CHAPTER-3
RESEARCH DESIGN AND METHODOLOGY

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CHAPTER-3

RESEARCH DESIGN AND METHODOLOGY

"When you do not know a thing, to allow that you do not know it - this is knowledge."

(Confucius, 551 BC – 479 BC)

3.1 Introduction

This chapter presents a detailed account of the strategy that was followed by the researcher in conducting the research. It covers the research design, research method, sampling and sampling techniques, description and construction of research tools, techniques and procedures for the collection and analysis of data.

3.2 Research Design and Methods

Research design is the conceptual framework within which the research is conducted by the researcher. A research design becomes the researcher's systematic plan of action. It is a plan for collecting and analyzing data in an economic, efficient and relevant manner. According to Kerlinger,

"Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance."

Russel Lackoff views research design as,

"Design is the process of making decisions before a situation arises in which decision has to be carried out. It is a process of deliberate anticipation dictated towards bringing an unexpected situation under control."

Vimal Shah defines research design as,

"The design is the plan of study, and as such it is planned in every study, uncontrolled as well as controlled and subjective as well as objective."

Research design depicts the modus operandi for conducting a particular research study. This includes when, from whom, and under what conditions the data will be obtained (Mc Millan and Schumacher, 2001). When the research is conducted within the area of a definable mode of investigation, it becomes highly purposeful, meaningful and systematic. Thus, research design is the systematic way of investigation (Chikuya, 2007). The various research designs that can be employed for conducting the research are; case studies, historical designs, experimental designs,
and descriptive survey designs. However, the 'descriptive research design' was chosen by the investigator to carry out the current study on 'Secondary school Principals and teachers attitude towards ICT and its implementation in Jammu Kashmir and Uttar Pradesh' in India. Thus, descriptive survey method was employed as a method of research. The descriptive research design enables the researcher to describe or present picture of a phenomenon under investigation.

Basically there are three approaches to research, namely quantitative, qualitative and mixed mode research approaches. The investigator used the mixed mode research approaches in the current study.

![Diagram: Mixed mode research approach]

Fig. 3.1 Approaches of Research

3.3 Mixed mode research approach

Mixed mode research method is an approach that combines quantitative and qualitative research methods in the same research study. Quantitative and qualitative methods are representing the first and second methodological movements respectively while as mixed mode research approach has been termed as the third methodological movement (Ridenour and Newman 2008; Teddlie and Tashakkori 2003, 2009). Quantitative and qualitative approaches to research are often understood as opposite to one another. The main difference between the quantitative and the qualitative approach to research is the relationship between cause and effect (Monyatsi 2002). In the quantitative approach, statistical data analysis can be used to show such relationships, but the information rich qualitative research approach provides explanatory data from the interview and observation schedules. Recently mixed mode
of research approach has received much attention in the social and behavioural sciences (Tashakkori and Creswell 2008). In mixed mode research approach, both quantitative and qualitative research approaches are used either independently (concurrently) or dependently (sequentially) to understand a phenomenon of interest. When used dependently the findings from one approach helps to draw out the inferences from the other. In the present study the investigator has followed a mixed mode research approach with a sequential strategy. This strategy helps the researcher to investigate the attitude of secondary school Principals and teachers first and then to understand the effect of the attitude on the implementation of ICT. The results from secondary school Principals and teachers attitude towards ICT helps to explore the status of ICT in secondary schools of Uttar Pradesh and Jammu and Kashmir.

Creswell and Clark (2007) advocated four major types of mixed method designs which are as:

(1) Triangulation which means merging qualitative and quantitative data to understand a research problem.

(2) Embedded means using either qualitative or quantitative data to answer a research question within a largely quantitative or qualitative study.

(3) Explanatory means use of qualitative data to help explain or elaborate quantitative results.

(4) Exploratory means (i.e., collect quantitative data to test and explain a relationship found in qualitative data). In the current study the researcher has followed triangulation design of mixed methods research approach. Proponents of mixed methods research appreciate the value of both quantitative and qualitative worldviews to develop a deep understanding of a phenomenon of interest.

Cresswell (1994) as quoted by Monyatsi (2002) suggests five benefits while combining qualitative and quantitative research approaches in a single study. These benefits are as under:

a) It helps to combine results.

b) It is complimentary as it may evolve different facts of a phenomenon.

c) It is developmental as the findings from one approach inform the other.
d) It facilitates contradictions and new perspectives to emerge.

e) Mixed methods add scope and breadth to a study.

Keeping the above mentioned benefits in view the investigator employs mixed mode research approach in the present study.

The current study investigates the 'Secondary school Principals' and Teachers' attitude towards Information and Communication Technology (ICT) and its implementation in Jammu and Kashmir and Uttar Pradesh.' In the present study the investigator employed two samples, the 'pilot sample' for the construction of tool and the 'main sample' for substantive inquiry.

The investigator employed 'Principals attitude towards ICT Scale' and 'Teachers Attitude towards ICT Scale' for measuring the secondary school Principals and teachers attitude towards ICT. While as the researcher employed 'Principals Implementation of ICT Scale' and 'Teachers Implementation of ICT Scale' for assessing the secondary school Principals and teachers level of implementation of ICT.

3.4 Ethical considerations

Ethics are usually considered to deal with beliefs about what is right or wrong, proper or improper, good or bad (McMillan and Schumacher 2001). In order to get the reliable and qualitative information from the respondents, the investigator must try to minimize the risk of participants/subjects participating in a research study (Saunders et al. 2007). It is the responsibility of the investigator to ensure that ethical standards are adhered to. Therefore ethical measures were given due consideration throughout the study. The researchers of educational studies need to be more sensitive to ethical principles (Adam, 2005). Voluntary participation of the respondents, confidentiality and relationship with respondents was some ethical considerations that were taken care of while planning and conducting the present study. These measures were taken in order to ensure that the rights and welfare of the respondents would be protected and nobody will be harmed in any way during the process of the research.

Voluntary participation of the respondents is the pre-requisite for the success of the research. The respondents were fully informed about the purpose of the present study in advance before they fill in the scales. The researcher confirmed the
willingness of Secondary school Principals' and Teachers' to fill in the respective scales during the visit as they were the respondents in the present study and was given assurance of full confidentiality and anonymity. The investigator ensured confidentiality by managing to capture the confidence of respondents by revealing what the purpose of the investigation was that prompted them to divulge information that was needed for the research. The personal data gathered from the participants should be secured or concealed and made public behind a shield of anonymity (Christians, 2000). According to Maseko (2002), researchers are ethically obliged to possess a high level of competence and skill in undertaking a study. The investigator maintained a healthy rapport with the respondents of the targeted population and shared a high degree of trust throughout the investigation.

3.5 Variables under study

3.5.1 Independent Variables
- Secondary School Principals and Teachers Attitude

3.5.2 Dependent Variable
- Implementation of ICT

3.6 Sources of data

The investigator used primary as well as secondary sources of data in the current study. The primary sources of data were secondary school Principals and teachers who were the respondents from whom the reliable and adequate information was got through scales. The secondary sources of data constitute the documents like; DISE Reports, Indian statistics, census reports and the minutes, recommendations and reports of Project monitoring and evaluation group. Appropriate statistical treatments were used for the analysis of data.

3.7 Target Population

A population is any set of persons or objects that possesses at least one common characteristic (Busha and Harter, 1980). According to Monyatsi (2002), a population in research is a discrete group of units of analysis such as organizations or schools. That is why secondary schools were used for the selection of sample for the study rather than using all educational institutions. The target population for the present study was secondary school Principals and Teachers of Jammu Kashmir and Uttar Pradesh. However, the investigator has delimited the size of the target
population by including only secondary school Principals and teachers of District Pulwama of Jammu Kashmir and District Aligarh of Uttar Pradesh.

Pernia (2008) recognizes that the features of ICT are biased towards those who are already literate in a more traditional sense (have reading and writing skills) and are numerate (can understand and use numbers). Secondary school Principals and teachers, being literates, are therefore a suitable group for the present study investigating their attitude towards ICT and its implementation in Jammu Kashmir and Uttar Pradesh in India.

![Diagram](image)

**Fig. 3.2 Drawing of inferences about population from a Sample**

3.7.1 Sampling

Limited time, lack of large amount of funds, and population scattered in a very wide geographical area often makes sampling necessary. Sample is a model or representation of the population under study. It is a unit that provides a practical and efficient means to collect data for the study. According to Manheim (1977), "a sample is a part of the population which is studied in order to make inferences about the whole population." According to Saunders et al. (2007), sampling provides a valid alternative to a whole population because surveying an entire population may lead to budget constraints, time constraints and delay analysis of results. In defining 'population' from which the sample is taken, it is necessary to identify the 'target population' and 'sampling frame'. The target population is one which includes all the units for which information is required. It should be noted that sampling frame is not a sample; rather it is the operational definition of the population that provides the basis for the sampling. The sampling frame in the present study is Principals and Teachers of secondary schools of Jammu Kashmir and Uttar Pradesh.
Sampling methods can be classified into probability and non-probability sampling (Panneerselvam, 2008). The different methods of data collection are shown in the figure (3.3) as under:

Fig. 3.3
Data collection Methods

Methods of data collection

Census Method  Sampling Method

Probability Sampling  Non-Probability Sampling

1. Simple Random Sampling  1. Convenience Sampling
2. Stratified Random Sampling  2. Purposive Sampling
3. Systematic Sampling  3. Quota Sampling
4. Cluster sampling  4. Snowball sampling
5. Multistage sampling  5. Volunteer sampling
6. Multphase sampling

The investigator employed probability sampling technique in the present study. The random sampling technique of probability sampling is considered to be the best and is preferred over other types of probability sampling. According to Gay (1987),

'Random sampling is the best single way to obtain representative sample. No technique, not even random sampling guarantees a representative sample, but the probability is higher for this procedure than for any other.'

(p.104)
The investigator had selected all Principals of the selected secondary schools. However, after determining the actual number of secondary school teachers from the concerned departments, the secondary school teachers were selected through stratified random sample technique. The investigator selected a total of 76 Secondary Schools from the two states, thirty (30) from district Pulwama of Jammu Kashmir and forty six (46) from district Aligarh of Uttar Pradesh. However there were only thirty (30) government higher secondary schools in district Pulwama of Jammu and Kashmir and the investigator had selected all of them. Also the investigator selected all the (46) CBSE affiliated secondary schools from district Aligarh.

3.7.2 Deciding on a suitable sample size

The present study is confined to secondary stage only. That is why the researcher had selected only secondary schools. The number of secondary schools is very high in Uttar Pradesh and Jammu and Kashmir and it is not possible to select the whole population and that is why a small proportion (sample) from the target population has been selected from both the States. The larger the absolute size of a sample, the more closely its distribution will be to the normal distribution (Saunders et al., 2007). According to Paneerselvam (2008), the larger the size of the sample, the lower is likely the error in drawing generalization about the population.

The sample consisted of 30 higher secondary schools affiliated to Jammu and Kashmir Board of school Education from district Pulwama of Jammu and Kashmir and 46 Secondary schools affiliated to CBSE from district Aligarh of Uttar Pradesh making total of 76 secondary schools (see in Appendix- E). The initial sample consists of 631 respondents (76 secondary school Principals, 5 vice Principals and 550 secondary school teachers i.e. 300 from U.P and 250 from J&K). The investigator deleted some subjects due to the following reasons:

- Some respondents were outside the country.
- Respondents were busy in conducting exams.
- Some scales were incomplete as some respondents left some statements blank in one or more scales.
- Scales were returned totally blank.
- Few respondents were on either maternity or paternity leave.
- Some respondents have not returned the scales.
Finally after deleting some subjects, a sample of 529 was used in the current study from whom the relevant data was gathered by administering different research tools. The description of the sample is shown in the table 3.1 as under:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Target Group Selection</th>
<th>Sample Size Selected</th>
<th>Strategies for Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Secondary school Principals from district Pulwama (J&amp;K)</td>
<td>35</td>
<td>All</td>
</tr>
<tr>
<td>2.</td>
<td>Secondary school teachers from district Pulwama (J&amp;K)</td>
<td>236</td>
<td>Stratified Random sampling</td>
</tr>
<tr>
<td>3.</td>
<td>Secondary school Principals' from district Aligarh (Uttar Pradesh)</td>
<td>38</td>
<td>All</td>
</tr>
<tr>
<td>4.</td>
<td>Secondary school teachers from district Aligarh (Uttar Pradesh)</td>
<td>220</td>
<td>Stratified Random sampling</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>529</td>
<td></td>
</tr>
</tbody>
</table>

3.8 Description of Data collection techniques

The data collection techniques are the research instruments used for the collection of data. The selection of research tool depends on the nature of research problem to be investigated and the research questions to be answered or the hypotheses to be tested. The research tools used in the present study are self constructed scales and document analysis. The investigator has used the following four scales for the collection of data:

1. A self constructed scale for measuring secondary school Principals attitude towards ICT.
2. A self constructed scale for measuring secondary school teachers' attitude towards ICT.
3. A self constructed scale for assessing the level of implementation of ICT by the secondary school Principals.
4. A self constructed scale for assessing the level of implementation of ICT by the secondary school teachers.
The scale as a research tool is discussed in the section that follows;

3.8.1 Scale- A research tool

Scale is a measuring instrument consisting of a set of statements, symbols or numerals so designed that the statements, symbols or numerals can be assigned by rule to the individuals to whom the scale is applied. The individual manifests the information for which the scale has been designed to measure. Scale is used in two ways: to indicate a measuring instrument and to indicate the systematized numerals of the measuring instrument. We use it in both senses without bothering about a well defined difference (Kerlinger 2012).

The most commonly used techniques of data collection in education, social sciences and behavioural sciences research are interview, questionnaires, observation schedules, tests and scales. So, scales were used for the collection of data in the current study because they produce quantifiable data readily usable for statistical analysis. The scales when used in a research study produces standardized data which helps to increase the validity and reliability of results.

The present study focuses on secondary school Principals’ and teachers attitude towards ICT and its implementation in Uttar Pradesh and Jammu and Kashmir. The researchers employed four different scales to serve the purpose.

3.8.2 Development of Scales

The description of the development of scales used in the current study is as under;

1. Construction of ‘Principals Attitude towards ICT Scale’ and ‘Teachers Attitude towards ICT Scale’

The ‘Principals Attitude towards ICT Scale’ and ‘Teachers Attitude towards ICT Scale’ were developed on Likert Method, a method also known as ‘Method of Summated Ratings’. A summated rating scale is a set of statements to which the subjects respond with degrees of agreement or disagreement (Kerlinger 2012). The scales constructed according to Likert method uses five choices expressing different levels of agreement or disagreement. These two scales were designed to extract information from the subjects (secondary school Principals and teachers) on their attitude towards ICT with respect to the objectives of the study. The development of these scales involved the following steps:
Preliminary Draft of the Scale
Inquiry and evaluation of Statements
Try-Out of the Scale
Analysis of statements
Final Draft of the Scales
Scoring Procedures
Validity and Reliability

1. Preliminary Draft of the Scale

The first step in the development of scales for measuring secondary school Principals and teachers’ attitude towards ICT was the collection of statements for the preliminary drafts. For the collection of statements the investigator conducted extensive review of related literature, educational surveys, journals and scales used in different educational backgrounds (Al-Oteawi, 2002; Bannon, Marshall, and Fluegal, 1985; Bear, Richards, and Lancaster, 1987; Christensen & Knezek, 1996; Gardner, Discenza, and Dukes, 1993; Gressard and Loyd, 1986; Harrison and Rainer, 1992; Isleem, 2003; Jones and Clarke, 1994; Meier, 1988; Na, 1993; Robertson, Calder, Fung, Jones, and O.Shea, 1995; Sookmanan, 2002; Swadener and Hannafin, 1987) for the development of scales used for measuring secondary school Principals and teachers attitude towards Information and Communication Technology and prepared separate and long lists of statements relevant for the determination of Principals and teachers attitude towards ICT respectively. On the basis of this extensive review of related literature and scales used in different educational backgrounds, the investigator developed a preliminary draft of these scales. After preliminary scrutiny, editing of the statements and their pre-try-out and modification, the initial form of the scales comprised of (40) and (50) statements respectively on a five point rating scale were constructed.

2. Inquiry and evaluation of Statements

After the completion of the preliminary draft of ‘Principals Attitude towards ICT Scale’ and ‘Teachers Attitude towards ICT Scale’ in all respects, the investigator submitted them personally for open criticism and healthy suggestions to the experts, researchers and linguistic experts to improve the quality of the scales. These scales were evaluated by a panel of experts for face/ content/ expert validity. The panel included three content experts (Professors of Educational Technology), two bilingual
experts, one measurement expert, and four population experts (Secondary school principals and teachers). Most of the experts took much pain and were highly serious in the process of evaluation of each and every statement of these scales. They have made appreciable and worthy suggestions for the qualitative and quantitative improvement of the statements of these two scales. These suggestions include; reshaping of some statements, exclusion of some other statements, language upgradation and chronological and systematic arrangement of the statements. The feedback got from the panel of experts was used mainly to ensure that these scales measures the content areas of investigation and are culturally and technically appropriate for the context of the present study. After following the suggestions of the experts, the quality of these scales was improved and the revised version of these scales consisting (25) and (30) Likert type statements respectively were subjected for the tryout.

3. Try-Out of the Scale

The initial draft of the "Principals Attitude towards ICT Scale" consisted of (40) statements while as the initial draft of the "Teachers Attitude towards ICT Scale" consisted of (50) statements which were larger than the number of statements needed for the final scales. These two scales were subjected for the tryout on a small proportion of respondents who voluntarily participated from the target population (secondary school Principals and teachers). These scales were developed on a 5 point scale. The respondents (secondary school principals and teachers) were required to select their level of agreement or disagreement for each statement in the scales to indicate how they feel or react towards ICT. There was no right or wrong answer in the scales, however the response categories were; SD= strongly disagree, D= Disagree, UD= Undecided, A= Agree, SA= strongly agree.

4. Analysis of statements

With the help of SPSS Version 20, the total scores for (20) Principals and (100) teachers were arranged in a descending order. Twenty five percent (25%) of the high scores and twenty five percent (25%) of low scores were identified in both the scales and then, by doing "Paired samples T-test" for each of the statements, t-ratio was computed for the higher and the lower groups to find out the discriminating power of each statement. On the basis of the value of t-ratio, (15) statements of
‘Principals attitude towards ICT scale’ and (20) statements of ‘Teachers attitude towards ICT Scale’ were deleted as they were not significant even at (0.05) level of significance.

5. Final Draft of the Scales

The final draft of the scale for measuring secondary school principals’ attitude towards ICT comprised of (25) statements. Distribution of positive and negative statements has been presented in table (3.2) below:

<table>
<thead>
<tr>
<th>Statement Type</th>
<th>Statement Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>1,3,4,5,7,8,9,10,13,14,16,18,19,22,23,24=16</td>
</tr>
<tr>
<td>Negative</td>
<td>2,6,11,12,15,17,20,21,25=9</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
</tr>
</tbody>
</table>

The final draft of the scale for measuring secondary school teachers’ attitude towards ICT comprised of (30) statements. Distribution of positive and negative statements has been presented in table (3.3) below:

<table>
<thead>
<tr>
<th>Statement Type</th>
<th>Number of statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>30</td>
</tr>
<tr>
<td>Negative</td>
<td>Nil</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
</tbody>
</table>

6. Scoring Procedures

The scoring procedures were same for both the scales in terms of the response categories. These two scales were developed on a 5-point Likert scale. Different values were assigned to different responses. These values were ranging from 1-5, where 5 (Strongly Agree) represents the maximum score of the scale and 1 (Strongly Disagree) represents the minimum score in respect of responses pertaining to positive statements. However, the values were reversed for the negative statements where
5 (Strongly Disagree) represents the maximum score of the scale and 1 (Strongly agree) represents the minimum score. The sum of these values gives the total score of attitude towards ICT for the respondent. The scale for measuring secondary school Principals’ attitude towards ICT consisted of (16) positive statements and (9) negative statements making a total of (25) statements as shown in the table (3.2). Thus there was polarity in the response category of “Principals Attitude towards ICT Scale”. While as the scale for assessing secondary school teachers attitude towards ICT consisted of all the (30) positive statements with no negative statement as shown in table (3.3) Thus, no polarity was found in the response category of “Teachers Attitude towards ICT Scale”. The polarity in the “Principals Attitude towards ICT Scale” will be used for subsequent statistical analysis.

7. Validity and Reliability

7.1 Validity

To establish validity of these two scales ‘Principals attitude towards ICT Scale’ and ‘Teachers attitude towards ICT Scale’, face or expert validity and construct validity was determined.

7.1.1 Face validity

In order to check the face validity of these two scales, the investigator submitted them to a panel of experts. The panel included three content experts (Professors of Educational Technology), two bilingual experts, one measurement expert, and four population experts (Secondary school principals and teachers).

7.1.2 Construct validity

To assess the construct validity of “Principals attitude towards ICT Scale” and “Teachers Attitude towards ICT Scale”, Pearson’s Product moment correlation technique was employed. The purpose of using Pearson Product moment correlation technique was to make these scales homogenous by evaluating consistency of each statement with the total scale and discarding the statements showing inconsistency. To this end, scores on each statement of the subjects were correlated with their total score. Based on the correlation between the statement scores and the total scores few statements from both the scales were deleted to finalize the final draft of these scales.
7.1.3 Pearson’s coefficient of correlation

The investigator calculated the relationship between each statement and the total score of ‘Principal’s Attitude towards ICT scale’ and the coefficient of correlation of all the statements were found significant. This indicates that all the statements are related to Principal’s attitude towards ICT and the scale has good construct validity. The researcher also calculated the relationship between each statement and the total score of ‘Teacher’s attitude towards ICT scale’ and the Pearson’s correlation coefficients were found significant as shown in the table (3.4). This indicates that the ‘Teacher’s attitude towards ICT scale’ has good construct validity.

Table 3.4
Showing correlation between each statement and Total Score of Teacher’s attitude towards ICT Scale

<table>
<thead>
<tr>
<th>Statement</th>
<th>‘r’ Values</th>
<th>Sig.</th>
<th>Statement</th>
<th>‘r’ Value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.430**</td>
<td>.001</td>
<td>16</td>
<td>.394**</td>
<td>.002</td>
</tr>
<tr>
<td>2</td>
<td>.031*</td>
<td>.000</td>
<td>17</td>
<td>.257**</td>
<td>.045</td>
</tr>
<tr>
<td>3</td>
<td>.412**</td>
<td>.001</td>
<td>18</td>
<td>.267**</td>
<td>.038</td>
</tr>
<tr>
<td>4</td>
<td>.390**</td>
<td>.002</td>
<td>19</td>
<td>.370**</td>
<td>.003</td>
</tr>
<tr>
<td>5</td>
<td>.513**</td>
<td>.000</td>
<td>20</td>
<td>.132*</td>
<td>.051</td>
</tr>
<tr>
<td>6</td>
<td>.307**</td>
<td>.016</td>
<td>21</td>
<td>.462**</td>
<td>.000</td>
</tr>
<tr>
<td>7</td>
<td>.572**</td>
<td>.000</td>
<td>22</td>
<td>.273*</td>
<td>.033</td>
</tr>
<tr>
<td>8</td>
<td>.343**</td>
<td>.007</td>
<td>23</td>
<td>.319**</td>
<td>.012</td>
</tr>
<tr>
<td>9</td>
<td>.348**</td>
<td>.006</td>
<td>24</td>
<td>.168*</td>
<td>.015</td>
</tr>
<tr>
<td>10</td>
<td>.300**</td>
<td>.019</td>
<td>25</td>
<td>.088*</td>
<td>.023</td>
</tr>
<tr>
<td>11</td>
<td>.227*</td>
<td>.048</td>
<td>26</td>
<td>.350**</td>
<td>.006</td>
</tr>
<tr>
<td>12</td>
<td>.364**</td>
<td>.004</td>
<td>27</td>
<td>.471**</td>
<td>.000</td>
</tr>
<tr>
<td>13</td>
<td>.535**</td>
<td>.000</td>
<td>28</td>
<td>.188*</td>
<td>.047</td>
</tr>
<tr>
<td>14</td>
<td>.544**</td>
<td>.000</td>
<td>29</td>
<td>.153*</td>
<td>.041</td>
</tr>
<tr>
<td>15</td>
<td>.423**</td>
<td>.001</td>
<td>30</td>
<td>.356*</td>
<td>.005</td>
</tr>
</tbody>
</table>

**Correlation is significant at 0.01 level
* Correlation is significant at 0.05 level

From the perusal of table (3.4), it can be interpreted that the correlation coefficient of all the statements were found significant. This indicates that all the
statements are related to Teachers attitude towards ICT and the scale has good construct validity.

7.2 Reliability

Reliability of the two scales "Principals attitude towards ICT Scale" and "Teachers Attitude towards ICT Scale" were assessed by using Cronbach's alpha. The Cronbach's alpha reliability coefficient for "Principals attitude towards ICT Scale" was equal to (0.71) and the Cronbach's alpha reliability coefficient for "Teachers Attitude towards ICT Scale" was found equal to (0.80). According to Garson (2008) an instrument is acceptable for research purposes when its reliability using Cronbach’s alpha is more than 0.70.

The Cronbach Alpha coefficient or the coefficient of reliability and Pearson's correlation coefficient of two scales "Principals attitude towards ICT Scale" and "Teachers Attitude towards ICT Scale" is shown hereunder in the table that follows.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the scale</th>
<th>No. of Statements</th>
<th>Reliability coefficient</th>
<th>Pearson's correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Principals' Attitude Towards ICT Scale (PATICT)</td>
<td>24</td>
<td>0.82</td>
<td>(.933, .944, .848, .868, etc.)**</td>
</tr>
<tr>
<td>2.</td>
<td>Teachers' Attitude Towards ICT Scale (TATICT)</td>
<td>30</td>
<td>0.71</td>
<td>(.430, .412, .390, .513, etc.)**</td>
</tr>
</tbody>
</table>

** Correlation significant at 0.01 levels

2. Construction of 'Principals implementation of ICT Scale' and 'Teachers implementation of ICT Scale'

The 'Principals implementation of ICT scale' and 'Teachers implementation of ICT scale' was developed on Likert Methods. These scales were constructed in a way as to get information regarding the level of implementation of ICT from secondary school Principals and teachers. The development of these scales involved the following phases:
- Preliminary Draft of the Scale
- Try-Out of the Scale
- Analysis of statements
- Final Draft of the Scale
- Scoring Procedures
- Validity and Reliability

1. Preliminary Draft of the Scale

The statements for the preliminary draft of the two scales ‘Principal implementation of ICT scale’ and ‘Teachers implementation of ICT scale’ were prepared after reviewing available literature on the implementation of ICT and after consultation with two experts from Computer Science Department, two experts from Correspondence Education Department and two experts from English Department. After preparing the initial drafts of ‘Principal implementation of ICT scale’ and ‘Teachers implementation of ICT scale’ in all respects, these scales were subjected to screening and editing of the statements and for their pre-try-out and modification. The preliminary form of ‘Principal implementation of ICT scale’ consisted of (25) statements on a five point Likert type scales and the initial form of ‘Teachers implementation of ICT scale’ comprised of (30) statements on a three point respectively.

2. Try-Out of the Scale

The preliminary draft of ‘Principal implementation of ICT scale’ consisted of (25) statements and the initial draft of ‘Teachers implementation of ICT scale’ comprised of (30) statements which was higher than the number of statements required for the final draft of the scales. These two scales were applied for tryout on a small sample of (20) secondary school Principals and (100) secondary school teachers. The secondary school Principals were required to select their level of agreement for each statement to indicate how they feel to implement ICT on a 5-point Likert scale ranging from 1 to 5, where 5 (Strongly Agree) represents the maximum score of the scale and 1 (Strongly Disagree) represents the minimum score. The secondary school teachers were required to select their level of agreement for each statement to indicate how they experience to introduce ICT on a 3-point Likert scale ranging from 1 to 3, where 3 (Fully) represents the maximum score of the scale and 1 (No) represents the minimum score and the scoring will be done accordingly.
3. Analysis of the statements

The total scores of (20) secondary school Principals and (100) secondary school teachers will be arranged in a descending order with the help of SPSS version (20). Then after identifying (25%) of the high scores and (25%) of low scores of these two scales, t-ratio was computed for the higher and the lower groups to find out the discriminating power of each statement in both the scales with the help of “Paired T-test”. On the basis of the values of t-ratio, (7) statements of ‘Principals implementation of ICT Scale’ were deleted and (10) statements of ‘Teachers implementation of ICT Scale’ statements were discarded as they did not discriminate even at 0.05 level of confidence.

4. Final Draft of the Scale

The final draft of ‘Principals implementation of ICT scale’ comprises of (18) statements and the ‘Teachers implementation of ICT scale’ consists of (20) statements.

5. Scoring Procedure

The ‘Principals implementation of ICT scale (PIICT)’ and ‘Teachers implementation of ICT scale (TIICT)’ were developed and used by the investigator for measuring the level of implementation of Information and Communication Technology by the secondary school Principals and teachers respectively. The ‘Principals implementation of ICT scale’ scale consists of (18) statements on five-point scale; strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1). The individual score is the sum of the scores of all the (18) statements. These scores were summed up to get an overall score for the individual in the scale. The ‘Teachers implementation of ICT scale’ consists of (20) statements developed on three point scales fully (3), partially (2), and no (1). The individual score is the sum of the scores of all the (20) statements. These scores were summed up to get an overall score for the individual in the scale. Higher score indicates the high level of implementation of ICT.
6. Validity and Reliability of the Scales

6.1 Validity

To evaluate validity of these two scales ‘Principals implementation of ICT scale’ and ‘Teachers implementation of ICT scale’ face/ content or expert validity and construct validity was determined.

6.1.1 Face validity

In order to check the face validity of ‘Principals implementation of ICT scale’ and ‘Teachers implementation of ICT scale’, the investigator sought consultations of experts from different departments like department of Computer Science, Education, and English from the initial draft up to the final draft of the scales of implementation of ICT for the improvement of these research tools.

6.1.2 Construct validity

To assess the construct validity of ‘Principals implementation of ICT scale’ and ‘Teachers implementation of ICT scale’, Pearson Product moment correlation technique was employed. The purpose of using Pearson’s Product moment correlation technique was to make these scales (‘Principals implementation of ICT scale’ and ‘Teachers implementation of ICT scale’) homogenous by assessing the uniformity of each statement with the total scale and rejecting the statements showing inconsistency. To this end, scores on each statement of the subjects were correlated with their total score. Based on the correlation, between the individual statement scores and the total scores, few statements from both the scales were deleted to finalize the final draft of these scales.

6.1.3 Pearson’s coefficient of correlation

The investigator calculated the relationship between each statement and the total score of ‘Principals implementation of ICT scale’ and the coefficient of correlation of all the statements was found significant. This indicates that all the statements are related to Principals implementation of ICT and the scale has good construct validity. The researcher also calculated the relationship between each statement and the total score of ‘Teachers implementations of ICT scale’ and the Pearson’s correlation coefficients were also found significant as shown in table (3.6). This indicates that ‘Teachers implementations of ICT scale’ has good construct validity.
Table 3.6
Showing correlation between each statement and Total Score of Teachers
Implementation of ICT Scale

<table>
<thead>
<tr>
<th>Statements</th>
<th>‘r’ Values</th>
<th>Sig.</th>
<th>Statements</th>
<th>‘r’ Values</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.416**</td>
<td>.003</td>
<td>11</td>
<td>.444**</td>
<td>.001</td>
</tr>
<tr>
<td>2</td>
<td>.547**</td>
<td>.000</td>
<td>12</td>
<td>.584**</td>
<td>.000</td>
</tr>
<tr>
<td>3</td>
<td>.541**</td>
<td>.000</td>
<td>13</td>
<td>.306**</td>
<td>.030</td>
</tr>
<tr>
<td>4</td>
<td>.594**</td>
<td>.000</td>
<td>14</td>
<td>.586**</td>
<td>.000</td>
</tr>
<tr>
<td>5</td>
<td>.479**</td>
<td>.000</td>
<td>15</td>
<td>.552**</td>
<td>.000</td>
</tr>
<tr>
<td>6</td>
<td>.668**</td>
<td>.000</td>
<td>16</td>
<td>.533**</td>
<td>.000</td>
</tr>
<tr>
<td>7</td>
<td>.560**</td>
<td>.000</td>
<td>17</td>
<td>.626**</td>
<td>.000</td>
</tr>
<tr>
<td>8</td>
<td>.688**</td>
<td>.000</td>
<td>18</td>
<td>.796**</td>
<td>.000</td>
</tr>
<tr>
<td>9</td>
<td>.559**</td>
<td>.000</td>
<td>19</td>
<td>.780**</td>
<td>.000</td>
</tr>
<tr>
<td>10</td>
<td>.688**</td>
<td>.000</td>
<td>20</td>
<td>.745**</td>
<td>.000</td>
</tr>
</tbody>
</table>

**Correlation coefficient significant at 0.01 level

From the perusal of table (3.6), it can be concluded that the correlation coefficient of all the statements were found significant. This indicates that all the statements are related to Teachers implementation of ICT and the scale has good construct validity.
6.2 Reliability

The reliability of 'Principals implementation of ICT scale' and 'Teachers implementation of ICT scale' was determined by employing Cronbach's alpha. The Cronbach's alpha reliability coefficient for 'Principals implementation of ICT scale' was equal to (0.79) and the reliability coefficient for 'Teachers implementation of ICT scale' was found to be equal to (0.89) respectively.

The Cronbach Alpha coefficient or the coefficient of reliability and Pearson's coefficient of correlation of the two scales 'Principals implementation of ICT scale' and 'Teachers implementation of ICT scale' is shown in the table (3.7) below:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the scale</th>
<th>No. of Statements</th>
<th>Reliability coefficient</th>
<th>Pearson's correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Principals' Implementation of ICT Scale (PIICT)</td>
<td>18</td>
<td>0.79</td>
<td>.680*, .728**, .774**, .572*, etc.</td>
</tr>
<tr>
<td>2.</td>
<td>Teachers' Implementation of ICT Scale (TIICT)</td>
<td>20</td>
<td>0.89</td>
<td>.416**, .547**, .541**, .594**, etc</td>
</tr>
</tbody>
</table>

**Correlation coefficient significant at 0.01 level
*Correlation coefficient significant at 0.05 level

The Cronbach Alpha coefficient or the coefficient of reliability of different scales used in the present study is shown hereunder in the table that follows.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name of the scale</th>
<th>No. Statements</th>
<th>Reliability coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Principals' Attitude Towards ICT Scale (PATICT)</td>
<td>25</td>
<td>0.82</td>
</tr>
<tr>
<td>2.</td>
<td>Teachers' Attitude Towards ICT Scale (TATICT)</td>
<td>30</td>
<td>0.71</td>
</tr>
<tr>
<td>3.</td>
<td>Principals' Implementation of ICT Scale (PIICT)</td>
<td>18</td>
<td>0.79</td>
</tr>
<tr>
<td>4.</td>
<td>Teachers' Implementation of ICT Scale (TIICT)</td>
<td>20</td>
<td>0.89</td>
</tr>
</tbody>
</table>

### 3.8.3 Document analysis

Documentation was not the focus of this study. In order to gain a broad insight into the background of Information and Communication Technology scheme in schools and implementation of ICT in secondary schools of Jammu Kashmir and Uttar Pradesh the investigator analyzed documents emanating from different perspectives: (a) national governmental documents like Census 20011 and Indian statistics; (b) the DISE Reports; (c) National Policy on Information and Communication Technology (ICT) in School Education (Revised Draft 2011); (d) Reports from Department of School Education and Literacy Ministry of Human Resource Development Government of India; and (e) documents of Project Monitoring and Evaluation Group. These documents, called archival records (Nachmias and Nachmias, 1987) were obtained either online, or were hard copy documents obtained from government departments or from the Internet. These documents of the government of India on Information and Communication Technology in education were verified by the investigator to ascertain the rationale for the current study. These documents acted as information sources and were used to justify research aims and a means of triangulating data collected from scales.
3.9 The pilot sample

The most important phase in the development of research tool was the piloting stage. Bell (2005) stated that,

"all data gathering instruments should be piloted to test how long it takes recipients to complete them, to check that all questions are clear and to enable the researcher to remove any items that do not yield usable data" (p. 84).

In pilot study of the current study, twenty schools were randomly selected from the target population, ten from Jammu and Kashmir and ten from Uttar Pradesh. Secondary school Principals and teachers of these twenty schools were the respondents. They were requested to respond to the draft scales. The pilot sample helps in validation and standardization of the research tool by identifying possible ambiguities in both content and language. The tools so prepared can be used for the collection of main data from the main sample. It also helped the researcher to form an idea of the time required to complete the scale and to anticipate any problems likely to be encountered during the main data collection. Respondents were also asked to give suggestions or comments if any regarding the research tools. After analysis of the pilot responses to the scales, the research tools were reproduced for administration to the main sample. In this way the discrepancies if any were removed from the research tools.

3.10 Validity and Reliability

Silverman (2004) states: "validity and reliability are two important concepts to keep in mind when doing research, because in them the objectivity and credibility of research are at stake." Validity is more imperative and comprehensive than reliability, as it is harder to evaluate or measure (Ary et al., 2002). The validity and reliability is elaborated in the section that follows:

3.10.1 Validity

A major concern in research is the validity of the procedures or data gathering tools. According to Gay & Airasian (2000), validity is that quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure. The idea of validity rests on the extent to which research data and the methods for obtaining data are deemed accurate, honest and on target (Descombe, 2000). Validity
addresses the question of whether one is measuring suitable indicators of the concept, accuracy of the results and the extent to which an instrument measures what it was meant to measure (Dambudzo, 2005). Among various types of validity, the main ones are; face validity/ content validity and construct validity. The current study focused mainly on face/ content and construct validity as briefly explained in the sections that follow.

3.10.2 Face/ content validity

Face/ content validity are taken sometimes synonymously. Face validity is less systematic than content validity (Saunders et al., 2007). Content validity involves confidence that items comprising the measuring instrument are representative of the field which they intend to serve (Crowe, 2004). In the current study, the researcher used four research tools and each tool was designed in a way as to include the suitable statements necessary for measuring the secondary school Principals and teachers’ attitude towards ICT and the level of ICT implementation. In order to determine face/content validity, the researcher specified the domain of variables under investigation. Then the investigator handed over these tools to different experts so that the validity may be ensured. These experts included linguistic experts, measurement experts and subject experts. The experts verified face/ content validity of all the four scales one by one.

3.10.3 Construct validity

Validity which is nonfigurative, intangible and multifaceted is known as Construct validity. A research tool is said to possess construct validity to the degree that it confirms to predicted correlations with other speculative propositions. In order to check the construct validity of all the four research tools used in the current study, the investigator calculated correlation between the scores of each statement and the total score of the research tool. The correlation coefficient of all the research tools were found significant which indicated that all the tools related to different variables possessed good construct validity.

3.10.5 Reliability

According to McMillan and Wergin (2002) reliability refers to, “the degree of error that exists when obtaining a measure of a variable. No measure or instrument is perfect; each will contain some degree of error. The error can be because of
individual (general skills, attitudes, motivation) or because the way the instrument is
designed and administered. Reliability is the estimate of the error in the assessment”.
The two researchers studying a single setting may come up with different data and
produce different findings (Saunders et al. 2007). Both studies can be reliable, but the
reliability of one or both studies would be questioned if they yield incompatible
results. Reliability therefore addresses the question: “Will two researchers
independently studying the same setting or subject come up with same findings?”
Reliability is essential to the effectiveness of any data gathering procedure. In support
of this, Gay and Airasian (2000) noted that reliability is the degree of consistency that
the instrument or procedure demonstrates.

The reliability was an important concern in the present study because
reliability is a necessary condition for validity and consequently without reliability
there can be no valid results (McMillan & Schumacher, 2001). An instrument for
example, a scale or a questionnaire is said to be reliable to the extent that independent
administrators of it or a comparable instrument, consistently yield similar results
(Saunders et al., 2007). Thus, the more reliable the tools, the more reliable and
dependable the results will be. There are several procedures for establishing reliability
of the research tool such as Cronbach’s Alpha technique, test re-test and split-half
methods; the Cronbach’s Alpha technique is the most commonly used in educational
research. In the current study, the Cronbach’s Alpha technique was employed.

3.1.1 Administration of research tools
The administration of research tool is one of the important steps in the
research process. One cannot get the reliable results without administration of
research tools. The research tools used in the present study were self-administering
scales. The investigator sought permission from the concerned District Education
Officer (DEO) or Chief Education Officer (CEO) who directed the secondary school
Principals to cooperate and provide the necessary support and information to the
investigator. Latter on the researcher got a list of secondary schools from the office of
the District Education Officer or Chief Education Officer and after identifying the
secondary schools the investigator visited these institutions by his own. While visiting
these institutions the concerned Principals were contacted and the purpose of the
research study was thoroughly explained to them. The respondents in the present
study were secondary school Principals and teachers. So all the Principals of selected secondary schools were contacted and the teachers were selected through random number tables. In order to get the right information the investigator explained the research tools briefly to the subjects and they were requested to go through the instructions carefully and ask the investigator if any difficulty was felt in understanding the instructions given in each scale. It was indicated in the scales that there is no right or wrong answer but the subjects had to represent their level of agreement or disagreement. The subjects were given full assurance that their responses will be kept confidential and the information they will reveal through their responses will be used for research purpose only.

3.12 Data Processing

Data processing was carried out for each of the scales. The processing was done for quantitative data using descriptive and inferential statistics. Responses from all the respondents to all the statements of all the scales were analyzed to facilitate coding processing and entered into the computer for further analysis. Keeping in view the objectives and hypothesis of the study and nature of data, the data-processing exercise started with the coding of all the responses obtained to facilitate easy analysis using the advanced Statistical software Package for Social Sciences (SPSS V.20). A comprehensive data sheet was prepared with proper coding of the dependent Variable (Implementation of ICT) and independent variable (secondary school Principals and teachers attitude) taking care of the requirements of the SPSS package. After the data was fed in the software worksheet, a master codebook was designed to ensure that all the scales were coded uniformly and crosschecked to find out and eradicate the mistakes.

The ‘Principals attitude towards Information and Communication Technology scale (PATICT)’ and ‘Teachers attitude towards Information and Communication Technology scale (TATICT)’ (Appendix A and Appendix C respectively) had (25) and (30) statements respectively in total for quantitative analysis; this analysis was done for assessing the secondary school Principals and teachers attitude towards ICT which partly described the nature of respondents. The scales ‘Principals attitude towards Information and Communication Technology scale (PATICT)’ and ‘Teachers attitude towards Information and Communication Technology scale (TATICT)’ were analyzed
as an index on a Likert scale as 1-strongly disagree, 2-disagree, 3-undecided, 4-agree, 5-strongly agree.

The 'Principals implementation of Information and Communication Technology scale (PHICT)' and 'Teachers' implementation of Information and Communication Technology scale (THICT)' shown in (Appendix B and Appendix D respectively) set out to determine the level of implementation of ICT in secondary schools of Jammu and Kashmir and Uttar Pradesh in India consists of (18) and (20) statements respectively for analysis. The implementation of ICT by the Principals was analyzed as an index on a Likert scale as 1-strongly disagree, 2-disagree, 3-undecided, 4-agree, 5-strongly agree. The implementation of ICT by the teachers was analyzed as an index as follows: 3-fully, 2-partially, 1-no.

The percentage, mean, standard deviation, t-test (Paired sample t-test and One sample t-test), Pearson's Product moment Correlation and 2x2 Factorial Design ANOVA were used to analyze the data. T-test is a statistical technique used to compare the differences between the means of two groups. All data was analyzed at a level of 95% or $\alpha = 0.05$ and degree of freedom depending on the particular case as was determined. The value $\alpha = 0.05$ has been chosen because the sample size is adopted from calculated figures based on 0.95 level of confidence. The statistical and documentation results are presented in the chapter that follows.

3.13 Conclusion

This chapter presented a detailed description of the research strategy developed and used in the present study. The chapter focused on the theoretical purpose and justification of the research approach followed, methodology chosen, ethical considerations, data gathering techniques and an explanation of the data processing method used. Techniques of sampling, validity and reliability were described and explained. The data analysis methods used for quantitative and qualitative data in the current study were explained.
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http://www2.chass.ncsu.edu/garson/pa765/reliab.htm


