Chapter 4

METHODOLOGY

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METHODOLOGY

4.1 Methodology: A Guideline

Research Methodology describes various steps of the plan of attack to be adopted in solving a research problem such as the manner in which the problems are formulated, the definition of terms, the choice of subjects for investigation, the validation of data gathering tools, the collection, analysis and interpretation of data and the process of inferences and generalization. Methodology is defined by O’Leary (2011) as overarching, macro-level frameworks that offer principles of reasoning associated with particular paradigmatic assumptions that legitimate various schools of research. Methodologies provide both the strategies and grounding for the conduct of the study.

Research methods are of utmost importance in a research process. A method is the way of approaching the problem. It is the micro-level techniques used to collect and analyze data (O’Leary, 2011). A pre-planned and well-described method will provide the researcher a scientific and feasible plan for attacking and solving the problem under investigation. The selection of a method and the specific design within that method appropriate to the research problem will depend upon the nature of the problem and upon the kind of data. The validity and reliability of the research findings also depend on the method adopted for the research work.

4.2 Method Adopted for the Study

The major objective of the present study is to conduct an experiment to find out the effectiveness of certain Inclusive approaches to overcome the exclusion of Pupils with LD from the teaching-learning environment in the Inclusive classrooms. Bender (2008) asserts that Differentiated instruction provides one of the most effective models for inclusion of students with learning disabilities that is currently available. So the Investigator decided to conduct a study to ascertain the relative effectiveness of two types of Pedagogy, Inclusive Differentiating Instructional Approaches (IDIA) and Existing Activity Method of Instruction (EAMI) in enhancing the Academic Achievement in Basic Science and for improving the Self
Chapter 4

Concept and Achievement Motivation of pupils with LD and Non-Disabled Pupils in an Inclusive Classroom at Upper-Primary Level.

So the current research study was experimental in nature. Experimentation is the most sophisticated exact and powerful method for discovering and developing an organized body of scientific knowledge which attempts to provide a precise answer to a precise question.

This multistage process of investigation demands the use and embossing of mixed methodology integrating both quantitative and qualitative approaches. Mixed method is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches for the broad purposes of breadth and depth of understanding and corroboration (cited in Tashakkori and Teddlie, 2010). It is the combination of applying qualitative and quantitative techniques in a single research study. (Mangaleswaran, 2011). This method has particular value when a researcher is trying to solve a problem that is present in complex educational or social contexts. (Teddlie and Tashakkori, 2009 as reported by Mertens, 2010). The combination of two different methods can create a synergistic research project whereby one method enables the other to be more effective, and, together both methods provide a fuller understanding of the research problem.

4.3 Design Selected

The research design is a systematic structure of research, which is prepared for formulating the research study. It is taken as a tentative plan, which guides the researcher in order to go in depth into the research. Methodological design is basically the study’s blueprint and as such will comprise elements that are as broad as questions related to paradigm, and as specific as questions dealing with the nuts and bolts of who, where, when, how and what. Credible research design requires more than just the adoption of data collection and data analysis methods. It requires that such methods are nested within more macro-level frameworks, or methodologies, that work in concert with methods to provide researchers with a voracious design that can stand up to the highest level of scrutiny. (O’Leary, 2011). In this study the Investigator adopted the Pre-Test Post-Test non-equivalent groups design. The groups exposed to Experimental treatments were the Intervention groups and the other group exposed to
the Existing Activity oriented treatment was the Control group. At first, the Pre tests were administered among the selected groups and subsequently they were randomly assigned to the expected procedures. A schematic representation of the research design of the study is given in Figure 4.1

![Schematic representation of research design](image)

**Figure 4.1.** Schematic representation of the research design of the study

CX<sub>0</sub> – Represents the Pre-test scores of the Control group.

T<sub>0</sub> - Treatment given to the Control group.

CY<sub>0</sub> – Post test score of the Control group.

EX<sub>1</sub>, EX<sub>2</sub>, EX<sub>3</sub> – represents the Pretests scores of the three Experimental groups.

T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> – the treatments given to the three Experimental groups.

EY<sub>1</sub>, EY<sub>2</sub>, EY<sub>3</sub> – the Post tested scores of the three Experimental groups.

### 4.4 Variables in the Experiment

Variables are the conditions or characteristics that the experimenter manipulates, controls or observes. (Best and Kahn, 2007). They are the vital aspects of a study and are mainly of two types: Independent variables and Dependent Variables.
I. Independent variables

Independent variables are the conditions or characteristics that the experimenter manipulates or controls in his or her attempt to ascertain their relations to observed phenomena. (Best and Kahn, 2007). Selected Inclusive Differentiating Instructional Approaches (IDIA) namely Learning Stations/Centers, Tiered Lessons and Graphic Organizers and the Existing Activity Method of Instruction (EAMI) were the independent variables for the present study.

II. Dependent Variables

The dependant variables are the conditions or characteristics that appear disappear or change as the experimenter introduces, removes or changes independent variables (Best and Kahn, 2007). In the study the dependant variables were

- Academic Achievement in Basic Science
- Self Concept
- Achievement Motivation
- Continuous Academic Performance of Pupils with LD

Figure 4.2 Schematic Representation of the Variables in the experiment
4.5 Research Population and Sample Selected

O’Leary (2011) defines population as the total membership of a defined class of people, objects or events. Sampling is the process of selecting elements of a population for inclusion in a research study. Many samples attempt to be representative: that is, the sample distribution and characteristics allow findings to be generalized back to the relevant population. Sampling can also be used to represent a population with some level of ‘confidence’.

The samples selected for the study are described as follows:

(a) As part of qualitative study a survey was conducted. The population for the survey was Upper Primary General and Special teacher educators of Kerala. From that population a sample [N=100] of General and Special education Upper Primary Teachers are selected by Stratified random sampling technique from two districts of Kerala. The details of the samples are given below.

Table 4.1

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Educators</td>
<td>68</td>
</tr>
<tr>
<td>Special Educators</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

In order to check the validity of the prepared IDIA lesson transcripts, Investigator adopted the help of few Experts in the field of LD, Teacher Educators at B.Ed and M.Ed level and experts in Science subject. The details of the samples are given below
Table 4.2

Sample of Experts selected for the study

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experts in the Learning Disability Field</td>
<td>4</td>
</tr>
<tr>
<td>Teacher educators at B.Ed level</td>
<td>12</td>
</tr>
<tr>
<td>Teacher educators at M.Ed level</td>
<td>8</td>
</tr>
<tr>
<td>Experts in General Science in upper Primary Level</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
</tr>
</tbody>
</table>

(b) The aim of the study was to find out the effectiveness of **Inclusive Differentiating Instructional Approaches** on Academic Achievement in General science of pupils with LD and Non Disabled pupils in an Inclusive Class. Learning disability in a child becomes apparent when he enters primary school. Children who are at-risk for learning disabilities can benefit from help at the earliest possible moment. So the Investigator was very particular in selecting schools which includes pupils with LD as struggling learners along with Non Disabled pupils. The Investigator selected three Inclusive schools by Handpicked Sampling Technique, which involves the selection of a sample with a particular purpose in mind (O’Leary, 2011) and collected data about the pupils of 6th classes. The Population is Upper Primary Inclusive class Pupils and a sample of 467 Pupils from three schools belong to Thrissur District of Kerala. Scholastically backward Pupils were identified from this population and after applying the Inclusion –Exclusion criteria regarding the selection of Pupils with LD, 72 Pupils were identified as the struggling pupils with LD.
Table 4.3

Distribution of the Participants of the study

<table>
<thead>
<tr>
<th>SI. No</th>
<th>Name</th>
<th>Treatment</th>
<th>Ability Group</th>
<th>Total</th>
<th>Learning styles</th>
<th>Group and Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ad Gr LD</td>
<td></td>
<td>V A K</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R W A</td>
<td></td>
<td>EAMI L.S T.L G.O</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>JPE HSS Koorkenchery</td>
<td>C</td>
<td>4 26 2 3 1</td>
<td>36</td>
<td>15 10 11</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E1</td>
<td>3 28 2 3 1</td>
<td>37</td>
<td>16 10 11</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E2</td>
<td>4 26 2 3 1</td>
<td>36</td>
<td>11 14 11</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3</td>
<td>4 25 2 3 1</td>
<td>35</td>
<td>11 10 14</td>
<td>37</td>
</tr>
<tr>
<td>2.</td>
<td>CNN GHS Cherpu</td>
<td>C</td>
<td>4 31 3 2 1</td>
<td>41</td>
<td>15 12 14</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E1</td>
<td>4 34 3 2 1</td>
<td>44</td>
<td>15 19 10</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E2</td>
<td>4 33 3 2 1</td>
<td>43</td>
<td>17 11 15</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3</td>
<td>4 33 3 2 1</td>
<td>43</td>
<td>17 10 16</td>
<td>44</td>
</tr>
<tr>
<td>3.</td>
<td>H.F.C G.H.S S Cheruppakavu</td>
<td>C</td>
<td>3 30 4 2 0</td>
<td>39</td>
<td>15 13 11</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E1</td>
<td>4 29 3 2 1</td>
<td>39</td>
<td>18 10 11</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E2</td>
<td>3 27 3 2 1</td>
<td>36</td>
<td>15 10 11</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3</td>
<td>4 28 4 2 0</td>
<td>38</td>
<td>15 11 12</td>
<td>39</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>45 350 34 28 10</td>
<td>467</td>
<td>180 140 147 116 113 116 120</td>
<td></td>
</tr>
</tbody>
</table>

The Inclusion and Exclusion criteria for the Identification of Pupils with Learning Disability

There is no one sign that shows a person has a learning Disability. Generally, experts look for a noticeable difference between how well a student does in school and how well that student could do, given the child’s intelligence or ability. Inclusionary criteria was to ensure that the children included in the study had difficulties when assessed on the basis of the test and the exclusionary criteria was used to eliminate children experiencing learning problems other than Learning Disability. To identify the pupils with LD, the Investigator consulted with experts regarding inclusion-exclusion criteria and also referred relevant literature. Keeping all the above in mind, the Investigator set the inclusion-exclusion criteria for the present study.
Criteria set for identification of pupils with LD

**Inclusion criteria:** These are the criteria selected for treating the learners to participate as a part of the study

1. Studying in regular schools under state.
2. Children who comes under Learning Disability category as per screening schedule.
3. Children who have average or above average Intelligence.
4. Children without sensory handicaps
5. Children without any apparent emotional disturbance
6. Children of age between 11-13
7. Children who may have scholastic backwardness
8. Children who have difficulties in Reading, Writing and Arithmetic

**Exclusion criteria:** These are the criteria which is not applicable to the learners so that they cannot treat as a part of study

1. Children who do not come under Learning Disability category as per Screening schedule.
2. Children who have below average Intelligence
3. Children having sensory handicaps
4. Children with apparent emotional disturbances
5. Children less than 11 and more than 13 years of age
6. Children who are absent frequently in school
7. Studying in other than regular school under state syllabus
8. Children who have no difficulties in reading, writing and Arithmetic

**4.6 Phased Implementation of the investigation.**

This multistage process of investigation was conducted in four stages. Accordingly all the stages were planned systematically. A schematic design of the phases employed in the study by the Investigator is given in Figure 4.3
Figure 4.3 Schematic Design of the Phases employed in the study.
A description regarding the phased implementation is given below.

**Phase I: Initiation** phase of the study was meant for determining whether the educators displayed the Dispositions, Knowledge & Skills necessary to implement in Inclusive Classrooms. The survey addresses the teacher Dispositions towards an inclusive environment and teacher knowledge & skill level specific to the differentiated classroom. List of schools selected for conducting survey is given in Appendix A. The differentiated curriculum model was chosen because it focuses instruction on classrooms with mixed ability groups (Tomlinson, 2001). The survey was conducted among Upper Primary level Teacher Educators. A representative sample of 100 Upper Primary Level General and Special Teachers responded to a Scale of Dispositions and Knowledge & Skills for Inclusion. (Appendix D)

**Phase II: Preparation**

By synthesizing the ratings, opinions and interpretations of, the Disposition scale, the Investigator reified and selected three **Inclusive Differentiating Instructional Approaches** for transacting General science at Upper Primary Inclusive Class which includes pupils with LD as Struggling pupils along with Grade level and Advanced Pupils. Investigator prepared **three Inclusive Differentiating Instructional approach (IDIA)** Lesson Transcripts based on **Learning Stations/Centers, Tiered lessons and Graphic Organizer**. (Appendices K, L & M) The prepared IDIA lesson transcripts were submitted to few experts in the field of LD, Teacher educators at B. Ed and M. Ed levels and General Science Teachers at Upper Primary Level for an educational discourse by administering a Judgment Schedule (Appendix E) and the evolved modifications were accommodated.

**Phase III: ‘Knowing the Learner’**.

The next important step taken by the Investigator was ‘knowing the Learner’ by collection of data about pupils. Since the aim of the study was to find out the effectiveness of **Inclusive Differentiating Instructional Approaches** on Academic Achievement in General science of pupils with LD and Non Disabled pupils in an inclusive Upper Primary class, the Investigator was very particular in selecting schools which includes only pupils with L D as Struggling Pupils along with
Non Disabled pupils. So the Investigator selected 3 Inclusive schools and collected data about the Pupils of 6th classes. For that at first the Investigator collected the previous year’s academic scores of the pupils. From that 102 scholastically backward pupils (marks less than 30%) were screened out. To find out the pupils with LD of the class a Screening Test was administrated to the Scholastically Backward pupils. After screening pupils with LD, Raven’s intelligence test was administrated to find out the achievement intelligence discrepancy to confirm LD among the screened pupils. To again confirm the particular difficulty present in the child, the Investigator prepared and distributed a checklist for Reading, Writing and Arithmetic difficulties to the teachers of the screened pupils with LD. From the remaining group of pupils those pupils who have scored 80% and above in all the subjects were grouped as Advanced Level Pupils and the rest as Grade Level Pupils. The Investigator also administrated a learning style inventory for the Upper Primary level pupils (N=467) of the selected schools to find out the preference based on the sensory modalities. After getting response of learners on the Learning style inventory, the frequencies of each response on each item was counted. The learner who has maximum frequency response for a particular style considered as having that specific type of learning style (Visual, auditory and kinesthetic). Thus the researcher calculated the proportion of different types of learners with regard to their learning preferences for getting an awareness of pupils having different learning styles, which is an essential need for the differentiated classroom.

**Phase IV: Experimentation**

During the last stage of the study, the Investigator adopted experimental procedure with the following end in view:

- Testing the effectiveness of the selected **Inclusive Differentiating Instructional Approaches** namely, Learning Stations/Centers, Tiered Lessons and Graphic Organizer with reference to the Academic Achievement in the General Science, Self Concept and the Achievement Motivation of all the three types of the learners.
• Comparing the effectiveness of the selected Inclusive Differentiating Instructional Approaches namely, Learning Stations/Centers, Tiered Lessons and Graphic Organizer with reference to the Ability Grouping, Learning Styles and Type of Disability.

For this purpose, three Experimental groups (I, II and III) and one Control group were selected. After administering the Pre-Tests (Achievement Test, Self Concept scale, Achievement motivation Scale) to all the learners, Group I was taught using the Inclusive Differentiating Instructional Approach based on Learning Stations/Centers, Group II with Inclusive Differentiating Instructional Approach based on Tiered Lessons and Group III with Inclusive Differentiating Instructional Approach based on Graphic Organizer, where as the Control group followed the Existing Activity Method of Instruction (EAMI). Curriculum Based Assessment (CBA) was also administered for the pupils with LD in the experimental group to assess their progress continuously, so that the Investigator can cater their instructional needs to Differentiate Instruction in each class. At the end of the treatment, the Post-Tests were administered over each group in order to assess the effectiveness of the select Inclusive Differentiating Instructional Approaches namely, Learning Stations/Centers, Tiered Lessons and Graphic Organizer on the Academic Achievement, Self Concept and Achievement Motivation of Upper Primary Inclusive Class pupils.

4.7 Data Gathering tools used in the study

The select Tools and Materials developed for gathering data have been classified under four phases namely Initiation phase, Preparation phase, ‘Knowing the Learner’ phase, and Experimentation phase and the rationale for using the tools were presented in Table 4.4.
Table 4.4.

Summary of Data Gathering Tools across all Phases and Rationale for their Use.

<table>
<thead>
<tr>
<th>Phases of the Study</th>
<th>Data Gathering Tools</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Initiation phase</td>
<td>• Scale of Dispositions and Skills for Inclusion.</td>
<td>To assess the teacher dispositions, knowledge and skills for inclusion</td>
</tr>
</tbody>
</table>
| II. ‘Knowing the Learner’ phase | • Screening Schedule for LD  
• Ravens matrices for intelligence  
• Check Lists for Reading, writing and Arithmetic difficulties  
• Learning Style checklist | To screen out the pupils with LD in the class and to analyze learner preferences. |
| III. Preparation phase       | • IDIA lesson Transcript (Learning Stations/Centers  
• IDIA lesson Transcript based on Tiered Lessons  
• IDIA lesson Transcript based on Graphic Organizer  
• Judgment schedule | To judge the efficacy of the prepared IDIA Lesson Transcripts             |
| IV. Experimental phase       | • IDIA lesson Transcripts based on (Learning Stations/Centers Tiered Lessons, Graphic Organizer)  
• EAMI lesson Design  
• Achievement test in general science  
• Self Concept Scale  
• Achievement Motivation Scale  
• Curriculum Based Assessments | To find out the effectiveness of the inclusive differentiated lesson designs in the inclusive class setting.  
To check whether there is improvement in Achievement, Self Concept and Achievement Motivation among pupils.  
To assess the Continuous Academic Progress of pupils with LD |
The ‘Initiation phase’ was intended to build a background for the conduct of the study by analyzing the Dispositions, Knowledge & skills of General and Special Teachers of Upper Primary Schools by conducting a survey and administering a Scale for Inclusion among the Teachers.

The second Phase, ‘Knowing the Learner’ is one of the important phases as far as the Differentiated Instruction is concerned. In order to know the Learners ability group, Learning Styles and Type of disability for effectively implementing Differentiated Instruction, Investigator made use of many Tools. Learning Style checklist, Screening Test for Learning Disability, Ravens Matrices for Intelligence and Check Lists for Reading, Writing and Arithmetic difficulties are the tools administered in this phase.

The ‘Preparation’ phase focuses on preparing three Inclusive Differentiated Instructional Lessons (Learning Stations, Tiered Lessons and Graphic Organizers) for transacting Upper Primary General Science curriculum. For validating the feasibility of the prepared lessons, the Investigator administered a Judgment Schedule for the same.

The fourth is the Experimentation phase. The experimental groups were given the intervention according to the prepared IDIA lesson transcripts and the control group was given the intervention with Existing Activity Method of Instruction. Also to ascertain the outcome of these Lesson transcripts, an achievement Test, self Concept Scale and Achievement Motivation scale were used. Curriculum Based Assessments were done for pupils with LD of experimental groups to continuously monitor their progress.

**Description of the tools**

**4.7.1 Scale of Dispositions and Knowledge & Skills for Inclusion.**

In the context of present study, for framing a landscape of investigation a scale to determine whether the teachers displayed the Dispositions and Knowledge & Skills necessary to implement in the Inclusive Classes was administrated with a select
sample of 100 Upper primary General teachers and Special education resource teachers from schools in Thrissur and Ernakulam districts of Kerala. It is important to know the status of Knowledge, Skills and Dispositions that are needed to enable teachers to practice inclusive education appropriately.

The Scale of Dispositions and Knowledge & Skills for Inclusion is distributed to the teachers consists of three sections. Basic demographic of the respondents including gender, age range, state certification whether general or special education, grade level taught and current employment status were requested in the first section of the scale. Section II of the scale includes 15 statements that focus on the teacher’s Dispositions and readiness for inclusion. This section stresses teacher attitudes for inclusion. Each statement uses a Likert scale with values ranging from 1 (strongly agree) to 5 (strongly disagree). Section III of the scale was designed to examine specific knowledge, skills and strategies that the respondents may implement in the classroom. The skills determined are appreciated approaches to the differentiated classroom, a model for meeting the varied needs of a diverse population in the classroom. Fifteen statements were posed with a Likert- style scale ranging from 1 to 5 based on the frequency of the teacher’s usage of each strategy. A score of 1 indicated most frequent use 5 indicated either disuse or a lack of understanding of the strategy. This information enabled to compare similarities and differences between those professionals trained as Special and General Teachers, on ones’ Dispositions, Skills and Knowledge for inclusive education.

Construction and standardization of Scale of Dispositions and Knowledge & Skills for Inclusion

Construction and standardization of Survey scale involves the following steps.

1. Planning

During the planning stage the Investigator studied some of the available materials in the area of Disposition Scale construction. The informal criteria of editing the statements by various researchers in the field of psychological measurements like Edward and Kilpatrick (1940), Thurstone and Chave (1956), Likert (1932) was reviewed thoroughly. The attitude scale prepared by Thankam (2009) was reviewed
by the Investigator in order to get an insight into the constructs for preparing Dispositions scales.

It is important to know the Skills, Knowledge and Dispositions that are needed to enable teachers to practice inclusive education appropriately. The term ‘Disposition’ is defined as the propensity of an individual to behave in a certain manner based on a specific belief system. Specifically, we are evaluating teachers’ Dispositions related to including students with special needs in general education programmes. The standards related to individual learning differences, learning environments, social interactions, assessment and collaboration reflect skills needed by special educators both in an inclusive environment as well as in segregated special education programmes (Council for Exceptional Children 2003). The investigator decided to select these constructs for constructing the Disposition Scale. They are;

1. Accepting Individual differences
2. Creating appropriate learning environments
3. Maintaining proper social interactions
4. Willingness to collaborate

Those statements regarding the level of Skills and Knowledge teachers have for meeting the varied needs of students were based on the work of curriculum differentiation (Heacox 2001; Tomlinson 2001). The investigator decided to select these constructs for constructing the Knowledge and Skills part of the Scale. They are;

1. Flexible grouping
2. Building safe environment
3. Varying instructional strategies
4. Multiple assessment practices

The draft scale was prepared with twenty statements each for Dispositions and Knowledge & Skills for inclusion. Adequate numbers of positive and negative statements were included. To each Dispositions statement the respondent has to mark the responses which may reveal the degree of agreement or disagreement towards that particular disposition and whether use the skill often or rarely basis for the knowledge and skills for inclusion part of the scale.
2. Preparation of the Scale

For the preparation of statements the Investigator collected all possible information through related literature, conducted formal and informal interviews with teachers in inclusive set-up, other experts in the field and research workers. The investigator took a lot of efforts to select the statements that are believed to cover the entire attributes. While editing the items, the Investigator took care to avoid factual statements, statements which could be interpreted in more than one way, statements likely to be endorsed similarly by everyone and statements in compound sentences. More or less equal weightage was given to all the constructs planned for Dispositions and Skills parts of the scale. It was decided to include provisions for indicating the degree of agreement or disagreement or for indicating the often or rarely usage of the skills of the respondents on a 5 point scale in the same scale for marking the responses of the subjects.

3. Pilot Testing

In order to finalize any instrument, the items of the tool should be tried out with a small group in pilot run (Wiersma, 1986). The draft scale was administered on a small group of Upper Primary General and Special Teachers. It was done with a view to getting feedback so that necessary corrections and restructuring of the items could be made. On the basis of the feedback from pilot testing, changes in the language and structure of the statements were made and an estimate of the time required to complete the marking of responses were obtained.

Construct- wise distribution of the statements and weightage given to each construct in the draft tool is given in Table 4.5
Table 4.5

*Construct-wise Distribution of the Statements of Dispositions for Inclusion in the Draft Tool*

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Constructs</th>
<th>Statement No.</th>
<th>No.of Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Accepting Individual differences</td>
<td>1,2,4,14,16</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Creating appropriate learning environments</td>
<td>7,9,10,12,15</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Maintaining proper social interactions</td>
<td>3,13,18,19,20</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Willingness to collaborate</td>
<td>5,6,8,11,17</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.6

*Construct-wise Distribution of the Statements of Skills for Inclusion in the Draft Tool*

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Constructs</th>
<th>Statement No.</th>
<th>No.of Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flexible Grouping</td>
<td>2,3,8,12,18</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Building Safe environments</td>
<td>5,11,19,15,16</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Varying Instructional Strategies</td>
<td>6,7,9,13,20</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Multiple assessment practices</td>
<td>1,4,10,14,17</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td></td>
</tr>
</tbody>
</table>

4. **Scoring**

The responses were recorded along a 5 point scale, and the scoring adapted for the scale is as follows. For positive statements, scores 4,3,2,1,0 were given for marking responses Strongly agree, agree, neutral, disagree, and strongly disagree respectively. Reverse scoring procedure was adopted in the case of negative statements.
5. Try out and Finalization of the Tool

The draft tool was tried out on a sample of 60 upper primary school teachers from various schools of Thrissur and Ernakulam districts of Kerala. All response sheets collected were scored as per the scoring procedure explained. The scores given to each item was summated to yield the total score. Finally 50 response sheets were randomly selected for item analysis.

6. Standardization of the Tool.

The Investigator used the following procedure in order to standardize the tool.

Item Analysis

Statements were selected for the final scale on the basis of discriminating power of each item. The discriminating power of each item was calculated on the basis of ‘t’ value of item. The method is as follows.

The response sheets were scored using the scoring scheme as described earlier. The scores obtained for each item and the total score for each individual were marked. On the basis of the scores obtained, the response sheets were arranged in the descending order. Then the top 14 and bottom 14 response sheets were taken as High and Low groups respectively. The number of subjects marking SA, A, N, DA and SDA for each item was calculated and presented in the form of a frequency table. For each item the mean and standard deviation of the scores were then found out. The ‘t’ value of each item was calculated. The draft form of the Scale of Dispositions and Skills for Inclusion and the obtained ‘t’ value of each statement in the draft scale are given in Appendix B, and Appendix C respectively.

A statement with ‘t’ value greater than or equal to 1.96 considered to be good item for measuring the Dispositions and Skills. Thus 15 statements each for Dispositions and Skills were selected for the final tool. The final form of the Dispositions and Skills for Inclusion is given in Appendix D. Details of construct-wise distribution of the statements and weightage given to each construct in the final tool are given in Table 4.7.
Table 4.7

**Construct-wise Distribution of the Dispositions Statements in the Final Tool**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Constructs</th>
<th>Statement No.</th>
<th>No.of statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Accepting Individual differences</td>
<td>1,9,10,12</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Creating appropriate learning environments</td>
<td>2,7,11</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Maintaining proper social interactions</td>
<td>3, 14,15</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Willingness to collaborate</td>
<td>4,5,6,8,13</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

Table 4.8

**Construct-wise Distribution of the Statements of Skills for Inclusion in the Final Tool**

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Constructs</th>
<th>Statement No.</th>
<th>No.of Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flexible Grouping</td>
<td>2,3,13</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Building Safe environments</td>
<td>5,10,14</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Varying Instructional Strategies</td>
<td>6,7,8,11,15</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Multiple assessment practices</td>
<td>1,4,9,12</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>15</strong></td>
</tr>
</tbody>
</table>

7. **Validity of the Scale**

According to joint committee on Standards for Educational and Psychological Testing (1999), different types of tests are used for different purposes and therefore need different types of validity evidence. Attitude or Dispositions scales are based on psychological theory or construct. Therefore evidence for content and prediction are necessary.

The Scale of Dispositions and Skills for Inclusion was prepared on the basis of theory of construction of attitude scale by Likert. The investigator selected the constructs essential for including in an inclusive class setting. The statements
representing the universe of interest were prepared from an extensive review and also by asking the subjects to write short description of their feelings about the constructs. Due care was taken to avoid statements which may be given particular interpretation by the individual themselves. Hence, it is assumed that the scale has construct validity.

Maximum effort was taken to avoid statements which are factual and statements with complexity in comprehending language. Each statement was so written as to reveal the subject’s Disposition and Skill. Through these efforts the Investigator was able to establish face validity.

8. Reliability of the Scale

A test is reliable to the extent that it measures whatever it is measuring consistently. In tools that have high coefficient of reliability, error of measurement has been reduced to minimum. Reliability tests are stable in whatever they measure and yield comparable scores on repeated administration. The reliability of attitude scale was established through test-retest method. The scores of attitude scale were correlated with scores of retest administered after one week. The reliability coefficient obtained was 0.924 (N=30). This index suggests that the scale is highly reliable.

4.7.2 Screening Schedule for Learning Disability

Investigator adopted the Association for Learning Disability, India Screening Schedule (ALDISS) to screen those children with learning disabilities, prepared by Joseph (1996).

Screening is the first step in the process of gathering relevant information about an individual with a suspected learning disability. Screening does not determine whether or not the person has a learning disability. It may include observations, informal interviews, the use of a written tool, and/or a review of medical, school, or work histories. It helps to detect pupils who may need a more comprehensive examination. In screening students in a particular grade, school or district is given a cursory test to ascertain those who need a more intensive evaluation. Here screening test is used to screen and identify children who are exhibiting delays and experience learning problems.
Test Description

The test consists of three Questionnaire Parts. Part A is used to collect the basic nature of child’s problem. Part B consists of Questions to check the conduct disorders of the child. Part C helps us to reach comparatively right inference about child’s Learning Problem. For the present study purpose Investigator omitted part B and made use of only the Part A and Part C of the ALDISS to screen out the Learning Disabled children. In the present study, screening has two major roles. The first role is to identify high risk children and design intervention procedures. The second role is to minimize the risk of exposing children to academic failures when they enter formal academics. The screening test adopted for this study is meant for identifying students belonging to standards V and VI.

Test administration

Assistance from Teachers and Parents of 102 Scholastically backward students selected were sought for identification of such students with Specific Learning Disabilities. Necessary instructions were given to the teachers to note down the information about the children’s problems.

Scoring Procedure of the Test

In Part A, If the answer to the Question no.1 is ‘d’ (worse) or ‘e’ (worst) and the answer to the question no.2 is ‘b’ (yes), then it is inferred that the Child is having low IQ or there is a lag in basic knowledge and readiness skills.

If the answer is ‘Yes’ i.e. ‘b’ for the questions 5, 6, and 10 of Part A , then there is a chance of Learning Disability in the child. In order to arrive at an inference about the disability, in addition to this, Part C questions would help. If at least three answers are ‘yes’ among the questions 5,9,10,13,17,20,21,24,36,41 and 42, the child can be categorized as Learning Disabled., or if at least seven answers are ‘yes’ among the questions 1,2,3,4,6,7,12,14,16,22,23,25 and 28, then the Learning Disability can be the reason for his scholastic backwardness. If at least five answers are ‘yes’ among the questions 29,30,31,32,33,34,37,39 and 40 , then it indicates lack of motor coordination. And the child may be a slow learner if the answers to three questions among 8,11,15,29 is ‘yes’.
A sample copy of the ALDISS is given in the Appendix F.

4.7.3 Checklist for Reading, Writing and Arithmetic Difficulties

The checklist was prepared in consultation with the experts working in the field of Association for Learning Disabilities, India (ALDI), and Special educators (List of experts is attached as Appendix V). Check list helps teachers to observe children and record their performance in various areas and identify the difficulties faced by them. This test assesses skills needed by children to succeed in school.

The preliminary check list contains 45 questions. The questions were prepared by giving due weightage to the noted symptoms of Reading, Writing and Arithmetic Difficulties of Learning Disabled students. The questions concentrate on the main features like Reversal, Substitution, Omission and addition of words or letters, organizing problems, putting language to math processes, math concept rules etc. It also consists of statements related to symptoms of Reading, Writing and Arithmetic Difficulties. There are 15 statements each related with Reading Difficulty, Writing Difficulty and Arithmetic Difficulty. This draft checklist was distributed among 10 expert teachers to check the ambiguity of the statements included. As per their suggestions, 5 statements each from Reading, Writing and Arithmetic Difficulty sections were deleted. And the final test consists of 30 statements. The statements given in the checklist regarding LD symptoms were provided with Yes or No responses which score 1 & 0 respectively. Thus the total score of the checklist is 30

Administration

The check list was administered to 32 UP General and Special Teachers who are dealing with 72 pupils with LD. The report of prevalent symptoms of specific Learning Disabilities in Reading, Writing and Arithmetic, among the selected Upper Primary school pupils with LD were collected from the teachers.

Copies each of the Draft and Final forms of Checklist are given in Appendix H and Appendix I respectively.
4.7.4 Raven’s Matrices for Intelligence

The first intelligence test was developed by Alfred Binet in 1904. Intelligence is a collection of faculties including judgment, practical sense, initiative and the ability to adapt with circumstances (Binet & Simon, 1916). It is important to know that different intelligence tests are based upon different definitions of what constitutes intelligence. As a result, different tests may measure different skills and abilities. There are a number of skills that an intelligence test appears to measure – social judgment, level of thinking, language skill, perceptual organization, processing speed and spatial abilities. Intelligence test can also yield valuable information about a students’ ability to process information. Intelligence tests are more helpful when they are used to determine specific skills, abilities and knowledge that the child either has or does not have and when such information is combined with other evaluation data and then directly applied to school programming.

RPM was first introduced in 1936 by J.C. Raven. RPM is a non-verbal test of inductive reasoning based on figural stimuli. This test has been very popular in basic research and is also used in some institutional settings for the purpose of intellectual screening. The RPM is particularly valuable for supplemental testing of children and adults with hearing language or physical disabilities.

RPM was originally designed as a measure of Spearman’s ‘g’ factor. Raven’s test is actually a series of three different instruments. Even though the three forms of the RPM resemble one another, there may be subtle differences in the problem solving strategies required by each.

The coloured progressive matrices are a 36 item test designed for children from 5-11 years of age. Raven incorporated colours into this version of the test to help to hold the attention of the young children.

Factor I of the test consists largely of very difficult items and might termed closure and abstract reasoning by analogy. Factor II is labeled pattern completion through identity and closure. Factor III consists of easiest items and is defined as simple pattern completion. The very easy and the very hard items of the Coloured Progressive Matrices appear to tap different intellectual processes.
For the Coloured Progressive Matrices, split half reliabilities in the range of 0.65 to 0.94 are reported with young children producing lower values. The validity coefficient with other intelligences test ranges from 0.30 to 0.80 (A copy of the scoring sheet of the test is given in the Appendix G).

**Administration of the test**

The intelligence test was administered to the final sample of 72 students. The results revealed that all the 72 LD students belong to ‘normal or ‘above average’ intelligence group, which is a condition for a student to be Learning Disabled.

**4.7.5. Learning Style Check List**

The notion of learning styles is not new, but seems to have revived in the past few years. Learning styles theory suggests that students may learn and solve problem in different ways and that some ways are more natural for them than others. Learning style is that consistent pattern of behavior and performance by which an individual approaches education experiences. It is the composite of characteristic cognitive, affective and psychological behaviours that serve as relative stable indicators of how a learner perceives, interacts with and respond to the learning environments. Learning styles of students are determined by combination of heredity and environmental influences. Some learn most effectively those things they hear. Others learn best when they see material in writing and some students prefer considerable structure. Others learn best in a formal surrounding; some prefer an informal relaxed environment. Some can concentrate only in an environment which is completely free from disturbances; others like to learn in noisy and active environments. Some learn best when they follow intuition while others prefer to learn by following logical sequential steps.

“Learning Style is the way that the students begin to concentrate on process, internalize, and remember new and difficult academic information”. Many people can learn things that are easy for them without their learning styles but all people can learn new and difficult information better when they capitalize on their styles (Dunn and Dunn, 1993).
V A K Learning Styles

The VAK learning style is the model used in neuro linguistic programme. It uses three main sensory modalities – visual, auditory and kinesthetic to determine the dominant learning style. Learners use all three to receive information. However, one or more of these receiving styles are normally dominant. This dominant style defines the best way for a person to learn new information by filtering what is to be learnt. The concept of accelerated learning which incorporates the principles of neuro linguistic programming and multiple intelligence takes the view that each of us has a special view of learning that suites us best. If we are able to learn techniques that correspond with our preferred learning style, then that learning becomes faster, more enjoyable and more effective to integrate these styles into the learning environment. The characteristics of different learning styles are given.

Visual Linguistic:-

They prefer to learn through written language. They remember what has been written down. They like to write down directions.

Visual Spatial:-

They have difficulty with written language; they do better with charts, demonstration and videos. They visualize faces and places by using their imagination.

Auditory:-

They talk to themselves a lot. They may have difficulty with writing and reading faster. They often do better talking to a colleague or hearing what was said.

Kinesthetic:- They tend to lose concentration if there is no external stimulation or movement.

Tactile:-When listening to lectures, they may want to take down notes. They use colour high lighters and takes notes by drawing pictures or material first and focus on details.
Administration of the Learning Style Checklist

The checklist is a tool adopted from Association for Learning Disabilities India (ALDI), Thrissur, Kerala. The tool comprises statements related to visual, auditory and kinesthetic styles of various aspects like learning, spelling, handwriting, remembering, visualizing, distractions, solving problems, talking to others and getting dressed. Identifying the factors that positively impact the child’s learning may be very valuable in developing effective intervention strategies. When they are taught or asked to perform in ways that deviate from their natural style, their performance will be affected. So the Investigator has decided to administer the learning style checklist among the final sample to find out the particular learning style that is to be followed by them. Differentiated Instruction lesson transcripts are developed by the Investigator by giving due weightage to the identified learning styles. The scores obtained are tallied in the appropriate boxes given for visual, auditory and kinesthetic learning styles. (A copy of the Learning style Checklist is given in Appendix J)

4.7.6 Inclusive Differentiating Instructional Approach (IDIA) Lesson Transcripts

The mainstreaming and Inclusion movements have placed at-risk students in many classrooms, further challenging the effectiveness of whole class instruction. Inclusive service delivery for students with mild to moderate disabilities is designed to provide these students with a successful school experience comparable to that of typically developing peers. Students with mild to moderate disabilities may have average or above average intellectual ability, yet not experience school success due to the nature of their disabilities. In an inclusive delivery model, these students participate in normal classroom activities with additional supports and services as specified by the Individualized Education Program (IEP) team. Inclusive service delivery has proven successful for many students with mild to moderate disabilities in helping them achieve academically and socially.

Differentiation takes the philosophy of inclusion a step further to provide for the individual needs of all students within a general education classroom. Differentiation describes a philosophy that seeks to make education more meaningful for all students, from high achieving gifted students to those who are struggling in school (Tomlinson, 1999). Differentiation of instruction becomes an important
strategy for achieving new roles and relationships in the classroom. The inextricable link of Differentiated Instruction strategies in the context of curriculum transaction of the present study is detailed in the succeeding section.

In the present context, the Investigator conducted a survey among General and Special teachers of Upper Primary level, to ascertain the Skills, Knowledge and Dispositions of those teachers with regard to the instructional practices in the Inclusive classrooms. The conclusions arrived from the survey provide a landscape for the study. Majority of the General and Special education teachers are not well aware of the Differentiated Instructional strategies and they lack the necessary skills to implement such strategies in the Inclusive Classrooms. There are many research based strategies that can be effectively implemented in a differentiated classroom. From among them the Investigator selected and prepared three lesson Transcripts based on Differentiated Instructional practices, namely, Learning Stations/Centers, Tiered Lessons and Graphic Organizers. With the increasing numbers of students with learning disabilities (LD) educated in the general education environment, educators face the challenge of providing these students opportunities to access the general curriculum, while ensuring that they receive free and appropriate public education. Since the major purpose of the study was to include LD pupils properly without suffering from any sort of exclusion, the Investigator was very particular in selecting such strategies that can cater the needs of these pupils along with non-disabled pupils. The selected strategies serve the purpose of providing appropriate challenging activities for all types of learners to ensure active learning. The development of the lesson Transcripts was based on the Universal Design for Learning (UDL) Lesson Plan Cycle.

The UDL Cycle for Differentiating Content, Product and Process

The model of Differentiated Instruction requires teachers to be flexible in their approach to teaching and adjust the curriculum and presentation of information to learners rather than expecting students to modify themselves for the curriculum. According to (Fortini, and Fitzpatric, 2000) “Universal Design is a concept that refers to the creation and design of products and environments in such a way that they can be used without the need for modification or specialized designs for particular circumstances.” (as cited in Thousand et al., 2007). UDL is the application of these
universal design concepts to education so that curriculum can accessed without the need for specialized modifications and adaptations for particular students. UDL provides a way for educators to view diversity in students as strength instead as a problem.

Figure represents the four primary design points of the UDL Lesson Plan Cycle to Differentiate Instruction—student facts, content, product, and process. This cycle helps teachers to think about their work in a different way. After gathering information about the learners, educators think about three additional distinct “access design points”—content, product, and process (Tomlinson, 2001).

- The content access design point is focused on what is taught and what we want students to learn.
- The product access design point is focused on how students might demonstrate what is learned and how it is assessed.
- The process access design point is focused on how teachers might structure classroom-learning activities in ways that match how their students go about making sense of what they are learning.

Figure: 4.4 UDL Lesson Plan Cycle (source: Thousand et al., 2007)
The Design points are described below in detail specifying the components in each stage.

**Design point 1. Gathering Facts about the Learners**

The starting point of UDL framework is to gather facts about the diverse learners in their classroom. The process of differentiating curriculum, instruction, and assessment begins by knowing the students. Teachers applying a universal design approach must gather information about their student’s strengths, interests, learning styles, preferences and intelligences. This information helps the teachers establish a shared vision of their student’s active involvement and can reveal pertinent strategies for effective teaching, motivation and differentiation. Gathering facts about the students involves considering the form of communication through which students best accesses information.

![Diagram of Gathering Facts about Learners](image)

**Figure.4.5** Highlights of the ‘Gathering Facts about Learners’ Phase

**Design point 2: Content**

Content, the second design point is focused on two aspects, what is taught and what we want students to learn. The first aspect focuses on ‘What to teach’- the standards or goals that will be addressed in a lesson or unit. Once it is determined,
then content differentiation considerations become a priority. One differentiation consideration is focused on instructional materials. Materials are the means by which students access information and demonstrate their comprehension of content. In order to reach and teach wider range of students, Instructional materials need to be multilevel in terms of difficulty and complexity, varied in form, and multisensory. The more varied and rich the materials, the more likely the teacher will be able to spark student engagement. Another important content differentiation is the scope and degree of content mastery that we expect of students. This may vary considerably from one student to the next; that is, within any lesson or unit, there likely will be multilevel goals.

Figure 4.6. Highlights of the ‘Content’ Phase

Design point 3: Product

Connected to the content design point of what students learn is the product design point of how students demonstrate and convey their learning and how it is assessed. It requires teachers to develop and provide multiple means for students to express their understanding of the curriculum. Learning preferences information provides an important guide to thinking about the assessment and the products of learning in new ways. At the product design point, teachers consider the learning outcomes and arrange for multilevel, authentic, performance assessments. Authentic assessment occurs when students are expected to perform, produce, or otherwise
demonstrate skills that represent realistic learning demands. Curriculum based assessments, artifact collections and portfolios, individual learning contracts and demonstrations are other examples of authentic assessments. Performance assessments are open-ended, real-world applications that allow for a variety of methods or approaches for a student to achieve a “correct” response and can reflect a student’s unique experiences and interests.

**Figure 4.7.** Highlights of the ‘Product’ Phase

**Design point 3: Process**

Process, the fourth design point in the UDL cycle, is focused on how teachers might structure classroom-learning activities in ways that match their students go about making sense of what they are learning. It focuses on the instructional process so as to provide students with multiple means of engaging with the curriculum. Teachers can use a wide range of instructional processes. *Instructional formats* refer to how teachers impart information to students and how students take part in learning. *Instructional arrangements* dictate whether a student will be working alone or with a partner, operating in coordination with a small number of classmates or functioning as a part of large group. Then teachers must use research based *Instructional strategies* in the classroom to ensure active learning from students with a variety of interests. Then care should be taken to keep a proper *social/physical Environment or Classroom climate* as it greatly influences the behavior, interactions and learning of its members.
Figure 4.8. Highlights of the ‘Process’ Phase

Concluding thoughts

This UDL cycle helps teachers to think about their work in a different way. Using a universal Design Lesson Plan Template will automatically lead to differentiation of instruction because the template suggests multiple representations of content, multiple ways for students to express or represent what they have learned, and varied ways to facilitate student learning. From this perspective, it can be concluded that using this type of pedagogic practice, we can illuminate the strengths of each learners in the inclusive classroom environment. In order to develop the Inclusive Differentiated Lesson Transcripts, the Investigator incorporated slight change in the co-teaching Lesson Plan Template prepared by Thousand et al. In the Implementation phase, the Investigator avoided the role of co-teaching since the purpose of study was to equip the General teachers to manage the Inclusive Class rooms by themselves, as the Special teachers’s presence and help is very limited in the schools of Kerala. The special educators are working as itinerant teachers, who visit the school once or twice in a week. So the Investigator decided to include their help at the time of planning phase of the Lesson only, to gather the facts of special needs students and to decide the appropriate strategy to teach them.

The stages in the preparation of the Differentiated Instruction Lesson Transcripts, according to the UDL principles are the following.
Table 4.9

*Stages in the preparation of the IDIA Lesson Transcripts*

<table>
<thead>
<tr>
<th>Stages</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning Stage</strong></td>
<td>Step 1. Knowing the learner</td>
</tr>
<tr>
<td></td>
<td>Step 2. Content (What will students learn?)</td>
</tr>
<tr>
<td></td>
<td>Step 3. Product Showing Student Success (How will students convey their learning?)</td>
</tr>
<tr>
<td></td>
<td>Step 4. Process of instruction: (How students engage in learning)</td>
</tr>
<tr>
<td><strong>Implementation Stage</strong></td>
<td>What are the dates of the lesson(s)?</td>
</tr>
<tr>
<td></td>
<td>What are the specific tasks that I do BEFORE the lesson?</td>
</tr>
<tr>
<td></td>
<td>What are the specific tasks that I do DURING the lesson?</td>
</tr>
<tr>
<td></td>
<td>What are the specific tasks that I do AFTER the lesson?</td>
</tr>
<tr>
<td><strong>Reflection Stage</strong></td>
<td>How did students do? Where needs of the learners met?</td>
</tr>
<tr>
<td></td>
<td>What are recommendations for the design of the next lesson(s)?</td>
</tr>
</tbody>
</table>

**Stage 1: Planning**

The initial stage in the preparation of the Inclusive Differentiated Lesson Transcripts begins by the ‘Knowing the learner’ step. With the help of the appropriate tools and techniques and in consultation with the general as well as special education teachers of the learners, the Investigator tried to gather facts about the learners in the class. Then the second step focuses on what content to be taught and what we want students to learn. Content differentiation consideration is a priority at this step. The next step taken is the product access design point, which is focused on how students might demonstrate what is learned and how it is assessed. And in the last and fourth step taken while planning the lesson is the process access design point, which is
focused on how teachers might structure classroom-learning activities in ways that match how their students go about making sense of what they are learning.

**Stage 2: Implementation**

The purpose of this stage is to plan the actual execution of the differentiated lesson tasks in the classroom. During this stage the Investigator develops the lesson tasks according to the selected strategy. The tasks that do before, during and after the lesson are discharged well according to the selected strategy in the classroom.

**Stage 3: Reflection**

The lesson transcripts end with a reflection stage that includes evaluation of the effectiveness of the efforts taken to Differentiate Instruction. This is a step, where the teachers reflect upon how the students do and where the needs of the learners met or not. This self reflection enables the teachers to make even better differentiation decisions as they embark on their next lesson.

**4.7.6.1 IDIA Lesson Transcripts Based on Learning Stations/Centers.**

Stations, Centers and learning zones are synonymous terms for designated areas where students can find hands-on, learner-focused, problem-solving activities. Each one is designed to provide students with opportunities to explore, practice and work with content information. The activities may reteach, extend, and enrich current learning areas or lead students to discover new subject matter. Students work on activities purported to achieve certain objectives. Because stations or learning centers are student centered rather than teacher centered, it is conducive to individual learning. Learning becomes meaningful and challenging when each student competes only with himself or herself. Students explore, estimate, experiment, question and hypothesize through learning center activities. Students rotate to different stations to explore new topics or practise skills. Stations provide interest and challenge for all types of leaners. Stations can be differentiated by readiness level or can be developed around different learning styles or intelligence or they can be interest-based stations. In the present context, the Investigator adopted Learning Stations/Centers as a classroom practice with a view to Differentiating Instruction so that students may
rotate each station and try each activity or students may be assigned to specific stations to meet specific needs.

The topic “If the mirror is Fine” from the general science text book of standard VI in the Kerala Syllabus was selected for the present experimental study. The construction of lesson transcripts and learning materials was a very challenging and time-consuming exercise. The stages in the preparation of the Lesson Transcript followed the UDL lesson plan cycle.

Planning Stage

The initial stage in the preparation of the Inclusive Differentiated Lesson Transcripts based on Learning Station strategy begins by the ‘Knowing the learner’ step. With the help of the appropriate tools and materials and in consultation with the general as well as special education teachers of the learners, the Investigator tried to gather facts about the learners in the class. Struggling LD students are identified and note down their strengths and weaknesses. Then second step in this stage focuses on what content to be taught and what we want students to learn. Content differentiation consideration is a priority at this step. The next step taken is the product access design point, which is focused on how students might demonstrate what is learned and how it is assessed. And in the last and fourth step taken while planning the lesson is the process access design point, which is focused on how teachers might structure classroom-learning activities in ways that match how their students go about making sense of what they are learning.

Implementation stage

In the implementation stage, where the actual execution of the differentiated lesson tasks according to the selected strategy takes place, the Investigator incorporated 5E instructional models. The model consists of 5 phases. Engagement, Exploration, Explanation, Elaboration, and Evaluation.
5E Instructional Model

![5E Instructional Model](image)

**Figure 4.9  5 E Instructional Model**

Source: Google image

This model describes a teaching sequence that can be used for entire programs, specific units and individual lessons. The 5E Model was developed by the Biological Science Curriculum Study (BSCS). The stages are explained below in detail specifying the responsibilities of students and teachers in each stage.

**Phase 1: Engage**

Pique student’s interest and get them personally caught up in the lesson while pre-assessing prior understanding. Students are introduced to the instructional task during the ENGAGE stage. The students mentally focus on a problem, situation or event. They make connections between past and present learning experiences and think about what they will learn during the forthcoming activities. An example of the activity given during this stage taken from the lesson transcript is given below.

**Eg: Motivational Activity (whole group instruction)**

Teacher reminds the students the situation where photographers use flash lights and shows the pictures of the situations. Students are given the idea that they are going to learn about ‘the importance and the properties of light’. Teacher provides large pieces of paper, and asks the students to write ‘what we know’ and ‘what we want to know’ about light. Encourage them to read what others have written before adding their own contribution. Invite a class discussion about what has been written on the paper.
<table>
<thead>
<tr>
<th>What we know</th>
<th>What we want to know</th>
</tr>
</thead>
</table>

**Phase 2: Explore**

Get the students involved in the topic so that they can develop their understanding. Considering the Piagetian concepts, engagement brings about disequilibration, while exploration initiates the process of equilibration. Learners have hands-on activities that help them use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct a preliminary investigation. The teacher acts as a facilitator, providing materials and guiding the students’ focus. An example of the activity given during this stage taken from the lesson transcript is given below.

**Eg: Activity** (This is one of the steps that lends itself well to Differentiated learning)

Break the students into 5 small scientific teams, four of which were heterogeneous and one consisting of advanced learners only. Teacher set up learning stations as shown below. Students will be given time to rotate through a number of stations. In this section different learning styles are considered to allow the students to investigate the information with the help of different learning styles. It is important to identify for different groups, the expectations you have of them. Give each group a piece of paper detailing the work requirements for each station. A description of the stations set-up in the class is given below.

**Station 1: Video/Picture Station**

This is a designated area set up in the classroom to suite the pupil with visual/spatial intelligence. Appropriate resources like, Photographs taken with and without using flash lights are provided. Heterogeneous group and advanced group work with them according to their work requirements.
Station 2: ‘Look and Compare’ Station (Kinesthetic)

Resources like, Torch, Tiles, Mirror, Aluminum Plate, Steel Plate, Paper, Glass, Glass Tumbler, Clear Water, Bulb, Glycerin, Rock piece etc are kept in this station. Groups of pupils are given enough freedom to do hands-on activities according to the work requirements. Pupils with LD are getting proper assistance from peers as well as from the teacher if needed. Advanced group engages in their own challenging enriched activities.

Station 3: Ray box station (kinesthetic)

Resources like Ray box, Torch, Comp, Cardboard box, Glass paper, Mirror, smooth tiles etc. are provided. Both heterogeneous and advanced group pupils’ work with them according to their work requirements as mentioned in the piece of pare provided to them.

Phase 3: Explain

Provide students with an opportunity to communicate what they have learned and figure out what it means. During the EXPLAIN stage, students begin to communicate what they have learned by demonstrating their concept understanding, process skills or behaviours. Students share ideas with each other and with their teacher. An example of the activity given during this stage taken from the lesson transcript is given below.

Eg: Activity Explanation (Whole Group Activity)

Students are grouped into 4 or 5 heterogeneous groups. Each group is asked to engage in a review and reinforcement activity, which is mainly, lies in auditory reinforcement. Each student receives a card with an answer to a question followed by a new question. One student has a card with “Start Here” in the middle of the card above the new question. The student begins by asking “Who has …?” The student
with the correct response calls out, “I have…” and then asks the next “Who has….?. The activity continues until a question is asked which is answered by the person who began.

This activity trains each student to listen carefully for the question that can be answered by the response on the top of the card. This can also be use an early form of assessment to identify student’s further requirements in understanding the topic.

**Phase 4: Elaborate**

Allow students to use their new knowledge and continue to develop a deeper and broader understanding. During the ELABORATION stage, students expand on the concepts they have learned, make connections to other related concepts and apply their understandings to the world around them through additional activities. Students are engaged in discussions and information seeking activities. An example of the activity given during this stage taken from the lesson transcript is given below.

**Eg: Activity** Allow the students to engage in discussions and information seeking activities. During the group discussion students present and defend their approaches to the instructional task. Group discussions and co operative learning situations provide opportunities for students to express their understanding of the subject and receive feedback from others who are close to their own level of understanding.

**Phase 5: Evaluate**

The Evaluation phase helps students and teachers assess how much learning and understanding has taken place. It allows teachers to evaluate student progress towards achieving the educational objectives. This is the phase teacher administer tests or performance activities to determine each students understanding. An example of the activity given during this stage taken from the lesson transcript is given below.

**Eg: Activity.** This is the step in which the teacher assesses what the students have learned to check whether they have met the outcome that the teacher had set at the start of the lesson plan. Have the students used the product that they produced at the explain stage of the lesson plan. Give them the time to expand upon what they have done or created separate piece of work that answers the focus question. Have them also include a section that explains what they would like to learn more about the
reflection of light. Students expand upon what they have done. They individually show their product. They also give suggestions of what they want to learn further.

**Reflection stage**

The lesson transcripts end with a reflection stage that includes evaluation of the effectiveness of the efforts taken to Differentiate Instruction. This is a step, where the teachers reflect upon how the students do and where the needs of the learners met or not. This self reflection enables the teachers to make even better differentiation decisions as they embark on their next lesson. Here care should be taken to particularly reflect upon the difficulties faced by the struggling pupils with LD to work in each station.

The format of the IDIA lesson Transcript based on Learning Station/center has been appended in Appendix K.

**4.7.6.2 IDIA Lesson Transcripts Based on Tiered Lessons.**

The focus of a differentiated classroom is to implement strategies that will enhance learning for all students. One strategy that supports this is Tiered lessons and assignments. The technique of ‘Tiering’ provides most advantageous learning for all students in the classroom by allowing the same concept to be developed using differing levels of instructional activities. Learners must have a challenge that is appropriate for them in order for learning to occur. Students experience more success when learning occurs at the level of challenge that is appropriate for them. In a mixed ability classroom, the teacher develops lessons at varying levels based on the same curriculum concept, so that students may experience the learning at their appropriate ability level. When teachers tier assignments, they make slight adjustments within the same lesson to meet the needs of students. All students learn the same fundamental skills and concepts but through varying modes and activities. The tiers appropriately challenge students at their ability levels. The teacher’s challenge is to make sure all tasks, regardless of the tier level, are interesting, engaging, and challenging.

In the present context, the investigator adopted Tiered Lessons as a classroom practice with a view to differentiating instruction so that students may experience the learning at their appropriate ability level. The topic “If the mirror is Fine” from the general science text book of standard VI in the Kerala Syllabus was selected for the
present experimental study. The stages in the preparation of the Lesson Transcripts followed the UDL lesson plan cycle.

**Planning Stage**

The initial stage in the preparation of the Inclusive Differentiated Lesson Transcripts based on Tiered Lesson strategy begins by the ‘Knowing the learner’ step. With the help of the appropriate tools and materials and in consultation with the general as well as special education teachers of the learners, the Investigator tried to gather facts about the learners in the class. Struggling pupils with LD are identified and note down their strengths and weaknesses. Then in the second step in this stage focuses on what content to be taught and what we want students to learn. Content differentiation consideration to plan the tiered activities is a priority at this step. The next step taken is the product access design point, which is focused on how students might demonstrate what is learned and how it is assessed. And in the last and fourth step taken while planning the lesson is the process access design point, which is focused on how teachers might structure classroom-learning activities in ways that match how their students go about making sense of what they are learning.

**Implementation phase**

While planning the Implementation phase of the Tiered Lessons, Investigator incorporated three stages. **Whole Class Initial Activities, Tiering Activities and Whole Class Culminating Activities.**

Implementation phases of the Tiered lessons

**Stage 1: Whole Class Initial Activities**

This is the stage at which teacher assesses the readiness levels of students in the class. After assessing the wide range of readiness levels among the students teacher should plan to give some whole class instruction inorder to share some learning experience in common. An example of the activity given during this stage taken from the lesson transcript is given below.
Activity: Whole class activities

Teacher introduces the lesson topic. Children are asked the question “Why do photographers use flash light?” They are asked to investigate this problem by brainstorming all the different reasons they have in their mind. Teacher asks the question “Even though you have eyes to see, Why can't you see during night?” Teacher asks the students to write down “What you know” and “what you want to know” about light. All students involve in brainstorming, in discussion, and list out many reasons. They have come to many conclusions. All students participated in discussions and they start to fill up the graphic organizer.

<table>
<thead>
<tr>
<th>What you know</th>
<th>What you want to know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stage 2: Tiering Activities

This is the stage at which differentiation occurs. A tiered lesson is a differentiation strategy that addresses a particular standard, key concept, and generalization, but allows several pathways for students to arrive at an understanding of these components based on their interests, readiness, or learning profiles. A lesson tiered by readiness level implies that the teacher has a good understanding of the students’ ability levels with respect to the lesson and has designed the tiers to meet those needs. Many examples of lessons tiered in readiness have three tiers: below grade level, at grade level, and above grade level. There is no rule that states there may only be three tiers, however. The number of tiers we use will depend on the range of ability levels in your own classroom since you are forming tiers based on your assessment of your students’ abilities to handle the material particular to this lesson. An example of the activity given during this stage taken from the lesson transcript is given below.

Eg: Activity:

Tier I Activities

These activities are meant for struggling students. Students work in pairs. Each pair is given a torch and a cardboard box with some objects inside. There is a
small hole made on it. Ask the children to look into it through the hole with and without light. “What difference you can see now?” Each student makes an observation report of what they have seen in both situations. They accurately engage in the activity and observe and distinguish the differences between the two instances. Observation reports are made.

**Tire 2 Activities**

These are the activities designed for Grade level students. Students work in pairs. Each pair is given a torch and a cardboard box with some objects inside. There is small hole made on it. Ask the children to look into it through the hole with and without light. “What difference you can see now?” ‘Why there is difference?’ Each student accurately engages in the activity by observing neatly and distinguishing the differences and predicts the reason behind the differences.

**Tire 3 Activities**

These are the activities designed for Advanced level students. Students work in pairs. Each pair is given a torch and a cardboard box with some objects. There is small hole made on it. Ask the children to look into it through the hole with and without light. “What difference you can see now?” ‘Why there is difference?’ Now with the help of the observations find out the reasons, why we could not see objects during night time? Students accurately do the experiment, note down the differences and predict the reasons. Each student makes a generalized conclusion that Light is necessary to see objects.

**Stage 3: Whole Class Culminating Activities.**

In this stage products from the small group tiered investigations are discussed and shared in the whole class. One group presents at first, then the rest of the members participate in discussion, rating the complexities of the activities done. This stage provides a space for evaluation of the work done by the group members.

**Reflection stage**

The lesson transcripts end with a reflection stage that includes evaluation of the effectiveness of the efforts taken to Differentiate Instruction. This is a step, where the teachers reflect upon how the students do and where the needs of the learners met...
or not. This self reflection enables the teachers to make even better differentiation decisions as they embark on their next lesson. Here care should be taken to particularly reflect upon the difficulties faced by the struggling pupils with LD to work in each station

The Prepared Lesson Transcript has been appended in Appendix L.

4.7.6.3 IDIA Lesson Transcripts Based on Graphic Organizers

Graphic Organizers provide teachers with tools to help students on the road to higher achievement. Graphic organizers that target critical and creative thinking verbs are vehicles to help develop students’ cognitive abilities and provide formats for students to process their thinking and content. Its formats also allow teachers to diagnose where students’ thinking has gone awry. Teachers can pin-point areas in which students’ thinking is weak, illogical, or unclear. In the present context, the Investigator adopted Graphic Organizer as a way to Differentiate Instruction with a view to enhancing active learning of all types of learners in an inclusive class set-up. Cognitive Graphic Organizers are one of the most powerful tools to support differentiated instruction. The versatility of the Graphic organizers makes them perfect tools for differentiation.

In order to familiarize the students with the processes embedded in the select classroom practice-Graphic Organizer- they were led through the ways suggested by Drapeau (2009). She has suggested six ways to differentiate using Graphic Organizers. Five of those focus on modifying the organizer itself, the prompt and/or the resources based on the needs of the students. A sixth way to differentiate involves creating your own graphic organizer, when existing ones just won’t work in a situation. Investigator, in the present study mainly adopted three of the ways i.e., differentiating using ‘open-ended prompt’, differentiating using ‘the Directed prompt’ and differentiating using ‘Resources Make the Difference’.

The Open-ended Prompt

This way to differentiate involves an open-ended prompt. Here all students use the same high-level thinking graphic organizer. All the students hear the same prompt and all students use the same resources. The prompt is a directive that students
respond to an organizer. The prompt usually in a statement form but can include a question. The graphic organizer provides an open ended structure that allows for a basic level of differentiation. The teacher expects student responses to reflect their level of understanding. This is differentiated because students are able to respond at their own level of understanding.

**The directed prompt**

In this type of differentiation, only one graphic organizer is used and all students use the same resources but students receive differentiated prompts. So according to the ability level of students, the Investigator differentiates the prompts, so that all students can engage in challenging activities. Just by tweaking the question with one or two words, the Investigator creates harder and easier questions.

**Resources Make the Difference**

In this type of differentiation, all students use the same graphic organizer with the same prompt, but they use different resources. This is a great approach for everyone to focus on the same content, but need to modify the print material for students who are struggling or extend the print material for advanced learners.

The topic “If the mirror is Fine” from the general science text book of standard VI in the Kerala Syllabus was selected for the present experimental study. The stages in the preparation of the Lesson Transcript followed the UDL lesson plan cycle, Planning stage, implemenation stage and reflection stage.

**Planning Stage**

The initial stage in the preparation of the Inclusive Differentiating Lesson Transcripts based on Graphic Organizer strategy begins by the ‘Knowing the learner’ step. With the help of the appropriate tools and techniques and in consultation with the general as well as special education teachers of the learners, the Investigator tried to gather facts about the learners in the class. Struggling pupils with LD are identified and note down their strengths and weaknesses. Then in the second step in this stage focuses on what content to be taught and what we want students to learn. Content differentiation consideration to plan the tiered activities is a priority at this step. The
next step taken is the product access design point, which is focused on how students might demonstrate what is learned and how it is assessed. And in the last and fourth step taken while planning the lesson is the process access design point, which is focused on how teachers might structure classroom-learning activities in ways that match how their students go about making sense of what they are learning.

**Implementation Stage**

Here also as in the case of Learning Station Lesson transcripts, in the implementation stage, the Investigator incorporated 5E instructional models to execute differentiated lesson tasks according to the selected Graphic Organizer strategy. The model consists of 5 phases. Engagement, Exploration, Explanation, Elaboration And Evaluation. An example of the activity given during each stages taken from the lesson transcript is given below.

**Eg: Stage 1- Engage**

Teacher familiarizes the whole group students the situation where flash lights as used by photographers. Teacher shows the video clippings. Explain the students that you are going to be learning about the importance and properties of light”. Teacher asks them to fill a graphic organizer. Students actively gets warmed up, because of the familiarity of the situation presented. They make connection with the past and present and immediately engage in the activity by filling up the two columns of graphic organizer.

<table>
<thead>
<tr>
<th>What they know</th>
<th>What they want to know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Eg: Stage 2- Explore**

Students get opportunity for analyzing different graphic organizers and identify each one’s procedure and structure. Teacher divides the class into 4 or 5 groups. Motivates each group for selecting suitable graphic organizer through which students get the opportunity to actively explore the concepts in an effective manner.
Formation of groups
↓
Provide activities for each group
↓
Selection of suitable Graphic Organizer
↓
Exploration of ideas and concepts
↓
Integrates concepts in the Graphic organizer.

Activity

Break the students into 4 or 5 heterogeneous groups. Groups contain children with Learning Disabilities also. Ask the group members to render help to the LD child to participate in the group activities. Teacher has provided some focus questions in the form of prompts (differentiated prompts), so that the students can concentrate on it and sum up their ideas by integrating the concepts in the graphic organizers.

Teacher asks students the situation where photographers use flash lights and exhibits the photographs. Explain the students that they are going to learn about ‘the importance and the properties of light.

Groups are provided with a ‘Thought Bubble Graphic Organizer’ and given some prompts so that students discuss in the group and try to fill up the graphic organizer.

<table>
<thead>
<tr>
<th>Thought Bubble Graphic Organizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assume</td>
</tr>
<tr>
<td>1. What is your assumption about the use of flash lights in cameras?</td>
</tr>
<tr>
<td>Assume</td>
</tr>
</tbody>
</table>
Activity

Ask the students in each group to make a Ray box with the given objects. Let them allow light to pass through the hole to fall on different objects like mirror, glass plate, new and old steel plates etc. Prompts are given.

- What happens when light falls on objects?
- What difference observes, when light falls on opaque and transparent objects?
- Which objects reflects light well?

To sum up the idea gained through the experiments ask the students to fill up “A paint jar graphic organizer” which will help the students to form inference from the experiences.

Stage 3: Explain

Students get the opportunity to explain what they have explored in respective groups. They demonstrate their conceptual understanding, process, skills and explain the generalization of concepts developed by various groups.

Cube activity:

Teacher encourages the learners to analyse the major concepts and the sub concepts, identified through the exploration of the content and to systematically club them together. To help them, teacher asks them to play a “Cube activity”. A Cube is made.
with cardboard. Verbs are written according to the levels of Bloom’s taxonomy on the six faces of the Cube.

**Example:**

1. Describe
2. Compare
3. Connect or design
4. Analyze
5. Apply
6. Argue for (or) against it

Toss the Cube. If the child gets no. 2 (compare) verb, then ask him to make a question which contain that verb. Eg. Compare opaque and transparent object? The child sitting next to him should answer that question. The next child can accept it or reject it. If he reject it, he should say the correct answer. Those who answer get the chance to toss the cube and make questions. The play can proceed till all the sides come up. To the LD child, teacher can offer help to frame and answer the question.

Through this activity, all students are getting a chance to review the learned concepts again so that they can demonstrate their conceptual understanding well (this can be used as an early from of assessment and then a secondary assessments can be done at the evaluation step. This step helps the teacher to identify students that require further assistance with understanding the topic)

**Stage 4: Extend**

Challenges and extends students conceptual understanding and skills. Through new experiences, students develop deeper and broader understanding, more information and adequate skills.

**Activity:**

Students are asked to work in groups and are to choose their own model to investigate on the process of reflection of light. By mutually helping, and allowing engaging in activities, the group members extend their understanding and skills. The
fellow students help pupils with LD to develop their understanding. Teacher supervises the group work and renders help at times needed. Each group masters the concept. They draw ray diagrams by themselves.

**Stage 5: Evaluate**

Encourage the students to assess their understanding and abilities and provides opportunities for teacher to evaluate student progress towards achieving educational objectives.

**Activity:**

Teacher disperses the group and asks the children to have whole class session. Teacher starts assessing the students through quizzes and questions. Students are given enough freedom to express their answer. They can create a written poster, or they can present a graphic organizer of their own choice to present their generalization.

The Lesson Transcript has been appended in Appendix M

**4.7.7 Judgment Schedule for Validating the IDIA Lessons**

After formulating the framework of Differentiated Instructional Transcripts based on Learning stations/Centers, Tiered Lessons and Graphic Organizers, the Investigator followed UDL lesson planning template for developing the select differentiating Transcripts. In order to judge these frameworks of these Transcripts with regard to the elements of Differentiation, a judgment schedule was prepared. This schedule consists of five Specific elements namely Safe environment, Honoring Diversity, Assessing the Learner, Instructional Strategies and Instructional Approaches. This makes the schedule more objective, valid and reliable. This instrument is prepared in such a manner in which participants were asked to put their reflections against each element of differentiation and their respective aspects. The judgment schedule was given for validation among the select experts in the area of Special Education, Learning Disability and Teacher education and compiled their recommendations and suggestions in the specific aspects and subsequently the tool was refined (list of experts attached.) The final form of the tool was administered
along with the prepared differentiated instructional lessons to a sample of experts and mentioned recommendations were incorporated in modifying the Lesson transcripts and were used for experimental purpose.

**Validation of IDIA Lesson Transcripts**

Inclusive Differentiated Instructional Approaches based on different transaction strategies for including children with diverse needs must articulate varied dimensions during the design process including Safe environment, Honoring Diversity, Assessing the Learner, Instructional Strategies and Instructional Approaches, etc; to get most out of the deliberate instructive gains. In the present study, the select IDIA based on Learning Stations, Tiered Lessons and Graphic organizer strategies were analyzed among the sample of experts and practitioners in the field of science education and special education for justifying the rationale behind the decisional alternatives, with due attention on the design qualities prescribed in the judgment schedule deliberately constructed for the intention of validation. (Appendix E).

The design qualities specified in this tool provides course of action for evaluating and framing opportunities for effective learning that support personal strengthening and enhanced proficient practice for interlocking academic enhancement and educational reform goals which certainly create superior excel students. The design qualities projected in the select judgment schedule are: Safe environment, Honoring Diversity, Assessing the Learner, Instructional Strategies and Curriculum Approaches. The sample of experts located their valued observations with regard to the particular developed instructional strategies and the corresponding lesson transcripts and they are consolidated in Table 4.10.
Table 4.10.

Observations and Ratings of qualities of the select IDIA Lesson Transcripts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Safe environment</td>
<td>Nil 12% 88%</td>
<td>Nil 4% 96%</td>
<td>Nil 18% 82%</td>
</tr>
<tr>
<td>2.</td>
<td>Honoring Diversity</td>
<td>Nil 6% 94%</td>
<td>Nil 5% 95%</td>
<td>Nil 12% 88%</td>
</tr>
<tr>
<td>3.</td>
<td>Assessing the Learner</td>
<td>Nil 16% 84%</td>
<td>Nil 8% 92%</td>
<td>Nil 14% 86%</td>
</tr>
<tr>
<td>4.</td>
<td>Instructional Strategies</td>
<td>Nil 8% 92%</td>
<td>Nil 6% 94%</td>
<td>Nil 10% 90%</td>
</tr>
<tr>
<td>5.</td>
<td>Curriculum Approaches</td>
<td>Nil 12% 88%</td>
<td>Nil 9% 91%</td>
<td>Nil 12% 88%</td>
</tr>
</tbody>
</table>

It can be consolidated from the above table that all the select IDIA lesson transcripts as alleged by the sample experts were highly appreciated with the set lesson qualities and consequently it could lay down the stage for considering the diverse needs of upper primary level students. The experts who are working in the field of identification and remediation of learning disabilities proposed that the select instructional strategies are competent of equipping all types of learners including children with learning disabilities at upper primary level. The experts are of the outlook that the instructive objective of Learning Station strategy emphasizes meaningful learning through interaction with suitable challenging activities at each station. The Graphic Organizer strategy allows creating a classroom environment in which all types of diverse learners engage in differentiated activities. The Tiered Lessons approach helps the practitioners to provide multilevel activities, which is suitable for including all types of learners in the classroom.

The summary of this section generally squeezed the view that the select IDIA namely Learning Station/Centers, Tiered Lessons and Graphic Organizers are highly
recommended and can be tested for its effectiveness in excelling Academic Achievement, Self Concept and Achievement Motivation of Upper Primary Pupils

4.7.8 Existing Activity Method of Instruction (EAMI) Lesson Transcript

For comparing the effect of teaching through Differentiating Instruction, Existing Activity Method of Instruction (EAMI) was selected and the control group was taught using this method. The Lesson Transcripts on the same topic on which IDIA lesson Transcripts were prepared was selected for the preparation of EAMI.

Activity Method is a student centered approach in which students are taught the objectives through discussion, observation, secondary data collection, drill and practice, notes on the board and practice problems from the text.

4.7.9 Preparation and Standardization of Achievement Test in General Science

Achievement is the accomplishment or proficiency of performance in a given skill or body of knowledge. Therefore it can be said that achievement implies overall mastery of pupil in a particular context. Any measuring instrument that measures the attainments or accomplishments of a pupil must be valid and reliable. Achievement tests serve four general purposes, namely summative assessment, formative assessment, placement assessment and diagnosis (Bloom et al., 1971). As no specific standardized achievement test was available on the topic “If the mirror is fine” of standard VI General Science, the Investigator developed and standardized an achievement test in General Science to:

- assess the students’ Remembering, Understanding, Applying, Analyzing, Evaluating and Creating levels related to the topic of upper primary inclusive pupils
- grade pupils in terms of achievement as Struggling, Grade and Advanced performers
- measure the performance of students before and after the experiment
- evaluate the effectiveness of the select IDIA namely Learning Stations/Centers, Tiered Lessons and Graphic Organizers.
An achievement test in General Science on the topic ‘If the mirror is fine’ at Sixth standard comprising of the descriptive type items was prepared, standardized and administrated in the present study because descriptive type items demand the learners to harmonize the set levels of cognition proposed by Blooms revised taxonomy of educational objectives. The draft and final forms of Achievement Test are given in Appendices N and O and scoring key of the final form of the test is given in Appendix P.

**Bloom’s Revised Taxonomy.**

Anderson, revisited the cognitive domain in the learning taxonomy and made some changes, with perhaps the most prominent ones being (1) changing the names in the six categories from noun to verb forms, and (2) slightly rearranging them (Pohl, 2000). The lowest level of the original, Knowledge was renamed and became Remembering, Comprehension and Synthesis was re-titled to Understanding and Creating. The top two levels, Synthesis and Evaluation are essentially exchanged in their hierarchical order from the old to the new version. The major terminology changes and changed hierarchical order of the two top most levels are given in the figure 4.

![Changes to Bloom's](https://via.placeholder.com/150)

*Figure 4.10. Bloom’s Revised Cognitive Taxonomy (Source: Google Image)*

The pedagogically significant feature of the revised taxonomy are the shift from one dimension to two dimensions, the inclusion of metacognitive knowledge category and the inclusion of the two dimensional taxonomy table (Amer, 2006). The revised taxonomy separate the noun and verb components of the original category into two separate dimensions: knowledge dimensions and cognitive process dimensions. The knowledge dimensions include four categories newly named as factual, conceptual, procedural and metacognitive.
Factual knowledge includes the basic elements and discrete facts that pupils must know to be acquainted with a discipline or solve problems in it; conceptual knowledge deals with the interrelationships among the basic elements within a larger structure that enable them to function together. When students can explain the concepts in their own words and transfer information to new situations they have acquired conceptual knowledge. Procedural knowledge is often a series or sequence of steps to follow in doing something and it includes the criteria of when to use various procedures, skills, algorithms and techniques and reflects knowledge of different processes. The fourth dimension of knowledge is metacognitive knowledge, an awareness of and knowledge about one’s own thinking. It occupies knowledge of cognition in general as well as awareness and knowledge of one’s own cognition. Another notable change in the revised Bloom’s taxonomy is the formation of the Two Dimensional Taxonomy Table. In the Taxonomy Table, the knowledge dimension forms the vertical axis; the cognitive process dimension forms the horizontal axis and the intersection of the two axes form the cells.

Based on the revised Bloom’s Taxonomy of Cognitive domain the Investigator prepared a map of the test items. Table 4. Gives the mapping of the achievement test and it confirms that the items are diverse in the cognitive abilities as it occupies different cells in the Taxonomy table.

Table 4.11

Mapping of items onto Taxonomy Table

<table>
<thead>
<tr>
<th>Knowledge Dimension</th>
<th>Cognitive Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remember</td>
</tr>
<tr>
<td>Factual Knowledge</td>
<td></td>
</tr>
<tr>
<td>Conceptual Knowledge</td>
<td>3</td>
</tr>
<tr>
<td>Procedural Knowledge</td>
<td></td>
</tr>
<tr>
<td>Metacognitive Knowledge</td>
<td></td>
</tr>
</tbody>
</table>

The numbers in each cell denotes the item number in the set achievement test.
Chapter 4

Methodology

For the purpose of standardization of the test, a draft form comprising of ten descriptive type items was prepared according to the revised taxonomy table and the prevailing mode of test administration by SSA and was pilot tested on 75 pupils at upper primary level. The ‘Facility value’ and ‘Discriminating index’ of the items were calculated for item analysis using the formula specified by the Examination Reform Committee, Department of Calicut University. According to this method the Facility value and Discriminating Index of the items were estimated using the formula:

\[
\text{Facility value} = \frac{\text{Total marks obtained by all students on the particular question}}{\text{Number of students} \times \text{Maximum marks allotted to the question}}
\]

\[
\text{Discrimination Index} = (\text{Facility value of top-ranking 27% students} - \text{Facility value of low-ranking 27% of students})
\]

The items having both Facility value between 0.35 and 0.65 and Discrimination Index greater than 0.4 were selected for the final form of the test. Five questions thus selected were subjected to expert judgment by experienced teachers and teacher educators at B.Ed and M.Ed level and suggested remarks were assimilated.

Reliability of the Test

Reliability refers to the consistency with which a measure assesses whatever it is measuring. It is the degree to which the test scores are free from errors of measurements. As the length of the test is short, the reliability for the achievement test was estimated using parallel form method. The Investigator prepared a parallel form for the achievement test with the same blueprint and the two tests were administered in two consecutive days. The scores of the two tests were collected and correlated using Pearson’s product moment correlation coefficient. The coefficient was obtained as 0.79, which indicates high reliability of the test.

Validity of the test

Validity refers to the defensibility of inferences made from the test scores regarding its functions. Content validity and empirical or statistical validity are of prime importance for achievement test (Best and Kahn, 2007).
Content Validity

Content validity is the degree to which a test measures the intended content area. It requires both item validity and sampling validity. Content validity is determined by expert judgment. Investigator discussed the test items with various experts in the subject and made appropriate modifications in the test items and hence ensured content validity.

Empirical validity

Empirical validity is determined by establishing relationship between scores on the prepared test and scores on some established test or criterion. The Investigator selected the average scores of pupils in two General Science test papers as criterion scores for estimating validity. The correlation coefficient between these two was estimated and was found to be 0.81, which indicates that the test is having reasonable validity.

Objectivity

Adequate subdivisions with scoring stage are provided with all the test items for ensuring objectivity. Besides systematic scoring scheme was employed in the scoring procedure which offers high objectivity of the test.

The final form of the test used for the experimental purpose was administered for a maximum score of twenty marks and duration of forty five minutes. Adequate instructions were given in the question paper. A scheme of scoring stages was also prepared for objective scoring. Adequate accommodations like additional support, extra time for needy students etc are provided in the scoring scheme. According to the disability level, they are provided alternate ways of expressing their understanding of the content. The achievement in general science of the select sample of Upper Primary Pupils was assessed by considering the total score on the achievement test and the data obtained were subjected to quantitative analysis.
4.7.10 Self Concept Scale

Self concept or perceived self is the summation of the ways by which one evaluates one’s own characteristics and behaviour. Each individual has a concept of self, made up of his thoughts and feelings about himself.

Wellington et al. (1965) points out some major problems of children with poor self concept. They are feelings of personal inadequacy, uncertainty, general lack of confidence, anxiety related to the feeling of inadequacy and inability to cope with problems. They are also likely to negative attitude towards school, little interest in reading and a tendency to procrastinate. So the Investigator is keenly interested in taking up a systematic investigation in these grounds. The Investigator adopted a modified self concept scale by David (2010), which was modified to suite the pupils with LD of Primary students.

Scoring

The scale contains 50 items. This tool is in the form of a 4 point scale, the students are expected to indicate their degree of consent by making any of alternatives A, B, C, D (Always, Often, Sometimes, and Never). A is given a weightage of 3, B’ a weightage of 2, ‘C’ a weightage of 1 and ‘D’ of 0 in case of positive items. For the negative statements correct answers are given a weightage like 3 to ‘D’ 2 to ‘C’ , 1 to ‘B’ and 0 to A’. The total score for each individual was obtained by adding up the scores obtained on each item.

4.7.11 Achievement Motivation Scale

Motivation is a personal, internal process, a state of arousal; a striving determines the strength and direction of a person’s behavior. It is something within the individual that not only arouses but also directs and sustains the line of action. It empowers a person to achieve a specific goal and make efforts to realize it. “A motivated person strives to accomplish something, to do his best, to excel others in performance” (Kundu, 1989).

Achievement motivation is an important determinant of aspiration, efforts and persistence when an individual expects that his personality and his achievements in
life will be evaluated in relation to some standard of excellence. Achievement motivation refers to a pattern of actions and feelings connected with strivings to achieve some internalized standard of excellence on performance (Vidler, 1977).

For analyzing the achievement Motivation of Upper Primary inclusive students with learning difficulties, the Investigator adopted the tool constructed and standardized by David (2010). The different dimensions selected for Achievement Motivation scale are

- Academic Motivation
- Pursuit of excellence
- Status aspiration
- Acquisitiveness
- Need for achievement

**Scoring**

The scale consists of 60 items both positive and negative. It is a 3 point scale following a response pattern of ‘Yes’, undecided and ‘No’. The respondents were required to indicate their response in the form of symbol ’X’ against any of the alternatives. The score for each positive item will be in a sequence of 2, 1, 0 and 0, 1, 2 for negative items.

**Reliability of the Self Concept and Achievement Motivation Scales**

Reliability is the degree of consistency that the instrument or the procedure demonstrates. The reliability of the Self Concept Scale and Achievement Motivation Scale is established by test-retest method. For this, 10 students with learning difficulties were selected and the same tool is administered twice with a gap of 25 days. The correlation coefficient was calculated using Karl Pearson’s Product Moment method. The obtained ‘r’ values of Self Concept Scale (0.88) and Achievement Motivation Scale (0.87) are high and hence the tools used for the study is highly reliable.
Validity of the Self Concept and Achievement Motivation Scales

Validity is the quality of the research tool or procedure that measures what it purports to measure. According to Best (1989), “validity is the quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure”. The index of reliability is sometimes taken as a measure of validity (Garrett et al., 1981). Several kinds of validity are ascertained. They are:

a) **Content Validity:** Content validity indicates how adequate is the content of a test about which inferences are to be made. The content validity of the Self Concept Scale and Achievement Motivation Scale is assessed by a panel of experts in the field who judge its adequacy. In order to validate the content of the test items, the test was given to three special education teachers, and two teacher educators working in B. Ed colleges. Content validity is estimated by evaluating the relevance of the test item individually and as a whole. The panel of experts opined that all the tests were having content validity.

b) **Face Validity:** This is the term used to characterize test materials that appear to measure what the test author describes to measure that the test contains items that seem to be related to the variable being measured. From the opinion of the experts the Investigator assured that the tools have face validity.

c) **Intrinsic Validity:** Intrinsic validity is stated as how well the obtained scores measure the test’s true score. The intrinsic validity which is the square root of reliability also was established and it was found (0.94) for Self Concept Scale and (0.93) for Achievement Motivation Scale.

The self concept scale and answer sheet are given in Appendix Q and R. Achievement motivation Scale and answer sheet are given in Appendix S and T.

**4.7.12 Curriculum Based Assessment (CBA)**

Curriculum Based Assessment is both assessment and a teaching practice that uses the material to be learned as the basis for evaluating student performance for the purpose of determining the learner’s instructional needs. It has evolved over recent
decades as one performance monitoring system that allows teachers to focus specifically on highly discrete skills in the curriculum, and to differentiate their instruction to emphasize the specific skills a child has not mastered (Deno, 2003; Fuchs and Deno, 1994). It measures the student’s level of achievement in terms of the expected curricular outcomes of the school. It is a form of both – formative evaluation and Summative assessment.

Curriculum-based assessment is defined by Deno (2003) as "any set of measurement procedures that use direct observation and recording of a student’s performance in a local curriculum as a basis for gathering information to make instructional decisions". Curriculum-Based Assessment or Measures (CBA or CBM) were developed to function as "academic thermometers" to monitor students’ growth in basic academic skills domains. They are a set of simple, short-duration fluency measures most frequently applied to reading, spelling, written expression, and Arithmetic. Typically, CBA is used in the subject areas of Arithmetic, Reading and Spelling, but has also been found effective in other areas. CBA can be used in general education as well as special education classroom settings.

Scholars agree that through repeatedly measuring a child’s progress on a particular set of academic skills, we obtain information that is highly useful for planning the next instructional tasks for that child (Fuchs et al., 2000). For this reason, assessment based directly on the skills in the child’s curriculum, measured on a repeated and frequent basis, seems to be the option of choice for differentiating instruction for students with Learning Disabilities. CBA is a procedure designed to strengthen the connection between assessment and instruction by evaluating the students in terms of curricular requirements of the student’s class or school. This is the tool used by the classroom teacher or the subject specialist teacher. In the CBA the materials that are used are drawn directly from the student’s curriculum.

A primary goal of the CBA is to provide useful data for instructional planning, the data, which is not available on standardized tests. The essential comparisons made in CBA are to compare a learner’s performance on a subsequent day, rather than compare the performance with peers or norms. An important feature is its use in identifying the learner’s instructional level and avoiding instruction that is either too frustrating or boring.
Curriculum-Based Assessment is beneficial for all students. It helps teachers to:

- plan effective instruction;
- estimate student progress;
- document student progress;
- Communicate with parents or other professionals about student progress.

CBA data can help teachers improve the academic growth of at-risk students or students with learning disabilities who may need a change of instruction or additional services.

Teachers may use CBA to:

- identify skills with which students are having the most difficulty;
- compare the effectiveness of different instructional strategies;
- identify students who are not making adequate progress in a general education setting and may need special education services;
- track progress toward Individualized Education Plan (IEP) goals for students receiving special education services.

**Preparation of probes in CBA**

The Investigator followed the following steps to prepare CBA probes in Basic Science:

**Step 1:** Identify the skill to be tested on the probe. Write the specific statement of the skill.

**Step 2:** List down the items or actual matter to be tested.

**Step 3:** Plan for the precise instructions to be given.

**Step 4:** Decide and prepare for the observation or recording sheet. The teacher decides the cut-off criteria for performance on the probe.

**Step 5:** The teacher administers the probe or the test prepared. The teacher observes and records the errors that the child makes during the administration of the probe.

**Step 6:** The teacher analyzes the student performance on the given probe and the listed achievement criteria. The need for further assessment is decided based on the student performance.
For the present study Investigator has prepared many CBAs for assessing the continuous performance of Learning Disabled Students. A Sample one has been appended in Appendix U.

4.8 Procedures Adopted

The focus of the present study was to overcome the exclusion of pupils with LD from the teaching-learning process by following an effective Inclusive approach. So the Investigator has adopted an Inclusive Differentiating Instructional Approach as an effective way of transacting curriculum in a mixed ability classroom with pupils with LD. As a preliminary step towards this task, the Investigator conducted a survey in determining whether the educators displayed the Dispositions, Knowledge and Skills necessary to implement in Inclusive Classrooms by administering a scale meant for the purpose.

By synthesizing the ratings, opinions and interpretations of, the survey scale, the Investigator reified and selected three Inclusive Differentiating Instructional Approaches for transacting General science at Upper Primary Inclusive Class which includes pupils with LD as Struggling students along with Grade level and Advanced learners. Investigator prepared three Inclusive Differentiating Instructional approach (IDIA) lessons based on Learning Stations/center, Tiered lessons and Graphic Organizer.( Appendix K,L & M)

The next important step taken by the Investigator was collection of data about students.

For the experimental phase of the study, Pre test Post test non-equivalent group design was adopted to assess the effectiveness of the select learning approaches. A sample of 467 Upper Primary Pupils hailing from three schools of Thrissur District were identified and were classified as three experimental groups and one control group as described in Table 4.1. After administering the Pre-tests (Achievement Test, Self Concept scale, Achievement Motivation Scale) to all the learners, Group I was taught using the Inclusive Differentiating Instructional Approach based on Learning Stations/Centers, Group II with Inclusive Differentiating Instructional Approach based on Tiered Lessons and group III was taught using
Inclusive Differentiating Instructional Approach based on Graphic Organizer, where as the Control group followed the Existing Activity Method of Instruction (EAMI). Curriculum Based Assessments (CBA) was also administered for the pupils with LD in the experimental group to assess their progress continuously, so that the Investigator can cater their instructional needs to Differentiate Instruction in each class. At the end of the treatment, the Post-tests were administered over each group in order to assess the effectiveness of the select Inclusive Differentiating Instructional Approaches based on Learning Stations/Centers, Tiered Lessons and Graphic Organizer on the Academic Achievement, Self Concept and Achievement Motivation of Upper Primary Inclusive Class pupils.

4.9 Statistical Procedures Resorted

Statistical procedures help the Investigator to frame the conclusions of any research study. In the present study, the Investigator made use of the following statistical procedures to codify the results and reaching the conclusions.

- Descriptive Statistics
- Analysis of Variance
- Analysis of Covariance
- Estimation of adjusted means by using Scheffe multiple comparison (Post hoc Test)
- The Mann-Whitney U Test
- The Friedman Test

The analysis and interpretation of the data thus collected through these data gathering tools and the techniques is given in the succeeding chapter.