CHAPTER-3

METHODOLOGY

The chapter deals with the methodology for investigating the research problem i.e., exploration of factors that are responsible for teacher professionalism and students' achievement at the secondary school level. An in-depth assessment of the problem requires both quantitative and qualitative information. A blend of both quantitative and qualitative methods is best suited to unearth additional facts concerning the data.

The blueprint to be followed for carrying out the research was designed according to the nature of the variables and the context in which they were planned to be measured. To seek answers to the research questions of the study, teachers' perception of the various aspects of their professional practice was recorded, and to see the effect of their professional practice on the learning achievement of students, students' scores on science and mathematics achievement tests were acquired. The use of mixed methods helped in gaining an elaborate insight into the existing operations and attitudes that emerged in the data. While the quantitative method helped in objectively dealing with the perceptions of the teachers at the same time, the qualitative data explained the probable reasons behind the existing patterns in the data. The chapter discusses in detail the methods, sampling procedures, tool construction, data collection, and analysis techniques used.

3.1. Method used

Both qualitative and quantitative approaches were used to assess the relationship between the variables. The present research attempts to specifically account for the effect of students' characteristics on their academic performance and the factors that impact the professionalization aspect of teachers at the secondary school level.

The research uses a triangulation approach to address the research objectives. This approach is useful in obtaining "different but complementary data on the same topic" (Morse, 1991) and increases the credibility and validity of research findings (Cohen, Manion & Morrison, 2002; Noble & Heale, 2019). The intention behind using both quantitative and qualitative data is to put to use the strengths of both the techniques and at the same time to compensate for the weaknesses of each other (Patton, 1990; Maxwell, 2012). The triangulation approach induces richness and clarity in research studies (Heale & Forbes, 2013) and is the most commonly used approach of mixed methods and has been discussed in the literature in great detail (Amin et al., 2020; Farquhar, Michels & Robson, 2020).

The data was collected in a single-phase where both quantitative and substantiated by qualitative methods. Due to the collection of both kinds of data at the same time, this design is also referred to as the "concurrent triangulation design"' (Creswell, et al., 2003; Pardede, 2019). As a result, the study measured the same phenomenon through complementary datasets, after which the results are merged and interpreted.

3.2 Sources of Data

The research is based on primary data collected by the researcher through Teacher Professionalism Scale. Achievement Tests were also administered to students towards the end of their secondary education. The researcher collected qualitative data through semi-structured interviews conducted with teachers. Apart from this, policy documents dealing with the importance of the teaching profession and learning outcomes were analyzed, and the recommendations of these documents were also studied. An extensive review of existing knowledge was done to deduce the attributes of the construct for measuring the magnitude of professionalism among teachers. The

model questions of the PISA mathematics and science achievement test were used to measure the academic performance of students in these subjects.

3.3 Population and Sample

The present research used data collected from private and public schools of Jhunjhunu district in the state of Rajasthan in India. Unified District Information System for Education (U-DISE) as one of the largest management information system on school education reveals that Rajasthan has the largest number of secondary and higher secondary schools. With a total of 28,534 secondary and higher secondary schools, every one of 10 secondary schools in India is located in the state of Rajasthan. Rajasthan is also among the twelve states that have a higher percentage of private unaided schools (50.24%) than the national average (39.81%). 96.67% of teachers teaching at the secondary school level are professionally qualified. At the same time, the state records low levels of participation of females in education. The data discloses that only 30% of secondary teachers are females and out of the students enrolled in secondary grades, the enrolment of girls was only 43.31%. Despite ranking highest in terms of availability of infrastructural facilities and qualified teaching workforce, the low enrolment rate of girls in secondary grades makes Rajasthan one of the poor performing states in girl child education.

The participants of the study included teachers from both private and public schools of the Jhunjhunu district in Rajasthan, India. As per Census 2011, Jhunjhunu records the third highest literacy rates in Rajasthan (76.53%) after Kota (76.56%) and Jaipur (75.51%). Kota district records the highest literacy as the district serves as a hub for promoting higher education apart from serving as a coaching capital for students preparing for various competitive exams. The district of Jaipur being the capital

remains the center of development of the state. The study explores the prevailing educational scenario in the Jhunjhunu district, especially at the secondary school level.

The sampling frame for the study was acquired from the U-DISE (2016-17) database. The database is the largest EMIS in the country maintained by the National Institute of Educational Planning and Administration (NIEPA). The database is extensively used for planning and management of the school education system, especially for implementing interventions under Sarva Shiksha Abhiyan (SSA) and Rashtriya Madhyamik Shiksha Abhiyan (RMSA). U-DISE consists of information of individual government and private schools right from the block level. Sampling was done based on data from the year 2016-17 published online in 2018. According to the data, Jhunjhunu is divided into eight educational sub-divisions namely, Alsisar, Buhana, Chirawa, Jhunjhunu (Headquarter Sub-division), Khetri, Nawalgarh, Surajgarh, and Udaipurwati (Figure 3).

Figure 3: Block level map of Jhunjhunu district, Rajasthan

Sampling was done at three levels i.e., schools, students, and teachers. The data was filtered to obtain the number of schools that had upper primary, secondary, and higher secondary grades (SCHCAT = 5); were co-educational (TYPE = 3); were government or privately managed (SCH MGT = Department of Education (category 1) and Private Unaided (category 5). Based on these three criteria, out of a total of 1288 schools, a total number of 48 schools were obtained which was treated as the population. Out of these 48 schools, 18 were managed by the department of education at the state level and 30 were private unaided schools. According to Mugenda & Mugenda (2003), any sample between 20%-50% is a good representation of the population. Following this recommendation, 30% of schools from each block were selected through a simple random sampling technique.

Table 4: Block wise Secondary Schools

Blocks	Public	Private	Total
Alsisar	0	3	3
Buhana	3	3	6
Chirawa	1	2	3
Jhunjhunu	1	5	6
Khetri	5	4	9
Nawalgarh	1	3	4
Surajgarh	1	6	7
Udaipurwati	6	4	10
Total	**18**	**30**	**48**

The sample consisted of one private and one government school each from Buhana, Chirawa, Jhunjhunu, Khetri, and Nawalgarh. From Surajgarh one public and two private schools were selected; from Udaipurwati, two public and one private school were selected and from Alsisar one private school was selected (Table 4). In total, seventeen schools (eight public and nine private schools) were sampled out of the population of forty-eight schools.

Sampling of students and teachers was also done following the sampling rule stated by Mugenda & Mugenda (2003). It was ensured that from each school, at least 20% of grade ten students present in the school on the day of data collection participated in the test. The total number of students' responses analyzed was 424. Out of which, 200 students belonged to the private schools and 224 students belonged to the public schools. Data was collected from all the teachers of the sampled 17 secondary schools from all the blocks. The total number of responses was 192 with 97 teachers from the public schools and 95 teachers from the private schools.

3.4 Tools for Data Collection

For the purpose of collection of data, two measures were prepared namely the Teacher Professionalism Scale (Appendix-A) and the Student Achievement Test (Appendix-B). To substantiate quantitative data, qualitative measures for conduction of semi-structured interview was also constructed. The purpose of substantiation was to triangulate information on the importance of the teaching profession and pertinent challenges.

3.4.1 Student Achievement Test

The research used the PISA Framework Student Achievement test (Sample Questions) for assessing secondary grade students' performance on Mathematics and Science Achievement Tests. A section recording demographic characteristics of students were also used, where, whether the student studies in a centrally or state managed school is recorded. Also, students' gender, whether they have completed preschool or not, and whether they take private tuitions outside the school were recorded.

The achievement test was divided into two parts: Part I consisted of questions measuring Mathematics Achievement and Part II consisted of questions measuring Science Achievement. The total maximum marks for Part I and Part II were 100 where Part I was 52 marks and Part II was 48 marks. The combined scores of both the tests were taken as a representation of the cognitive abilities of the students.

The PISA Framework of Mathematics and Science Achievement Tests formed the basis of the achievement test used in the study. Model questions from PISA Mathematics and Science test were used to construct the Achievement Test. The test was designed such that it should not take more than one hour to complete. Six levels of cognitive proficiency were tested in both Science and Mathematics Achievement Test. Each level consisted of questions that tested a particular set of cognitive abilities of students.

Part I: Mathematics Achievement Test

In the Mathematics Achievement test, level 1 dealt with basic numerical concepts and abilities; level 2 consisted of questions based on basic algorithms and formulae; level 3 tested students on their abilities to make decisions on problems on decimal, fraction, proportion, and percentage; level 4 questions required to make assumptions and work with symbolic representations in real-world situations; level 5 assessed students' abilities to identify constraints, form assumptions and problem-solving strategies, integrate representations and reflect communication. Level 6 dealt with conceptualizing, generalizing, and utilizing information to solve complex problems in novel situations. The level-wise marking scheme of the Mathematics Achievement Test can be observed in Table 5.

Table 5: Level wise Marking of Mathematics Achievement Test

Mathematics Achievement Test			
Level	Components Measured	No. of Questions	Total Marks
1	Basic numerical concepts and abilities	2	2
2	Basic algorithms and formulae	2	4
3	Decisions making on problems on decimal, fraction, proportion, and percentage	2	6
4	Assumptions and symbolic representations; real world problems	4	16
5	Identifying constraints, specifying assumptions, problem-solving strategies, integrate representations and reflection and communication	1	12
6	Conceptualizing, generalizing, and utilizing information, use of mathematical operations to develop new approaches	1	12
	Total	**12**	**52**

Part II: Science Achievement Test

The Science Achievement test also comprised of five levels of proficiency, where levels 1 and 2 had low cognitive demand where the student was expected to successfully distinguish between scientific and non-scientific tasks and identify simple causal relationships in the data presented to them; level 3 and 4 had medium cognitive demand where the students' ability to think scientifically and reasoning abilities were assessed in familiar situations. Level 5 tested the students' ability to interpret complex data. Finally, level 6 tested the students' ability to interpret complex data and draw inferences in multi-step causal relationships in unfamiliar situations. The level-wise marking of the Science Achievement Test can be observed in Table 6.

Table 6: Level wise Marking of Science Achievement Test

Science Achievement Test				
Cognitive Demand	**Level**	**Measures**	**No. of Questions**	**Total Marks**
Low	1	Distinguish between scientific and non-scientific tasks	2	4
	2	Identify simple causal relationships in data	2	4
Medium	3	Ability to think scientifically	2	6
	4	Reasoning ability	2	10
High	5	Interpret complex data	1	12
	6	Draw inferences in multi-step causal relationships in unfamiliar situations.	1	12
		Total	**10**	**48**

Using data from the pilot study, the reliability and validity of the Student Achievement Scale were checked. The tool was validated by five secondary school Mathematics and Science teachers were contacted and their reviews on the test were sought. The teachers suggested the translation of tools in Hindi for public school students for better understanding. The suggestion was implemented and the tools were translated into Hindi.

3.4.2 Teacher Professionalism Scale

Teacher Professionalism Scale recorded the demographic characteristics of the teachers that according to literature influence professionalism. This part of the instrument is intended to acquire specific demographic data about the teachers within the participating schools. The section recorded teachers' gender, the highest academic qualification they possess, i.e., whether they are graduate or postgraduate or if they hold an M.Phil. or a Ph.D. degree. Teachers' age, the years of experience they possess as a teacher, their job description (whether they have been appointed as an assistant teacher, a Trained Graduate Teacher (TGT), or a Post Graduate Teacher (PGT) have also been recorded. The annual income of teachers and the highest teacher training they have received was also recorded. Prior to constructing the tool for assessing

Teacher Professionalism, a thorough review of existing literature was carried out to extract the attributes of the variable.

Based on the review conducted, the attributes of teacher professionalism were extracted to proceed with the formulation of the tool as depicted in Figure 4. A Likert Scale was constructed to measure the professionalism of teachers where 5 represented strong agreement with the statement 3 represented neutral response and 1 represented strong disagreement with the item statement. Reverse scoring was done for items that were worded negatively.
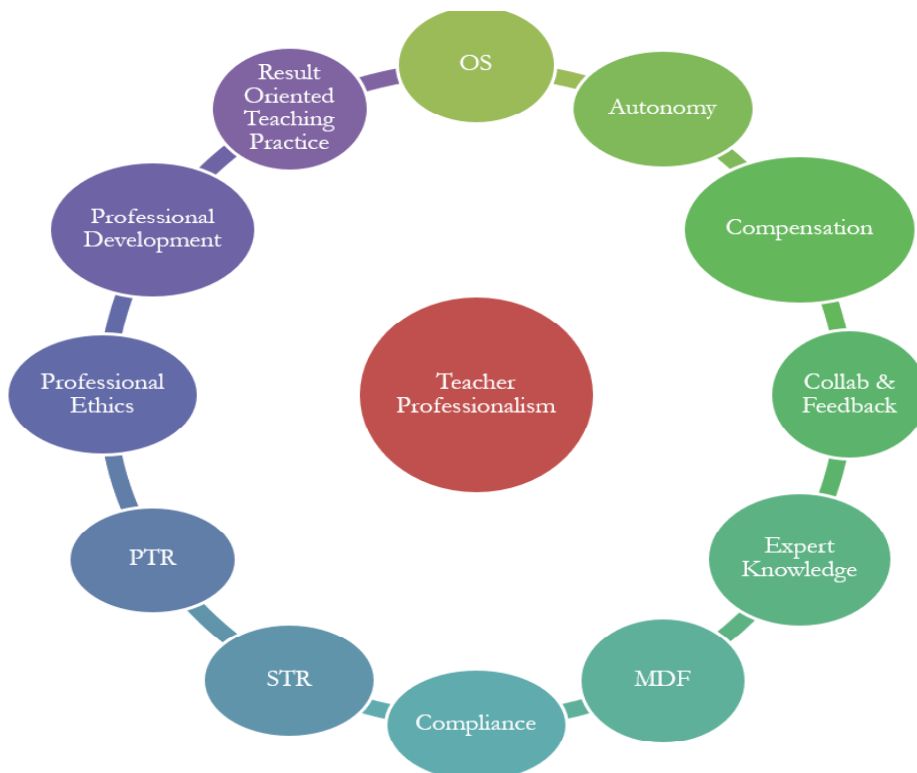

Figure 4: Attributes of teacher professionalism

The initial draft of the scale attempted to measure the construct of teacher professionalism using 12 attributes namely, Occupational Status; Autonomy; Compensation; Collaboration and Feedback; Expert Knowledge; Multi-Dimensional Functioning; Compliance; Communication with Parents; Student-Teacher

Relationship; Professional Ethics; Professional Development and Result Oriented Teaching Practice.

3.4.3 Teacher Professionalism Interview Schedule

An interview schedule was constructed to conduct semi-structured interviews of secondary school teachers to aid in-depth analysis of their perceptions regarding the status of their profession. The interview also probes into the teachers' opinions about attributes of their professional practice and the demographic characteristics that facilitate or inhibit professionalism.

3.4.4 Operational Definitions

In order to construct the scale, the attributes that were extracted from the literature review were operationally defined to facilitate item construction. The operational definitions of the attributes are as follows:

- **Teacher Professionalism** is an attitudinal construct denoting the commitment of teachers towards practice at the workplace and also refers to the extent to which an individual possesses the attributes of a professional.

  The attributes of professionalism with their operational definitions are as follows:

- **Occupational Status** refers to the 'social standing' of the teaching profession. It also refers to the self-perception about the importance of functionality which they perceive their profession to possess. The items assess teachers' perception of the importance of their occupation and service to society and the social standing they perceive their profession to have.

- *Autonomy* refers to the control of the teacher on their teaching practices. It concerns the degree of freedom exercised by the teacher in decision-making at their workplace both at the classroom and the school level.

- *Compensation* gauges the perception of teachers pertaining to their compensation levels when compared to the other established professions.

- *Collaboration and Feedback* refer to the efforts of teachers to build strong peer networks and work collectively towards achieving high standards of performance.

- *Expert Knowledge* refers to the extent to which the teachers perceive the importance of in-depth knowledge of their subject and the continuous efforts they make to improve this knowledge and teaching skills.

- *Multi-Dimensional Functioning* concerns the multiple roles played by a teacher other than the teaching role. These roles ensure the overall development of students in the school.

- *Professional Development* refers to the efforts of teachers to improve their instruction. It also assesses the teachers' perception about the support they receive from their school to engage in professional development activities.

- *Compliance* refers to the extent to which teachers function within the boundaries of rules and regulations laid down by the schools so as to become good role models to the students.

- *Communication with Parents* refers to the efforts of teachers to stay connected with the parents. The items assess the regularity with which

teachers maintain students' academic records and share them with the parents
and encourage their participation in their ward's school.

- *Student-Teacher Relationship* refers to the efforts of teachers to establish a
  healthy rapport with the students and inculcate values in them while taking
  feedback from them continuously.

- *Professional Ethics* refers to the extent to which teachers follow normative
  values while performing professional acts, use self-judgment as an individual
  to perform in the way their duties need to be performed. Items assess the
  ethical functioning of teachers as an individual, and while dealing with
  students and peers.

- *Results Driven Teaching Practice* measures the extent to which teachers
  correlate their teaching practice and students' achievement/grades. Keeping a
  track of students' performance and introducing reforms in the teaching
  methods, is also an important part of the results-driven practice of teachers.

- *Student Achievement* in the current study refers to the academic performance
  of students in mathematics and science which indirectly measures the
  cognitive abilities of students at the secondary school level.

- *Secondary School Level* refers to the education phase when the students are in
  the 9th and the 10th grade. In this study, the academic performance of students
  towards the end of their secondary grades is checked i.e., towards the end of
  grade ten.

Based on the definitions elaborated above, the initial draft of the Teacher
Professionalism Scale consisted of 66 items. The scale was evaluated by six

experts in the field of education for establishing content validity. Along with the Student Achievement Test, Teacher Professionalism Scale was also translated in Hindi for smooth administration of students and teachers. Based on the recommendations, the scale was revised adequately, wherein the deletion of redundant items, splitting of an item into two, and rewording of items was accomplished.

3.5 Pilot Study

A pilot study was undertaken using the resulting draft of the scale consisting of 30 items. Trying out of the tools was carried out as a pre-testing method in order to standardize the tool, based on which reliability and validity were checked. Data were collected from 100 teachers and 100 students from the Jhunjhunu district. The sample for the pilot study consisted of 70 teachers from private schools and 30 teachers from public schools. similarly, the students' sample consisted of 50 students from private schools and 50 students from public schools.

The need for translation of both the tools was realized and a large number of items were deleted based on the data analysis of the pilot data. The reliability (Cronbach's Alpha) of the scale was checked before factor analysis. The value of Cronbach's Alpha was found to be 0.99 which indicated excellent reliability. The reliability of the students' achievement test was also checked and the Cronbach's Alpha value was found to be 0.87 which also indicated good reliability (Bland & Altman, 1997; Hinton et al., 2004). Test-Retest reliability was also checked and the correlation coefficient was found to be 0.7 which was significant at the 0.05 level indicating acceptable reliability of the test.

Exploratory Factor Analysis (EFA) was done to identify the latent factor structure for teacher professionalism and the variations in the measure caused by these factors.

3.5.1 Factor Analysis

The Principal Component Method was used to assess the latent factor structure underlying the construct of teacher professionalism. Items that were not found to have significant inter-item correlation within a factor were deleted. Further factors having communalities below 0.30 were also removed. The deletion resulted in the retention of twenty-four items in the scale measuring teacher professionalism by the means of four attributes. The overall reliability of the scale after execution of factor analysis was calculated as 0.93 (Cronbach's Alpha); which indicates a high reliability of the scale.
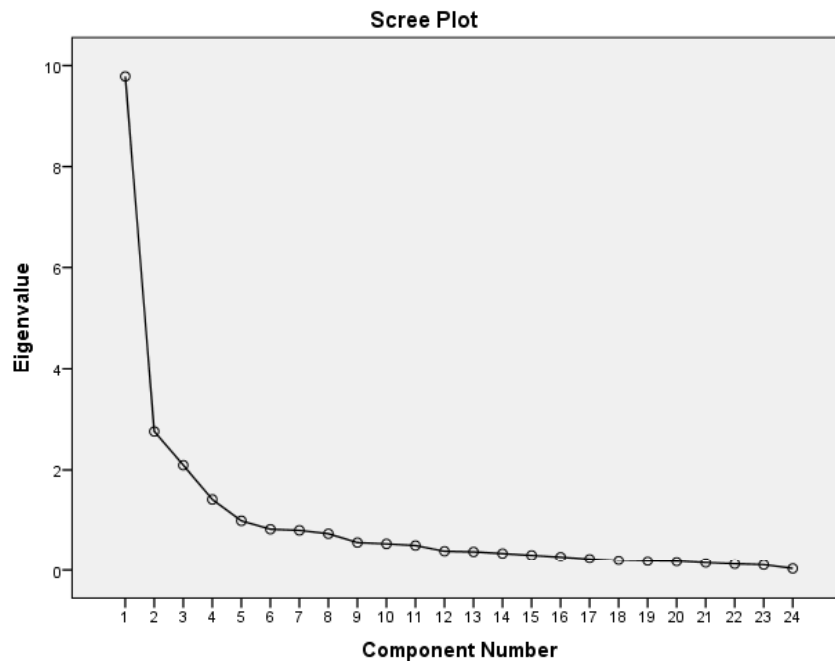

Figure 5: Scree Plot of the components of teacher professionalism extracted

The Kaiser Maiyer Olkin value of the data set was 0.86 indicating that the sample was adequate for carrying out factor analysis and Bartlett's Test of Sphericity was significant at the 0.00 level (Awang, Hui & Zainudin, 2018). Both measures confirm

the adequacy and suitability of the data for conducting factor analysis. Four significant factors were extracted

Table 7: Variance caused by the factors extracted

	F1	F2	F3	F4	Total Variance
Eigen Values	7.05	3.87	3.27	3.21	
Percentage of Variance	28.2%	15.5%	13.08%	13%	70.5%

based on the eigenvalue-one criterion as depicted in the scree plot in Figure 5. These four factors explained 70.5 percent of the total variance (Table 7). The rotated factor loadings and the extracted items are depicted in Table 8. Eleven items were found to be loaded under the first factor. The second factor consisted of four items and the third and fourth factors consisted of five and four items respectively.

Table 8: Rotated Component Matrix and the Factor Loadings

Factor Loading				
Items	**F1**	**F2**	**F3**	**F4**
Item_3	0.775			
Item_6	0.893			
Item_7	0.865			
Item_8	0.748			
Item_9	0.763			
Item_10	0.77			
Item_11	0.829			
Item_12	0.782			
Item_17	0.744			
Item_18	0.898			
Item_19	0.741			
Item_13		0.849		
Item_14		0.766		
Item_15		0.749		
Item_16		0.722		
Item_4			0.785	
Item_20			0.725	
Item_21			0.862	
Item_23			0.846	
Item_24			0.791	
Item_1				0.76
Item_2				0.743
Item_5				0.825
Item_22				0.819

3.5 Data Collection

The data was collected by blending methods after the finalization of tools. The researcher provided tools to the respondents to answer the items. Instructions were provided on the first page of the scale and a proper rapport was established for cooperation with the respondents. The parameters of research ethics were duly followed by acquiring informed consent and ensuring confidentiality as the data was supposed to be used for the purpose of investigation of the research problem only. Several visits were made to the field for data collection in order to substantiate the findings from the quantitative data, the semi-structured interview schedule was also conducted by random selection of teachers.

In order to ensure diverse responses, field notes were also maintained through observation to triangulate the information by blending methods. Student Achievement Test was administered to all the tenth-grade students from the sampled schools in the same manner.

3.6 Data Analysis

Data from scale were compiled, cleaned, edited, and coded to be able to be analyzed. Various statistical procedures were used to analyze the data in order to address the objectives. The data was examined through the Normal Probability Curve to obtain the skewness and kurtosis values were obtained, thereafter, inferential statistics were used to analyze the data.

In accordance with the nature of the data, parametric statistics were used to analyze the data using SPSS Version 22. t-test was used to determine the differences between the two groups whether the groups differ significantly from each other in the case of

more than two groups ANOVA was used to determine the significance of the difference between the groups. In order to establish a cause-and-effect relationship and to identify the predictors, multiple regression was executed on the dataset. Content analysis was done to analyze the interviews and field notes and observations were also used to substantiate obtaining the overall picture from the field.

Qualitative data collected through semi-structured interviews were analyzed using content analysis and specifically employing the thematic analysis technique. The technique is helpful when the conduction of qualitative data collection and analysis is not driven by a particular theoretical framework.