%	39.0%
Third-born	Count	4	0	10	0	4	18
	Expected Count	1.6	.8	11.0	2.0	2.6	18.0
	% within Birth Order	22.2%	0.0%	55.6%	0.0%	22.2%	100.0%
	% of Total	2.3%	0.0%	5.8%	0.0%	2.3%	10.5%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within Birth Order	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.153[a]	8	.330
N of Valid Cases	172		

a. 6 cells (40.0%) have an expected count of less than 5. The minimum expected count is .84.

Interpretation

Table 5.19 shows the LS preferences of the Muslim elementary school children concerning their birth order. Concerning all the Muslim elementary school children (N=172), most of the children preferred RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%). That means that the majority of the children prefer RWLS, while they least preferred ALS. The same table also shows that out of 172 children, 87 (50.6%) are first-born children, 67 (39.0%) are second-born children, and 18 (10.5%) are third-born children.

The preferences of the first born children for VLS, ALS, RWLS, KLS, and MMLS are 8.0%, 5.7%, 58.6%, 12.6%, and 14.9% respectively. This means most of the first-born children preferred the RWLS.

The preferences of the second born children for VLS, ALS, RWLS, KLS, and MMLS are 6.0%, 4.5%, 65.7%, 11.9%, and 11.9%, respectively. This means most second-born children also preferred the RWLS.

The preferences of the third-born children for VLS, ALS, RWLS, KLS, and MMLS are 22.2%, 0.0%, 55.6%, 0.0%, and 22.2%, respectively. This means most of the third-born children also preferred the RWLS.

The preference for VLS is highest for third born children (22.2%) and lowest was for second born children (6.0%). The highest number of first-born children (5.7%) preferred ALS, and the lowest for third-born children (00%). The highest number of second-born children (65.7%) preferred RWLS and the lowest was for third-born children (55.6%). The highest number of first-born children (12.6%) preferred KLS and the lowest was for third-born children (0.0%). The highest number of third-born children (22.2%) preferred MMLS and the lowest was for second-born children (11.9%).

Finally, the Chi-Square test results showed that the variations in LS preference concerning birth order of the Muslim elementary school children is not significant (X^2=9.153, df=8, *p*=.330).

5.1.4.6. Associations between BMI and LS Preferences

Table 5.20. Associations between BMI and LS Preferences

BMI Level * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
Underweight	Count	12	7	88	16	24	147
	Expected Count	12.8	6.8	89.7	16.2	21.4	147.0
	% within BMI Level	8.2%	4.8%	59.9%	10.9%	16.3%	100.0%
	% of Total	7.0%	4.1%	51.2%	9.3%	14.0%	85.5%
Normal Weight	Count	3	1	14	2	0	20
	Expected Count	1.7	.9	12.2	2.2	2.9	20.0
	% within BMI Level	15.0%	5.0%	70.0%	10.0%	0.0%	100.0%
	% of Total	1.7%	0.6%	8.1%	1.2%	0.0%	11.6%
Overweight	Count	0	0	3	1	1	5
	Expected Count	.4	.2	3.1	.6	.7	5.0
	% within BMI Level	0.0%	0.0%	60.0%	20.0%	20.0%	100.0%
	% of Total	0.0%	0.0%	1.7%	0.6%	0.6%	2.9%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within BMI Level	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.652[a]	8	.686
N of Valid Cases	172		

a. 9 cells (60.0%) have an expected count of less than 5. The minimum expected count is .23.

Interpretation

Table 5.20 shows the LS preferences of the Muslim elementary school children concerning their BMI. Concerning all the 172 participants, most of the children preferred RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%). It also shows that out of 172 Muslim elementary school children, 147 (85.5%) are underweight, 20 (11.6%) are normal weight, and only 5 (2.9%) are in the overweight category.

Within underweight category, 8.2% of students preferred VLS, 4.8% ALS, 59.9% RWLS, 10.9% KLS, and 16.3% preferred MMLS. This means most of the underweight children preferred the RWLS.

In the normal weight category, the preference for VLS, ALS, RWLS, KLS and MMLS are 15.0%, 5.0%, 70.0%, 10.0%, and 0.0%, respectively. This means most of the normal weight children also preferred the RWLS.

In overweight category, the preference for VLS, ALS, RWLS, KLS and MMLS are 0.0%, 0.0%, 60.0%, 20.0% and 20.0% respectively. This means most overweight children also preferred the RWLS.

The preference for VLS is highest for normal weight children (15.0%) and lowest was for overweight children (0.0%). The preference for ALS is highest for normal weight children (5.0%) and lowest was for overweight children (0.0%). The preference for RWLS is highest for normal weight children (70%) and lowest was for underweight children (59.9%). The preference for KLS is highest for overweight children (20.0%) and lowest was for normal weight children (10.0%). The preference for MMLS is highest for overweight children (20.0%) and lowest was for normal weight children (00%).

Finally, the Chi-square test results revealed that these variations in LS preferences concerning BMI is not significant (X^2=5.652, df=8, p=.686).

5.1.4.7. Associations between Number of Siblings and LS Preferences

Table 5.21. Associations between Number of Siblings and LS Preferences

Number of Siblings * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
Single Child	Count	2	2	16	3	2	25
	Expected Count	2.2	1.2	15.3	2.8	3.6	25.0
	% within Number of Siblings	8.0%	8.0%	64.0%	12.0%	8.0%	100.0%
	% of Total	1.2%	1.2%	9.3%	1.7%	1.2%	14.5%
Having One Siblings	Count	8	6	68	15	15	112
	Expected Count	9.8	5.2	68.4	12.4	16.3	112.0
	% within Number of Siblings	7.1%	5.4%	60.7%	13.4%	13.4%	100.0%
	% of Total	4.7%	3.5%	39.5%	8.7%	8.7%	65.1%
Having More than One Sibling	Count	5	0	21	1	8	35
	Expected Count	3.1	1.6	21.4	3.9	5.1	35.0
	% within Number of Siblings	14.3%	0.0%	60.0%	2.9%	22.9%	100.0%
	% of Total	2.9%	0.0%	12.2%	0.6%	4.7%	20.3%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within Number of Siblings	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.179[a]	8	.327
N of Valid Cases	172		

a. 7 cells (46.7%) have an expected count of less than 5. The minimum expected count is 1.16.

Interpretation

Table 5.21 shows the LS preferences of the Muslim elementary school children concerning their number of siblings. Concerning all the children (N=172), most of the children preferred RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%). It also shows that out of 172, 25 (14.5%) are single-child, 112 (65.1%) have one sibling, and 35 (20.3%) have more than one sibling.

In the single child category, 8.0% of students favoured the VLS, 8.0% the ALS, 64.0% the RWLS, 12.0% the KLS, and 8.0% the MMLS. This means that the majority of single child preferred the RWLS. The preference of children with having one sibling for VLS, ALS, RWLS, KLS and MMLS are 7.1%, 5.4%, 60.7%, 13.4%, and 13.4%, respectively. This means most of the children having one sibling also preferred the RWLS. The preferences for VLS, ALS, RWLS, KLS, and MMLS in having more than one sibling are 14.3%, 0.0%, 60.0%, 2.9%, and 22.9%, respectively. This means most children with more than one sibling also preferred the RWLS.

The preference for VLS is highest for the children with more than one sibling (14.3%) and lowest was for children with having one sibling (7.1%). The highest number of single-child (8.0%) favoured ALS, and the lowest was for having more than one sibling (0.0%). The highest number of single-child (64.0%) preferred RWLS, and the lowest was for having more than one sibling (60.0%). The highest number of children with having one sibling (13.4%) preferred the KLS and the lowest was for those with more than one sibling (2.9%). The highest number of children having more than one sibling (22.9%) preferred MMLS, and the lowest was for single child (8.0%).

Finally, the Chi-square test results revealed that these overall variations in LS preferences concerning number of sibling are not significant ($X2=9.179$, $df=8$, $p=.327$).

5.1.4.8. Associations between Parental Educational Qualification and LS Preferences among Muslim Elementary School Children

5.1.4.8.1. Associations between FEQ and LS Preferences

Table 5.22. Associations between FEQ and LS Preferences

FEQ * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
Illiterate	Count	2	0	11	2	1	16
	Expected Count	1.4	.7	9.8	1.8	2.3	16.0
	% within the FEQ	12.5%	0.0%	68.8%	12.5%	6.3%	100.0%
	% of Total	1.2%	0.0%	6.4%	1.2%	0.6%	9.3%
Up to Class-IV	Count	1	2	19	2	5	29
	Expected Count	2.5	1.3	17.7	3.2	4.2	29.0
	% within the FEQ	3.4%	6.9%	65.5%	6.9%	17.2%	100.0%
	% of Total	0.6%	1.2%	11.0%	1.2%	2.9%	16.9%
Class-V to VIII	Count	9	3	49	10	15	86
	Expected Count	7.5	4.0	52.5	9.5	12.5	86.0
	% within the FEQ	10.5%	3.5%	57.0%	11.6%	17.4%	100.0%
	% of Total	5.2%	1.7%	28.5%	5.8%	8.7%	50.0%
Class-IX to X	Count	1	2	9	4	4	20
	Expected Count	1.7	.9	12.2	2.2	2.9	20.0
	% within the FEQ	5.0%	10.0%	45.0%	20.0%	20.0%	100.0%
	% of Total	0.6%	1.2%	5.2%	2.3%	2.3%	11.6%
Class-XI and Above	Count	2	1	17	1	0	21
	Expected Count	1.8	1.0	12.8	2.3	3.1	21.0
	% within the FEQ	9.5%	4.8%	81.0%	4.8%	0.0%	100.0%
	% of Total	1.2%	0.6%	9.9%	0.6%	0.0%	12.2%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within the FEQ	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.626[a]	16	.552
N of Valid Cases	172		

a. 17 cells (68.0%) have an expected count of less than 5. The minimum expected count is .74.

Interpretation

Table 5.22. shows the learning style preferences of the Muslim elementary school children with respect to their FEQ. Regarding all 172 participants, the maximum number of children favoured RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%).

The table also shows that out of 172 children, 16(9.3%) children's fathers are illiterate, 29(16.9%) have passed up to class IV, 86 (50.0%) are class V to VII, 20 (11.6%) are class IX to X, and 21 (12.2%) are class-XI and Above.

Out of the 16 children whose fathers are illiterate, 12.5% students preferred VLS, 68.8% RWLS, 12.5% KLS, and (6.3%) MMLS. Not a student (0.0%) preferred ALS. This indicates that most students whose fathers were illiterate choose the RWLS.

Out of 29 children, whose fathers have up to class IV educational qualification, 3.4% students preferred VLS, 6.9% preferred ALS, 65.5% preferred RWLS, 6.9% preferred KLS, and 17.2% preferred MMLS. This indicates that the majority of students whose FEQ is up to class IV have preferred the RWLS.

In the class V to VIII FEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 10.5, 3.5, 57.0, 11.6, and 17.4 percent respectively. This indicates that most students in this category also prefer RWLS.

In the class IX to X FEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 5.0, 10.0, 45.0, 20.0 and 20.0 percent respectively. This indicates that most students in this category also prefer RWLS.

In the class XI and above FEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 9.5, 4.8, 81.0, 4.8 and 0.0 percent respectively. This indicates that most of the children in this category also prefer RWLS, and no one preferred MMLS.

The preference for VLS is highest for illiterate FEQ group (12.5%) and lowest for up to class IV group (3.5%). The preference for ALS is highest for IX to X group (10.0%) and lowest for illiterate group (0.0%). The preference for RWLS is highest for XI and above group (81%) and lowest for class IX to X group (45.0%). The preference for KLS is highest for IX to X group (20%) and lowest for class XI and above group (4.8.0%). The preference for MMLS is highest for IX to X group (20.0%) and lowest for class XI and above group (0.0%).

However, the Chi-square results revealed that these overall variations in LS preferences are not significant (X^2=14.626, df=16, p=.552).

5.1.4.8.2. Associations between MEQ and LS Preferences

Table 5.23. Associations between MEQ and LS Preferences

MEQ * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
Illiterate	Count	1	0	9	3	0	13
	Expected Count	1.1	.6	7.9	1.4	1.9	13.0
	% within the MEQ	7.7%	0.0%	69.2%	23.1%	0.0%	100.0%
	% of Total	0.6%	0.0%	5.2%	1.7%	0.0%	7.6%
Up to Class-IV	Count	4	0	15	4	6	29
	Expected Count	2.5	1.3	17.7	3.2	4.2	29.0
	% within the MEQ	13.8%	0.0%	51.7%	13.8%	20.7%	100.0%
	% of Total	2.3%	0.0%	8.7%	2.3%	3.5%	16.9%
Class-V to VIII	Count	4	4	42	5	12	67
	Expected Count	5.8	3.1	40.9	7.4	9.7	67.0
	% within the MEQ	6.0%	6.0%	62.7%	7.5%	17.9%	100.0%
	% of Total	2.3%	2.3%	24.4%	2.9%	7.0%	39.0%
Class-IX to X	Count	4	3	25	6	4	42
	Expected Count	3.7	2.0	25.6	4.6	6.1	42.0
	% within the MEQ	9.5%	7.1%	59.5%	14.3%	9.5%	100.0%
	% of Total	2.3%	1.7%	14.5%	3.5%	2.3%	24.4%
Class-XI and Above	Count	2	1	14	1	3	21
	Expected Count	1.8	1.0	12.8	2.3	3.1	21.0
	% within the MEQ	9.5%	4.8%	66.7%	4.8%	14.3%	100.0%
	% of Total	1.2%	0.6%	8.1%	0.6%	1.7%	12.2%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within the MEQ	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.701[a]	16	.694
N of Valid Cases	172		

a. 16 cells (64.0%) have an expected count of less than 5. The minimum expected count is .60.

Interpretation

Table 5.23. shows the learning style preferences of the Muslim elementary school children with respect to their mother's educational qualification. Regarding all 172 participants, the maximum number of students favoured RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%). The table also shows that out of 172 students, 13 (7.6%) students' mothers are illiterate, 29 (16.9%) are up to class IV, 67 (39.0%) are class V to VII, 42 (24.4%) are IX to X, and 21 (12.2%) are class XI and above.

In the illiterate MEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 7.7%, 0.0%, 69.2%, 23.1% and 0.0% respectively. This indicates that most students in this category prefer RWLS.

In Class I to IV MEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 13.8%, 0.0%, 51.7%, 13.8% and 20.7% respectively. This indicates that most students in this category also prefer RWLS.

In Class V to VIII MEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 6.0%, 6.0%, 62.7%, 7.5%, and 17.9% respectively. This indicates that most students in this category also prefer RWLS.

In Class IX to X MEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 9.5%, 7.1%, 59.5%, 14.3% and 9.5% respectively. This indicates that most students in this category also prefer RWLS.

In Class XI and above MEQ group, the preferences for VLS, ALS, RWLS, KLS and MMLS are 9.5%, 4.8%, 66.7%, 4.8% and 14.3% respectively. This indicates that most students in this category also prefer RWLS.

The preference for VLS is highest for up to class IV MEQ group and lowest for class V to VIII group. The preference for ALS is highest for IX to X group and lowest for illiterate and up to class IV group. The preference for RWLS is highest for illiterate group and lowest for up to class IV group. The preference for KLS is highest for illiterate and lowest for class XI and above group. The preference for MMLS is highest for up to class IV group and lowest for illiterate group.

Finally, the Chi-square results revealed that these overall variations in LS preferences are not significant. (X^2=12.701, df=16, p=.694).

5.1.4.9. Associations between Family Type and LS Preferences

Table 5.24. Associations between Family Type and LS Preferences

Family Type*LSs Crosstabulation							
			LSs				Total
			VLS	ALS	RWLS	KLS	MMLS	
	Joint Family	Count	1	0	27	8	6	42
		Expected Count	3.7	2.0	25.6	4.6	6.1	42.0
		% within Family Type	2.4%	0.0%	64.3%	19.0%	14.3%	100.0%
		% of Total	0.6%	0.0%	15.7%	4.7%	3.5%	24.4%
	Nuclear family	Count	14	8	78	11	19	130
		Expected Count	11.3	6.0	79.4	14.4	18.9	130.0
		% within Family Type	10.8%	6.2%	60.0%	8.5%	14.6%	100.0%
		% of Total	8.1%	4.7%	45.3%	6.4%	11.0%	75.6%
Total		Count	15	8	105	19	25	172
		Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
		% within Family Type	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
		% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.464[a]	4	.076
N of Valid Cases	172		

a. 3 cells (30.0%) have an expected count of less than 5. The minimum expected count is 1.95.

Interpretation

Table 5.24. represents the LS preferences for the Muslim elementary school children belong to joint and nuclear family. It is observed that out of the 172 children, 42 (24.4%) belong to joint family, and, and 130 (75.6%) belong to nuclear family. Concerning all 172 Muslim elementary school children, most of the children preferred RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%).

Within the joint family, 2.4% of students preferred VLS, not a single student preferred ALS, 64.3% preferred RWLS, 19.0% preferred KLS, and 14.3% preferred MMLS. Means the majority of the children belong to joint family preferred RWLS. The preference for VLS, ALS, RWLS, KLS, and MMLS in the nuclear family are 10.8%, 6.2%, 60.0%, 8.5%, and 14.6%, respectively. This means most of the children belong to nuclear family also preferred the RWLS.

The VLS was preferred more by children belong to nuclear family (10.8%) than joint family (2.4%). The ALS was preferred more by children belong to nuclear family (6.2%) than joint family (0.0%). The RWLS was preferred more by children belong to joint family

(64.3%) than nuclear family (60.0%). The KLS was preferred more by children belong to joint family (19.0%) than nuclear family (8.5%). The preference for MMLS was almost similar for both nuclear family (14.6%) and joint family (14.3%).

Finally, the Chi-square test results revealed that these overall variations in Learning Style preferences are not significant (X^2=8.464, df=4, *p*=.076).

5.1.4.10. Associations between Family Monthly Income and LS Preferences

Table 5.25. Associations between Family Monthly Income and LS Preferences

Family Monthly Income * LSs Crosstabulation							
		LSs					Total
		VLS	ALS	RWLS	KLS	MMLS	
Up to 6174	Count	6	5	41	6	12	70
	Expected Count	6.1	3.3	42.7	7.7	10.2	70.0
	% within Monthly Income	8.6%	7.1%	58.6%	8.6%	17.1%	100.0%
	% of Total	3.5%	2.9%	23.8%	3.5%	7.0%	40.7%
6175 to 18496	Count	9	2	56	12	12	91
	Expected Count	7.9	4.2	55.6	10.1	13.2	91.0
	% within Monthly Income	9.9%	2.2%	61.5%	13.2%	13.2%	100.0%
	% of Total	5.2%	1.2%	32.6%	7.0%	7.0%	52.9%
18497 to 30830	Count	0	1	8	1	1	11
	Expected Count	1.0	.5	6.7	1.2	1.6	11.0
	% within Monthly Income	0.0%	9.1%	72.7%	9.1%	9.1%	100.0%
	% of Total	0.0%	0.6%	4.7%	0.6%	0.6%	6.4%
Total	Count	15	8	105	19	25	172
	Expected Count	15.0	8.0	105.0	19.0	25.0	172.0
	% within Monthly Income	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%
	% of Total	8.7%	4.7%	61.0%	11.0%	14.5%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.471[a]	8	.706
N of Valid Cases	172		

a. 6 cells (40.0%) have expected count less than 5. The minimum expected count is .51.

Interpretation

Table 5.25. represents the LS preferences of Muslim elementary school children concerning their family monthly income. The compared family monthly income groups are up to 6174, 6175 to 18496, and 18497 to 30830 INR. It shows that out of 172 children, 70 (40.7%) belong to up to 6174 family monthly income group, 91 (52.9%) belong to 6175 to 18496 family monthly income group, and 11 (6.4%) belong to18497 to 30830 family monthly income group. Among all 172 Muslim elementary school children, the maximum

number of children preferred RWLS (61.0%), followed by MMLS (14.5%), KLS (11.0%), VLS (8.7%), and ALS (4.7%).

In the up to 6174 family monthly income group, 8.6% children preferred VLS, 7.1% preferred ALS, 58.6% preferred RWLS, 8.6% preferred KLS, and 17.1% preferred MMLS. This indicates that most of the up to 6174 family monthly income group children preferred the RWLS.

Within the 6175 to 18496 family monthly income group, the preference for VLS, ALS, RWLS, KLS and MMLS are 9.9%, 2.2%, 61.5%, 13.2% and 13.2%, respectively. This means the majority of the 6175 to 18496 family monthly income group children also preferred the RWLS.

In the 18497 to 30830 family monthly income group, the preference for VLS, ALS, RWLS, KLS and MMLS are 0.0%, 9.1%, 72.7%, 9.1% and 9.1%, respectively. Additionally, the maximum number of 18497 to 30830 family monthly income group students favoured the RWLS.

Among all the family monthly income groups, the preference for VLS is highest in 6175 to 18496 family income group (9.9%) and the lowest for 18497 to 30830 family monthly income group (0.0%). The preference for ALS is highest in 18497 to 30830 family monthly income group (9.1%) and the lowest for 6175 to 18496 family monthly income group (2.2%). The preference for RWLS is highest in 18497 to 30830 family monthly income group (72.7%) and the lowest for up to 6175 family monthly income group (58.6%). The preference for KLS is highest in 6175 to 18496 family monthly income group (13.2%) and the lowest for up to 6174 family monthly income group (8.6%). The preference for MMLS is highest in Up to 6174 family monthly income group (17.1%) and the lowest for 18497 to 30830 family monthly income group (9.1%).

Finally, the Chi-square results revealed that these overall variations in Learning Style preferences among the monthly groups are not significant (X^2=5.471, df=8, p=.706).

5.1.5. Influence of Learning Styles on Cognitive Equivalence

$H_0$5: OCE does not vary significantly across various LS preferences of the Muslim elementary school children.

$H_0$6: Test-wise CE does not vary significantly across various LS preferences of the Muslim elementary school children.

$H_0$7: Dimension-wise CE does not vary significantly across various LS preferences among the Muslim elementary school children.

5.1.5.1. Influence of Learning Styles on Overall, Test-wise and Dimensions-wise CE among Muslim elementary school children

Table 5.26. Influence of LSs on Overall, Test-wise and Dimensions-wise CE

		N	Mean	SD	Std. Error	df	F	*p*
OCE	VLS	15	27.60	10.006	2.583	4/167	3.274*	.013
	ALS	8	25.13	6.128	2.167			
	RWLS	105	33.47	10.732	1.047			
	LKS	19	32.05	8.791	2.017			
	MMLS	25	27.76	8.462	1.692			
	Total	172	31.58	10.279	.784			
PCE	VLS	15	9.60	3.521	.909		4.378**	.002
	ALS	8	10.13	3.137	1.109			
	RWLS	105	12.51	4.197	.410			
	LKS	19	11.05	2.990	.686			
	MMLS	25	9.80	2.630	.526			
	Total	172	11.59	3.939	.300			
MCE	VLS	15	9.13	3.204	.827		3.798**	.006
	ALS	8	10.00	4.408	1.558			
	RWLS	105	12.06	3.640	.355			
	LKS	19	11.37	3.166	.726			
	MMLS	25	9.84	3.727	.745			
	Total	172	11.31	3.722	.284			
WCE	VLS	15	9.27	5.325	1.375		1.453	.219
	ALS	8	5.00	3.207	1.134			
	RWLS	105	9.16	5.364	.523			
	LKS	19	9.63	4.833	1.109			
	MMLS	25	8.28	4.326	.865			
	Total	172	8.90	5.119	.390			
PE	VLS	15	4.20	2.513	.649		1.714	.149
	ALS	8	5.88	7.240	2.560			
	RWLS	105	6.77	3.691	.360			
	LKS	19	6.89	3.914	.898			
	MMLS	25	5.80	3.862	.772			
	Total	172	6.38	3.906	.298			
FE	VLS	15	16.53	7.963	2.056			

	ALS	8	12.63	6.610	2.337		3.108*	.017
	RWLS	105	20.43	7.780	.759			
	LKS	19	19.63	8.001	1.836			
	MMLS	25	17.04	6.991	1.398			
	Total	172	19.15	7.853	.599			
NE	VLS	15	5.67	2.526	.652		1.702	.152
	ALS	8	5.00	3.207	1.134			
	RWLS	105	4.65	2.948	.288			
	LKS	19	3.63	2.499	.573			
	MMLS	25	3.72	2.525	.505			
	Total	172	4.51	2.846	.217			
		N	Mean	SD	Mean Rank	df	X^2	*p*
AE	VLS	15	.67	1.113	79.83	4	5.455	.244
	ALS	8	1.00	.926	77.25			
	RWLS	105	1.36	1.912	89.49			
	LKS	19	1.58	1.924	97.24			
	MMLS	25	.64	1.114	72.76			
	Total	172	1.20	1.740				
FiE	VLS	15	.53	.743	90.20		9.074	.059
	ALS	8	.63	.518	115.25			
	RWLS	105	.26	.555	83.29			
	LKS	19	.32	.749	82.97			
	MMLS	25	.56	1.003	91.24			
	Total	172	.35	.680				

Result is statistically significant at *0.05 level and **0.01 level of significance.

Interpretation

Table 5.26. represents the mean score of the overall, test-wise, and dimension-wise CE concerning LS preference of Muslim elementary school children. In OCE, the mean scores for VLS, ALS, RWLS, KLS, and MMLS preferences are 27.60, 25.13, 33.47, 32.05, and 27.76, respectively. That indicates that the children who prefer RWLS have higher OCE than the other groups. The one-way ANOVA result revealed that these variations are significant (F=3.274, *p*=.013). Further, the LSD test revealed that the actual differences lie between VLS and RWLS (*p*=.035), ALS and RWLS (*p*=.024), and MMLS and RWLS (*p*=.011).

The table also shows that the mean scores for PCE for children with VLS, ALS, RWLS, KLS, and MMLS preferences are 9.60, 10.13, 12.51, 11.05, and 9.80, respectively. Means children with RWLS have higher PCE than other categories. The one-way ANOVA result indicated that these variations are statistically significant (F=4.378, *p*=.002). Furthermore, the LSD test revealed that the actual differences are between RWLS and VLS (*p*=.006) and RWLS and MMLS (*p*=.002).

In the case of MCE, the mean scores for the children with VLS, ALS, RWLS, KLS, and MMLS preferences are 9.13, 10.00, 12.06, 11.37, and 9.84, respectively. That means students with an RWLS have higher MCE than the other categories. The one-way ANOVA result revealed that these variations are statistically significant (F=3.798, p=.006). Additionally, the LSD test revealed that the actual differences lie between VLS and RWLS (p=.004) and RWLS and MMLS (p=.006).

In the case of WCE, the mean scores for the children with VLS, ALS, RWLS, KLS and MMLS preferences are 9.27, 5.00, 9.16, 9.63, and 8.28, respectively. The means that children with KLS has a higher WCE than other groups. However, the one-way ANOVA revealed that these variations are not significant (F=1.453, p=.219).

The mean PE for each LS preference groups are 4.20, 5.88, 6.77, 6.89, and 5.80, respectively. The result indicates that children with KLS preference has a higher mean score than other LSs. However, these variations are not significant (F=1.714, p=.149).

In the case of FE, the mean scores for each learning style groups are 16.53, 12.63, 20.43, 19.63, and 17.04, respectively. The result indicates that children with RWLS has a higher FE compared to other learning styles groups, The one-way ANOVA result revealed that these variations are significant (F=3.108, p=.017). Further LSD tests revealed that the actual differences lie between ALS and RWLS (p=.006) and ALS and KLS (p=.032).

The mean NE for the mentioned LS preference groups are 5.67, 5.00, 4.65, 3.63, and 3.72, respectively. It suggests that the children with VLS preference has a higher mean score compared to the other LSs, however, these variations in NE among the LSs preference groups are not significant (F=1.702, p=.152).

The mean rank in AE for VLS, ALS, RWLS, KLS and MMLS are 79.83, 77.25, 89.49, 97.24, and .72.76 respectively. However, the K-W test result revealed that these variations in the mean ranks are not significant (K-W=5.455, p=.244).

In the case of FE, the mean rank for the mentioned LS categories are 90.20, 115.25, 83.29, 82.97, and 91.24 respectively. However, the differences in mean ranks are not statistically significant (K-W=9.074, p=.059).

5.1.5.2. Moderating Effect of Selected Anthro-Pedagogical Factors in the Relationship Between LS Preference and OCE among Muslim Elementary School Children

$H_0$8: Selected Anthro-pedagogical variables i.e. number of stimuli taken, total time taken, age, BMI and family monthly income have no significant moderation effect in the relationship between LS preference and CE among Muslim elementary school children.

To test this hypothesis, regression analysis was run for each of the moderating variables separately through Haye's Process Macro in SPSS. The results for each moderating variables are presented in table 5.27.

5.1.5.2.1. Moderating Effects of Average Number of Stimuli

The regression analysis results (see table 5.27) shows a moderate correlation (R=.474) and 22.4% variations in OCE is caused by average number of stimuli taken and LSs all together, and this variation is significant (F=16.189, *p*=.000). However, the interaction between LS and average number of stimuli is not significant (X*W=1.179, t=1.278, *p*=.203), and the R^2-change is also not significant (R^2-chng=.008, F=1.633, *p*=.203). Which means average number of stimuli taken to form groups is not significantly moderating the relationship between LS and OCE among the Muslim elementary school children.

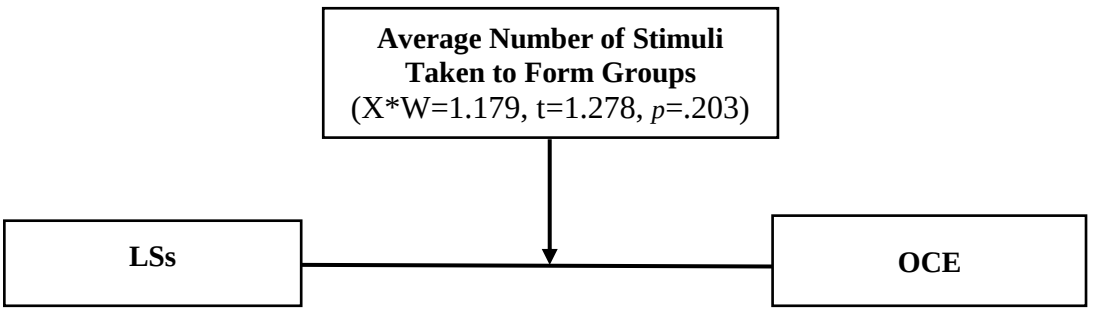

Fig. 5.1. Moderating Effects of Average Number of Stimuli

5.1.5.2.2. Moderating Effects of Total Time Taken

The regression analysis results (see table 5.27) shows a small correlation (R=.240) and 8.5% variations in OCE is caused by total time taken and LS all together, and this variation is significant (F=3.418, *p*=.019). However, the interaction between LS and time is not significant (X*W=-.071, t=.765, *p*=.445), and the R^2-change is also not significant (R^2-chng=.003, F=.585, *p*=.445). Which means total time taken to complete the CETs is not significantly moderating the relationship between LS and OCE among the Muslim elementary school children.

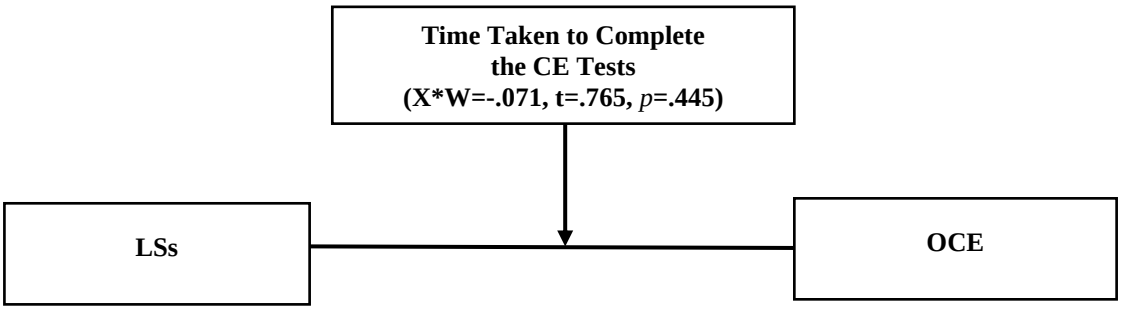

Fig. 5.2. Moderating Effects of Time Taken to Complete the CETs

5.1.5.2.3. Moderating Effects of Age

The regression analysis results (see table 5.27) shows a low correlation (R=.297) and 8.8% variations in OCE is caused by age and LS together, and this variation is significant (F=5.403, *p*=.0014). However, the interaction between LS and age is not significant (X*W=.059, t=1.423, *p*=.157), and the R^2-change is also not significant (R^2-chng=.011, F=2.025, *p*=.157). Which means age of the children is not significantly moderating the relationship between LS and OCE.

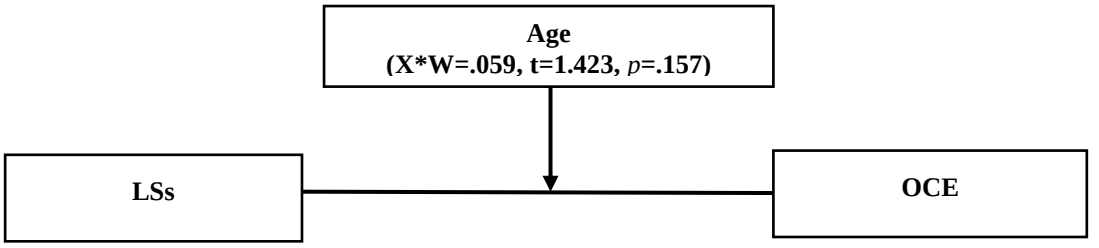

Fig. 5.3. Moderating Effects of age

5.1.5.2.4. Moderating Effects of BMI

The regression analysis results (see table 5.27) shows a low correlation (R=.147) and 2.17% variations in OCE is caused by BMI and LS together, but the variation is not significant (F=1.244, *p*=.296), and the contribution of BMI is higher than LS. The interaction between LS and BMI is not significant (X*W=.131, t=.489, *p*=.626), and the R^2-Change is also not significant (R^2-Chng=.0014, F=.239, *p*=.626). Which means BMI is not significantly moderating the relationship between LS and OCE among the Muslim elementary school children.

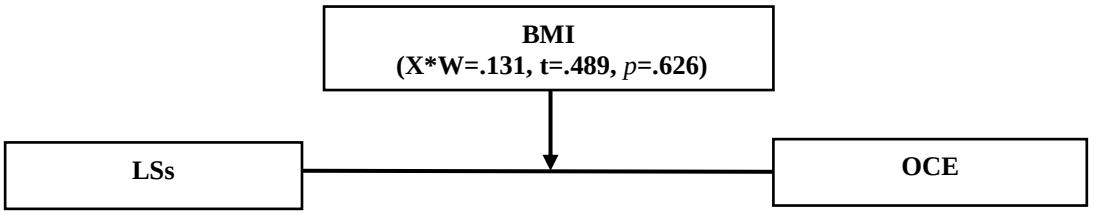

Fig. 5.4. Moderating Effects of BMI

5.1.5.2.5. Moderating Effects of Family Monthly Income

The regression analysis results (see table 5.27) shows a low correlation (R=.151) and only 2.28% variations in OCE is caused by family income and LS together, and this variation is not significant (F=1.266, *p*=.288). The interaction between LS and family income is not significant (X*W=-.0002, t=-1.916, *p*=.057), and the R^2-change is also not significant (R^2-chng=.022, F=3.673, *p*=.057). Which mean family monthly income is not significantly moderating the relationship between LS and OCE.

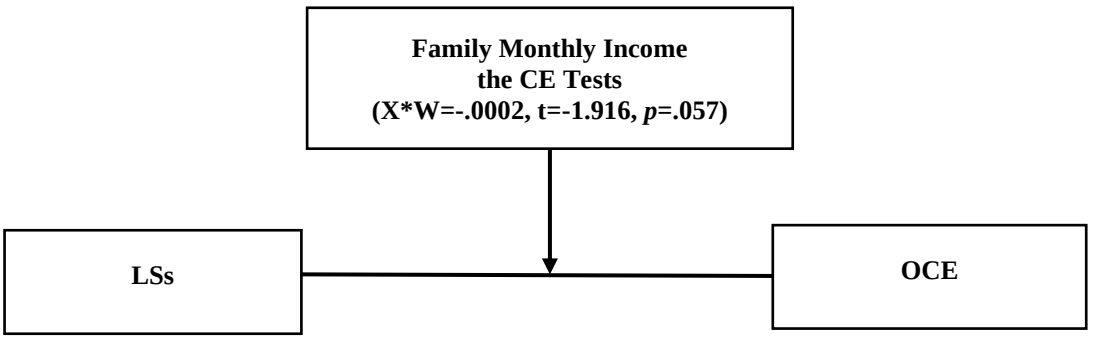

Fig. 5.5. Moderating Effects of Family Monthly Income

Table 5.27. Moderation Effects of Number of Stimuli Taken, Total Time Taken, Age, BMI and Family Monthly Income in the Relationship between LS and OCE

Model Summary							Model					
Dependent Variable (Y)	Independent Variable (X)	Moderator (W)	R	R-Square	F	*p*	Coeff X W X*W	t	*p*	R^2-Chng	F	*p*
OCE	LS	Average Number of Stimuli Taken	.474	.224	16.189	.000**	-4.092 2.521 1.179	-1.30 .827 1.28	.196 .409 .203	.008	1.633	.203
		Total Time Taken	.240	.058	3.418	.019*	1.612 .471 -.071	.603 1.518 -.765	.547 .131 .445	.003	.585	.445
		Age	.297	.088	5.403	.001**	-6.70 -.031 .059	-1.397 -.219 1.423	.164 .827 .157	.011	2.025	.157
		BMI	.147	.022	1.244	.296	-1.968 .054 .131	-.467 .059 .489	.641 .953 .626	.0014	.239	.626
		Family Monthly Income	.151	.023	1.266	.288	1.378 .0006 -.0002	1.286 1.929 -1.916	.200 .056 .057	.022	3.673	.057

Note: Result is statistically significant at *0.05 level and **0.01 level of significance

CHAPTER-VI

MAJOR FINDINGS AND CONCLUSION

Chapter-VI

Major Findings and Conclusion

6.0. Introduction

The ‘major findings and conclusion’ secion is very crucial in any research report. The primary purpose of this chapter is to pull the whole thesis together (Murray, 2017). In this chapter the findings of own work are compared with the existing theory which help drawing conclusions (Evans, Gruba & Zobel, 2011). The researcher has reached this crucial phase, guided by the previous chapters. This chapter is structured into five sub-sections: major findings, discussion of the major findings, educational implications, limitations, and suggestions for further research.

6.1. Major Findings of the Study

Based on the analysis and interpretation of data given in the previous chapter, the following findings were drawn:

6.1.1. Number of Stimuli Taken to Form Groups

1. The Muslim Elementary School Children studying in higher classes (Class IV a& V) have formed groups with more stimuli than lower classes (Class I, II & III) in the CET.
2. On average, Muslim Elementary School Children studying in lower classes took fewer pictures to form groups in the PCET than the children studying in higher classes.
3. On average, Muslim Elementary School Children studying in lower classes took fewer models to form groups in the MCET than children studying in higher classes.
4. On average, Muslim Elementary School Children studying in lower classes took fewer naming words to form groups in the WCET than the children studying in higher classes.
5. Muslim Elementary School Children studying in Class I and V have formed groups with the highest number of stimuli in the PCET and the lowest in the WCET.

6. Muslim Elementary School Children studying in Class II, III, and IV have formed groups with the highest number of stimuli in the MCET and the lowest in the WCET.
7. All the Muslim elementary school children formed groups with the highest number of stimuli in the model-based cognitive equivalence test and the lowest stimuli in the word-based cognitive equivalence test.

6.1.2. Time Taken to Complete the CET

1. The Muslim elementary school children studying in Class IV and V took more time to complete the CET than in Class I, II, and III.
2. The children studying in Class IV and V have spent more time to complete the picture-test than the children studying in Class I, II, and III.
3. The Muslim elementary school children in Class V took more time to complete the MCET than Class I, II, III, and IV.
4. The analysis revealed an apparent class-wise increase in the time to complete the MCET.
5. The Muslim elementary school children studying in Class I, have spent more time completing the picture-test and less time on the word-test.
6. The Muslim elementary school children studying in Class II also have spent more time to complete the PCET and less time in the WCET.
7. The Muslim elementary school children studying in Class III also spent more time completing the PCET and less time on the WCET.
8. The Muslim elementary school children studying in Class IV also spent more time completing the PCET and almost the same time on the MCET and WCET.
9. The Muslim elementary school children studying in Class V completed the MCET in less time than the WCET and PCET.
10. All the Muslim elementary school children have spent the highest time to complete the PCET and the lowest time in the WCET.

6.1.3. Association between Age and Overall, Test-wise and Dimension-wise CE

1. The age of the Muslim elementary school children is positively and significantly correlated with OCE.
2. The age of the Muslim elementary school children is not significantly correlated with PCE.

3. The age of the Muslim elementary school children is positively and significantly correlated with MCE.
4. The age of the Muslim elementary school children is positively and significantly correlated with WCE.
5. The age of the Muslim elementary school children is negatively but not significantly correlated with PE.
6. The age of the Muslim elementary school children is positively and significantly correlated with FE.
7. The age of the Muslim elementary school children is positively but not significantly correlated with NE.
8. The age of the Muslim elementary school children is positively and significantly correlated with AE.
9. The age of the Muslim elementary school children is negatively and significantly correlated with FiE.

6.1.4. Variations in Overall, Test-wise and Dimension-wise CE Concerning Class

1. There are significant variations in overall CE concerning the Class of the Muslim elementary school children.
2. There are no significant variations in PCE concerning the Class of the Muslim elementary school children.
3. There are significant variations in MCE concerning the Class of the Muslim elementary school children.
4. There are significant variations in WCE concerning the Class of the Muslim elementary school children.
5. There are significant variations in PE concerning the Class of the Muslim elementary school children.
6. There are significant variations in FE concerning the Class of the Muslim elementary school children.
7. There are no significant variations in NE concerning the Class of the Muslim elementary school children.
8. There are significant variations in AE concerning the Class of the Muslim elementary school children.
9. There are significant variations in FiE concerning the Class of the Muslim elementary school children.

6.1.5. Variations in Overall, Test-wise and Dimension-wise CE Concerning Gender

1. There is no significant difference in OCE between male and female Muslim elementary school children.
2. There is no significant difference in PCE between male and female Muslim elementary school children.
3. There is no significant difference in MCE between male and female Muslim elementary school children.
4. There is no significant difference in WCE between male and female Muslim elementary school children.
5. There is no significant difference in PE between male and female Muslim elementary school children.
6. There is no significant difference in FE between male and female Muslim elementary school children.
7. There is no significant difference in NE between male and female Muslim elementary school children.
8. There is no significant difference in AE between male and female Muslim elementary school children.
9. There is no significant difference in FiE between male and female Muslim elementary school children.

6.1.6. Variations in Overall, Test-wise and Dimension-wise CE Concerning Birth Type

1. There is no significant difference in OCE between normally-born and caesarean-born Muslim elementary school children.
2. There is no significant difference in PCE between normally-born and cesarean-born Muslim elementary school children.
3. There is no significant difference in MCE between normally-born and cesarean-born Muslim elementary school children.
4. No significant difference is present in WCE between normal and cesarean-born Muslim elementary school children.
5. There is no significant difference in PE between normally-born and cesarean-born Muslim elementary school children.
6. There is no significant difference in FE between normally-born and cesarean-born Muslim elementary school children.

7. There is no significant difference in NE between normally-born and cesarean-born Muslim elementary school children.
8. There is no significant difference in AE between normally-born and cesarean-born Muslim elementary school children.
9. There is no significant difference in FiE between normal and cesarean-born Muslim elementary school children.

6.1.7. Variations in Overall, Test-wise and Dimension-wise CE Concerning Birth Order

1. There are no significant variations in OCE among the Muslim elementary school children concerning their birth order.
2. There are no significant variations in PCE among the Muslim elementary school children concerning their birth order.
3. There are no significant variations in MCE among the Muslim elementary school children concerning their birth order.
4. There are no significant variations in WCE among the Muslim elementary school children concerning their birth order.
5. There are no significant variations in PE among the Muslim elementary school children concerning their birth order.
6. There are no significant variations in FE among the Muslim elementary school children concerning their birth order.
7. There are no significant variations in NE among the Muslim elementary school children concerning their birth order.
8. There are no significant variations in AE among the Muslim elementary school children concerning their birth order.
9. There are no significant variations in FiE among the Muslim elementary school children concerning their birth order.

6.1.8. Variations in Overall, Test-wise and Dimension-wise CE Concerning BMI

1. There are no significant variations in OCE among the Muslim elementary school children concerning their level of BMI.
2. There are no significant variations in PCE among the Muslim elementary school children concerning their level of BMI.
3. There are significant variations in MCE among the Muslim elementary school children concerning their level of BMI.

4. There are no significant variations in WCE among the Muslim elementary school children concerning their level of BMI.
5. There are no significant variations in PE among the Muslim elementary school children concerning their level of BMI.
6. There are no significant variations in FE among the Muslim elementary school children concerning their level of BMI.
7. There are no significant variations in NE among the Muslim elementary school children concerning their level of BMI.
8. There are significant variations in AE among the Muslim elementary school children concerning their level of BMI.
9. There are significant variations in FiE among the Muslim elementary school children concerning their level of BMI.

6.1.9. Variations in Overall, Test-wise and Dimension-wise CE Concerning Number of Siblings

1. There are no significant variations in OCE among Muslim elementary school children concerning their number of siblings.
2. There are no significant variations in PCE among the Muslim elementary school children concerning their number of siblings.
3. There are no significant variations in MCE among the Muslim elementary school children concerning their number of siblings.
4. There are no significant variations in WCE among the Muslim elementary school children concerning their number of siblings.
5. There are no significant variations in PE among the Muslim elementary school children concerning their number of siblings.
6. There are no significant variations in FE among the Muslim elementary school children concerning their number of siblings.
7. There are no significant variations in NE among the Muslim elementary school children concerning their number of siblings.
8. There are no significant variations in AE among the Muslim elementary school children concerning their number of siblings.
9. There are no significant variations in FiE among the Muslim elementary school children concerning their number of siblings.

6.1.10. Variations in Overall, Test-wise and Dimension-wise CE Concerning Parental Educational Qualification

6.1.10.1. Father's Educational Qualification

1. There are no significant variations in OCE among the Muslim elementary school children concerning their father's educational qualification.
2. There are no significant variations in PCE among the Muslim elementary school children concerning their father's educational qualification.
3. There are no significant variations in MCE among the Muslim elementary school children concerning their father's educational qualification.
4. There are no significant variations in WCE among the Muslim elementary school children concerning their father's educational qualification.
5. There are no significant variations in PE among the Muslim elementary school children concerning their father's educational qualification.
6. There are no significant variations in FE among the Muslim elementary school children concerning their father's educational qualification.
7. There are no significant variations in NE among the Muslim elementary school children concerning their father's educational qualification.
8. There are no significant variations in AE among the Muslim elementary school children concerning their father's educational qualification.
9. There are no significant variations in FiE among the Muslim elementary school children concerning their father's educational qualification.

6.1.10.2. Mother's Educational Qualification

1. There are no significant variations in OCE among the Muslim elementary school children concerning their mother's educational qualification.
2. There are no significant variations in PCE among the Muslim elementary school children concerning their mother's educational qualification.
3. There are no significant variations in MCE among the Muslim elementary school children concerning their mother's educational qualification.
4. There are no significant variations in WCE among the Muslim elementary school children concerning their mother's educational qualification.
5. There are no significant variations in PE among the Muslim elementary school children concerning their mother's educational qualification.
6. There are no significant variations in FE among the Muslim elementary school children concerning their mother's educational qualification.

7. There are significant variations in NE among the Muslim elementary school children concerning their father's educational qualification.
8. There are no significant variations in AE among the Muslim elementary school children concerning their mother's educational qualification.
9. There are no significant variations in FiE among the Muslim elementary school children concerning their mother's educational qualification.

6.1.11. Variations in Overall, Test-wise and Dimension-wise CE Concerning Family Type

1. There is no significant difference in OCE among the Muslim elementary school children concerning their family type.
2. There is no significant difference in PCE among the Muslim elementary school children concerning their family type.
3. There is no significant difference in MCE among the Muslim elementary school children concerning their family type.
4. There is no significant difference in WCE among the Muslim elementary school children concerning their family type.
5. There is no significant difference in PE among the Muslim elementary school children concerning their family type.
6. There is no significant difference in FE among the Muslim elementary school children concerning their family type.
7. There is no significant difference in NE among the Muslim elementary school children concerning their family type.
8. AE has no significant difference in AE among the Muslim elementary school children concerning their family type.
9. There is no significant difference in FiE among the Muslim elementary school children concerning their family type.

6.1.12. Variations in Overall, Test-wise and Dimension-wise CE Concerning Family Monthly Income

1. There are no significant variations in OCE among the Muslim elementary school children concerning their family monthly income.
2. There are no significant variations in PCE among the Muslim elementary school children concerning their family monthly income.
3. There are no significant variations in MCE among the Muslim elementary school children concerning their family monthly income.

4. There are no significant variations in WCE among the Muslim elementary school children concerning their family monthly income.
5. There are no significant variations in PE among the Muslim elementary school children concerning their family monthly income.
6. There are no significant variations in FE among the Muslim elementary school children concerning their family monthly income.
7. There are no significant variations in NE among the Muslim elementary school children concerning their family monthly income.
8. There are no significant variations in AE among the Muslim elementary school children concerning their family monthly income.
9. There are no significant variations in FiE among the Muslim elementary school children concerning their family monthly income.

6.1.13. Associations between Age and LS Preferences

1. The age of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.14. Associations between Class and LS Preferences

1. The Class of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.15. Associations between Gender and LS Preferences

1. The gender of the Muslim elementary school children is significantly associated with their LS preferences.

6.1.16. Associations between Birth Type and LS Preferences

1. The birth type of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.17. Associations between Birth Order and LS Preferences

1. The birth order of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.18. Associations between BMI and LS Preferences

1. The BMI of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.19. Associations between Number of Siblings and LS Preferences

1. The number of siblings of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.20. Associations between Parental Educational Qualification and LS Preferences

1. Father's educational qualifications of the Muslim elementary school children is not significantly associated with their LS preferences.
1. Mother's educational qualifications of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.21. Associations between Family Type and LS Preferences

1. Family type of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.22. Associations between Family Monthly Income and LS Preferences

1. The family monthly income of the Muslim elementary school children is not significantly associated with their LS preferences.

6.1.23. Variations in Overall, Test-wise and Dimension-wise CE Concerning LS Preferences

1. There are significant variations in OCE among the Muslim elementary school children concerning their preferences for LSs.
2. There are significant variations in PCE among the Muslim elementary school children regarding their preferences for LSs.
3. There are significant variations in MCE among the Muslim elementary school children concerning their preferences for LSs.
4. There are no significant variations in WCE among the Muslim elementary school children concerning their preferences for LSs.
5. There are no significant variations in PE among the Muslim elementary school children concerning their preferences for LSs.
6. There are significant variations in FE among the Muslim elementary school children concerning their preferences for LSs.
7. There are no significant variations in NE among the Muslim elementary school children concerning their preferences for LSs.
8. There are no significant variations in AE among the Muslim elementary school children concerning their preferences for LSs.

9. There are no significant variations in FiE among the Muslim elementary school children concerning their preferences for LSs.

6.1.24. Moderating Effects of Selected Anthro-Pedagogical Factors in the Relationship Between LSs and OCE

1. The average number of stimuli taken by the Muslim elementary school children to form groups do not significantly moderate the relationship between LSs and OCE.
2. The total time taken by the Muslim elementary school children to complete the CET does not significantly moderate the relationship between LSs and OCE.
3. There is no significant moderating effect of BMI of the Muslim elementary school children on the relationship between LSs and OCE.
4. The age of the Muslim elementary school children has no significant moderating effect on the relationship between LSs and OCE.
5. The family monthly income of the Muslim elementary school children has no significant moderating effect on the relationship between LSs and OCE.

6.2. Discussion of the Major Findings

This section is the most crucial part of the study. In this section, the major findings that emerged from the analysis and interpretations are compared with the existing theories and previous research findings, and the conclusions are drawn, as in the preceding paragraphs.

One of the objectives of the study was to know how many stimuli the Muslim elementary school children are taking to form groups with pictures or models or words. The findings of the study revealed that compared to higher classes, students in lower classes have formed groups with fewer stimuli. The trend is also similar in PCE, MCE and WCE. It might be because children in lower classes or younger ages cannot think from multiple perspectives. As they grow, they become aware of different perspectives and think accordingly. Their memory also develops with age. This may be why older children form groups with more stimuli than younger children. Not a single study found that can relate to the present finding. Therefore, this finding is unique is the elementary school context. Further, it was found that overall, Muslim elementary school children in each Class formed groups with the highest number of stimuli in the MCET, followed by the PCET and the WCET, which means that the MCET and the PCET were easier for them than the WCET because the first two tests present concrete situation to the children. The participants were in the concrete operational stage of cognitive development (7 to 11 years). At this stage,

the child develops logical thinking, and their logic centers around concrete situations. As the MCET and the PCET were present in front of them, therefore those tests were easier for them. The WCET was more difficult than the others because it requires language development, reading abilities, and higher-order thinking. This finding confirms the findings of Melkman, Tversky & Baratz (1981) and Caffarra et al. (2017), which state that learning to read influences written word processing and visual object recognition. This finding also confirms the Piagetian notions of age-related changes in cognition and the findings of Joseph and Joseph (1982).

Another objective of the present study was to measure the time taken by the Muslim elementary school children to form groups with pictures, models, and words. Generally, it is expected that compared to younger, older children take less time to complete any cognitive task. However, the present study revealed that, on average, children studying in Class I, II, and III had taken less time to complete all CETs than in Class IV and V. The reason behind this is that there was no pre-fixed grouping. There is no fixed time frame to complete the tasks and no fixed justification for the groups. They formed their groups, took as much time as needed, and provided as many justifications as possible. Elderly children (studying in Class IV and V) have given more justifications and scored higher than younger ones (studying in Class I, II and III), which is why elders have taken more time. This is also a unique finding in the context of the cognitive development of elementary school children.

Anthro-pedagogical Factors and CE

This study also intended to explore the association between age and overall, test-wise, and dimension-wise CE among the Muslim elementary school children studying in Class-I, II, III, IV, and V. Results revealed a low positive and significant relationship of age with OCE, MCE, WCE, WCE, and the FE and AE. That means the mentioned aspects of CE increase with age. This trend is similar at the Class levels. However, no significant variation was present in PCE and NE. That means in most of the cases of CE, class (Academic grade) plays a significant role. Similar to the findings of Olver and Hornsby (1966), this study also found that except for FiE, all the other aspects of CE increased from the lower class to the higher class. Only FiE decreased with age. Except FiE, overall, test-wise and dimension-wise CE increased because the age of the Muslim elementary school children also increased with their class levels. Consequently, their logical and critical thinking also developed. These findings supported the notions of earlier theorists like Piaget and Bruner. Few other researchers also reported age-related changes in similarity

judgment (Fahrmeier & Medin, 1977) and cognitive transformations and showed proficiency with both words and pictures (Joseph & Joseph, 1982). Hughley (1989) also reported a similar finding, which states that structural dimension influences similarity/dissimilarity judgments in categorizing paintings across academic grades. Mix (1999) reported a gradual increase in numerical equivalence. However, contradictory results are also present (González et al., 2020; Schmedemann, 1970), which is years back. Further, it also revealed a negative relationship between age and PE and FiE, which indicates that PE and FiE decrease with age. Therefore, it can be concluded that Cognitive Equivalence significantly increases with age and class level. Fiat Equivalence is the inability to justify similarity after forming groups based on similarity. It mainly happens due to delayed or inadequate language development. It represents intuitive thoughts, which is a characteristic of the Piagetian pre-operational stage of cognitive development. At young ages, when children are in lower classes, sometimes they lack an adequate stock of words or vocabulary. However, when children grow, their brains function more, and consequently, FiE disappears. This study revealed that the trend of more perceptible responses with pictorial stimuli than verbal stimuli is the same even after more than fifty years (Wiviott, 1970).

One of the significant findings of this study is that OCE or PCE, MCE, WCE, and each dimension of CE is the same between male and female Muslim elementary school children. Which means gender is not a significant factor in cognitive equivalence. This finding aligns with the findings, which reported that male and female students possess similar levels of CE (Khan, 2017; Samanta, 2018) and in other areas of cognitive performance like-Piagetian conservation (Riley, 1989; Ahmad et al., 2018). However, some of the studies contradicted this finding (González et al., 2020; Xu et al., 2019), who reported that cognitive functioning varied by gender. Some studies reported that boys perform significantly better than girls in conservation (Zarour, 1971; Omotoso & Shapiro, 1976) in cognitive structuring (Bar-Tal & Jarymowicz, 2010). A few studies reported gender-dependent results in favour of girls in languages (Bart & Schils, 2014), cognitive development (Mierdel, 2019), and conservation ability (Uddinet et al., 2019). Therefore, this gender-independent result in the context of cognitive development in general is still inconclusive; however, in the CE context, this finding is unique.

Another objective of this study was to measure the difference in overall CE and CE measured through pictorial, model and word tasks, and the PE, FE, NE, AE, and FIE dimensions of CE concerning Birth Type (normal delivery and cesarean delivery) of the Muslim elementary school children. The result revealed no significant difference in all

aspects of CE. No other study reported this finding in the context of CE. However, a few studies reported contradictory results, but those results are from other cognitive aspects. For example, cesarean-born children perform significantly below normally-born children in cognitive performance in terms of numeracy tests (Polidano et al. (2017)**.** More recently, Lupu et al. (2024) reported that cesarean delivery has a high risk of neurocognitive disorders like ASD and ADHD.

Another objective of this study was to measure the variations in overall, test-wise and dimension-wise CE concerning Birth Order (firstborn, second-born, third-born) of the Muslim elementary school children. By contradicting the finding that firstborns display significantly better cognitive development regarding verbal ability than later-born children (Heiland, 2009), the present study revealed no significant variations in all aspects of CE, however, in most cases of CE, second-born children performed better than first and third-born children. The reason may be the sibling interaction, where firstborn elder children help the later-born children.

This study also measured the difference in overall, test-wise and dimension-wise CE concerning BMI (in terms of underweight, normal weight, overweight and obesity) of the Muslim elementary school children. Results revealed that most of the children were in the underweight category, which may be due to a lack of parental awareness and care or a lack of nutritious foods because the familial financial conditions of most of the children were deplorable. The results revealed no significant difference in all aspects of CE except MCE and AE; however, in most of the cases of CE, underweight children performed below normal weight and overweight children. Most previous studies support these findings (Krombholz, 2012; Hjorth et al., 2016; Li et al., 2018; Gunstad et al., 2008; Poh et al., 2013). Another study also reported that enhanced cognitive performance in early life may correlate with a reduced risk of being overweight in later childhood (Guxens, 2009). This means BMI plays a significant role in children's cognitive development; however, for generalising this finding, further study is required.

This study also measured overall, test-wise and dimension-wise CE among Muslim elementary school children who are single children with one sibling and more than one sibling and revealed no significant difference. This finding aligns with the findings of Khan (2017) and Samanta (2018). Further, this revealed that children with one sibling performed better than single children having more than one sibling. Supporting evidence is also present (Peyre et al., 2016; Rochebrochard & Joshi, 2013; McAlister & Peterson, 2007; Zhou et al., 2016). However, sibling additions are only crucial to first- and second-born

children's cognitive development, not later (Yue et al., 2022). The reason is that older brother/sister contributes much to their younger sibling's cognitive achievement (Dai & Heckman, 2013). Therefore, the sibling factor must be considered for better cognitive development.

This study also measured the overall, test-wise and dimension-wise CE variations among Muslim elementary school children concerning parental educational qualification. The result showed that except for the NE dimension for the mother's educational qualification, no significant variation was present in any aspect of CE concerning parental educational qualification. This finding is contradicted with the previous findings (González et al., 2020; Peyre et al., 2016; Schady, 2011), which state that parental education has some impact on a child's cognitive development. Therefore, it can be said that parental education is also crucial for children's other aspects of cognitive development.

When the Muslim elementary school children were compared in terms of overall, test-wise, and dimension-wise CE concerning their family type, the results revealed no significant difference between the children from joint and nuclear families. This finding aligns with the findings of Khan (2017) and Samanta (2018). However, other studies contradict this finding by reporting that family type and home environment impact children's cognitive development (Ajayi et al., 2017; Morais et al., 2021). Therefore, it is not easy to draw a certain conclusion.

This study revealed no significant influence of family monthly income on overall, test-wise and dimension-wise CE among Muslim elementary school children. This finding is contradicted with the findings of Peyre et al. (2016), who reported that house-hold income has significant influence on children's verbal and no-verbal cognitive skills. No other studies support or contradict this finding, so, it is easy to say that familial income is not an influential factor in the CE context.

Anthro-pedagogical factors and LSs

This study examined the association of the Muslim elementary school childrens' age and class with their LS preference and found no evidence of a significant association. This implies that learning styles do not change with age or academic level. In the present study, all the students were at a lower primary level, studying in classes I to V. However, Yusuf and Erviana's (2022) contradictory research suggested that learning style preferences are highly influenced by class level. This finding might be relevant for the contexts where

primary school children are compared with high school or higher education students. It suggests that factors other than age may significantly impact learning preferences.

The present study found that gender is significantly associated with LSs of Muslim elementary school children. This result is supported by several studies, including Khodabakhshzadeh et al. (2017), Hamidon (2015), Mulalic et al. (2009), Honigsfeld and Dunn (2003), Massachi (2000), Ewing and Yong (1992), and Cohen (1986). However, this finding contrasted by Park (2000), Singh et al. (2015), and Nasution et al. (2019), who reported no significant gender differences in learning style preferences. As a result, it makes it difficult to draw certain conclusions regarding gender differences in preferred learning styles.

The current study's results also revealed that LSs of the Muslim elementary school children are not significantly influenced by their birth order. This finding aligns with some other research (Chow & Amzat, 2024; Luo et al., 2022; Tobias, 2003). However, contradictory findings also exist (Queen & Chika, 2023; Menchak et al., 2022; Sucgang & Fabella, 2018), which state that birth order significantly influences learning style preferences. This contradictory finding makes it difficult to conclude and calls for further research.

The present study revealed that the birth order has no significant influence on learning style preferences of muslim elementary school children. This finding corroborates with the findings of Cohen (1986). This suggests that regardless of birth order, childrens learning style references remain largely unaffected. Other factors, such as cultural context, family environment, or individual personality, may substantially shape their learning styles more than birth order. This finding aligns with research suggesting that birth order may not play a critical role in learning strategy.

One of the primary objectives of this study was to measure the association between BMI and LS preferences of the Muslim elementary school children, and the result revealed no significant association. Babu (2020) and Alswat et al. (2017) corroborated this finding, meaning the learning style will remain unchanged even if body weight changes. No such study was found which could contradict this finding. Therefore, it can be concluded that LS preferences are independent of BMI.

The study findings also indicated that the number of siblings of the Muslim elementary school children is not significantly associated with their preferences for LS. This finding aligns with some recent researchers (Alamineisi & Sadeghi, 2023; Jiao, 2023; Sivanandan et al., 2014) who reported that siblings may not play a direct role, but cultural factors could

influence learning style preferences. No such study was found which could contradict this finding. Therefore, it can be concluded that LS preferences are independent of the number of siblings.

This study also explored the association between parental educational qualification and LSs of the Muslim elementary school children, and the analysis revealed no significant association between these variables. This finding aligns with the findings of Casinillo et al. (2023), Mozaffari et al. (2020), Taheri et al. (2021), Singh et al. (2015), Ningsih et al. (2023), and Casinillo et al. (2023). However, a few researchers, like Cholifah et al. (2016), Sinaga (2022), Sirait et al. (2024), Singh et al. (2015), and Maulidah et al. (2020), reported contradictory results. This contradictory finding makes it difficult to conclude and calls for future studies.

The present also revealed no significant association between the family type and learning styles of Muslim elementary school children. This finding is supported by Maurine et al. (2022), Yoo and Kim (2019), and Taheri et al. (2021). However, some contradictory evidence is also present (Krishnamoorthy & Lokesh, 2020; Mozaffari et al., 2020). This contradictory finding makes it difficult to conclude and calls for future studies.

The current study revealed that family monthly income off the Muslim elementary school children is not significantly associated with their LSs. Krishnamoorthy and Lokesh (2020), Mozaffari et al. (2020), and Taheri et al. (2021) also reported similar findings. However, noteworthy contrary findings were reported by Yoo and Kim (2019), Sintia et al. (2019), and Dutsinma and Temdee (2020), indicating that LSs are indeed influenced by family income. This finding is contradictory; therefore, to draw certain conclusions, further study is required.

One of the primary objectives of this study was to measure the influence of learning styles on the overall, test-wise and dimension-wise CE among Muslim elementary school children. The results revealed significant variations in OCE, PCE, MCE, and FE. This finding aligns with Zain et al. (2019), and Hames and Baker (2014), who highlighted that learning styles can substantially impact cognitive performance. A few contradictori evidence also present, however those are in other areas of cognition. For example, learning styles and language achievement are not significantly related (Gohar & Sadeghi, 2015), learning styles had little effect on elementary students' critical thinking skills (Leasa et al., 2020).

It was assumed that factors like the number of stimuli in forming groups, time taken to complete the CET, age, BMI and family monthly income may moderate the relationship between LS and CE among Muslim elementary school children. However, the results of this study revealed that these factors do not significantly moderate the relationship. A similar study reported that different aspects of student motivation significantly moderate the relationship between LSs and student engagement, including cognitive engagement (Halif et al., 2020). Personality type is also reported as a moderator between LSs and reading comprehension (Carrel & Monroe, 1993; Ehrman & Oxford, 1990; Myers & Myers, 1993; Sadeghi et al., 2012). This means that internal psychological factors, like motivation and personality, may play a more significant role in mediating the effects of LSs on cognitive performance than external variables.

6.3. Educational Implications of the Study

The present study revealed interesting findings about learning styles and cognitive equivalence of Muslim elementary school children. These findings have varied educational implications for students, teachers, parents, educators, and policymakers. The following are important areas of implications of this study.

1. Children who had better exposure to the test stimuli demonstrated better CE. Therefore, it is important to orient children with different perspectives on environmental factors that will help them develop concepts.
2. Spending more time on cognitive tasks does not always indicate cognitive delay; it may be due to approaches to processing information. Therefore, it is important to provide enough time so that students can learn in their own space and speed.
3. LSs do not vary significantly with age. Therefore, it is better to identify each individual learner's LSs at an early stage and teach them accordingly.
4. Schools must have facilities for all LS modalities so that children can learn according to their preferences.
5. This study confirmed the notions of age-related changes in cognitive abilities; therefore, the curricular load should be given accordingly.
6. Younger children studying in lower classes performed better in concrete situations (with pictures and models) than in abstract situations (words). Therefore, curriculum developers and implementers need to give more importance to concrete experiences in earlier stages of education and proceed towards abstract conceptualizations. This means that textbooks should contain concrete examples in

the form of colours, pictures, and diagrams. Other curriculum support materials and instructional strategies should also be designed based on these principles.

7. Variations in cognitive equivalence are not significantly caused by anthro-pedagogical factors like gender, birth type, birth order, BMI, number of siblings, family type, and family income; therefore, instead of focusing on these factors, it is important to treat all children equally in educational contexts.
8. Logical thinking, reasoning, and abstraction are vital in cognitive equivalence and are the basis of language. Therefore, stress must be given to the language development of this age group of children.
9. Parental education has a positive role in cognitive equivalence among Muslim elementary school children. Therefore, educational institutions and policymakers must advocate for parental education campaigns to facilitate comprehensive cognitive development in children.
10. Educators and parents should be urged to cultivate a supportive and engaging home environment that allows children to gain cognitive stimulation from sibling interactions. Having only one elder sibling is better for the cognitive growth of the younger sibling.
11. A specific LS category of children performed better in CE; therefore, it is important for the schools to identify the reason for the lack of progress in the other LS preference groups and take necessary steps for those children.
12. This study will guide to identify the moderating factors of learning styles (LS) and cognitive equivalence (CE), which is crucial for designing educational strategies that enhance cognitive development among elementary school children.

6.4. Limitations of the Study

The major limitations of the study lie in the following:

1. There was some error in the BMI calculation. As the researcher maintained the response sheet of the CET and wrote the students' responses on paper by himself, sometimes the researcher failed to count the exact time. Due to limited experience, the researcher also made some errors in measuring the height of the children. The weight of the participants was not measured in similar conditions. For example, some of the participants were empty stomachs. Therefore, there were some errors in weight measurement. As height and weight are the two components of BMI, there were some errors in the calculation of BMI.

2. There was no equal number of participants in each LS preference group; as the sampling was not done based on LS categories, and the LSs of the participants were measured after sampling, it was not in the researcher's hands to include an equal number of participants in each LS preference group.
3. The LSI could have been more effective in identifying the LSs of the participants, as there was no exposure to all the VARK components in pedagogical practices in the school.
4. The presence of the present while performing the CE tests influenced the children's performance. For example, sometimes the parents prompted, and some of the participants hesitated to give their natural responses.

6.5. Suggestions for Further Study

Several areas warrant attention to build on this research's findings and improve the robustness of future studies.

1. Proper attention should be given to measuring time accurately, and researchers should undergo training to become experts in measuring height and weight.
2. It would be better to use audio and video recorders instead of only written documents when recording CE responses.
3. To get better results, it is better to randomly select at least 30 participants from each LS preference category.
4. It should be ensured that schools have exposure to all the VARK components (facilities in schools) in teaching.
5. While performing the tasks, Parental influence should be minimized.
6. It is recommended that enough time be provided for performing each task, and more trials should be provided.
7. Regarding the difficulty of Task 3, the researcher must ensure that all the participants can read properly.
8. While assigning scores for CE, the researcher should properly follow the scoring procedure.
9. Further research is necessary to comprehensively understand CE, focusing on secondary and higher secondary students, incorporating other community demographics, and accounting for geographical variances.

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APPENDICES

Appendix-A
Consent Form

Dear Parents,

I, **Sharif Khan,** am a research scholar doing a Ph.D. under the supervision of Dr. **Lalit Lalitav Mohakud** from the Department of Education, Jadavpur University, Kolkata. The study title is '**Learning Styles and Cognitive Equivalence among Elementary School Children: A Study from Anthro-Pedagogical Perspective.'** It aims to assess the relationship between Learning Styles (LSs) and Cognitive Equivalence (CE) and determine the influence of selected Anthro-Pedagogical factors on LSs and CE among elementary school students. For this focused group study, he needs to collect data through a personal information sheet, a learning styles interview schedule, and three CE tasks. The whole process may take 40 to 45 minutes for each student. I am conducting this interview and a task-based observation with the permission of the Research Advisory Committee (RAC) and the Ph.D. Supervisor.

In this process, your and your child's participation will be voluntary. I hope your child will enjoy this activity-based learning and assure you that participating in this study will not harm any of you. The collected data will be kept confidential, used only for my Ph.D. work, and will be available until the end of the study and related publications. However, for both of your participation, you will be awarded a small gift (educational kits with snacks) as a token of appreciation.

By agreeing, you acknowledge the following:

1. You understand the purpose of the research and the study's objectives.
2. You are aware that your and your child's participation is voluntary, and you can withdraw both at any time.

If you have any queries about the study or your participation, you can contact the investigator, Sharif Khan, at **sharifkhan.education@jadavpuruniversity.in** or **9002215922**.

In this regard, kindly allow me to collect data from your child.

Parent/Guardian's Consent:

I, the undersigned, am the parent/guardian of the below-named student. I have read and understood the information provided above. I consent to our (parent and child) participation in this research.

I appreciate your consideration in this regard.

Thanking you

Signature of the Parent/Guardian

With Sincere Regards

(SHARIF KHAN)
Ph.D. Scholar, Department of Education,
Jadavpur University, Kolkata-32

Appendix-B
Anthro-pedagogical Information Sheet

Name	
Present Class	
Date of Birth	
Gender	
Type of birth	
Birth order	
Birth weight	
BMI (Height and Weight)	
Age of the mother at the time of Marriage	
Relation with spouse before marriage	
Number of Siblings	
Pre-primary schooling	
Private tuition	
How many?	
Other skill training	
Play participation	
Mother's Education	
Father's Education	
Family Monthly Income	
School name and address	
Contact number of the Guardian	

Appendix-C
Learning Style Inventory

1. **কোন তথ্য বা বিষয় আমার বেশি মনে থাকে**
    a. কোন অডিও রেকর্ডিং শুনে
    b. ইউটিউব বা অন্যান্য ভিডিও দেখে
    c. কোন বই পড়ে
    d. কোন বৈজ্ঞানিক পরীক্ষা-নিরীক্ষা করে
2. **আমি শ্রেণিকক্ষে সবচেয়ে বেশি মনোযোগী থাকি, যখন শিক্ষক-শিক্ষিকা**
    a. বোর্ডে বা দেওয়ালে কোনো ছবি দেখান
    b. খাতায় বা কাগজে কোন কাজ করতে দেন
    c. গুরুত্বপূর্ণ তথ্য বা বিষয় মনে রাখার জন্য ছড়া শেখান
    d. হাত-পা নেরে বা নেচে নেচে কোন গান করে শেখান
3. **যখন শিক্ষক-শিক্ষিকা কথা বলেন তখন আমি মূলত লক্ষ করি**
    a. তার জামাকাপড় বা পোশাক পরিচ্ছদ (আজ তাকে কেমন দেখাচ্ছে)
    b. তার গলার আওয়াজের পরিবর্তন (কণ্ঠস্বর)
    c. তিনি যা বলেন (তথ্য দেন) সেটা
    d. আমার খাতার আঁকিবুকি বা ছবি
4. **পরীক্ষার সেই প্রশ্নগুলি সবচেয়ে সহজ**
    a. যেটিতে নকশা বা চিত্র থাকে
    b. যেটি জোরে জোরে পড়ে শোনানো হয়
    c. যেটি ভাষাগত সমস্যা
    d. যেখানে রুলার বা ক্যালকুলেটরের মতো যন্ত্র ব্যবহার থাকে
5. **আমার সবচেয়ে পছন্দের প্রোজেক্ট হল**
    a. আর্ট বা আঁকার প্রোজেক্ট
    b. গানের প্রোজেক্ট
    c. বই এর প্রতিবেদন (বুক রিপোর্ট)
    d. বৈজ্ঞানিক পরীক্ষানিরীক্ষা
6. **শ্রেণীকক্ষের যে কাজটি আমি সবচেয়ে বেশি পছন্দ করি সেটি হল**
    a. শ্রেণীকক্ষের দেওয়ালে নতুন কোন পোস্টার লাগানো
    b. কোন worksheet এর কাজের নির্দেশ গুলো সকলকে পড়ে শোনানো
    c. কোন দলগত কাজের জন্য গুরুত্বপূর্ণ বিষয় গুলি লিখে রাখা
    d. কাগজ বিতরণের জন্য ঘড়ের এমাথা থেকে ওমাথা পর্যন্ত হাঁটাচলা করা

7. **আমি বড়ো হয়ে যে কাজটি(জীবিকা) করতে সবচেয়ে বেশি পছন্দ করবো তা হল**
    a. আর্ট বা আঁকা
    b. কণ্ঠ শিল্পী (যিনি গান করেন)Voice over artist- কার্টুন জাতীয় শোয়ার জন্য স্বর দেওয়া পাখি বা মানুষের আওয়াজ-যে বিভিন্ন রকম পশু -হরবোলা) করতে পারে
    c. লেখক – যিনি বই লেখেন
    d. ক্রীড়াবিদ – যিনি প্রতিদিন দৈহিক কসরত করেন
8. **আমি সাইকেল চালাতে শিখেছি**
    a. ভাইবোনের বা বন্ধুর দেখে-
    b. কিভাবে চালাতে হয় তা বাবামায়ের কাছ থেকে শুনে
    c. কিভাবে চালাতে হয় সে বিষয়ে বই পড়ে
    d. নিজে নিজে চেষ্টা করে
9. **কোন গ্রুপ প্রোজেক্ট এ আমি হলাম সেই ব্যক্তি যে**
    a. চার্ট বা ছবি আঁকে
    b. সবার চেয়ে বেশি কথা বলে
    c. গুরুত্বপূর্ণ বিষয় গুলি লিখে রাখে
    d. প্রয়োজনীয় জিনিসপত্র গুলি জোগার করে
10. **অঙ্ক পরীক্ষার জন্য আমি যখন বাড়িতে পড়ি তখন আমি মূলত**
    a. গ্রাফ এবং ব্যাখ্যা গুলি দেখি
    b. বাড়ির কেউ আমাকে ছোট ছোট প্রশ্ন জিজ্ঞাসা করে
    c. লিখিত প্রস্তুতি পরীক্ষা দিই
    d. ক্যালকুলেটর বা ব্লক নিয়ে অনুশীলন করি

Appendix-D_1
Cognitive Equivalence Test

Picture-based Cognitive Equivalence Test (Equivalence Formation with Pictures)
Trial-1

Explain why and how those pictures are similar or alike.

1.

Model-based Cognitive Equivalence Test (Equivalence Formation with Models)
Trial-1

Explanations:

1.

Word-based Cognitive Equivalence Test (Equivalence Formation with Words)

Trial-1

মশা, প্রজাপতি, বক, কাঁকড়া, কাক, হনুমান, চোখ, কান, চুল, হাত, পা, নখ, পুকুর, স্কুল, বাড়ি, ইট, কাঠ, বালি, পাকা রাস্তা, আমগাছ, বাঁশ, আখ, তাল, খেজুর, ডাব, কাজুবাদাম, ডিম, রবীন্দ্রনাথ, গান্ধীজি, সুভাষ চন্দ্র বসু, জাতীয় পতাকা, জন গন মন, ফুটবল, ব্যাট, কবাডি, চাঁদ, তারা, সূর্য, রামধনু, আকাশ
Explanations: 1.

Appendix-D_2
Cognitive Equivalence Test Materials

Appendix-E

Bona Fide Letter

যাদবপুর বিশ্ববিদ্যালয়
কলকাতা - ৭০০ ০৩২, ভারত

JADAVPUR UNIVERSITY
KOLKATA-700 032, INDIA

DEPARTMENT OF EDUCATION

To Whom It May Concern

This is to certify that **Sharif Khan,** with Registration No. A00ED1501419 dt. 19.08.2019, is a research scholar doing a Ph.D. from the Department of Education, Jadavpur University, Kolkata, under the supervision of **Dr. Lalit Lalitav Mohakud**, Assistant Professor, Department of Education, Jadavpur University, Kolkata.

The study title is "**Learning Styles and Cognitive Equivalence among the Elementary School Children: A Study from Anthro-Pedagogical Perspective**". It aims to assess the relationship between Learning Styles (LSs) and Cognitive Equivalence (CE) and determine the influence of selected Anthro-Pedagogical factors on LSs and CE among elementary school students. For this focused group study, he needs to collect data through a personal information sheet, a learning styles interview schedule, and three CE tasks. The whole process may take 40 to 45 minutes for each student. In this process, students' participation will be voluntary. He is conducting this interview and a task-based observation with the permission of the Research Advisory Committee (RAC) and the Ph.D. Supervisor.

We assure you that participation in this study will not cause any harm to the students. Should you have any concerns regarding the authenticity of the researcher, please feel free to contact the research supervisor at lalitlalitav.mohakud@jadavpuruniversity.in or 9433363885.

Therefore, we kindly request permission to collect data from the students of your institution. Your cooperation in this matter is greatly appreciated.

Thank you.

With Regards

01/11/2023

Dr. Lalit Lalitav Mohakud
(Ph.D. Supervisor)
Assistant Professor,
Department of Education
Jadavpur University, Kolkata

Dr. Lalit Lalitav Mohakud
Assistant Professor
Department of Education
Jadavpur University, Jadavpur,
Kolkata-700032

Appendix-F_1

Consent Letter for the School Heads-1

Consent Letter for school Heads

To
The HM/Teacher in Charge

Subject: "Asking Permission for Data Collection from Students and their Parents for research Purpose"

Dear Sir/Madam,

Myself **Sharif Khan,** with Registration No. A00ED1501419 dt. 19.08.2019, is a research scholar doing a Ph.D. from the Department of Education, Jadavpur University, Kolkata, under the supervision of **Dr. Lalit Lalitav Mohakud**, Assistant Professor, Department of Education, Jadavpur University. Kolkata.

The study title is "**Learning Styles and Cognitive Equivalence among Elementary School Children: A Study from Anthro-Pedagogical Perspective".** It aims to assess the relationship between Learning Styles (LSs) and Cognitive Equivalence (CE) and determine the influence of selected Anthro-Pedagogical factors on LSs and CE among elementary school students. For this focused group study, I need to collect data through a personal information sheet, a learning styles interview schedule, and three CE tasks. I am conducting this interview and a task-based observation with the permission of the Research Advisory Committee (RAC) and the Ph.D. Supervisor. In this process, students' participation will be voluntary. For the personal information section related to their age, gender, habitat etc., I may need to contact to the parents/guardians of the students, and in some cases I may need your kind help and cooperation. The whole process may take 40 to 45 minutes for each student. After completion of the whole process, I will give them some educational kits as token of appreciation.

I assure you that the participation in this study will not harm the student any way. The collected data will be kept confidential, and shall be used only for my Ph.D. work and this data will be available till the end of the study and related publications. If you have any further questions about the study, you may contact the researcher at sharifkhan.education@jadavpuruniversity.in or 9002215922.

In this regard I would like to request you to kindly allow me to collect data from students of your institution and from their parents.

I appreciate your consideration in this regard.

Thanking you

With Sincere Regards

Sharif Khan

SHARIF KHAN
Ph.D. Scholar, Department of Education,
Jadavpur University, Kolkata-32

Naba Kumar Kar

Signature and Official Seal of the School Head

Teacher-in-charge
NASHIPUR F. P. SCHOOL

Appendix-F_2
Consent Letter for the School Heads-2

Consent Letter for school Heads

To
The HM/Teacher in Charge

Subject: "Asking Permission for Data Collection from Students and their Parents for research Purpose"

Dear Sir/Madam,

Myself **Sharif Khan,** with Registration No. A00ED1501419 dt. 19.08.2019, is a research scholar doing a Ph.D. from the Department of Education, Jadavpur University, Kolkata, under the supervision of **Dr. Lalit Lalitav Mohakud**, Assistant Professor, Department of Education, Jadavpur University. Kolkata.

The study title is **"Learning Styles and Cognitive Equivalence among Elementary School Children: A Study from Anthro-Pedagogical Perspective".** It aims to assess the relationship between Learning Styles (LSs) and Cognitive Equivalence (CE) and determine the influence of selected Anthro-Pedagogical factors on LSs and CE among elementary school students. For this focused group study, I need to collect data through a personal information sheet, a learning styles interview schedule, and three CE tasks. I am conducting this interview and a task-based observation with the permission of the Research Advisory Committee (RAC) and the Ph.D. Supervisor. In this process, students' participation will be voluntary. For the personal information section related to their age, gender, habitat etc., I may need to contact to the parents/guardians of the students, and in some cases I may need your kind help and cooperation. The whole process may take 40 to 45 minutes for each student. After completion of the whole process, I will give them some educational kits as token of appreciation.

I assure you that the participation in this study will not harm the student any way. The collected data will be kept confidential, and shall be used only for my Ph.D. work and this data will be available till the end of the study and related publications. If you have any further questions about the study, you may contact the researcher at sharifkhan.education@jadavpuruniversity.in or 9002215922.

In this regard I would like to request you to kindly allow me to collect data from students of your institution and from their parents.

I appreciate your consideration in this regard.

Thanking you

With Sincere Regards

SHARIF KHAN
Ph.D. Scholar, Department of Education,
Jadavpur University, Kolkata-32

Teacher-in-Charge
Singhajuly F.P. School
Samudragarh, Purba Bardhaman

Signature and Official Seal of the School Head

Appendix-G
Copy of the Published Paper

Asian Research Journal of Arts & Social Sciences

Volume 22, Issue 1, Page 70-82, 2024; Article no.ARJASS.112462
ISSN: 2456-4761

Demographic Influences on Creativity and Learning Styles in Elementary School Students

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ARJASS/2024/v22i1513

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/112462

Original Research Article

Received: 10/11/2023
Accepted: 14/01/2024
Published: 15/01/2024

ABSTRACT

The aim of this cross-sectional survey was to investigate creativity (in terms of elaboration ability, originality) and learning style preferences of 303 elementary school students randomly selected from Grade-VI, VII and VIII, from schools of Paschim Medinipur district in the state of West Bengal, India. Creativity was measured using Baqer Mehdi's Non-Verbal Test of Creative Thinking. Learning style preferences were assessed using the Learning Style Inventory developed by Richard Oliver. Collected data were analysed concerning the age, grade, gender, and social caste of the participants through frequency, mean, standard deviation, percentage, independent samples t-test, one-way ANOVA and Chi Square test. Results revealed that age positively influence elaboration ability, with younger students displayed higher originality. Originality, and overall creativity did not

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[#] *Assistant Professor;*
[†] *Research Scholar;*
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show significant variations across age groups. Grade-VIII students performed best in all aspects of creativity; however, significant difference was present only in elaboration ability. No significant differences based on gender and social caste were observed in all aspects of creativity. A significant age and social caste difference was observed in learning style preferences, however, grade and gender differences were not found. Majority of students preferred unimodal learning styles, with visual learners demonstrating higher elaboration and originality. Elaboration ability was significantly influenced by learning styles preferences, however originality and overall creativity were invariant. The research fills the gap in existing literature by providing a comprehensive analysis of creativity and learning style preferences, offering insights into their combined impact on elementary school students' educational experiences. The findings contribute to the fields of education and social sciences, guiding educators and policymakers in adopting personalized learning approaches based on individual learning styles. This study underscores the significance of understanding creativity and learning styles concerning demographic factors, promoting inclusive and equitable educational practices for elementary school students.

Keywords: Creativity; learning styles; elementary school children; age; grade; gender; social caste.

1. INTRODUCTION

Creativity and learning style preferences are essential aspects of a child's educational journey, especially during their formative years in elementary school. Creativity refers to the ability to generate novel ideas, original solutions, and imaginative expressions. Elaboration ability an important factor of creativity, which refers to the ability of humans to expand, refine or add intricate nuances to thoughts, ideas or concepts. Creativity is a fundamental aspect of human cognition and problem-solving abilities, which can be viewed as a series of dimensions or attributes of an individual's ability to produce valuable ideas, or novel and workable tasks, or a unique talent, or to use imagination to create socially useful products [1-6]. While, Learning Style (LS) refers to a person's natural, habitual and preferred ways of learning. While defining Learning Styles (LSs) various cognitive psychologists have stressed on different viewpoints. Kolb sees learning style as the way we process the possibilities of each new emerging event [which] determines the range of choices and decisions we see, the choices and decisions we make, to some extent determine the events we live through, and these events influence our future choices [7]. According to Dunn and Dunn, "Learning-style is the way individuals concentrate on, absorb and retain new or difficult materials or skills"[8]. LSs are characteristic, cognitive, affective and physiological behaviours that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment [9]. In elementary school contexts, studying creativity and learning style preferences holds significant importance for several reasons. Fostering creativity at a young age can have far-reaching effects on a child's intellectual development, critical thinking skills, and adaptability in an ever-changing world. Without creativity, there would be no progress, and we would be forever repeating the same patterns [10]. It also plays an important role in technological advance, in social and behavioural sciences and in humanities and arts [11]. Therefore, education needs to foster creativity that is to encourage flexibility, innovation and positive identities [12]. According to Guilford, "Development of creativity on the part of students will depend upon changed attitudes of both the **teacher and students" [13]. The revised Bloom's** Taxonomy of Educational Objectives focuses on creativity as the highest objective of instruction [14]. Therefore, schools must be concerned to train the human brain to promoting and nurturing creative powers of children.

Understanding learning style preferences is crucial for creating effective and tailored learning experiences. Following by Pask's tradition of research on styles and strategies, some others researchers have explored the various aspects of Learning Style [15-19]. Learning styles helps students to discover different form of mental representations. Thus they are important when they construct knowledge. There are many styles of learning, and there is no evidence to suggest that one is better than another. What is better is the style that fits each person most comfortably, what is not better is to try to fit a person into a learning mode that seems alien and strange. An individual's basic style of learning is probably laid down early in life and is not subject to any fundamental change. For example, a pupil who likes to learn by listening and speaking (aural

style) is unlikely to change completely and become an outstanding reader. Therefore, it is essential for students to become more aware of the learning styles and strategies to think out carefully what is expected to achieve from studying and to understand the implications of adopting a particular learning strategy. In order to carry out learning tasks successfully, efforts should be made to match instruction to important study characteristics of the learner [20]. Optimising learning for all students in classrooms can be achieved through multiple learning opportunities and style-ships for all students as these differences are valued and celebrated [20]. Teachers are thus to identify students' learning styles and strategies and take them into consideration when designing instruction [21]. Teachers also need to provide opportunities for students to learn in a way which suits the preferred style of learning [22]. Anyway there are different learning styles identified by different psychologists, however, the basic and mostly preferred LSs are visual, auditory and kinaesthetic. Visual learners learn best by seeing and for them audio visual presentation is most suitable method of teaching [23]. Auditory learners learn best by listening and for them the most suitable method of teaching is lecture method [23]. Kinaesthetic learners learn best by doing and for them learner cantered activity methods, cooperative learning, project method etc. are suitable [23]. The person who learns best by a particular learning style is titled after the particular style. A student prefers a particular style in most situations is termed as unimodal, while in different conditions preferring more than one LS are termed as multimodal learners.

2. REVIEW OF RELATED LITERATURE

This literature review presents a comprehensive view about the related studies conducted in the field of creativity and learning styles across diverse age groups and perspectives. Empirical evidence presents that intervention positively impact verbal and graphic-figural creativity [24]. There are some variations in creativity concerning different factors. Like gender, which influences creativity having distinctions in fluency and originality among students [25]. Significant impacts of gender, locality, and class on non-verbal creativity among high school students were also reported [26]. Disparities in creativity between private and government school students also present [27]. Continuous creativity development with gender differences in play behaviours is also revealed [28]. Kim observed static or decreasing creative thinking scores despite rising IQ scores [29]. Positive correlation between freedom and creativity is also found [30]. However, on the other hand, few studies reported no significant differences in children's creative abilities concerning gender, grade, and social caste [31-33]. Another study reported no significant differences in visual-spatial creativity between countries [34], while others observed high creative thinking ability in children unaffected by school type, age, or gender [35]. Ward and Warren identified socio-economic status but not gender as a significant factor in creativity [36].

The review of learning styles (LSs) research revealed varied preferences among secondary school students, with visual as the most preferred LS [37]. Another study reported no significant impact of LSs preferences on learning outcomes [38], while another study reported a divergence LS preference among the majority of students [39]. Correlates of LSs included intelligences, emotional intelligence [40] and academic performance [41], cultural values [42], creativity, and problem-solving styles [43]. Identification of the preferred learning styles may help instructors to differentiate the teaching process and may have positive impacts on obtaining and improving learning outcomes [44]. However, another study, revealed that providing instruction based on students' learning style preferences does not improve learning [45]. Cultural, sex, and age-related differences in teacher instructional styles related to students' LS preferences is also present [46], whereas no significant correlations between LSs and learning outcomes is also revealed [47]. A study uncovered differences in LS between High School and Pre-university students, with gender-based variations in kinesthetic LS [48]. Another study highlighted LS score differences based on factors such as year of study, field of study, and type of learning institution [49]. Some other studies revealed age-related and interactive influences between concentration and LS on learning achievement, respectively [50,51]. LSs is also associated with academic performance by some of the researchers, but found no impact of demographic variables on LS [52]. These findings collectively depict the intricate landscape of creativity and learning styles across diverse populations and educational contexts.

The above discussion revealed that there were plenty of studies on creativity but few attempts

were taken to investigate about the non-verbal creativity of students. Till date non-verbal creative thinking is a fertile area of study in general that of elementary school children in particular. Further it was also found that no single attempt had been taken to make a comprehensive study of learning style and dimension/component wise study of each type of creativity and overall creativity with relation to age, grade, gender and social caste in West Bengal. Though many studies undertaken in order to know the impact of those factors but these studies produced mixed results and their results may not be generalized in every context or every place. These research gaps prompted the researchers to undertake the present study. That's why the present research was undertaken to study the creativity (in terms of elaboration ability and originality), and learning style preferences of elementary school students concerning their age, grade, gender and social caste, and to measure the influence of learning style preferences on creativity of elementary school students. It was hypothesised that there is no significant difference in creativity of elementary school students concerning their age, grade, gender and social caste. Learning style preferences is not significantly influenced by their age, grade, gender and social caste. Further, it was also hypothesised that creativity of the elementary school students in not significantly influenced by their learning style preferences.

3. METHODOLOGY OF THE STUDY

3.1 Participants

This study was carried out on 303 elementary school students selected from five Bengali Medium Government aided schools of Paschim Medinipur district in the state of West Bengal, India. The schools were conveniently selected as were easily accessible to the researchers, however the participants were selected randomly from Class-VI, VII and VIII. The age of the participants was ranging from 11 to 15 years. The participants comprise of male and female students, and there were representatives of General, Scheduled Social caste, Scheduled Tribe and Other Backward Classes.

3.2 Methods and Procedure

For this study the researchers conducted a cross-sectional survey among the selected participants. Before conducting the survey, first of all, the researchers identified the target population i.e. elementary school students of Paschim Medinipur District, and then identified five schools of their convenience. Then they contacted to school heads, described the purpose of the study and asked for permission to conduct the study. After getting permission from the school heads, they physically meet the participants, interacted with them, and explained the purpose of the research and all legal research procedures and asked for voluntary participation. When they agreed, the researchers randomly selected 22 students from each Class-VI, VII and VIII from each school, and administered the survey instruments. While administering the instruments, the researchers gave a short and meaningful description about the use of the instruments and items involved in it, and asked them to give their response accordingly. Fifty to fifty-five minutes was required to complete the survey. The total process of data collection was organized in 15 days. In total, 330 students participated in this study; however, after screening and scoring, due to incomplete information, 27 participants responses were excluded from the final analysis.

3.3 Measures

To measure the creativity and LSs of the participants, the researchers used standardized instruments. Creativity of the participants was measured in terms of flexibility and originality through the 'Non-Verbal Test of Creative Thinking (NVTCT-M) developed by Baqer Mehdi [53]. This non-verbal test of creative thinking is intended to measure the individual's ability to deal with figural content in a creative manner. This tool containing 26 items distributed in three different tasks/activities viz. Activity-I: Picture construction, Activity-II: Picture completion, and Activity-III: Triangles and ellipses. The total time required for administering the test is 35 minutes, in addition to the time necessary for giving instruction, passing out booklets and collecting them back. Scoring for elaboration, originality was done by following the manual of NVTCT-M. Finally, the elaboration and originality scores were summed up to compose the overall creativity score, where higher score indicates higher creativity.

The Learning Style Inventory developed by Richard Oliver, measures the individual's ability to deal with figural contents [54]. The tool contains 24 items in total, eight for each, visual, auditory and kinaesthetic/tactile LSs. Each item has three alternative choices i.e. often, sometimes and seldom. A score of 5 was

assigned for each often response, 3 for sometimes and 1 for seldom. Finally, scores of all the specified eight items for each LSs were summed up to get Visual Preference Score (VPS), Auditory Preference Score (APS), and Tactual Preference Score (TPS). For each individual the highest scored dimension/s were considered as his/her preferred LSs.

3.4 Techniques Used for Data Analysis

The study employed various data analysis techniques to gain insights into the data. Descriptive statistics, including Frequency (N), Mean (M), Standard Deviation (SD), and percentage (%) analysis, were used to describe the data. The choice of hypothesis testing techniques was determined based on the nature of the data. For the randomised large participant group (303) and scaled data for creativity measures, parametric t-tests and One-way ANOVA (F) techniques were applied. However, for categorical data, such as LSs, a nonparametric Chi-square test was utilized.

4. RESULTS

4.1 Difference in Creativity among Different Age Groups

The study examined the relationship between age and the levels of elaboration, originality, and overall creativity among students. Analysis revealed that as the age increased, there was an increase in the mean score for elaboration ability (See Table 1). Specifically, the mean scores for the 11,12,13,14, and 15 years' age groups were 30.42, 29.43, 32.94, 32.09, and 35.78, respectively, indicating higher elaboration ability in older students. However, when considering originality, the results showed a different pattern. The mean scores for the same age groups were 65.03, 56.51, 65.44, 63.11, and 61.50, respectively. This suggests that except 12 years' age group, younger students displayed higher levels of originality, which decreased with age.

Regarding overall creativity, the findings indicated that the 13 years' age group had the highest mean score (98.37), followed by the 15 years' age group (97.28), the 11 years' age group (95.45), the 14 years' age group (95.20), and the 12 years' age group (86.06), which had the lowest mean score. Further, the one-way ANOVA results revealed a significant difference in elaboration ability (P=.013<0.05), however, no significant difference was present either in originality (P=.136>0.05) or in overall creativity (P=.097>0.05) concerning the age of the participants.

4.2 Difference in Creativity among Different Schooling Graders

Regarding grade (schooling), the analysis (See Table 1) showed that Grade-VI had the lowest mean score, while Grade-VIII had the highest mean score for elaboration ability, originality, and overall creativity. Additionally, the one-way ANOVA results indicated a significant difference in elaboration ability (P=.009<0.01), suggesting variations among different grade levels. However, no significant difference was observed in either originality (P=.138>0.05) or overall creativity (P=.067>0.05) among the different grades.

4.3 Difference in Creativity between Gender Groups

In the comparison of elaboration ability, originality, and overall creativity between male and female students, the analysis (See Table 1) indicated that females outperformed males in elaboration ability. Conversely, male students demonstrated better performance in originality and overall creativity. However, the t-test results showed no significant difference in any of the three cases.

4.4 Difference in Creativity among Students Representing Different Social Caste

When examining the social caste of the students, the study revealed that ST students achieved the highest mean score in elaboration ability (See Table 1). The second-highest mean score was observed among students from the General category, while OBC students obtained the lowest mean score.

Regarding originality, SC students attained the highest mean score, followed by General students with the second-highest mean, OBC students with the third-highest mean, and ST students with the lowest mean score. Similarly, for overall creativity, SC students had the highest mean score, General students ranked second, ST students placed third, and OBC students had the lowest mean score. However, no significant difference was present in any of the three cases.

Table 1. Comparison of elaboration, originality and overall creativity concerning age, grade, gender and social caste of the participants

			Elaboration			Originality			Overall Creativity		
		N	M	SD	t/F df (*P*)	M	SD	t/F df (*P*)	M	SD	t/F df (*P*)
Age	11y	31	30.42	5.56		65.03	17.98		95.45	21.10	
	12y	80	29.43	8.33	3.206	56.51	27.35	1.763	86.06	34.55	1.986
	13y	108	32.94	9.38	4/298	65.44	25.68	4/298	98.37	33.10	4/298
	14y	66	32.09	7.79	(.013*)	63.11	18.42	(.136)	95.20	24.06	(.097)
	15y	18	35.78	10.94		61.50	22.73		97.28	31.73	
Grade	VI	64	30.06	5.97	4.84	57.44	19.74	1.99	87.50	24.24	2.73
	VII	112	30.67	10.44	2/300	62.28	29.89	2/300	93.04	38.64	2/300
	VIII	127	33.52	7.82	(.009**)	64.76	19.56	(.138)	98.28	25.06	(.067)
Gender	Male	182	31.36	8.61	.918	63.09	20.38	.702	94.47	26.64	.281
	Female	121	32.30	8.79	301	61.11	29.69	301	93.45	35.35	301
					(.359)			(.483)			(.779)
Social caste	General	181	31.76	8.89		63.66	8.68		95.51	32.31	
	SC	50	31.76	7.36	.194	64.58	25.22	1.406	96.34	23.84	.914
	ST	58	32.03	9.36	3/299	57.09	18.55	3/299	89.02	31.65	3/299
	OBC	14	30.07	8.03	(.901)	58.07	24.30	(.241)	88.14	29.93	(.435)

**Result is statistically significant at 0.05 level/ **Result is statistically significant at 0.01 level*

Table 2. Distribution of LS preferences concerning age, grade, gender and social caste of the participants

	Categories	N (%)	VLS	ALS	TLS	VLS& ALS	VLS & TLS	ALS & TLS	VLS, ALS & TLS	X^2 df (*P*)
Age	11y	31(100)	12 (38.7)	14(45.2)	1(3.2)	1 (3.2)	0 (0.0)	3 (9.7)	0 (0.0)	
	12y	80(100)	33 (41.3)	30 (37.5)	9 (11.3)	5 (6.3)	0 (0.0)	0 (0.0)	3 (3.8)	
	13y	108(100)	41 (38.0)	33 (30.6)	13(12.0)	11 (10.2)	5 (4.6)	3 (2.8)	2 (1.9)	
	14y	66(100)	30 (45.5)	19 (28.8)	6(9.1)	7 (10.6)	0 (0.0)	2 (3.0)	2 (3.0)	
	15y	18(100)	7 (38.9)	3 (16.7)	1(5.6)	1(5.6)	2(11.1)	3 (16.7)	1 (5.6)	38.82424(.028*)
Grade	VI	64(100)	28 (43.8)	26 (40.6)	5(7.8)	1(1.6)	1 (1.6)	1 (1.6)	2 (3.1)	
	VII	112 (100)	46 (41.1)	40 (35.7)	12(10.7)	7 (6.3)	1 (0.9)	4 (3.6)	2 (1.8)	
	VIII	127 (100)	49 (38.6)	33 (26.0)	13(10.2)	17 (13.4)	5 (3.9)	6 (4.7)	4 (3.1)	16.22712(.179)
Gender	Male	182 (100)	79 (43.4)	62 (34.1)	16 (8.8)	10 (5.5)	3 (1.6)	5 (2.7)	7 (3.8)	10.276

	Categories	N (%)	VLS	ALS	TLS	VLS& ALS	VLS & TLS	ALS & TLS	VLS, ALS & TLS	X^2 df (*P*)
Gender	Female	121(100)	44 (36.4)	37 (30.6)	14(11.6)	15 (12.4)	4 (3.3)	6 (5.0)	1 (0.8)	6(.114)
Social caste	General	181(100)	86 (47.5)	48 (26.5)	19(10.5)	15 (8.3)	4 (2.2)	5 (2.8)	4 (2.2)	
	SC	50(100)	19 (38.0)	17 (34.0)	3 (6.0)	7 (14.0)	0 (0.0)	3 (6.0)	1 (2.0)	
	ST	58(100)	16 (27.6)	27 (46.6)	7 (12.1)	2 (3.4)	1 (1.7)	2 (3.4)	3 (5.2)	32.267
	OBC	14(100)	2 (14.3)	7 (50.0)	1 (7.1)	1 (7.1)	2 (14.3)	1 (7.1)	0 (0.0)	18(.020*)

**Result is statistically significant at 0.05 level*

Table 3. Comparison of elaboration, originality and overall creativity concerning the LS preferences of the participants

		Elaboration			Originality			Overall Creativity		
LS Preferences	N (%)	M	SD	F df (*P*)	M	SD	F df (*P*)	M	SD	F df (*P*)
VLS	123	33.63	9.62		66.55	27.80		100.32	35.73	
ALS	99	30.06	7.96		59.19	23.45		89.19	29.98	
TLS	30	30.10	9.07		56.27	18.51		86.37	22.85	
VLS & ALS	25	32.72	7.12	2.242	62.12	15.04	1.372	94.84	20.15	1.779
VLS & TLS	7	28.43	4.76	9/296	55.29	15.83	6/296	83.71	18.60	6/296
ALS & TLS	11	32.27	6.50	(.039*)	65.00	17.45	(.226)	97.27	21.08	(.103)
VLS, ALS & TLS	8	28.50	3.74		60.88	14.12		89.38	16.04	
Total	303	31.74	8.68		62.30	24.02		94.07	30.83	

**Result is statistically significant at 0.05 leve*

4.5 Influence of Age on Learning Style Preferences

While the LS preferences were compared among the different age group students, the crosstab analysis (See Table 2) revealed that cumulatively 83.9 per cent 11 years' age group students preferred unimodal VLS and ALS, and only 3.2 percent students preferred TLS. On the other hand, only 12.9 percent of the same age group students were multimodal learners. Most of the 12years age group students (90%) also preferred unimodal learning styles, and the rest had multimodal preference. Most of the 13years age group students (80%) also preferred unimodal learning styles, and the rest had multimodal preference. Most of the 14years age group students (83.3%) also preferred unimodal learning styles, and the rest had multimodal preference. Most of the 15years age group students (61.2%) also preferred unimodal learning styles, and the rest had multimodal preference. Further the Pearson's Chi-square result revealed that LS preferences are significantly influenced by the age of the participants (P=.028<0.05).

4.6 Influence of Grade on Learning Style Preferences

When the LS preference were compared among Grade-VI, VII and VIII students (See Table 2), the analysis revealed that in the case of elaboration ability cumulatively 92.2 per cent of the Grade-VI students preferred unimodal learning styles, and the rest had multimodal preference. In Grade-VII, cumulatively 87.5 percent students preferred unimodal learning styles, and the rest had multimodal preference. In Grade-VIII, cumulatively 64.8 percent students preferred unimodal learning styles, and the rest had multimodal preference. It means students in lower classes prefer unimodal LSs, however, in higher class more number of students prefer multimodal LSs. However, the Pearson's Chi-square result revealed that grade of the participants had no significant influenced on their LS preferences (P=.179>0.05).

4.7 Influence of Gender on Learning Style Preferences

When the LSs was compared between male and female students (See Table 2), the analysis revealed that in comparison to female students' greater proportion of the male students preferred VLS and ALS. However, greater proportion of the female students preferred TLS than males. In the case of LS mode preferences, cumulatively 86.3 percent male students preferred unimodal learning styles, the rest preferred multimodal LSs. On the other hand, cumulatively 78.6 percent female students preferred unimodal learning styles, the rest preferred multimodal LSs. That means in comparison to male students' greater proportion of female students preferred multimodal LSs. Further, the Pearson's Chi-square result revealed that gender of the participants had no significant influenced on their LS preferences (P=.114>0.05).

4.8 Influence of Social Caste on Learning Style Preferences

Most of the students belong from each social caste preferred unimodal LSs. In comparison to other three castes, greater proportion (47.5%) of the general caste students preferred VLS (See Table 2). However, in the case of ALS, in comparison to general and SC students, greater proportion of ST and OBC students preferred ALS. Further in the case of TLS, in comparison to SC and OBC students, greater proportion of general and ST students preferred TLS. The multimodal preference of LSs was higher among OBC students (28.5%) than SC (22%), General (15.5) and ST (13.7%) students. Further the Pearson's Chi-square result revealed that LS preferences are significantly influenced by the social caste of the participants (P=.020<0.05).

4.9 Difference in Creativity among Different Learning Style Preference Groups

Table 3 presents the preferences of the 303 participants regarding learning styles (LS). Among the participants, 123 (40.59%) preferred Visual Learning Style (VLS), 99 (32.67%) preferred Auditory Learning Style (ALS), and 30 (9.90%) preferred Tactile Learning Style (TLS). Cumulatively, 83.16% of the students preferred a unimodal LS, such as VLS, ALS, or TLS. Conversely, only 16.84% of the students preferred a multimodal LS, which involves a combination of VLS and ALS, VLS and TLS, ALS and TLS, or VLS, ALS, and TLS.

The same table also reveals that students who preferred Visual Learning Style (VLS) obtained the highest mean score in elaboration. The second-highest mean score in elaboration was

observed among students who preferred a combination of VLS and Auditory Learning Style (ALS), followed by students who preferred a combination of ALS and Tactile Learning Style (TLS). Interestingly, the lowest mean score was found among students who preferred a combination of all three learning styles (VLS, ALS, and TLS).

Regarding originality, the analysis indicates that students who preferred Visual Learning Style (VLS) achieved the highest mean score. The second-highest mean score in originality was observed among students who preferred a combination of Auditory Learning Style (ALS) and Tactile Learning Style (TLS), followed by students who preferred a combination of VLS and ALS. Notably, the lowest mean score was found among students who preferred a combination of VLS and TLS.

When ranking the students based on their learning style preferences in terms of overall creativity, the order from highest to lowest is as follows: Visual Learning Style (VLS); a combination of Auditory Learning Style (ALS) and Tactile Learning Style (TLS); a combination of VLS and ALS; a combination of VLS, ALS, and TLS; ALS; TLS; and a combination of VLS and TLS.

After comparing the mean scores, the results of the one-way ANOVA indicated a significant difference in the elaboration ability ($P=.039 < 0.05$). However, there was no significant difference observed in either originality ($P=.226 > 0.05$) or overall creativity ($P=.103>0.05$).

5. DISCUSSION

The results revealed interesting patterns, showing elaboration ability, originality and overall creativity scored varied across different age groups, with the 13-year-olds scoring the highest. Except elaboration ability, no statistically significant difference was found among the age groups. Empirical evidence present in support of this finding [28], however, contradictory results also present [29,33,35], which shows not specific pattern of creativity development across ages. When grade was the concern, our results showed a clear cut increase in elaboration ability, originality and consequently overall creativity from grade/class six to class eight. However, the variances in creativity scores were statistically significant only for elaboration ability, not for originality and overall creativity. Previous study also reported a grade wise significant difference [26], however, no significant differences were also reported [31-33]. Based on these discussions it is clear that it is not easy to detect the changes in creative abilities with a little age variation. But if we observe it considering two to three years of time gap, then the differenced will be clearly visible to us.

Gender differences were observed, with females excelling in elaboration ability and males showing higher scores in originality and overall creativity, although these differences were not statistically significant. Empirical evidence also presents in support of this finding [25,31,32,35]. That means creative abilities among the elementary school students are not gender biased. whoever, few contradictory results also exist [26, 28, 55].

A social caste-based little difference were found in mean creativity score, with ST students performing well in elaboration, SC students scoring highest in originality and overall creativity, and OBC students having lower scores. However, the statistical analysis did not establish significant differences in any of the cases. That means social caste of the students has no significant influence in creativity among elementary school students. This finding is similar to the findings of Samanta and Jana [31,32]. Thant means this finding confirms the notion that creative abilities are similar among all social caste categories.

The study also examined the learning style preferences and results revealed that majority of students preferred a unimodal learning style, that confirms previous research findings [37, 39, 43, 56]. However, a smaller portion favoured a multimodal approach [57].

When age was the concern, younger students preferred mostly VLS and ALS, however, ALS preferences was decreased with age, and in 15year age groups few students preferred multimodal LSs. It is established that age is a significant factor in learning style preferences. Further, this notion was confirmed by the grade wise analysis, which showed lower-grade students showed a higher preference for unimodal learning styles, while a higher percentage of higher-grade students preferred multimodal learning styles. However, the grade of the participants did not have a significant influence on their learning style preferences. To generalize this notion, further large scale survey is of utmost important.

When comparing the learning style preferences between male and female students, a greater proportion of both gender students preferred visual and auditory learning styles, while a greater proportion of female students than males preferred tactile learning styles. However, the gender of the participants did not have a significant influence on their learning style preferences. This finding is not in line with the previous research, which presents a gender based variations [48].

Regarding social caste, most students from each social caste preferred unimodal learning styles. The general social caste had a higher preference for visual learning styles, while ST and OBC students showed a higher preference for auditory learning styles. Tactile learning style preference was higher among general and ST students. The Pearson's Chi-square test revealed that social caste significantly influenced learning style preferences.

Visual learners achieved higher scores in all aspects of creativity, whereas the combination of auditory and tactile learning styles also yielded favourable results. Concerning the LS preferences, a statistical significant difference was present in elaboration ability, however, there was no significant difference in originality and overall creativity. These findings emphasize the importance of considering individual learning styles when promoting creativity in educational settings.

6. CONCLUSIONS

This study intended to explore the influences of age, grade, gender, and social caste on the creative abilities and learning style preferences, and the influence of learning style preferences on creative abilities of elementary-level students in West Bengal. The findings underscore that age, social caste, and to a certain extent, grade, play influential roles in shaping students' learning style preferences. The study's contribution lies in its potential to enhance our comprehension of how individual variations in learning styles can be strategically integrated into educational methodologies and interventions. While the majority of students exhibited a preference for unimodal learning styles, with visual learners excelling in elaboration, originality, and overall creativity, the nuances uncovered emphasize the need for tailored educational approaches. The multifaceted implications of this research extend to students, teachers, parents, and policymakers, urging them to consider age, grade, gender, and social caste dynamics in teaching, parenting and policy-making for the development of creative abilities. This study advocates for a paradigm shift towards recognizing and accommodating individual learning styles in the design and implementation of educational strategies. The present study was considered fewer number of participants, with considering only the non-verbal test of creativity in a very small area. Further, larger scale comprehensive investigations, by considering both verbal and non-verbal and contemporary tests are suggested to refine and generalize our understanding of these complex relationships.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Appendix-H1

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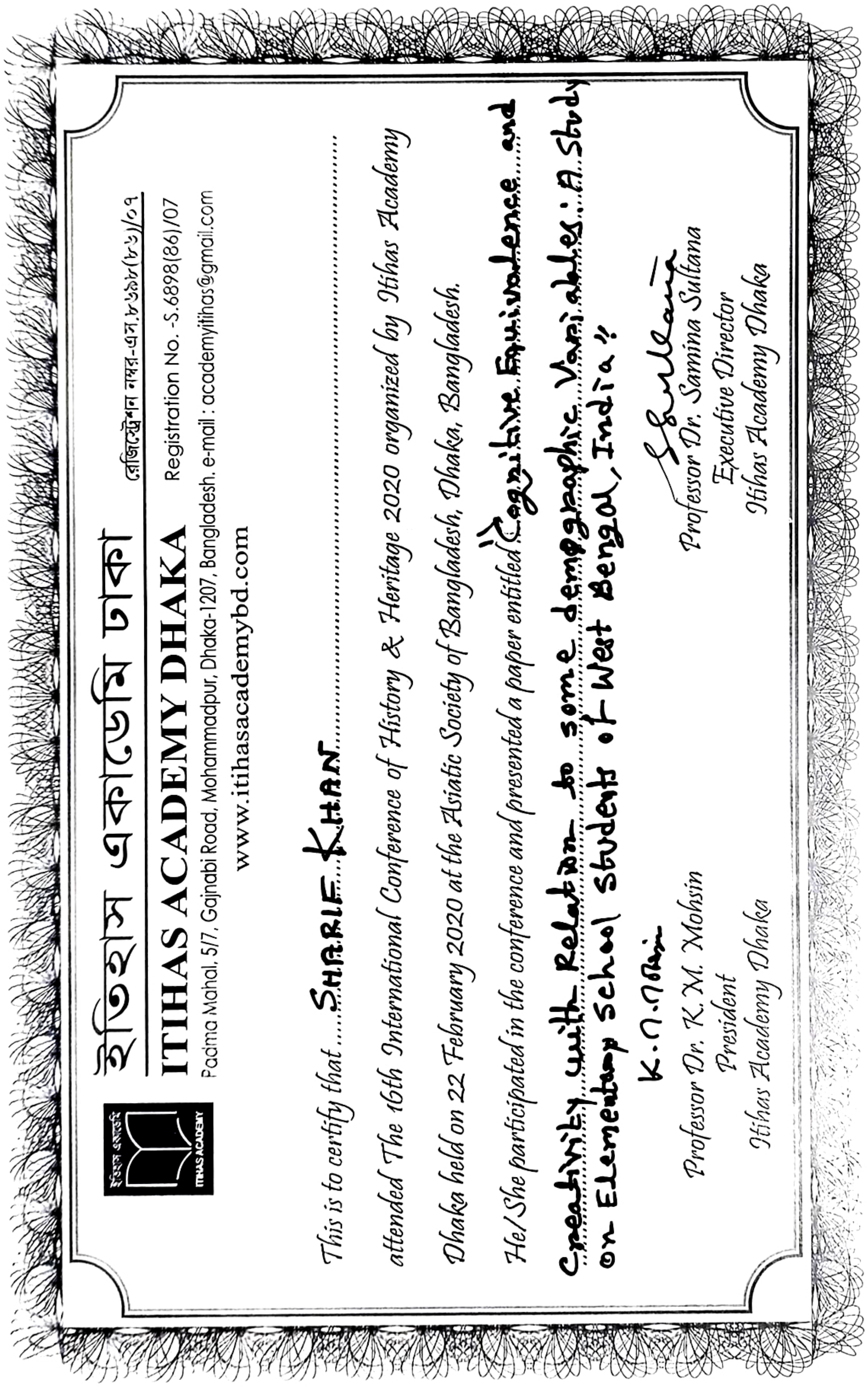

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This is to certify that ......SHARIF KHAN......

attended The 16th International Conference of History & Heritage 2020 organized by Itihas Academy Dhaka held on 22 February 2020 at the Asiatic Society of Bangladesh, Dhaka, Bangladesh.

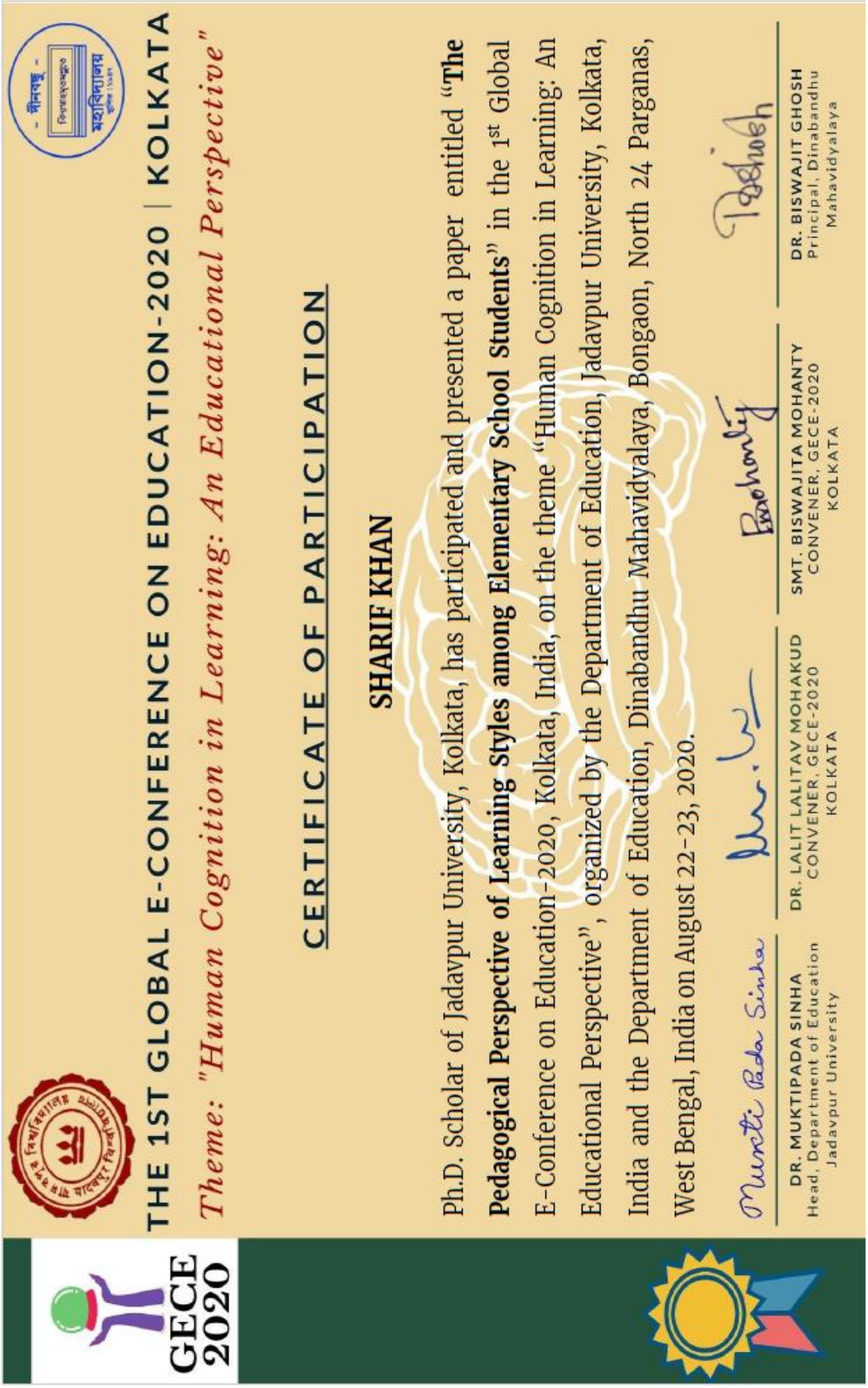
He/She participated in the conference and presented a paper entitled "Cognitive Equivalence and Creativity with Relation to some demographic Variables: A Study on Elementary School Students of West Bengal, India"

Professor Dr. K. M. Mohsin
President
Itihas Academy Dhaka

Professor Dr. Samina Sultana
Executive Director
Itihas Academy Dhaka

Appendix-H2

Paper Presentation Certificate-2



GECE 2020

THE 1ST GLOBAL E-CONFERENCE ON EDUCATION-2020 | KOLKATA

Theme: "Human Cognition in Learning: An Educational Perspective"

CERTIFICATE OF PARTICIPATION

SHARIF KHAN

Ph.D. Scholar of Jadavpur University, Kolkata, has participated and presented a paper entitled "**The Pedagogical Perspective of Learning Styles among Elementary School Students**" in the 1st Global E-Conference on Education-2020, Kolkata, India, on the theme "Human Cognition in Learning: An Educational Perspective", organized by the Department of Education, Jadavpur University, Kolkata, India and the Department of Education, Dinabandhu Mahavidyalaya, Bongaon, North 24 Parganas, West Bengal, India on August 22-23, 2020.

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Mahavidyalaya

Appendix-I
Some Pictures of My Ph.D. Journey

Appendix-J
Similarity Report

Learning Styles and Cognitive Equivalence among Elementary School Children: A Study from Anthro-Pedagogical Perspective

By Sharif Khan

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