Chapter 4

METHODOLOGY

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4.1 Methodology: A Prologue

Research is an intellectual and creative endeavour to discover, develop and verify knowledge. It entails objective and systematic effort to offer solutions to the problem and to formulate policies and programmes. Research is one of many ways of knowing or understanding. It is different from other ways of knowing, such as insight, divine inspiration, and acceptance of authentic dictates, in that it is a process of systematic inquiry that is designed to collect, analyse, interpret, and use data (Mertens, 2015). Research findings in general depend upon the systematic adoption of an apt methodological practice. It also depends upon the exact methodological trend which is mainly based on structured thematising of mixed methods research which integrates qualitative and quantitative data.

4.2 Ground Plan of Methodological Trek

The present study was ensouled on the set successional pertinacious procedure of developing a model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level. This multitudinous stage process of investigation headway through the use of mixed methodology research synchronizes both quantitative and qualitative approaches

Mixed methods can refer to the use of both quantitative and qualitative methods to answer research questions in a single study, as well as those studies that are part of a larger program and are designed as complementary to provide information related to several research questions, each answer with a different methodological approach. (Adams and Lawrence, 2015)
In this study, qualitative and quantitative methods were followed sequentially in order to obtain a better understanding of the effectiveness of developed model of teaching based on the objective create. The study was an exposition of four phases namely: cardinal, developmental, experimental, and terminal phases and are described as

- Need analysis
- Developing model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level
- Assessing the effectiveness of developing model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level.
- Analyzing the appropriateness of the developed model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level based on learner satisfaction form.
4.3 Schematic Sketch of the Investigation

**Figure 4.1: Schematic sketch of the investigation**
4.4 Phases of the Investigation

The study was oversight through four phases namely: Phase I-Cardinal, Phase II-Developmental, Phase III-Experimental, and Phase IV-Terminal phase.

4.4.1 Phase I-Cardinal

As the initial attempt of the study in the cardinal phase the investigator conducted need analysis about the prevailing modes of pedagogic practices and the hindrances confronted by the higher secondary school geography teachers and experts for the effective curriculum transaction of geography at higher secondary level and to find out the initial level of knowledge constructs and structured patterning of self directed learning from a select representative sample of higher secondary school geography teachers and to analyze the entry level creativity status of higher secondary school geography students.

4.4.2 Phase II-Developmental

The second phase was the paramount significant part of the study. Throughout this period the investigator developed a model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level. The developed model was validated through the model validating judgement schedule.

4.4.3 Phase III-Experimental

The third phase was the experimental phase. Here the investigator embraced the procedure of experimentation of the developed model with some intention in mind:
Testing the effectiveness of the developed model in terms of, self directed learning, creativity, and academic achievement among the geography students at higher secondary level was assessed by employing, self directed learning scale, creativity test in geography, and achievement test.

Comparing the effectiveness of the developed model of teaching based on the objective ‘create’ among the sub samples based on gender, locale and type of management.

Comparing the effectiveness of the developed model of teaching based on the objective ‘create’ among the geography students at higher secondary level with regard retention in self directed learning, creativity, and academic achievement.

For testing the potent of the developed model, the investigator selected experimental group and control group. The experimental group was taught by applying the developed model and the control group through prevailing activity oriented approach. The effectiveness of developed model in terms of, self directed learning, creativity and academic achievement was estimated by employing self directed learning scale, creativity test in geography and achievement test, and by comparing the retained scores by post test scores (immediately after intervention) and delayed post test scores (one month after intervention).

4.4.4 Phase IV-Terminal

The terminal segment emphasise on analyzing the appropriateness of developed model. For this purpose, the investigator developed and administered the learner satisfaction form and analyzed the appropriateness of the developed model of
teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level.

### 4.5 Research Design: A Trace of Deed

Research design was described as the overall plan for a piece of research. In experimental research design that attempts to determine a causal relationship by manipulating one variable, randomly assigning participants or subjects to different levels of that manipulated variable, and measuring the effect of that manipulation on another variable. (Adams and Lawrener, 2015). In the present study, pre test post test non equivalent group design was adopted to test the effectiveness of the developed model. A gambit of research design is given in figure 4.2

*Figure 4.2: Visual representation of Research Design*

Where CXo represents pre test scores of control group

EXo the pre test scores of experimental group

To the treatment given to control group
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Ti the treatment given to experimental group
CYo I the post test scores of control group
EYo I the post test scores of experimental group
CYo II the delayed post test scores of control group
EYo II the delayed post test scores of experimental group

4.6 Participants of The Study

Based on the statement of the problem, higher secondary school geography students in the Kerala state were selected as the population of the present study. For the experimentation, the investigator selected a sample of 269 XI geography students from five higher secondary schools from Kottayam and Eranakilam districts. Stratified random sampling was the technique adopted for selecting sample. Due weight age was given for different categories of students based on gender, locale, and type of management of schools. The details regarding the breakup of the total sample and their categorization for the experimentation is given in table 4.1

Table 4.1

Breakup of the sample selected for experimentation

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Subsamples</th>
<th>No. of students</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Experimental</td>
</tr>
<tr>
<td>1</td>
<td>Gender</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
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<tr>
<td>2</td>
<td>Locale</td>
<td>Urban</td>
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<td></td>
<td></td>
<td>Rural</td>
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<tr>
<td>3</td>
<td>Type of management</td>
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Apart from the select two districts Kottayam and Ernakulam, for the conduct of the qualitative analysis, a sample of 50 higher secondary school teachers and experts from the field of geography and education from, Thiruvananthapuram, Alappuzha, Pathanamthitta, Kottayam, Ernakulam, Palakkad, and Kannur, and 150 higher secondary school geography students were included.

4.7 Variables Established for the Study

Variables are the conditions or characteristics that the experimenter manipulates, controls, or observes (Best and Kahn, 2007). Independent variable is the variable that is manipulated in an experiment, and the dependent variable is the variable that is measured in an experiment and is expected to vary or change based on the independent variable manipulation. Independent variable is the cause and dependent variable is the effect. (Adams and Lawrener, 2015) In the present study, the independent and dependent variable are depicted in figure 4.3

**Figure 4.3: Variables established for the study**
4.8 Investigative Support and Techniques Accessed for Data Collections

The quality of any research depends largely on the efficiency of the tools and techniques selected and the procedures adopted for collecting data. In order to gather direct substantiation for the incremental elucidation of the effect of the developed model for promoting self-directed learning among the geography students at higher secondary level, quite a few tools and techniques were employed. They are:

- Semi structured interview
- Self directed learning perception questionnaire
- Entry level creativity scale
- Model validating judgment schedule
- Lesson designs based on activity oriented approach
- Lesson designs based on developed model
- Self directed learning scale
- Creativity test in Geography
- Achievement test
- Learner satisfaction form

The preferred tools and techniques developed for collecting allied data have been stratified under four phases namely, Cardinal, Developmental, Experimental, Terminal phase.

The cardinal phase was bound to have a background for carry on the study by conducting a need analysis to know about the prevailing pedagogic practices and
the hindrances confronted by the educational practitioners for the effective curriculum transaction in Geography at higher secondary level, to find out the initial level of knowledge constructs and structured patterning of self directed learning from a representative sample of higher secondary school geography teachers and to assess the entry level creativity status of higher secondary school level geography students. Need analysis was conducted through Semi structured interview, Self directed learning perception questionnaire and Entry level creativity scale.

The second phase developmental focus on developing a model of teaching based on the objective 'create' for promoting self directed learning among the geography students at higher secondary level. After the development of the model a judgement schedule was habituated among the teachers and experts from the field of geography and education to validate the practicability of the developed model.

In the experimental phase, lesson designs based on developed model and prevailing activity oriented approach are used for the experimentation. To, adjudge the level of self directed learning, creativity, and academic achievement, a self directed learning scale, creativity test in geography and an achievement test in geography were used as tools.

Furthermore a qualitative assessment of the developed model is done in the terminal phase for which the investigator entails a learner satisfaction form to analyze the appropriateness of the developed model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level. An brief depiction of each tool and technique is given below.
Figure 4.4: Schematic depictions of tools and techniques employed

The detailed description of the tools and techniques employed were detailed below.

4.8.1 Semi Structured Interview

In the present study, a semi structured interview was conducted to reflect about prevailing pedagogic practices and the hindrances confronted by the educational practitioners for the effective curriculum transaction in geography at higher secondary level. The interview schedule was developed by the investigator before the conduct of the interview. The focus areas in the interview schedule intends to address specific core questions prepared in advance related with major research question in the study and to explore in depth information and framing a scene of inquiry specifically
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• Prevailing tactics of pedagogic practices for the effective curriculum transaction in geography at higher secondary level

• Hindrances and challenges confronted if any, by the teachers for the effective curriculum transaction in geography

• Alternative tactics suggested for the effective curriculum transaction and strengthening the skills of creativity and self directed learning among geography students.

In order to procure conceptualization and facts on these cardinal themes based on the componential dimensions of geography education at higher secondary level, a semi structured interview schedule was prepared in such a way that the respondents could provide a free verbalism of their perceptions on these select themes. The earliest draft form of the semi structured interview schedule had 13 themes which were developed through extended literature review, converse with subject teachers and experts and discourse with the supervising teacher. For the initial try out, a draft form of the interview schedule with provision for suggesting far-reaching opinion was disbursed to subject teachers and experts in the field of geography. While preparing the final form of the interview schedule the opinions and suggestions collected from the subject teachers and express were taken in to account. The final form is based on three focal areas mentioned in the prior section and contains 8 questions with multiple choice and open ended responses. The interview schedule is given as Appendix I

The first five questions were allocated to unfurl the prevailing pedagogic practices for the effective curriculum transaction in Geography at higher secondary
level, the next question centres on hindrances and challenges confronted if any, by the teachers for the effective curriculum transaction and rest of the questions were devoted to ascertain alternative tactics suggested for the effective curriculum transaction and strengthening the skills of creativity and self directed learning among geography students at higher secondary level.

In order to assess the information on these cardinal themes, the semi structured interview was administered with a select sample of (50) higher secondary school teachers and experts in the field of geography. Analysis of the qualitative segment of the data collected through the semi structured interview fabulously advocates the importunity for developing certain innovative methods and practices for the effective curriculum transaction at higher secondary level with special reference to geography. The semi structure interview conducted among higher secondary school geography teachers and experts benefited the investigator to have a perception into the disparate modalities required for stimulating the instructional environment of geography curriculum. It prepare the investigator to probe and develop a model of teaching based on the objective 'create' for promoting self directed learning among the geography students at higher secondary level.

4.8.2 Self directed learning perception questionnaire

In the present study, the investigator prepared a self directed learning perception questionnaire for collecting data from higher secondary school geography teachers (50) with the focal motif to understand their perception about self directed learning and to find out the initial level of knowledge constructs and structured patterning of self directed learning.
In order to acquire felicitous information on these focal motifs, self directed learning perception questionnaire was prepared. In the first step a list of items were prepared by reviewing available literature, and by the consultation of experts and the supervising teacher. Next, a preliminary try out of the draft form with 25 items was conducted among higher secondary school geography teachers to examine the feasibility of the tool. As per the suggestions obtained, some of the items were eliminated and some others were modified for preparing the final form of the instrument. The final form of the self directed learning perception questionnaire entails 20 items based on the focal motif. The questionnaire is given as Appendix II.

Analysis of the qualitative part of the data collected through the self directed learning perception questionnaire to find out the initial level of knowledge constructs and structured patterning of self directed learning advocates the needfulness for promoting self directed learning among the higher secondary school geography students. It is clear that most of the teachers are so far not cognizant about self directed learning and how far it can be corroborated to promote this skill through geography education. These findings certainly revealed the requisite of promoting self directed learning among the geography students at higher secondary level.

4.8.3 Entry Level Creativity Scale

Scales are the tool which is used to signify the participant’s level of agreement, perception, importance or any other value based judgement related with the specific attributes of the variable. For the present study, before developing the model the investigator explored the entry level position of creativity among geography students at higher secondary school level. With this intension in mind the
investigator prepared and administered an entry level creativity scale. Before preparing the scale the investigator prepared a draft form of the test by listing a set of items based on creativity. As a pilot study, the draft form of the test including 20 items was tried out with a sample of 50 higher secondary school geography students. The final form of the scale was prepared based on the response obtained through the pilot test. The entry level creativity scale is given as Appendix III.

The final three point entry level creativity scale encompasses 13 items based on the focal area creativity was tried out with a sample of 50 higher secondary school geography students. The entry level creativity scale was appended as Appendix III. The ratings of students were collected and the percentages of the ratings were calculated. The analysis of the response obtained from the students indicates a strong need for enhancing the level of creative abilities among the geography students at higher secondary school level.

4.8.4 Model Validating Judgement Schedule

After acquiring the qualitative part of the data collected through the need analysis, the investigator developed a model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level. Before developing the final model the investigator tried to assess the practicability and quality of the developed model and to know about its suitability to transact the prescribed content in the geography curriculum effectively by promoting the skills of self directed learning and creativity. For that the investigator prepared a judgement schedule to assess and validate the developed with the prevailing activity oriented approach.
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The judgement schedule accommodates 21 items under seven focal areas to frame the schedule more reliable, valid and objective. The schedule is prepared in such a way that the participants were asked to place their reflections against each focal area.

*Figure 4.5: Focal areas of Model validating judgment schedule*

The judgment schedule was given for select sample of higher secondary school geography teachers and experts in geography and education and collected their remarks and suggestions about the prepared judgement schedule. The final form of the instrument (Appendix IV) was prepared and validated by compiling the modifications and suggestions rendered by the teachers and experts both in design quality and their specific focal areas. The developed model of teaching based on the objective ‘create’ is finalised after getting the validated version from the judgement schedule.
4.8.5 Lesson Designs Based On the Developed Model

In the present study for the purpose of experimentation, the investigator prepared lesson designs on developed model of teaching based on the objective 'create' for promoting self directed learning among the geography students at higher secondary level. Before developing the model, the investigator went through numbers of teaching methods, strategies and models which have been used in the area of geography education. A detailed cautious study of available literature reveals that most of the learning strategies have its own built-in strength and weaknesses. Afterward the detailed deconstruction of the results of need analysis and variegated teaching learning methods, strategies and models related to creativity and self directed learning, the investigator developed a model of teaching based on the objective ‘create’. The lesson design is given as Appendix V.

4.8.5.1 Development of Transformational Enactive Model Based on Creativity and Self directed learning

The present study intends to develop a model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level. The procedural pathways followed by the investigator to develop the particular model is given in the following figure 4.6
Figure 4.6: Process for generating episodes of model development
4.8.5.1.1 Need analysis

As a prelude to develop a model of teaching based on the objective ‘create’ for promoting self directed learning among the geography students at higher secondary level, the investigator conducted a need analysis to schematize the needfulness of developing such a model. For that the investigator analysed the prevailing modes of pedagogic practices and the hindrances confronted by the educational practitioners for the effective curriculum transaction of geography at higher secondary school level by conducting a semi structured interview among higher secondary school geography teachers. The investigator assessed the initial level of knowledge constructs and structured patterning of self directed learning at higher secondary level from a select representative sample of higher secondary school geography teachers. For that the investigator administered self directed learning perception questionnaire. The investigator also assessed the entry level creativity status of geography students at higher secondary level through an entry level creativity scale.

By diagnosing the results of data collected through the tools developed for need analysis, the investigator felt that it is essential to develop certain curriculum transaction modalities to orient the learners through creative and innovative learning opportunities which equip learners to exhibit autonomous and self initiated learning. The researcher also analysed the philosophical, psychological and sociological aspects of prevalent curriculum transaction practices in Geography at higher secondary level and made discussions with experts and teachers in the select fields. Keeping this in mind, the investigator found that there is a bare need for developing
a model of teaching based on the objective 'create' that is helpful for promoting self directed learning among the geography students at higher secondary school level.

4.8.5.1.2 Reflex on building glared association with the model of Successive Approximation

The present study is focused on developing a model of teaching based on the objective 'create' for promoting self directed learning among the geography students at higher secondary school level. The investigator adopted the stages suggested by Successive Approximation Model (SAM) by Allen Interactions for developing the select model with slight modifications to match with the developmental phases of the model namely Pre preparation phase, Interactive design phase, and Interactive development phase. Successive Approximation Model (SAM) is an approach to the development of instructional design products that address the performance need through iterations and repeated small steps. SAM is an agile e-learning development process built specifically for the creation of performance-driven learning. The design process of successive approximation model is given below.
I. Pre preparation Phase

1. Background

SAM starts with the pre preparation phase in which the investigator conducted a pre preparation before starting to develop a model of teaching based on the objective 'create' for promoting self directed learning among the geography students at higher secondary school level. During this period the investigator discussed with higher secondary school geography teachers and experts in the field of geography and education for gathering information and for framing a background idea about the proposed model.
The investigator thoroughly analysed the present condition of teaching learning practices and modalities at higher secondary school level. In order to identify the prevalent methods, strategies and models for teaching geography at higher secondary school level, the investigator analyzed the geography curriculum at higher secondary school level, higher secondary school geography text books, hand book, and resource book related to content and methods of teaching geography. Before developing the model, the investigator should have a clear idea about the existing methods, techniques, strategies, theories and models related to self directed learning and creativity and act as a frame while developing the learning sequence of the developed model. The investigator went through all the theories and models that are available to escalate the skills of self directed learning among the learners, the theories and models of creativity and also assessed the current trends of educational scenario in the field of geography education. Based on this analysis the investigator identified and selected certain models and methods that are suitable to develop the new model with set objectives.

II. Interactive Design Phase

In this phase there are three stages, namely Design, Prototype, and Review.

1. Design

In this stage, the investigator prepares a sample design or framework for developing a model of teaching based on the objective 'create' for promoting self directed learning among the geography students at higher secondary level. To improve the level of creativity through the dispositional stance as relying upon one’s self and doing things in unique, and self determined solution pathways of schematically designing learning solution. The background indication leads to adopt
a dynamic innovative and creative stand and the consequent individualizing and
directing their learning to an autonomous confrontation. For the creative nurturing of
the learners in the attainment of fullest potential in order to tackle the problematic
situations confronted by them and the learner’s readiness for effective planning and
report that the self directed learning literature clearly implies a relationship between
creative thinking and self directedness in learning. In this context, the investigator
decided to develop a model of teaching based on the objective ‘create’ for promoting
self directed learning and designed the pathways of model development in three
phases. The first phase emphasis on the development of Structured Interface of
Creativity Model, the second phase focus on Crafting of an Elucidated Self directed
learning model and the third phase stress on the development of Transformational
Enactive Model based on Creativity and Self directed learning. The phased segment
of model design is given in figure 4.8
Figure 4.8: Phased segments of model design

2. Prototype

Prototype is the primary version or early sample of a model developed. It is the formalisation stage in which the investigator decided to prototype the new model designed in three phases. It is the development in a variety of stacking methods, from simple ones to build complex learning models.

Phase I Structured Interface of Creativity Model

The investigator reflected upon the varied theoretical versions of creativity. Creative Problem Solving Model version 6.1 and Directed Creativity Cycle are found to be most suitable for developing the new model of creativity that is Structured Interface of Creativity Model. The detailed versions of these models are incorporated in the chapter II Theoretical Constructs. The phases of the developed Structured Interface of Creativity Model is a) Present the problem scenario, b) Structuring the problem, c) Immersing and accelerating ideas, d) Communication
and Building acceptance, e) Focus on implementation, and f) Evaluation and refinement are detailed below.

a) **Present the problem scenario**

In the launch of the creativity model the teacher presents or introduces the problem scenario to the students. It is the initial phase in which the general and specific knowledge about the problematic situation is presented to the learners. This stage is designed to formulate the knowledge structure required with the dynamic positive positional way of scenario planning in the set learning environment. This will guide the students towards the selection of most appropriate and feasible problem to be solved. So the creativity model requires present the problem scenario as the primary step.

b) **Structuring the problem**

Structuring the problem is the crucial stage because the teacher need to focus on the selection of the most appropriate and feasible problem to be solved through creative ideas. The problem acts as a stimulus for investigating the challenge through discussion and asking questions and act as a framework for organizing the creative ideas. Giving a befitting direction to the learners to focus rationally to understand the most appropriate and feasible problem through sequencing knowledgeable and creative potential challenged by the learners from within and in connection with peers. Once the problem that needs a creative solution is investigated and analyzed, the next step is to define and state the problem in brief.

c) **Immersing and accelerating ideas**

After structuring and defining the problem, the teacher directs or exposes students to actively engage in exercise that foster divergent or unconventional
thinking that promote the generation of ideas. When the students are searching for innovative solutions through the use of improvised tools and resources, which can be a powerful way to come up with or to gain clarity about a problem under exploration.

d) **Communication and Building acceptance**

After generating or accelerating unusual ideas, the generated ideas and solutions were communicated in small groups of select learners to share what ideas and solutions they have learned or developed. The teacher invites students from each group and allowed them to read the creative unusual solutions they attained to generalise and present it before the entire class. The effective communications that results and supports creative knowledge production develop insight and helps other learners to build a special collaboration for positive learning.

e) **Focus on implementation**

Idea implementation describes the process of converting the ideas into new and improved learning outcomes, idea collaboration and putting creativity by allowing a sense of satisfaction and positive learning attitude. At the implementation stage learners get the opportunity to execute their enunciated solutions which they communicated and accepted are applied for the building up of creative frames in a logical platform.

f) **Judgement of Creativity**

Having communicated the solutions in the above manner, in this final phase the teacher give feedback on the originality and feasibility of improved and creative learner framed ideas in relation with their enduring efforts to bring transformational change for the felt problem.
Phase II Crafting of an Elucidated Self directed learning Model

The investigator reviewed various research trends, theoretical versions and dynamic structure on model of self directed learning, Knowles 5 stage model (1975) and Self directed learning cycle are observed most sufficient for crafting of an elucidated self directed learning model. The model encompasses six stages namely 1. Analyze in the platform of learning needs, 2. Orientation to goal setting, 3. Planning resources, 4. Designing a coherent pathway of strategies, 5. Apply strategies and monitor performance, and 6. Task assessment.
1. **Analyze in the platform of learning needs**

   This is the initial stage of the learning process in which, learners analyze their own learning task taking into account their wants and interests and decide on learning priorities. In this stage learners are made aware of uncomfortable feelings and thought by confronting with the new events, experiences and actions of self directed learning, that are challenging to the learners. This awareness of conflicting or incompatible events makes them analyze learning needs that is the gap between where you are now and where you want to be in regard to a particular set of competencies.

2. **Orientation to goal setting,**

   After analyzing in the platform of learning needs, the learners began to work on the task such as working backward, breaking down the target activity into coherent segment and setting up own learning goals and sub goals. Goals should be specific, realistic, challenging, measurable, and unambiguous. Learners may have one or two overall goal and sub-goals which help them achieve their more general goals. In most situations learners need to explore and link what they know and have to fabricate learning goals in order to construct and develop their learning background.

3. **Planning resources**

   In order to investigate the learning task, learners must need resources to seek information with which to construct their autonomous learning performances. Students should determine what kind of resources they will need in order to attain stipulated learning goals. They can choose either material designed for geography learning or help from geography teacher or a combination of both. Students must
also decide how they are going to use the chosen resources in a way that will help students to achieve their set goals.

4. **Designing a coherent pathway of strategies**

   The strategy formulation pathway illustrates the basic components of a typical design process of learning. It indicates how and where the learner structure autonomous design pathway to process internal learning strategies, tasks, and experiences in a conducive learning environment to formulate conceptual structures tangled in the process of taking information and getting it transferred. In this stage students are asked to plan a solution strategy for a set of problem. In designing process, using students knowledge about the task and their needs to plan the self learning process that will be best-suited to help them to reach their goals.

5. **Apply strategies and monitor performance**

   After completing the planning of learning strategies, learners are then ready to start implementing or applying their learning strategies and activities. Self directed learners in the process of integrating the conceptual components, concept clusters, themes, descriptive and prescriptive generalizations and lays down the cascade of autonomous position. Strategy implementation plan which seeks to accommodate the students self learning experience exorted to integrate the newly designed learning strategies

   and share experiences about implementing strategies in the background of effective learning activation.
6. Task assessment

After students have gone through and finished their work or the learning strategies, students should reflect and evaluate their learning process. Explore ways to use guided self assessment to built high quality self directed learning process in students, which will assist to produce successful self directed learners. In self directed learning learners assess themselves individually as to their level of knowledge acquisition, self directed learning support of the group, attainment of the set learning goals, utilisation of the select learning resources, and time plan.

![Figure 4.10: Visual representation of Crafting of an Elucidated Self directed learning Model](image_url)
Phase III Transformational Enactive Model based on Creativity And Self Directed Learning

Interaction with the creative self is essential to the development of creative expression, transferable skills and structuring of a sense of self responsibility in order to and thus making learning more effective. Learning performance as a result of their learning techniques are derived from the tapping of a range of innovations from the creative state of learning instances, ownership and control of their radiant inner glow to empowering the learners to know how to learn independently. In this phase the Transformational Enactive Model based on Creativity And Self Directed Learning (TEMCS) has been designed from the above mentioned Structured Interface of Creativity model and Crafting of an Elucidated Self directed learning model to strengthen the power of self directedness through reinventing the learners best with high performances graphics and long lasting learning that match their individual learning style. A schematic web of the development of TEMCS is given below:
3. Review

This stage focuses on a formal assessment of the prototyped model with the intention of launching changes if necessary. In this stage, the preliminary version of the model presented in the stage prototype is critically reviewed and appraised by the experts. Based on the remarks, necessary modifications are added to the early version of the model.
III. Interactive Development Phase

In the interactive development phase the model development procedure rotates through development, implementation, and evaluation. As the teaching model is being developed, the investigator continuously analyses and evaluate, so that at any point a change needs to occur, it can happen quickly and limit any risk of the model development.

1. Development

Development is the crucial stage in which the early version of the model presented in the stage prototype is being developed as a teaching model by adding the suggestions and modifications emerged from the stage review. This stage is the extension of design and prototype stages of the interactive design phase. In this stage the basic elements of a teaching model – the syntax, principles of reaction, social system, support system, instructional effect, nurturant effects as suggested by Joice and Weil are developed.

Figure 4.12: Components of TEMCS
2. Implementation

The implementation stage reflects the tryout of the developed draft model to a representative sample (100) of higher secondary school geography students to make sure maximum efficiency and positive results are obtained. This stage ensures that the model can be delivered effectively and about the practicability of the developed model. For that meticulous monitoring is a must. When the teacher and learners actively contribute during the implementation stage, instantaneous modifications can be added to the model, and thus making the model more effective and successful.

This stage will help the investigator to deal with any possible errors during the implementation or testing of the model, teachers and students roles and response in each phases of the model while presenting the learning activities, to identify the things that do not go as planned, and to diagnose can the model help to promote creativity and self directed learning.

3. Evaluation

The final stage of the model development suggested by SAM model is evaluation. This is the essential stage of the model development in which the model is being subjected to meticulous final assessment regarding the what, how, why, when of the things that were accomplished of the developed model, that is implemented or tried out to a representative sample of higher secondary school geography students. The main goal of the evaluation stage is to determine if the goals have been met, and to establish what modifications will be required moving forward in order to further the efficacy and success rate of the developed model. For
that a model validating judgement schedule is prepared and distributed among the higher secondary school teacher and experts in the field of geography and education.

4.8.5.1.3 Preparation of the final model

The interactive approach to model development is based on several underlying values about the appropriate goals oriented objectives to instruction, including a substantial focus on self initiated learning task enforcement on everlasting transfer as well as retention. Based on the remarks obtained through the model validating judgement schedule the investigator modified the syntax and other aspects of the model and prepared a new model of teaching, Transformational Enactive Model based on Creativity And Self Directed Learning (TEMCS) describing a combination of Structured Interface of Creativity model and Crafting of an Elucidated Self directed learning model to bring transformational change towards better learning

Syntax of TEMCS

Syntax or phasing of the model describes the model in action. It is described in terms of sequence of events called phases. Each model has a distinct flow of phases. (Joyce and Weil, 1972). The syntax of the developed TEMCS is given below.

I Generating

1. Presenting the problem scenario

2. Pursue a pattern of challenge disposition

II Planning

3. Synaptic goal setting
Methodology

4. Planning resources

5. Focus on self planned creative activities

III Producing

6. Resonate planned activities in to action

7. Launch communication

8. Assessment pathways

A schematic design of TEMCS is given below

Figure 4.13: The Schematic design of the TEMCS
I. Generating

The first phase of the model is generating which sketch the background with unresolved need to generate a consistently creative orientation to the confronted problem scenario by silting the confrontational issues. Generating involves representing the problem and arriving at alternatives that meet certain criteria, or redefining or coming with a new representation of the problem that may suggest different solutions. Within the first phase of the model there are two facets, namely Presenting the problem scenario and Pursue a pattern of challenge disposition.

![Diagram showing facets of generating phase]

*Figure 4.14: Facets of Generating phase*

**Presenting the problem scenario**

It is the earliest facet in which the learners are made conscious about the new experiences and new actions or task that are effortful to the learner. Here teacher presents or introduce the problem scenario, its structure, and the modes of inquiry employed to the learners. Because learners need knowledge of the learning context from which the problem is drawn and also use knowledge and skills from both inside and outside the classroom. Presenting the problem scenario is designed to
build interest and readiness among learners and they can launch the investigation for the creative process and directs the learners to the particular learning problem.

**Figure 4.15: Highlights of Presenting the problem scenario**

**Pursue a pattern of challenge disposition**

In the second facet student identifies the major challenge from the presented problem scenario by analyzing the problem scenario through multilevel conceptual lens and its relevance is estimated in the light of various supportive evidences that are presented (slide presentations, net material, paper cutting, learning documents and the like). Facilitator should encourage students to think divergently towards the selection of felicitous and productive problems that require creative imagination. It will be a self initiated problem or challenge because students have the freedom to choose the challenge from the presented problem scenario. Once the challenge that needs a creative solution is identified, the facilitator should motivate the learner to define or state the challenge by providing as much information to the students. If the
stated challenge is less coherent or related or feasible, the learners have the freedom to shift the focus of the thinking process and initiate a new set of challenge statement.

**Figure 4.16: Highlights of Pursue a pattern of challenge disposition**

**II. Planning**

The second phase of the model is planning. Planning is the core which is specifically made to guide the learners in a series of creative explorations and problem solving activities that will direct them to self efficacious, autonomous learning endeavours. It is the developmental activity that is associated with the framework of guidelines and formats sequencing decisions for set learning tasks, including self directed task analysis network to enrich and individualize learning. Planning is needed to assure optimum learning by students, effective use of learning resources, and the achievement of set learning objectives. Within the second phase
of the model there are three facets namely, Synaptic goal setting, Planning resources, and Focus on self planned creative activities.

*Figure 4.17: Facets of Planning phase*

**Synaptic goal setting**

After identifying the challenge the learner began to break down the task or problem into constituent elements to setting up own learning goals and sub goals. Setting goals enables students for a proper orientation to learning leads to more inductive, flexible, and imaginative task orientation and thus spur in original thinking. At the time of such setting the students get ample opportunities to become critical thinkers, learn and reflect on their learning, accommodate and personalize the goals, and tries to apply it in intermittent situations. Here students should state their choice as goals that will act as clear guides to what they intend to do. Goal setting relates to the specific, desirable goals as statements.
Planning resources

Once learners have identified and analysed their challenge, the students are encouraged to plan the learning resources needed to attain the set learning goals from many sources of information from different point of view of the challenge. Purpose of this facet is to advance the learning experience of students through creating a more flexible learning environment. Planning resources provide a deep understanding of the learning challenge and directing student’s interaction with the learning situation. While investigating challenges in depth, they often come upon issues that are beyond the classroom community’s expertise including disciplinary expertise, telementors, list of World Wide Web and unique source of materials like pamphlets, magazines, newspaper articles, and text books which support student centered problem solving. Learners must also focus on approaches for identifying and selecting needed information, evaluating identified resources, and how they are
going to use the chosen resources in a way that will help them achieve their learning goals.

**Figure 4.19: Highlights of Planning resources**

**Focus on self planned creative activities**

In this facet teacher encourage the students to focus on creative learning activities to arrive at possible or tentative solutions to the identified challenge. It is the process through which students plan the most appropriate course of action to achieve its defined goals and provide a framework for the actions that direct to the anticipated solutions. It supports to planning learning activities, analysis and theoretical decisions about creative learning activities. In order to assist the students teacher extend their ideas about creative activities including Circle of opportunities, Text ticklers, Stereotype, mental breakdown, and the like. The activities are to be explicitly incorporated to stir interest, curiosity and motivation among learners.
Later the students discuss about the feasibility and consequences of the planned activities and reach a consensus regarding the most suitable activities.

**Figure 4.20: Highlights of Focus on self planned creative activities**

**III. Producing**

Producing involves carrying out a plan for producing a solution to the felt challenge that meets certain specifications. Producing is the process that turns planned creative activities into action plans and learning activities in order to accomplish set learning goals and objectives. The components of the phase Producing are Resonate planned activities in to action, Launch communication, and Assessment pathways.
**Resonate planned activities into action**

In this facet students are encouraged to implement the planned activities into action. It is the systematic sequencing of all the planned activities in solving the felt challenge and requiring careful attention to monitoring the action. This facet gives students opportunities to share thoughts and feelings, delegate responsibilities for individual and group work, and learn to express themselves. It encourages initiative and enables students to build on each other’s contributions which increase flexibility and minimize stress for more effective performance of an individually chosen activity. Here the students apply the planned activities and tools including Circle of opportunities, Text ticklers, Stereotype, mental breakdown, and the like to analyse, refine and select among the generated the solution pathways opted for and to seek possible solutions to the set goals.
Launch communication

In this facet learners display the novel outcome and developed solution to others and getting feedback. Students need spontaneous sharing of constructed knowledge in the geography classroom. The students are properly encouraged to an inspiring and useful way towards a move on productive self reflection and spontaneous sharing of identified and learned facts that penetrate in the classroom. Systematic communication of the developed facts strongly influences self management and process of developing effective functioning and provides opportunity for student reflection. The communication will enable the students to express information in a well organized way, interact with opposing views, embrace an appropriate stance, remove ambiguity and ensure sequential learning and motivate students to excel.
Assessment pathways

The final facet Assessment pathways intend to evaluating and reflecting students achievement and programmes towards the task and set goals. The creative outcome is judged in terms of its relevance and effectiveness by teachers and the student self assessment that the creative outcome is communicated. Students begin evaluating them by discarding the most obviously inappropriate ideas. Assessment process includes evaluation of stating of objectives in simple forms, planning resources, planning creative activities, and using the best set activities to make the learning process. Assessment pathways encourage the students to look for other innovative situations and logical confrontations that need creative solutions and to develop learner autonomy and self assessment habit. Through this, learners can determine whether the way they have been learning has had the desired effect on their learning proficiency in the focus area and they will have the opportunity to re-
examine the learning plan and change it to better fit their goals. Self assessment is meta-learning: learning how to learn.

**Figure 4.24: Highlights of Assessment pathways**

### 4.8.5.1.3.2 Components of TEMCS

**Principles of Reaction**

Principle of reaction guides the teacher’s response to the learner. It guides the teacher how to regard the learner and respond accordingly (Joyce and Weil, 1972). Principles of reaction narrate the teacher how to attend and admire the learner and how to react to what the learner does in each facet of the model. In this model TEMCS, the principles of reaction for the teachers are footing on self directed or student directed responses on the move to the enhancement of creativity towards the acquisition of knowledge for the set goals of instruction. Teacher should buck up the learners to come out of the formalized pattern of thinking and try to catalyze learning environment apt to generate creative responses. Teacher should react in
such a way as to help them define their problems, take responsibility for their learning, and plan and set their goals to achieve them. Always teacher should make an effort to encourage students independent thinking throughout the model.

In the first facet the teacher guide the learner through the pathways of the attainment of set objectives in the application of declarative (what students need to know) and procedural (what students can do with the learning) setting. Teacher further extents the guidelines of orienting towards the model and the procedures that are going to be embraced in this session. When the problem that needs a solution is identified, the facilitator should motivate the student to define or to year mark the peculiarities of the problem towards developing and building a continuous clinch. In order to create an inspirational move, facilitator should act as a leap-pad to look around the formulation and sparking up of appropriate and desirable goals to creative thinking or in to the imagination as a way of getting the ideas flooding in. While identifying and choosing the resources, teacher should help the learner to focus on set goals. In the idea generation facet, teacher should encourage students to indulge in irrelevance, fantasy, symbolism and other creativity techniques necessary to break out of the usual approach of thinking. Teacher should try to build a sense of positive reinforcement with appropriate discourses and constantly changing the creative trends of students to use their imaginations to develop interesting and original ideas of their own. During the subsequent facets the learner has arrived at the solution and to communicate aptly in the frequently formed small learning groups to build acceptance of the creative ideas it in the learning group. Here teacher must accept all the creative ideas that are flowing from the students and their mode of thinking emphasis originality, divergent thinking and production of new ideas and
suggest new ways of developing ideas. The teacher should encourage the learners to evaluate each of the proposed idea systematically and motivate to actively share their experience. In the final facet of the implementation of the developed model, the students are oriented towards to assess the level of attainment of the set goals through self assessment practices. Teacher should monitor and evaluate their way of working, the progress of work made, examine the learning process and provide effective feedback and remedial and enriched tracks to the learners.

**Social System**

The social system describes students’ and teachers’ roles and relationship and the kinds of norms that are encouraged. The leadership roles of the teacher vary greatly from model to model (Joyce and Weil 1972). It refers to additional requirements beyond the usual human skills, capacities and technical facilities necessary to implement a model.

In the TEMCS teacher plays a valuable role in helping students make a smooth transition from teacher directed to student directed learning by assuming different roles of facilitator, challenger, reflector, decision maker, manager, and the authority is shared between students and teacher. The social system is deliberately set creative backing with self centred and student is primarily responsible for the initiation, maintenance and monitoring of the enriched learning setup. Teacher helps the students intellectualise and realise their self skills. Rewards mainly in the form of approval of specific desired behaviour and in the form of negative or positive reinforcement. The rewards are internal coming from student's satisfaction and pleasure with the self directed innovative learning activity. The knowledge of
oneself and the psychological rewards gained from self-reliance are generated by student behaviour.

Conducive atmosphere has been created in the classroom for the effective coordination of the task performances between the learners who are active in their self exploration of innovative potential and for the transformational empowerment of individual and group of learners. In the developed model active participation of the learners are given more emphasis with the timely interference and suggesting guidelines which are sufficient enough to bring transformational impact on the learners. In each facet of the model more importance is given to the learner, even though the teacher’s role is also very significant

**Support System**

Support system describes the supporting conditions required to implement the model in the curriculum transaction process. ‘Support’ refers to the additional requirements beyond the usual human skills, capacities and traditional facilities. This includes disciplinary expertise, telementors, list of World Wide Web, and unique source of written materials like pamphlets, magazines, newspaper articles, text books, films, laboratory kits, and other reference materials.

In the developed model TEMCS based on self directed learning and creativity, the investigator has integrated all the support systems which are available and relevant to the select topic that reflects on conceptualizing range of skills to think independently and act freely in the phases of the model. TEMCS perforce a facilitator with masterly skills in the TEMCS to scaffold the leaner’s at each phases of the model. Other major instructional supports for the model focus on a rich array of necessary learning materials including, map, globe, video clippings, reading
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materials including library books, computer assisted instruction materials etc. A flexible instructor skilled in the process of self directedness and creative exposition, ample opportunities for the areas of self investigation and their ensuing problems, and required data source from which to conduct creative exploration in to these areas provide the necessary support system for this model.

The class requires a work space supportive for self directed learning must be made available and an environment which requires special arrangements in which creativity will be cherished by providing adequate time to explore the select problem in an unhurried manner. Above all the model place emphasise on a social environment that promote creativity and apply group cohesion to generate power that allow the learners to function independently in a creative archipelago.

Effects of the Model

Another crucial aspect of the model is about Instructional and Nurturent effects. The effect of an environment can be direct or can be implicit in the learning environment. The instructional effects are those directly achieved by leading the learner in certain directions. The Nurturant effects come from experiencing the environment created by the model. (Joyce and Weil, 1978).

Instructional Effect

Instructional effects are the direct effect of the model which results from the content and skills on which the activities are based. A systematic curriculum transaction through the developed model TEMCS provide a systematic planning and prioritising for the processing of knowledge and content and have a special concern for student autonomy, developing creativity through constructive and innovative learning strategies, improving communication skills, and self analysis of the learning
task. In this model teacher scaffolds students to attain the skills of thinking independently and creatively, and teaching students to think how to think and helping students to learn how to learn themselves. The major direct learning outcome of the model is mastery of the skills of self autonomy on the learning tasks through generating, planning, and producing creative solutions to the set learning tasks. This include skills of identification of the emergent problems and challenges that need a creative solution, synaptic goal setting to direct the students, planning of learning resources to acquire knowledge, setting self planned creative activities to arrive at creative solutions, implementation of planned activities in to action to produce novelty and originality, how to communicate the learned facts in the group and to build acceptance, assessment pathways including self assessment opportunities and thus a lasting learning for understanding.

**Nurturant Effect**

The developed model nurtures the learners to think independently around the felt problem that need a creative solution from the stance of a creative problem solver. Students acquire the mastery of the framework of thinking independently throughout the thrust area of geography. Through the faced integration of the model students gets an opportunity to integrate the self directed learning skills involving the ability to manage learning tasks with creative backing. The developed model TEMCS encourages a positive environmental attitude towards analogous synchronization of sequential relationship with activities for depriving generalizations. Students are actively involved in identifying the learning task, goal setting, planning resources, implementing and monitoring their own set learning strategies and the assessment of creative outcomes. Learning through the model
promote self confidence, motivation, self responsibility, cooperation among group members, problem solving abilities, decision making skills, self dependence, and the power of self efficacy.

4.8.6 Lesson designs based on activity oriented approach

The lesson designs based on the activity oriented approach were prepared using the XI geography text book, handbook, and course book. The draft form of the lesson designs were prepared by following the procedure for the development of lesson designs. It was distributed to experts for getting feedback and suggestions. The lesson design was modified by the investigator based on the feedback and suggestions received from the experts. Then the modified lesson design was given for try out among one class of XI geography students. After that the final form of the lesson designs was prepared on the basis of the actual classroom experience from the try out.

4.8.7 Creativity test in geography

Measuring is a comparison of unknown quantity to a known and canonised unit. This is particularly difficult when we are dealing with creativity. The essence of creativity is to produce something that is novel and unique and not existed before. So the biggest problem is comparison, which is why it is difficult to quantify. It is requisite to have adequate tool for measuring creativity in geography among higher secondary school geography students. A trustable standardised tool for measuring creativity in geography of higher secondary school geography students was not found acquirable. For this end, the investigator decided to prepare a creativity test in geography.
A standardised test has high validity and reliability. Standardisation is defined by (Waren 1934, p.261) as the establishment of fixed or standardised procedures in giving and scoring of test, as well as the establishment of adequate age, gender, race or other norms.

4.8.7.1 Construction of the test

After a keen analysis of the theory and available literature, the investigator prepared the creativity test in geography. The following steps were used while preparing the creativity test in geography.

Planning of the test

Before planning a test the investigator went through different studies and articles from different journals, and books related to (creativity, psychology, education, and measurement and evaluation) the specific area to find out the methods related to creativity test construction. The investigator frequently consulted with guide and also consulted with experts in the field. The investigator referred Language creativity test, Passi test of creativity, Creativity test of Guilford etc. For the present test the dimensions considered for the geography creativity test were fluency, flexibility, originality, sensitivity to problems and elaboration and redefinition.

For measuring creativity in geography, the content of test is related to geography. The items were selected based on the cognitive level of the higher secondary school students and are suitable for measuring the creative abilities of higher secondary school students. The numbers of creative task are limited to 30 which can be completed within the stipulated time. Because of the divergent nature
of the test, open ended questions were included and the respondent can reply freely in his own words including several possible unique responses.

**Preparation of the draft test**

The items selected for the draft test were grouped into five major components as fluency, flexibility, originality, sensitivity to problems and elaboration and redefinition. In each category several items were prepared based on the selected tasks and by referring related literature.

After grooming items based on the selected tasks expert opinion were thought out to find out the challenges and practicability of the test items. Test items were modified based on the feedback acquired through the expert opinion. Certain items were amended and modified several times before preparing the final draft. The draft test entails 28 items.

General instructions regarding the test, clarifying the aims of the test, nature of the test and what is what is expected from the subject are included in the front page. Space is provided for writing the name of the student, name of the school, boy/girl and the like. The test items were set in the form of a booklet. The specific directives were given clearly at the prefatory of each task. Enough space was provided for writing and drawing under each item. Separate answer sheets are also provided for additional rough work. Copy of the draft test is given as Appendix VIII

**Try out of the draft test**

Try out of the test was done to assess the practicability of the test items and to select good items for the final test. So the draft test was administered to a representative sample of (150) students higher secondary school students. After
getting permission from the head of the institution and subject teacher, the date and
time for the test was fixed. A good rapport was established before the administration
of the test to express their creative and imaginative ideas freely and friendly.
Necessary instructions were given and clarified the doubts of students. Students
were directed to respond to all the items freely and fearlessly and try to give
maximum number of unique responses to each item. Enough time was provided to
complete the test.

**Scoring technique**

A scoring scheme was prepared for scoring the test items. Each response was
scored for fluency, flexibility, and originality.

Fluency – Fluency has been scored in terms of total number of unique, relevant and
unrepeated responses. One score was given to each response.

Flexibility – Flexibility has been scored in terms of total number of categories of
response. One score was given for each category and no extra score is given for
more than one response in a category.

Originality – Originality has been scored in terms of their degree of unusualness.
Each response for every test item was compared to the total response from all the
subjects. The scores vary from zero to four.

**Standardisation procedure**

A standardised test has high validity and reliability. For that the items were
analysed quantitatively and qualitatively. Qualitative item analysis included the
evaluation of items in terms of content and form. For quantitative item analysis t-
value was considered.
Item analysis

Item analysis is the process to evaluate the effectiveness of item in terms of item difficulty and item discrimination power. In the construction of present creativity test difficulty index could not be resolved in the conventional manner because the items of creativity test in geography demanded response to divergent nature. In this study Edwards's (1969) procedure of item analysis was embraced.

On the basis of the total score obtained, the 150 response sheets were arranged in the descending order of marks. The high and low groups were formed by taking 27% (40 papers) of the total samples who obtained the highest scores and 27% of the total sample subjects who obtained the lowest scores respectively. The items with 't' value equal or above 2.75 were noticed and selected for the final test. The 't' value was calculated using the formula

\[
t = \frac{X_H - X_L}{\sqrt{\frac{\sum (X_H - \bar{X}_H)^2 + \sum (X_L - \bar{X}_L)^2}{n(n-1)}}}
\]

Where, \(X_H\) – Scores of the test in the upper group

\(X_L\) - Scores of the test in the lower group

\(X_H\) – Mean scores of the test in the upper group

\(X_L\) – Mean scores of the test in the lower group

n – Sample size
Preparation of the final test

The items for the final test were selected based on the item analysis. The items with 't' value equal or above 2.75 were noticed and selected for the final test. Among the 28 items in the draft test 20 were selected for the final test. The final form of the creativity test in geography is given as Appendix X.

4.8.7.2 Evaluating the test

Reliability

In order to substantiate the reliability of the test, test-retest method was adopted. The test was administered to 60 higher secondary school students after one month gap. The test-retest reliability coefficient was 0.81. The value shows that the test is a reliable one.

Validity

Validity shows the degree of accuracy to which a test measures what is intended to measure when compared with accepted criteria.

Content validity – Validity of the content through competent judgement is mostly satisfactory when the sampling of items is wide and judicious and when adequate standardisation groups were utilized (Garret, 2005). Different types of tasks that are competent for assessing geography creativity were included in the test. The investigator subjected the test items for expert's opinion. The test items were competent of assessing fluency, flexibility, and originality.

As the content of the scale was thoroughly covered through extensive literature reviewed and expert's opinion, it was assumed that the test measures what
is indented to measure. Therefore, the test is taken as a valid measure of creativity in geography.

4.8.8 self directed learning scale

All individuals are competent of self directed learning, but the level of development contrast due to their individual differences. Through our formal education learners must cultivate the skills of self directed learning, and can be competent enough to transfer the skills from education to throughout their life. Both the teachers and learners must have a clear notion about level of self directed learning for the selection of befitting teaching learning strategies to promote learners competence in becoming creative and self directed in their learning process.

We are all obligated to evidence-based assessment and evaluation and therefore we are committed to coming up with the tools which will permit us to measure the degree of progress or the lack of progress towards the objective of promoting self directedness among the learners.

Due to the dearth of concrete standardised scale to measure the level of self directed learning among geography students at higher secondary level and to comprehend the impingement of the developed model of teaching based on the objective 'create', the investigator decided to groom a scale for the present study. With the help of the research supervisor, the investigator prepared and standardised a (Likert scale type) scale to measure the level of self directed learning among higher secondary school students.

4.8.8.1 Preparation and standardisation of the scale

For the preparation of the draft scale the investigator consulted with experts and experienced teachers in the field and reviewed books, (by authors namely, Kosta
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& Kallick, Morris Gibbons) periodicals, websites related to particular area and other descriptive materials.

A five point Likert type of scale, whose response ranging from strongly agree to strongly disagree. For the purpose of standardisation of the scale, a draft form comprising 70 items, each reflecting the necessitous behaviour of self directed learners was developed. The draft scale was subjected to experts opinion and revised the items with respect to their feedbacks.

Tryout of the scale

The revised draft scale (Appendix VI) with 70 items was tried out among 110 higher secondary school students. General or guidelines were given in the facing paper of the scale and necessary directions were given prior to the administration of the self directed learning scale.

Scoring of the scale

A five point scale whose response ranging from strongly agree, agree, undecided, disagree and strongly disagree was selected. For the positive statements the scores range from 4 to 0 and for negative statements scores range from 0 to 4.

Standardisation procedure

The items were analysed quantitatively and qualitatively. Qualitative item analysis included the evaluation of items in terms of content and form. For quantitative item analysis t-value was considered.

Item analysis

Item analysis is the process to evaluate the effectiveness of item in terms of item difficulty and item discrimination power. For that the 110 response sheets were
scored and arranged in a descending order of the total score. The highest 27% and the lowest 27% of the response sheets were sorted out. For the item analysis the 'facility value' and 'discrimination index' of the items were calculated with the formula given below

\[ t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sigma H^2}{N_1} + \frac{\sigma L^2}{N_2}}} \]

Where, \( \bar{X}_H, \bar{X}_L \) – Means of higher and lower groups

\( \sigma H, \sigma L \) - Standard deviation of higher and lower groups

\( N_1, N_2 \) – Size of sample in higher and lower groups

Selection of items

According to the t-value obtained, the statements for which the value is greater than or equal to 1.75 was regarded as an item for the final scale. 30 statements with t-value less than 1.75 are rejected from the draft form of the scale. 40 statements selected for the final scale were deconstructed with the supervising teacher and the final scale is titled as Self directed learning scale and is given as Appendix VII

4.8.8.2 Evaluating the test

Reliability

The reliability co-efficient of self directed learning scale was established by split half method. The reliability co-efficient was 0.804 and it means the self directed learning scale is reliable.
Validity

Content validity requires both item validity and sampling validity. For content validity the investigator consulted with various subject experts and asked to review and evaluate the items for measuring the level of self directedness among the higher secondary school students. Sampling validity examines if the scale contains all the select aspects of the target group and do the select aspects are properly weighted.

4.8.9 ACHIEVEMENT TEST

Achievement test are assessment tools that aims to measure what students know to and what they are able to do in relation to academic learning objectives or learning standards. In this study, the investigator developed and standardised an achievement test in geography was used to evaluate the comparative acquirement of academic performance in geography among the higher secondary school students. The achievement test was dispensed as pre test (before intervention) and post test (immediately after intervention) and delayed post test (one month after intervention).

- To find out the coherence output of the linkage of set levels of learning goals of higher secondary school geography students
- To estimate the effectiveness of developed model and the prevailing activity oriented approach.
- To assess the standard performance behaviour of students both preliminarily and subsequently the experiment

As no precise or exact standardised test was available on the select content area of standard XI in the Kerala syllabus, the investigator prepared and standardised
an achievement test in geography. For the purpose of fulfilling the procedure of standardisation of the achievement test, a draft form comprising of 50 objective type test items was set based on Bloom's revised taxonomy of objectives. The draft test was tried out among 110 geography students at higher secondary level for item analysis. The 'facility value' and 'discrimination index' of the items were calculated for item analysis using the formula suggested by Ebel (1972)

**Facility Value**

\[
Dp = \frac{Ui + Li}{2N}
\]

**Discrimination Index**

\[
Di = \frac{Ui - Li}{2N}
\]

Where

- \(Ui\) - The number of correct response of \(i^{th}\) item in the upper group
- \(Li\) - The number of correct response of \(i^{th}\) item in the lower group
- \(N\) – No of students in the upper or lower group

The items having facility value between 0.35 and 0.65 and the discrimination index greater than 0.4 were selected for the final form of the achievement test. 25 questions thus selected were included for the final form of the test with a maximum score of 25 marks and duration of 45 minutes. Proper instructions were included in the question paper. Scoring key was also prepared for the objective scoring. A copy of the test and scoring key is given as Appendix X and XI.
Reliability

Reliability is an indicator of consistency with which a measure assesses whatever it is measuring, i.e., an indicator of how stable a test score or data is across applications or time. The reliability co-efficient of this achievement test was established by split half method. The reliability co-efficient was 0.821 and it means the achievement test is found reliable.

Validity

Content validity and empirical or statistical validity are found for the achievement test.

Content validity – The degree of content validity is largely a function of the extent to which test items are a complete and representative sample of the content and skills to be learned. The investigator consulted and discussed the test items with various experts in the subjects and added necessary modifications in the test items and thus ensured content validity.

Empirical or Statistical validity - Empirical validity was ensured by establishing relationship between scores on the prepared test and score on some established test or criterion. The investigator selected the average scores of students in two geography test papers as criterion scores for the appraisement of validity. The correlation coefficient between these two was determined and was found to be 0.76, which indicates the test is having reasonable validity.

4.8.10 Learner satisfaction Form

The learner satisfaction form is a measuring tool which includes a set of statements that requires the respondent to make their reflections regarding the set
educational experience. In the present study, higher secondary school geography students were being subjected to experiment. Throughout this period it was noticed that the students exposed to the developed model of teaching showed clear-cut change in their mode of interaction, classroom performance, and learning pattern than the students who were exposed to the prevailing activity oriented approach. Therefore, the investigator decided to adjudge the appropriateness of the developed model of teaching in the regular classroom endeavors of the students qualitatively. For that a learner satisfaction form was prepared and administered among higher secondary school geography students of experimental group after the intervention. A draft form including 20 queries were discussed with expert for ensuring the validity of the tool. The final pattern of the learner satisfaction form comprising 15 queries was prepared based on the feedback obtained from the expert validation and by the discussion with the supervising teacher. It is given as Appendix XII.

4.9 Statistical Techniques Used

Statistical procedures help the investigator to frame strong, convincing and cogent conclusions for any research study. In the present study, the investigator made use of the computation of percentages, mean, standard deviation, quartile deviation, range, skewness, and kurtosis for the primary data analysis and following procedures to study the effect of the developed model

- Independent sample t-test
- Paired t-test
- Analysis of variance
- Analysis of c-variance
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- Adjusted mean

4.10 Conclusion

Research methodology is a systematic way to solve research problems. Research methodology describes the method of conducting the research in technical terms. The details of research methodology and the procedure adopted for the present study is explained in this chapter. It reveals the various steps that are generally adopted by the researcher studying the research problem and the logical background behind it. It also describes the sampling design stating how the sample in the study will be selected and what would be the size of the sample. The details of the tool and method of measuring the variables under the study and the statistics used give a clear idea about the study. The analysis and interpretation of data collected and the conclusion of the present study are resented in the next chapter.