

III. METHODOLOGY

The current study gains importance with 11 to 15 years as this age group is perceived as a crucial period wherein these children begin to take their early steps toward adulthood by facing varied and rapid physical, emotional, and psychological changes. At this critical juncture, apart from self-help, they also need the helping hands of their parents and teachers. There is also a dire need for them to deal with academics as they leave behind the primary level and enter middle school. Classroom teaching becomes imperative at this level in facilitating students' learning-specific knowledge and skills. Here, the Multiple Intelligence (MI) constructs could provide educators with a tool to recognise and nurture children's different abilities. Aligned with the MI, children's appropriate Learning Styles (LS) promote excellence with them. For MI and LS to be efficiently adopted and fostered, the teachers' teaching pedagogy (TP) should have creativity and genius as ingredients.

Considering the abovementioned considerations, the present study focused on the **"Predictive Models of Multiple Intelligence, Learning Style and Teaching Pedagogy for the Academic Achievement of School Children"**. Hence, the rationale behind the research topic was to formulate a suggestive model for AA of school children by identifying the predictive capacity of MI and LS of school children and the TP practised by teachers. Moreover, this study gains significance in formulating predictive and suggestive models for each core subject the schools offer to every student.

With the theoretical knowledge, the study's conceptual framework was derived with the outcome variables as AA in five major subjects (Language, English, Mathematics, Science, and Social Science). For these outcome variables, specific research questions, as specified below, were to be answered:

1. How does Multiple Intelligence (MI) affect the subject-wise AA?
2. How does Learning Style (LS) affect the subject-wise AA after controlling MI?
3. How does Teaching Pedagogy (TP) affect the subject-wise AA after controlling MI and LS?

Operational Definitions

Academic Achievement (AA): Generally, 'achievement' refers to individual performance outcomes. As per the present educational scenario in India, the performance outcome of a student at the school level is judged by the marks procured in every exam in each subject. Hence, the current study operationally defines Academic Achievement (AA) as a measure calculated with the average effects procured by the student respondent in five major exams of an academic year (first term, quarterly exam, second term, half-yearly exam, and third Term) in every subject of study namely Language (Tamil, the regional Language) English, Mathematics, Science, and Social Science.

Multiple Intelligence (MI): Howard Gardner's theory of MI that involves reasoning, planning, solving problems, thinking abstractly, comprehending complex ideas, learning quickly, and learning from experience was considered for the present study. Thus, nine domains of MI, namely Linguistic, Logical, Bodily-Kinesthetic, Spatial, Musical, Naturalistic, Interpersonal, Intrapersonal, and Existential intelligence, describe the way a student learns and acquires information formed the MI construct of the current study.

Learning Style (LS): With the assumption that every learner is born with specific biological characteristics to understand, process, express, and remember information, the present study refers to 'Learning Style' (LS) as the conditions that enable students to perceive, interact and respond to the educational environment. Consequently, the reproducing and constructive style gains significance as a learning method. However, concerning the power of learning, a learner uses three styles – Enactive, Verbal and Figural. Hence, a combination of the technique and control of learning was considered for the present study. Thus, six types of LS were considered: Enactive Reproducing (ER), Enactive Constructive (EC), Verbal Reproducing (VR), Verbal Constructive (VC), and Figural Constructive (FC).

Teaching Pedagogy (TP): Pedagogy is a term that refers to the method by which teachers teach both in theory and practice. Based on the ideas of Grasha (1994) on teaching styles, the current study defines Teaching Pedagogy (TP) as a pervasive way of approaching students with consistency over the teaching styles, namely Expert, Formal Authority, Demonstrator, Facilitator, and Delegator.

Variables of the study

The variables of the present study are given in Figure 8.

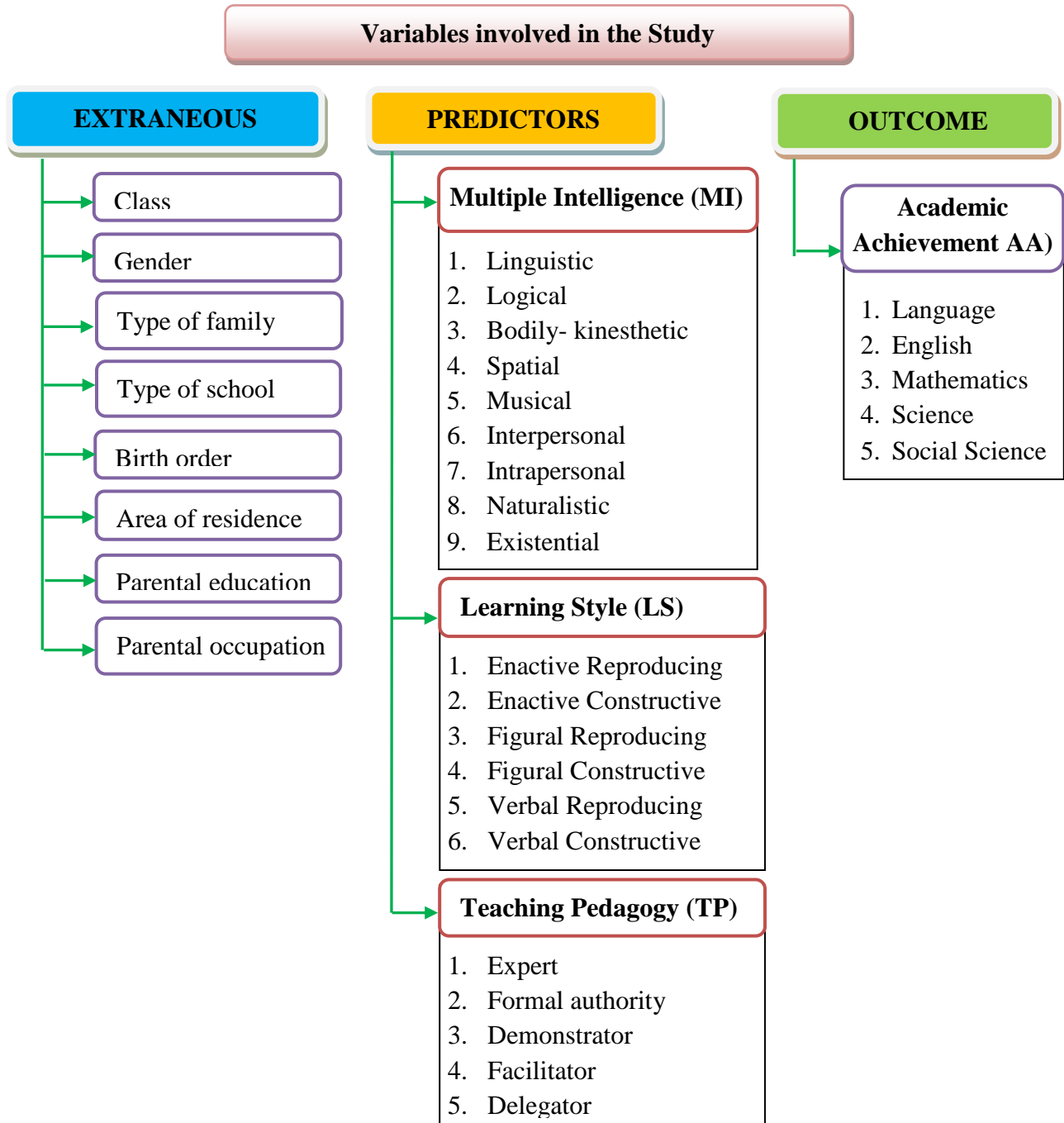


Figure 8

Design of the study

Considering the objective of the study, which called for an investigation into the Multiple Intelligence (MI) and Learning Style (LS) of school children as well as the Teaching Pedagogy (TP) followed by the teachers and the huge sample size, an exploratory design was adopted. This kind of research design ideally aids in investigating the research objectives involving huge sample sizes that have not been studied in depth.

Methodology

The methodology of the present study was detailed under the following heads:

- A. Population and sampling
- B. Tools used
- C. Conduct of the study
- D. Analysis of data

A. POPULATION AND SAMPLING

Coimbatore is the second-largest city in Tamil Nadu after Chennai and is said to be India's 16th-largest urban agglomeration. Coimbatore is called as the educational hub of Tamil Nadu. It is also a hub for the manufacturing and healthcare industries. It is one of the fastest-growing tier-II cities in India. True to its name as an educational hub, in the recent past, a good number of quality schools have mushroomed in Coimbatore. Based on administration, three types of schools operate in Coimbatore: government-run schools, schools funded by the government but run by private trusts (aided schools), and schools funded entirely by private organisations. However, based on the curriculum followed, the schools are of 4 types, namely - The Indian Certificate of Secondary Education (ICSE), The Central Board of Secondary Education (CBSE), the Samacheer Pattern (Uniform syllabus of Tamil Nadu), the International General Certificate of Secondary Education (IGCSE) and National Institute of Open Schooling (NIOS).

School children aged 11-15 years were identified as a study sample. Identifying children's intelligence potential and learning style in this age span becomes imperative to channel their capabilities and provide optimal stimulation to foster the potential they lack. Hence, school

children enrolled in 6th, 7th, and 8th standards constituted the sample. However, to maintain the homogeneity of the study population, specific inclusion criteria were set to avoid noise in the data for practical statistical analysis. The criteria were:

1. ***Schools within 5 km from the heart of the city:*** To get a fair representation for the research (Coimbatore city), the schools located within 5 kilometres of the city centre were shortlisted from the four zones. All of these schools come under the corporation limit of the city
2. ***Schools following the Samacheer syllabus:*** The schools following the Samacheer pattern of the syllabus were chosen as it is the only curriculum followed by both government and private schools in Tamil Nadu, where Samacheer Kalvi was introduced by the Tamil Nadu Uniform System of School Education Act 2010 with a view of integrating the various school educational systems within the state. Another primary reason for setting this criterion for inclusion in the present study was that this syllabus pattern was least explored in terms of MI, LS, and TP and
3. ***Co-education schools:*** To maintain homogeneity and explore the sex-based differences in MI and LS, the schools that enrolled both boys and girls were identified.

With the set inclusion criteria, 7 to 8 schools were shortlisted in each of the four zones, and hence, a total of 30 schools were identified for the study. Of the 30 schools, 18 (4 to 5 schools in each of the four zones) extended their willingness to participate in the study. As the study focused on middle school children within the age ambit of 11-15 years, a simple random sampling method was adopted with the probability of every child in the 6th, 7th, and 8th standard of the selected schools having the chance of being included as a sample of the study. Consequently, 3035 school children and 215 teacher respondents consented to be associated with the investigation. However, nine children were filtered out due to incomplete form submissions. So, the final total sample accounted for 3026 student respondents and their respective 215 teacher respondents. Based on the subjects handled, the 215 teacher respondents were further categorised (Language - 32, English - 49, Mathematics - 43, Science - 51, Social Science - 40). A detailed list of the population sample has been provided in Appendix I.

Given the objective of the study, the willingness of the children and teachers was the primary criterion for their participation. The children of all eighteen schools and teachers involved with these children were given a 15-minute brief introduction of the study, the importance of being aware of their LS and MI, and enthused to spend at least 45 minutes answering the data collection tool. After which, prescribed questionnaires were handed over to them. The teachers spent 20 minutes filling out the questionnaires collected by the researcher the next day. The population distribution flow chart was as projected in Figure 2.

Ethical Consideration

As a matter of ethics, children were informed about the research orally, and a written consent form was obtained from their teachers. The sample was thus allowed to make a voluntary choice of participating. The application form explaining the design and protocols used in the research study was subjected to Institutional Human Ethical Committees (IHEC), and the approval number was AUW/IHEC/HD-17-18/XPD/30. The approval letter was given as Appendix II.

Population and Sampling – At a glance

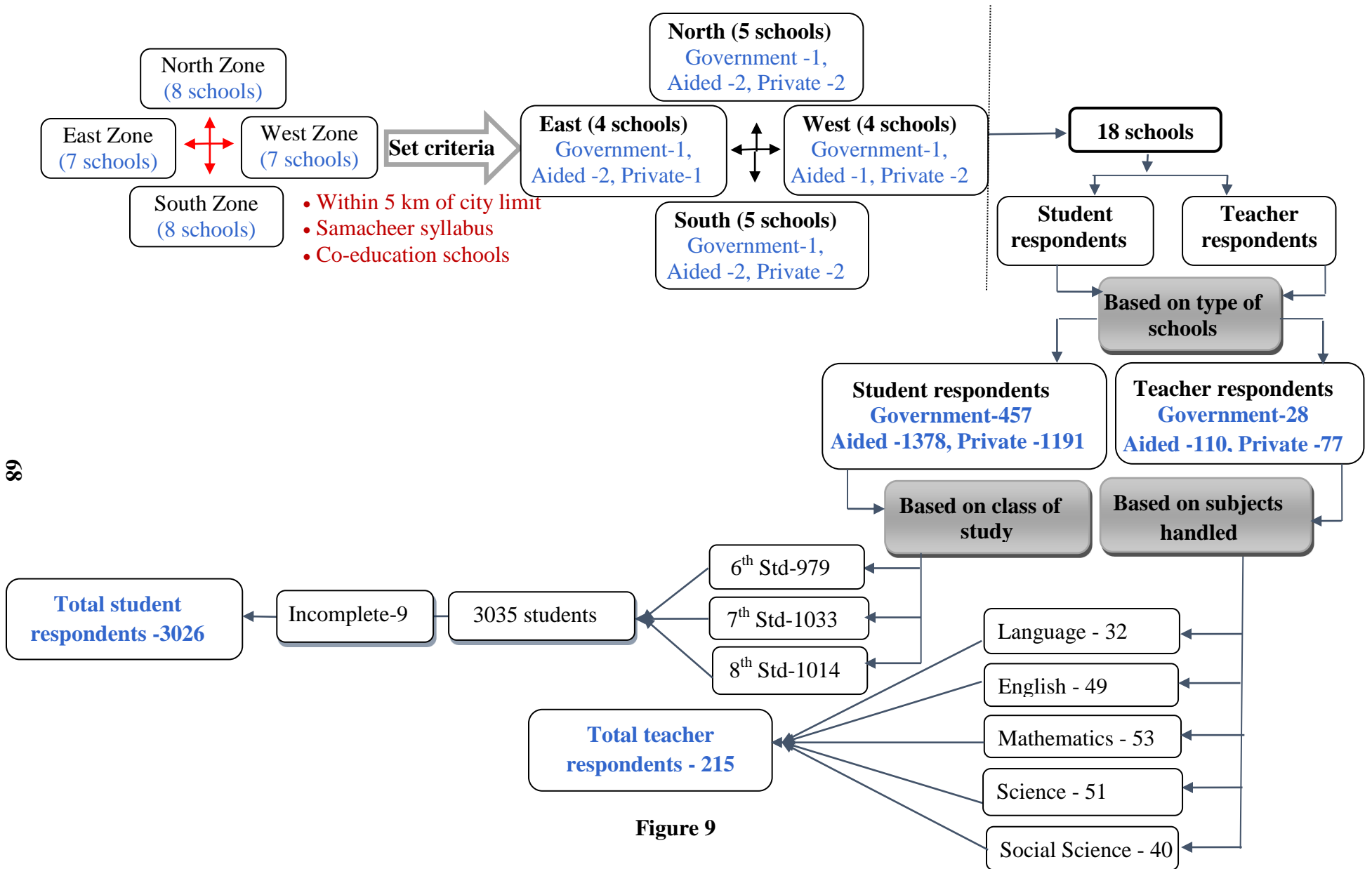


Figure 9

B. SELECTION OF THE TOOLS

The section below details the tools used for the study under two heads based on the type of respondents.

I. Tools administered to the student respondents

- a. General Background Questionnaire
- b. Multiple Intelligence Scale (MIS)
- c. Learning Style Inventory (LSI)
- d. Likert scale on Academic Achievement

II. Tools administered to the teacher respondents

- a. Personal Profile Questionnaire
- b. Teaching Style Scale (TSS)

I. Tools administered to the student respondents

Four tools were used to get the necessary data from the student respondents, out of which three were standardised tools, and each was detailed below:

a. General background Questionnaire

A self-formulated questionnaire to elicit the general profile of the selected school children was devised with two subsections. The first section aided in collecting the personal profile of the selected respondents concerning class-of-study, gender, type of school, type of family, birth order, and area of residence. The second section dealt with the educational and occupational details of the parents of the school children (Appendix III).

b. Multiple Intelligence Scale (MIS)

Over the recent years, many standardised psychological assessment tools have been developed on Multiple Intelligence (MI) addressing varying age groups. Based on the target

respondents' age criteria, the researcher selected a standardised Multiple Intelligence Scale designed by Agarwal and Pal (2016). The scale had 90 statements in nine domains of intelligence, namely

- ✓ ***Linguistic (word smart)*** - Ability to use words and language
- ✓ ***Logical (number smart)*** - Ability to use reason, logic, and numbers
- ✓ ***Bodily-kinesthetic (body smart)*** - Ability to control body movements and handle objects skillfully
- ✓ ***Musical (music smart)*** - Ability to produce and appreciate music, to think in sound, rhythms, and patterns
- ✓ ***Spatial (picture smart)*** - Ability to perceive the visual
- ✓ ***Naturalistic (nature smart)*** - Ability to discriminate among living things as well as sensitivity to other features of the natural world
- ✓ ***Interpersonal (people smart)*** - Ability to relate and understand others
- ✓ ***Intrapersonal (self-smart)*** - Ability to self-reflect and be aware of one's inner state of being and
- ✓ ***Existential (cosmic smart)*** - Ability to be sensitive to or have the capacity for tackling more profound or more significant questions about human existence.

The response for every statement was scored on a 5-point Likert Scale. The statements were both positive and negative. Positive statements scoring pattern was as follows: Always - 5, Mostly - 4, Often - 3, Rarely - 2, and Never - 1. The negative statements scoring pattern was as Never - 5, Rarely - 3, Often - 3, Mostly - 2, and Always - 1. The maximum time allowed to complete the MIS was 20 minutes, and the minimum to maximum scores for each intelligence ranged from 10 to 90. Table I gives the domain-wise distribution of 90 MI statements.

TABLE I
DOMAIN-WISE DISTRIBUTION OF MI STATEMENTS

Domains	Nature of Statements	No. of statements	Total No. of statements	Total
Linguistic	Positive	10,19,37,46,64,73	06	10
	Negative	1,28,55,82	04	
Logical	Positive	2,20,29,47,56,74,83	07	10
	Negative	11,38,65	03	
Bodily-kinesthetic	Positive	3,12,30,39,57,66,84	07	10
	Negative	21,48,75	03	
Spatial	Positive	13,22,40,49,67,76	06	10
	Negative	4,31,58,85	04	
Musical	Positive	5,23,32,50,59,77,86	07	10
	Negative	14,41,68	03	
Naturalistic	Positive	6,15,33,42,60,69,87	07	10
	Negative	24,51,78	03	
Interpersonal	Positive	16,25,43,52,70,79	06	10
	Negative	7,34,61,88	04	
Intrapersonal	Positive	8,26,35,53,62,80,89	07	10
	Negative	17,44,71	03	
Existential	Positive	9,18,36,45,63,72,90	07	10
	Negative	27,54,81	03	
Total statements - Positive 60; Negative 30				90

Standardisation norms: The scale's reliability was measured by the test-retest and split-half methods. The Spearman-Brown correlation coefficient for the whole MI scale was 0.71 in the test-retest process and 0.83 in the split-half method. The scale was also subjected to content validity and intrinsic validity. Based on mean and standard deviation, the raw score for every domain was given along with the norms for interpretation, as provided in Table II. The same has been adopted for the current study without any modification.

TABLE II
NORMS AND INTERPRETATION OF THE LEVEL OF MI

Domain-wise range of raw score (Minimum to Maximum)									Level of MI
Linguistic (10 – 50)	Logical (10 – 50)	Bodily (10 – 50)	Spatial (10 – 50)	Musical (10 – 50)	Naturalistic (10 – 50)	Interpersonal (10 – 50)	Intrapersonal (10 – 50)	Existential (10 – 50)	
≥42	≥42	≥41	≥43	≥43	≥44	≥43	≥41	≥43	Extremely high
36 – 41	37 – 41	35 – 40	38 – 42	37 – 42	38 – 43	38 – 43	35 – 40	37 – 42	High
31 – 35	31 – 36	30 – 34	33 – 37	31 – 36	33 – 37	33 – 37	30 – 34	32 – 36	Above average
23 – 30	24 - 30	23 – 29	25 – 32	24 – 30	26 – 32	25 – 32	23 – 29	24 – 31	Average
18 - 22	18 - 23	18 – 22	20 – 24	18 – 23	21 – 25	22 – 24	18 – 22	19 – 23	Below average
12 - 17	13 - 17	12 – 17	15 – 19	12 – 17	15 – 20	15 – 19	12 – 17	13 -18	Low
≤11	≤12	≤11	≤14	≤11	≤14	≤14	≤11	≤12	Extremely Low

Keeping in mind the 11-15-year-old school children who formed the target respondents of the study, the researcher modified the sentence formation of the statements provided in the selected MI scale to make it easier for the target respondents to comprehend the statements better. Further, to check the effectiveness of the modified statements of the MI scale, a pilot study with 100 student respondents was carried out. After establishing the efficacy, the MI scale was administered to the rest of the student respondents. To check the reliability of the data, the data of 20% of the total student respondents (610 in number) were taken into account. Cronbach's alpha was calculated. It was found that the modified items were considered reliable, with Cronbach's alpha value ranging from 0.87 to 0.94, indicating more reliability for the present study. Finally, the MI raw scores were used to assess the various levels of intelligence, and further interpretation of exact raw scores was used for all the MI analyses of the target respondents. The modified version of the MI scale used has been enclosed in Appendix IV.

c. Learning Style Inventory (LSI)

Considering the target respondents' age limits and suitability for the Samacheer syllabus pattern, the researcher chose a Standardised tool developed in India to assess the LS of the student respondents. Accordingly, the Learning Style Inventory developed by Misra (2012), comprising 42 positive statements, was selected to determine the student respondents' LS. This inventory attempts to measure six LSs, and each LS had seven positive statements. The LS measures were:

- ✓ ***Enactive Reproducing (ER)*** indicates one's preference for action-based concrete experiences. The emphasis was on imitation and practice. It was reproduction-oriented
- ✓ ***Enactive Constructive (EC)*** indicates a preference for conceptualising one's experiences based on the processing of enactive information
- ✓ ***Verbal Reproducing (VR)*** refers to written or spoken information related to subject matter communicated through words
- ✓ ***Verbal Constructive (VC)*** refers to the preference for reflective, accommodative, and abstract thinking about the subject matter to develop conceptualisations

- ✓ **Figural Reproducing (FR)** refers to the preference for visual experiences related to making diagrams, charts, pictures, maps, and photographs. The emphasis was on imitation and practice and was reproduction-oriented and
- ✓ **Figural Constructive (FC)** refers to the preference for processing figural experiences, which will lead to conceptualisations.

There are five response alternatives for every learning behaviour ranging from ‘very much’ to ‘significantly less,’ wherein ‘very much’ is scored as five and ‘very less’ as 1 (in decreasing order). Scores on the seven items belonging to each LS were to be added to arrive at the raw scores for each of the 6 LS: ER, EC, FR, FC, VR, and VC. The maximum time allowed to fill in the LSI was 15 minutes, and the minimum and maximum score of each LS was 7 to 35. Table III portrays the number of items categorised under the six LS.

TABLE III
DIMENSION-WISE DISTRIBUTION OF LS ITEMS

Learning styles	Items in the inventory	Total items	
Enactive Reproducing (ER)	1,4,7,10,13,16,19	07	14
Enactive Constructive (EC)	22,25,28,31,37,40	07	
Verbal Reproducing (VR)	3,6,9,12,15,18,21	07	14
Verbal Constructive (VC)	24,27,30,33,36,39,42	07	
Figural Reproducing (FR)	2,5,8,11,14,17,20	07	14
Figural Constructive (FC)	23,26,29,32,35,38,41	07	
Total Items		42	

The alpha reliability of LSI for the six LSs was 0.775. The intrinsic validity of the LSI was calculated using the Moment Correlation among LS. All the LSs were positively related to one another, too. Like the MI scale, the LS scale was also modified in terms of sentence formation to simplify the statements for the target respondents, making it easy for them to understand and respond well. Further, to check the effectiveness of the statements modified, a pilot study was carried out among 100 student respondents. After establishing its efficacy, the same was administered to the rest of the student respondents. To check the reliability of the

data, the data of 20% of the total selected respondents (610 in number) were taken into account. Cronbach's alpha was calculated, and it was found that the items were reliable, with Cronbach's alpha value of 0.72. The scoring gradation and interpretation norm are shown in Table –IV. For the interpretation of LS scores, the raw scores were used to assess the various levels of LS, namely Extremely high, High, Average, Low, and Extremely low. Accordingly, the raw scores were used for all the analyses of LS. The LSI inventory used has been enclosed in Appendix V.

TABLE IV
NORMS AND INTERPRETATION OF THE LEVEL OF LS

Dimension-wise range of raw score (Minimum to Maximum)						Level of LS
ER	EC	VR	VC	FR	FC	
>32	>33	>33	>33	>26	>25	Extremely high
27 – 32	28-32	28-32	30 – 32	22 – 26	16 - 25	High
20 – 26	21-27	21-27	23-29	17-21	12-15	Average
13-19	14-20	14-20	15-22	12-16	10-12	Low
7-12	7-13	7-13	7-14	7-11	7-9	Extremely low

d. Likert scale on Academic Achievement

The word 'achievement' refers to an individual performance in education. It is the accomplishment of children's ability and performance. Academic Achievement (AA) is directly related to students' growth and development in an educational circumstance where the teaching and learning process occurs. AA has become the centre of a student's life, with the pillars on which the future structure of personality stands. Academic Achievement (AA) achieved at school decides the student's position in the class.

Academic Achievement (AA) was commonly measured with marks scored by students in their periodical academic assessments/examinations. The record stating these marks were

widely referred to as report card /mark card/progress report. They were the most readily and easily available secondary sources for measuring the AA of any student. More so, in schools following the Samacheer pattern, a student was branded academically strong or weak purely based on the marks scored.

To assess the AA of the selected student respondents, their report/mark cards were procured from the administrative office of the respective schools as secondary data. The average marks of five significant subjects (Language, English, Mathematics, Science, and Social Science) in the five major exams (I Mid Term, Quarterly Exam, II Mid Term, Half yearly Exam, and III Mid Term) conducted in an academic year were categorised into seven grades. The Likert Scale grading system was based on the commonly used grading system of the schools of Tamil Nadu. The grades and norms used were Outstanding (91%-100%), Excellent (81%-90%), Very Good (71%-80%), Good (61%-70%), Average (51%-60%), Below Average (41%-50%) and Poor (35%-40%).

Out of the five major subjects mentioned, the subject of Language must be explained for the present study. Tamil is the language spoken by the majority of people in Tamil Nadu. Tamil is also the official language in Tamil Nadu. As per the Tamil Language Learning Act 2006, learning the Tamil language has been made compulsory for all students from Class 1 to Class 10 following the Samacheer pattern. Hence, the Language would automatically refer to Tamil here. All four tools used to procure data from student respondents are briefed in Figure 10.

Tools administered to student respondents – At a glance

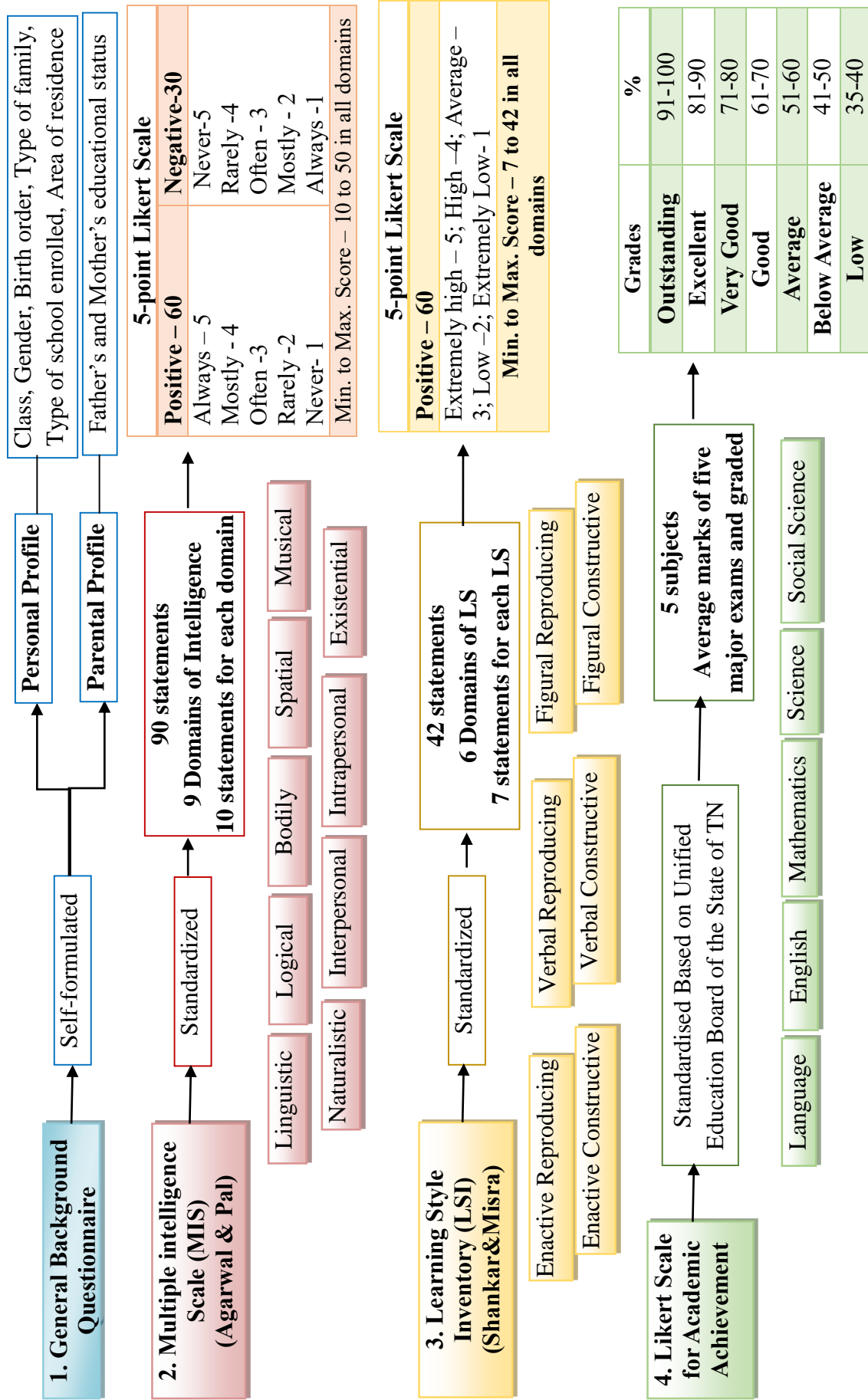


Figure 9

II. Tools administered to the teacher respondents

The tools administered to the teacher respondents were explained below:

a. Personal Profile of Teachers

A questionnaire eliciting the personal profile of teachers was formulated to procure information on their age, gender, educational qualification, subjects handled, professional experience, and type of school they worked for and was annexed as Appendix V.

b. Teaching Style Scale (TSS)

Based on the theories of Grasha (1994) concerning teaching styles, Sharma and Saran (2002) developed a Teaching Style Scale (TSS) to measure the actual teaching pattern of the teacher. They described the Teaching style as quite different from the methods of instruction used by the teacher. As the preferred TSS was considered an all-pervasive way of approaching the teachers to identify their unique teaching style in the classroom, this tool was chosen over the other available tools. The various kinds categorised in the TSS are given below:

- ✓ *Expert Style* - This style has the knowledge and expertise that the children require. The teachers concentrate on transmitting information, knowledge, and skills to the students, which aids them in enhancing their knowledge
- ✓ *Formal Authority Style* - This style possesses status because of knowledge. The teachers establish learning goals, expectations, and rules of conduct among students so that they concentrate on correct and standard methods
- ✓ *Demonstrator style* - This style believes in teaching by personal example. The teacher leads, guides, and directs by showing examples. The children are encouraged to observe and follow the teacher's approach
- ✓ *Facilitator style* - This style lays stress on teacher-student interactions. The teacher encourages self-learning and helps children to develop critical thinking skills and retain knowledge that leads to self-actualisation among children and
- ✓ *Delegator style* - In this style, the teacher encourages students to work on projects independently or as part of teams. The teacher is always available as a resource person.

The TSS consists of 60 statements (44 positively and 16 negatively worded) belonging to the five categories mentioned above of TS. The first two domains, Expert style, and Formal Authority, have fifteen statements each, whereas the remaining three types, namely Demonstrator, Facilitator, and Delegator, have ten statements each. Table V portrays the items categorised under the five Teaching Styles (TS).

TABLE - V
DISTRIBUTION AND NATURE OF STATEMENTS OF TP

Types of TS	Nature of Statements	No. of Statements	Total No. of Statements	Total
Expert	Positive	1,2,3,4,5,6,7,9,10,13,15	11	15
	Negative	8,11,12,14	04	
Formal authority	Positive	16,17,18,19,20,21,25,26,30	09	15
	Negative	22,23,24,27,28,29	06	
Demonstrator	Positive	31,32,33,36,37,38,40	07	10
	Negative	34,35,39	03	
Facilitator	Positive	43,44,45,46,47,48,49,50	08	10
	Negative	41,42	02	
Delegator	Positive	52,53,54,55,56,57,58,59,60	09	10
	Negative	51	01	
Total statements (Positive - 44 and Negative - 16)			60	

The response for every statement was scored on a 5-point Likert Scale. The scoring pattern of positive statements was Strongly Agree - 5, Agree - 4, Undecided - 3, Disagree - 2, Strongly Disagree - 1, and Negative statements was Strongly Disagree - 5, Disagree - 4, Undecided - 3, Agree - 2, Strongly Agree - 1. The minimum and maximum scores on the first two domains (Expert and Formal authority style) were 15 and 60, whereas the last three domains (Delegator, Demonstrator, and Facilitator) were 10 and 60. Scores of the items belonging to each TS were to be added together to arrive at the scores for each of the five TS: Expert, Formal Authority, Demonstrator, Facilitator, and Delegator. The teachers spent 20 minutes filling out the questionnaire.

The scale's reliability was found by the split-half (odd-even) method with the reliability correlation of the coefficient at 0.84, which is significant at a .01 significance level. The scale was also subjected to content validity. Further, to check the effectiveness of the TSS, a pilot study was carried out with 25 teacher respondents. After establishing its efficacy, the same was administered to the rest of the sample. For interpretation of TSS scores, the raw scores were used to categorise the level of TS ranging from Extremely High to Extremely Low, as in Table VI. The TSS used has been enclosed in Appendix VI.

TABLE VI
NORMS FOR INTERPRETATION OF THE LEVEL OF TP ADOPTED
BY THE TEACHERS

Dimension-wise range of raw score (Minimum – Maximum)					Level of TS
Expert (15 – 75)	Formal authority (15 – 75)	Demonstrator (10 – 50)	Facilitator (10 – 50)	Delegator (10 – 50)	
≥59	≥58	≥41	≥42	≥43	Extremely high
54 – 58	53 – 57	37 – 40	38 – 41	39 - 42	High
49 – 53	48 – 52	33 – 36	34 – 37	34 - 38	Above average
42 – 48	42 – 47	27 – 32	28 – 33	29 - 33	Average
37 – 41	37 – 41	23 – 26	24 – 27	24 - 28	below average
32 – 36	32 – 36	19 – 22	20 – 23	20 - 23	Low
≤31	≤31	≤18	≤19	≤19	Extremely low

The two tools used to procure data from the teacher respondents were briefed in Figure 11.

Tools administered to teacher respondents – At a glance

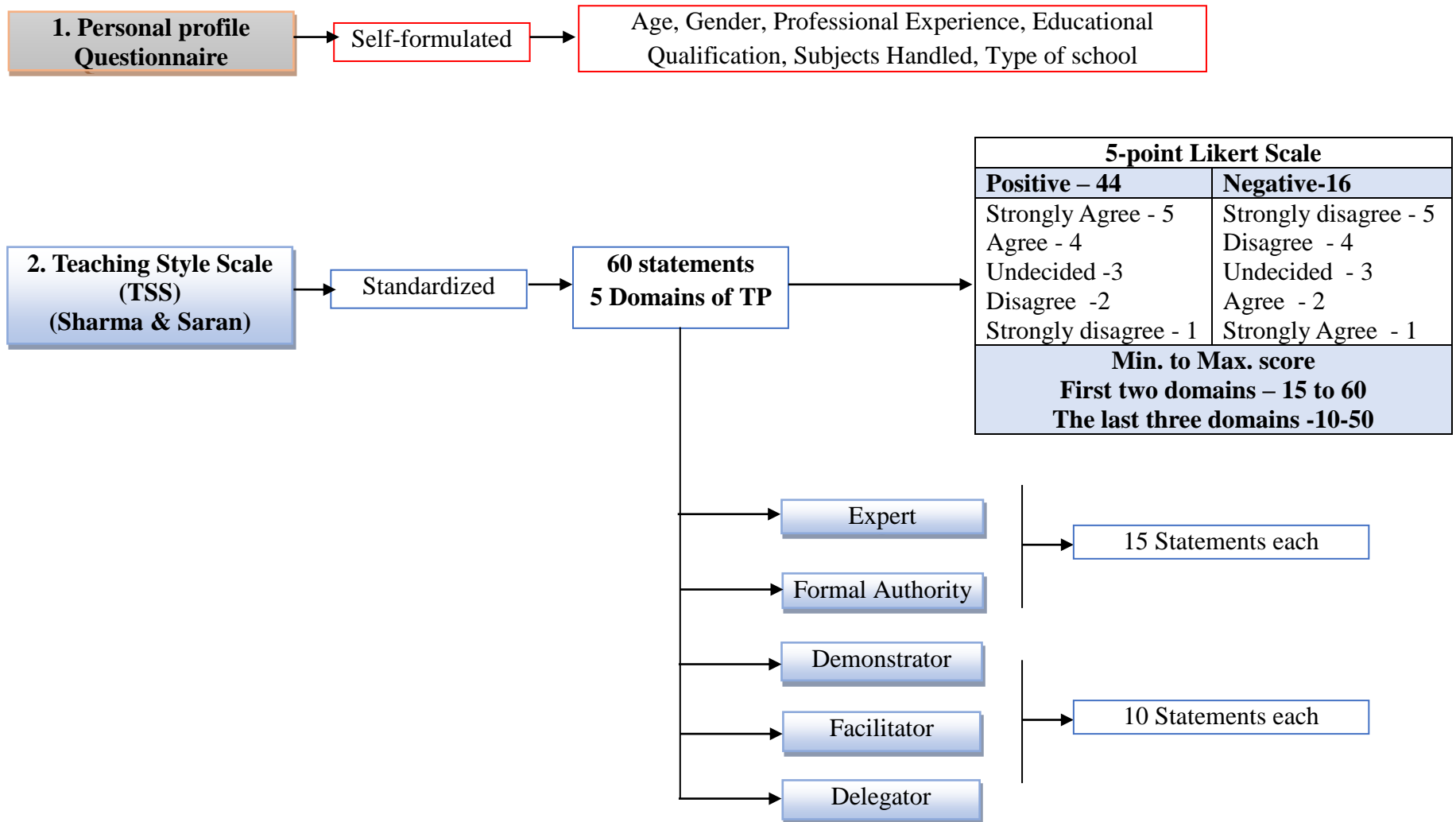


Figure 11

C. CONDUCT OF THE STUDY

The study was conducted in three phases, as described below:

Phase I: Permission from Authorities and Rapport building

Phase II: Pilot Study

Phase III: Collection of Data

Phase I: Permission from Authorities and Rapport building - The researcher informed the concerned authorities and target respondents why this study was essential to seek cooperation. As the District Education Office monitors schools' educational, administrative, and legal activities in the Coimbatore district, the researcher sought prior permission from the District Educational Officers (DEO) to collect data based on the study's objectives from the Coimbatore schools. With the letter of authorisation from DEO (Appendix VII), the investigator approached 30 schools that fall within the inclusive and exclusion criteria. Accordingly, 18 schools representing 4 Government schools, 7 Private schools, and 7 Government Aided schools permitted the researcher to conduct the research by collecting data from the 6th, 7th, and 8th standard classes and the Teachers involved. The study aimed to understand a central phenomenon in-depth, so rapport-building was essential. It builds confidence, trust, and acceptance between the respondents and the researcher. Hence, the researcher established direct contact with students and teacher respondents to get as close to the participant's perspective as possible. The 6th, 7th, and 8th class students were also oriented on their role in the research, and they were told how they should complete the questionnaires. Further, the researcher discussed the necessary arrangements, such as time and place allotment, with the heads or principals of the selected 18 schools. Time allotment for each class was scheduled so that the researcher could efficiently collect the data from children without any disturbance. Once all the preliminary arrangements were made, the investigator started to conduct the study.

Phase II: Pilot study - The pilot study was a crucial step and a fundamental stage of the present research, as it would go a long way in helping the researcher assess the validity, reliability, effectiveness, and feasibility of the survey design before launching it on to a larger population. The sample size for the pilot test depends on several factors, such as the pilot

objectives, survey design, and target population. Also, the sample size should be based on the researcher's expected margin of error, confidence level, and effect size while considering the uncertainty and variability of pilot testing. In the same way, the appropriate and representative sample for the pilot tryout was chosen to make the tools more effective in the research design. Accordingly, the pilot study was carried out among 100 student respondents (Government - 30, Aided - 35, Private - 35) and 25 teacher respondents (Government – 5, Aided - 10, Private - 10) teachers belonging to 4 schools (Government – 1, Aided -1, and Private - 2).

Before the students started responding, proper instructions were given to the students on how to answer them, and they were guided if they needed more clarity. A response for every statement was mandatory so the students could respond to each piece of information. Also, the researcher carefully set up a proper seating arrangement so that students could not discuss with each other. After collecting pilot data, the responses were checked for the reliability and effectiveness of the tools. Finally, the tools were administered to the rest of the sample size.

Phase III: Collection of data - Data collection is essential for any research. The same holds for present research, too. Once the sample size was decided for the study, the researcher carefully planned the schedule for each school and different classes from beginning to end. Two types of population, namely student and teacher respondents, and two types of data, namely primary and secondary data, were involved in the study. The researcher streamlined the data collection process, as depicted in Figure 9. The preliminary data was collected from student and teacher respondents using the self-formulated and standardised tools mentioned above.

The data collected from secondary sources were for the Likert scale on Academic Achievement (AA). The administrative offices of the respective schools were the centres where data was obtained in the form of student respondents' report cards. The time taken to complete the data collection was one year, owing to the enormous sample size.

Three standardised and two self-formulated tools were used as primary data for the current research. The researcher assured confidentiality, no right or wrong responses, and

requested honest responses from both student and teacher respondents. Hence, data was collected from 3026 students and 215 teacher respondents from 18 schools in the selected city. After collecting the data, the researcher entered the raw data in Excel. Post-cleaning of the data was carried out, and suitable statistical techniques were chosen.

D. ANALYSIS OF DATA

Data analysis was an essential step and the heart of the research work. It was carefully chosen to formulate a subject-wise suggestive model for AA of the school children following the Samacheer pattern by identifying the predictive capacity of MI and LS possessed by them and TP practised by their teachers. Based on this, the researcher was to investigate the relationship of three predictors, namely Multiple Intelligence, Learning Style, and Teaching Pedagogy, on the outcome variable, the Academic Achievement of students of 6th, 7th, and 8th standard in five different core subjects. The extraneous variables were students' socio-demographics and teachers' personal profiles. For analysis, the collected information was consolidated, coded, scored, and tabulated accordingly, which was then ready to be analysed. The data were analysed statistically using the SPSS tool to yield the desired results. The following statistical techniques were used, and Figure 12 briefs the same.

The frequency distribution count and percentage analysis were used to provide summary information about the distribution of extraneous variables (socio-demographic factors) and to find the categorisation of the student respondents based on the level of AA, level of MI, and level of LS. Likewise, percentages were used for teacher profiles and categorisation of the teachers based on their TP.

The t-test analysis determined the difference between two means of independent variables, namely AA, MI, LS, and TP, concerning gender. Cohen's d was calculated to provide a standardised effect size for measuring the difference between two group means (male and female respondents here). This measure reports the size of the mean difference by comparing it to the data's variability. Based on the Cohen's d value, it was suggested that 0.2 be considered as the "small" effect size, 0.5 as the "medium" effect size, and 0.8 as the "large" effect size. Because of the enormous sample size, Cohen's d interpretation was needed for the present research.

One-way ANOVA was carried out to determine the influence of the extraneous variables (socio-demographic factors, namely Age, Class-of-study, Father's education, Mother's education, Type of family, Type of school and Area of residence of student respondents and Age, Educational Qualification, Subject Handled, Professional experience and Type of school of teacher respondents) with that of the dependent variables, namely AA, MI, LS of student respondents and TP of teacher respondents. The Eta squared (η^2) was used to suggest the effect size of the subgroups. It is a squared measure of association defined as the ratio of variance associated with each main effect and interaction effect in an ANOVA model. The existing rule of thumb interpreting values of $\eta^2 < 0.01$ indicating a small effect size, 0.06 indicating a medium effect size, and 0.14 or higher indicating a large effect size was used. For further interpretation, the post hoc analysis was also conducted to determine the most influencing group of every factor under study.

Hierarchical regression, a regression model in which the predictors could be entered into as blocks, was used to formulate a predictive model for subject-wise AA. Hierarchical regression is a way to show if variables of interest explain a statistically significant amount of variance in the outcome variable (Subject-wise AA) after accounting for all other predictor variables (Three blocks of variables, namely nine domains of MI, six types of LS and five types of TP). This is a framework for model comparison, wherein the researcher could build several regression models by adding variables to a previous model at each step; later models always include smaller models in previous actions. The interest was determining whether newly added variables significantly improved R^2 (the proportion of outcome variable variance explained by the model). Five Hierarchical regression models for each of the five subjects' AA were computed, and the results were presented in three parts: a. Correlation statistics; b. Model summary with ANOVA statistics c. Hierarchical regression model quantifying each independent variable's predictive capacity over the outcome variable.

For all the statistical tests, the level of significance was tested at .05 and .01. If the results were significant, they were denoted by "*" (.05), "***" (.01), and superscripts of "ns" in the value.

Conduct of study and Analysis of the data - At a glance

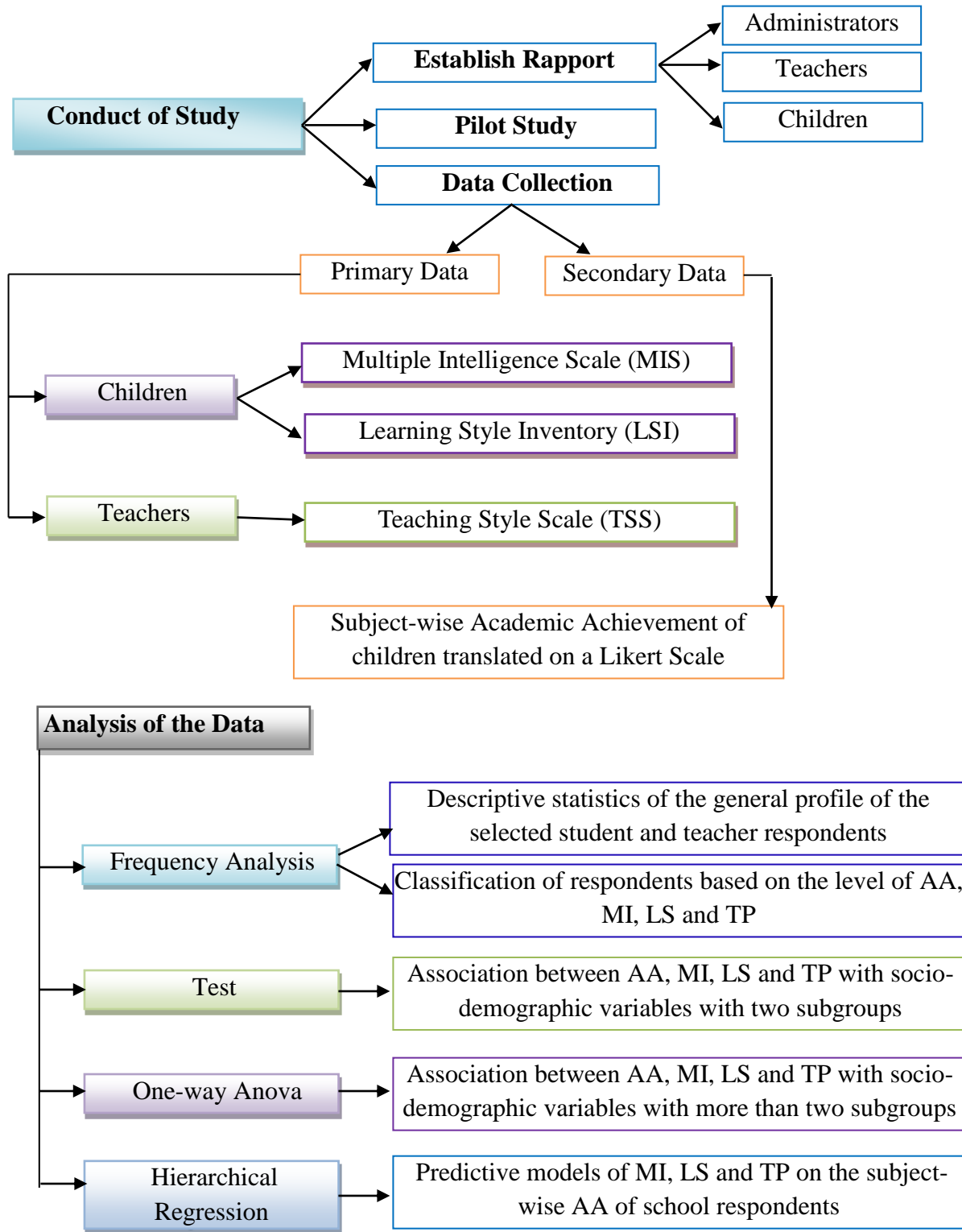


Figure 12