



EFFECTIVENESS OF EXPERIENTIAL LEARNING IN HISTORY AMONG CBSE SECONDARY SCHOOL STUDENTS

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Chapter I

Introduction to the Research

“History is who we are and why we are the way we are.” – David McCullough

1.1 Introduction:

History is the study of change in the Political, Social, Cultural, Economic, Geographical, Scientific, Technological, Medical, Intellectual, religious and life existing on earth since the prehistoric times, i.e., since time immemorial. It covers all aspects of human society and life on earth. The study of history is crucial to learn from the past and avoid making mistakes to create a better, progressive, and prosperous futuristic society.

The scope of studying and teaching History has been going through constant changes with the shift in philosophical thinking and changes in the society especially during the 18th, 19th, and 20th centuries due to the Industrial Revolution.

Also, Social Science curriculum in India has undergone several changes, both in approach and content, during the last forty years due to the various committees like Kothari Commission (1964-1966), Ishwarbhai Patel Committee (1977), The Framework of 1975, National Policy on Education (1986), NCF (1988), NCF for School Education (2000), NCF (2005) to name a few. These changes that also reflected in the textbooks were based on the global trends in Social Science education and the needs of the society. History as a social science does not have the luxury of a single Truth, but diverse truths, open to a variety of interpretations.

The secondary school students consider studying history as a study of the past, politics, great stories, fiction, and narrative writing. They are unable to link it with present times and phenomena. This becomes a challenge for the educator as the students consider the study of History as learning about the dates and chronological order of past events and thus start lacking interest in the subject. The most neglected aspect of teaching History is the

ability to develop interest in History among students. For majority of the students, History has a poor track record in the effective learning outcomes and without motivation, interest, and engagement there will be little achievement.

In the study of History, Heuristic is an approach to search, collect and organize sources of history and analyse them to obtain relevant historical facts and information according to the topic discussed. Heuristic for discovery is an approach of experiential learning that can simplify complex questions in studying historical concepts and link it with present times and phenomenon. This approach in experiential learning for CBSE secondary school students sought to develop the abilities of students as an independent discoverer. So, there is no teacher help or guidance in this method of experiential learning. The objective of this study was to encourage students to learn through doing and discovering things themselves rather than telling them about things.

To conduct this study, the students were made to do collect, research, organize, and analyse the facts about the concept "Sense of Collective Belonging" for the History lessons for class X on Rise of Nationalism in Europe and Nationalism in India to enable them to realise the role of cultural movements during the 18th and 19th centuries that paved the way to the making of the Nations of the world. Similarly, they learnt about various inventions during the period of proto-Industrialization and Industrial Revolution, i.e., 18th century onwards in the History Chapter 4 - "Age of Industrialization" for Class X from their CBSE textbook without the teacher guidance. The teacher only facilitated the heuristic approach, i.e., learning by doing. This led them to better learning outcomes and develop their interest in studying History as a discipline.

1.2 Need and Importance:

The need for this study was to find out the effective implementation of heuristic in experiential learning in studying history, i.e., learning by doing self-exploration, and experiencing the phenomena to analyse the sources of history, like, literature, photographs, material remains and conclude about facts and phenomena of the past which created the world that we see today and continues to do so.

The core aim was to develop interest in History as a discipline by studying the sources of history to derive conclusions about the events of the past and thus improving the learning outcomes of the students.

This study focussed on the impact analysis of the research on the students' learning outcomes, teachers' achievements in imparting History lessons, CBSE schools' system and the curriculum design to be implemented for better learning outcomes.

1.3 Assumptions:

Some assumptions that could be considered for the study were like: -

1. Majority of the schoolteachers teach Social Science using the conventional methods of teaching (Ramraj Sivakumar, 2018).
2. Many students find History boring and consider it as a memorizing of important dates and events. (Valerie Strauss Blog Washington post, 2017)
3. Historical work is a representation of the process of interaction between historians and the facts in the present. (E. H. Carr (Stanford 1994: 86))
4. Searching and collecting the historical materials or historical evidence to know historical events being discussed is called heuristic. (F. Sayer, Sejarah Publik. Yogyakarta: Ombak, 2017)

5. Some people still consider History as a study of political affairs, military, great narrative, narrative writing, and they still imagine it as a medium of romantic expression without connecting to the present phenomenon. (G. Himmelfarb, *The New History and The Old*. 1987)
6. History can be taught using heuristic approach of Experiential Learning. (Mohamad Zaenal Arifin Anis, Yetti Supriyati, Gaguk Margono, 2019)

1.4 Statement of Problem:

To develop and test the effectiveness of studying history through Experiential Learning for CBSE Secondary School Students.

1.5 Conceptual and Operational Definitions:

1.5.1 Conceptual Definitions:

Effectiveness

Ability to be successful and produce the intended results (Cambridge)

History Subject

History is the study of the past – specifically the people, societies, events, and problems of the past – as well as our attempts to understand them. It is a pursuit common to all human societies. (www.Alphahistory.com)

Central Board of Secondary Education (CBSE)

The Central Board of Secondary Education (CBSE) is a national level board of education in India for public and private schools, controlled and managed by the Government of India. (www.cbse.gov.in)

Secondary School Students

A secondary school is a school for pupils between the ages of 13 to 19. (Collins Dictionary)

Experiential Learning

Experiential learning is the process of learning through experience and is more narrowly defined. (Oxford)

1.5.1 Operational Definitions:

Effectiveness

In this study effectiveness refers to know the effect of the experiential learning on the students studying in S. B. Patil Public School (CBSE School) in terms of difference between the post test scores of experimental group and control group and their achievement by the students on the researcher developed tests.

Experiential Learning

In this study the researcher developed a programme based on Experiential learning in History using the heuristic approach. Heuristic approach (used about ways of teaching) of experiential learning means encouraging students to learn through doing and discovering things themselves rather than telling them about things as "learning through reflection on doing". Hands-on learning can be a form of experiential learning but does not necessarily involve students reflecting on their product. It is an economic and fast strategy that develops the habit of inquiring and investigating among students. The learning comes from real experiences based on scientific attitude which develops the habit of self- study and self – direction. Thus, is it a psychologically healthy learning system which helps to achieve cognitive, emotional, and psychological goals, i.e., overall development.

Thus, Heuristic in the context of this study refers to teaching History using the developed lesson plans on experiential learning using the heuristic approach and evaluating the achievement tests.

1.6 Objectives of the Study:

To develop and test the effectiveness of studying history through Experiential Learning for CBSE Secondary School Students.

1.7 Research Questions:

- ❖ Which methods and approaches teachers use to teach History?
- ❖ How can we effectively implement heuristic approach of experiential learning to study History?

The researcher hence decided to undertake the present study.

1.8 Hypothesis:

1.8.1 Research Hypothesis: - There is a significant difference of mean scores in post- test after implementation of experiential learning of History among secondary school students.

1.8.2 Null () Hypothesis: -There is no significant difference of mean scores in post-test after implementation of experiential learning of History among secondary school students.

1.9 Scope:

In the scope of the study were: -

1. All secondary schools affiliated to CBSE.
2. The present study focuses on secondary school students of Std. X.
3. Primary focus on using heuristic approach in experiential learning for improving learning outcomes of History Subject.

Delimitations and Limitations:

1.10 Delimitation:

1. This research was delimited to the use of heuristic approach of experiential learning.
2. This research delimited to Std. X students of CBSE Affiliated S. B. Patil Public School, Ravet Pune.
3. This research was delimited to all CBSE board affiliated schools.
4. This research was delimited to secondary school subject of History curriculum in CBSE schools.
5. This research is for the academic year 2022-23.
6. The survey includes responses of only those teachers who teach Social Science to the students of Std. IX, and X in CBSE Board Schools.
7. The study includes only the co-educational schools for the purpose of experiment.
8. The study considers chapters of Std. IX and X History from Social Science CBSE History Textbook.

1.10.1 Limitations:

1. The success of this study depended upon the response of Std. X students.
2. The responses of Std. X students depended upon the maturity levels, age, interest, and mental state.
3. Aspects like attitude, interest, motivation, fatigue, etc. of the teachers are beyond the control of the researcher.
4. Aspects like attitude, interest, span of attention, motivation, fatigue, etc. of the students are beyond the control of the researcher.

Population, Sampling Technique and Sample:

1.11 Population:

- ❖ Students of Standard X from secondary schools affiliated to CBSE (Central Board of Secondary Education)
- ❖ Teachers of schools affiliated to CBSE Board teaching History and Social Science to the students of Secondary Section in Pune city.

1.11.1 Sampling Technique:

Purposive Sampling method (non-probability)

1.11.2 Sample:

- ❖ Two groups with a total of 80 students from two sections of Std. X in S. B. Patil Public School, Ravet, Pune. {40 (Experimental) + 40 (Control)}
- ❖ 21 History Teachers teaching Std. IX and X from 10 Schools affiliated to CBSE for conducting survey to identify the most difficult topic in History.

1.12 Research Methodology:

Experimental Research Method was used with Multi method.

1.13 Research Design:

Two group design: All 40 students each of two groups (Sections A and D, with a total of 80) of Std. X were the two groups for this experimental research study and testing. Thus, post-test two group design was used.

1.14 Variables of Study:

1.14.1 Independent Variable:

Two groups/sections of Std. X students.

Group A - Teaching with use of heuristic approach in experiential learning in History in class X D.

Group B - Teaching without use of heuristic approach in experiential learning in History in class X A.

1.14.2 Dependent Variable:

Achievement test scores of both Std. X students' groups in History

1.14.3 Extraneous Variable:

Control of Extraneous Variables:

- ❖ The age group of all the students in the study were in the same range.
- ❖ Both the groups included boys as well as girls as students.
- ❖ The topics selected for the study were the same for the group of students.
- ❖ Tests given to both the groups were the same.
- ❖ The medium of instruction in both the groups was English.

Table 1.1
Variables of the Study

Independent Variable	Extraneous Variable	Dependent Variable
Programme based on Experiential Learning	Age, Sex, Topic, Time Duration, Tests, Medium of Instruction	Marks obtained by the students in the achievement tests.

1.15 Tools of Data collection:

1.15.1 Survey Questionnaire:

Survey Questionnaire was developed and administered as Pre research.

1.15.2 Post Test:

Post-tests for students to test the effectiveness of the method for achieving the desired learning outcomes

1.15.3 Usability Testing Questionnaire:

Usability questionnaire for experts and teachers. (After Implementation)

1.15.4 Teachers Handbook and Lesson Plan:

Teachers' handbook for on heuristic method of experiential learning for lesson delivery.

1.15.5 Feedback Sheets:

Feedback Sheets for Students and Teachers.

1.16 Tools of Data Analysis:

- ❖ Mean
- ❖ Standard deviation
- ❖ t-Test
- ❖ Frequency

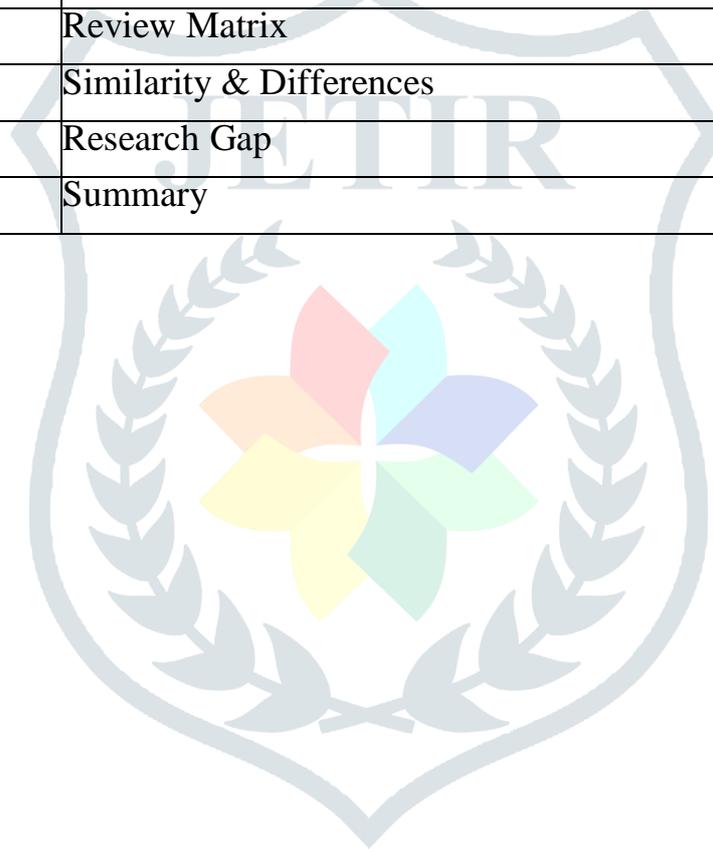
1.17 Significance of Study:

- ❖ Enable students to realize the importance of studying History as a discipline.
- ❖ This study will help develop lesson plans and activities for history using heuristic approach in experiential learning in History
- ❖ This study will help in engaging the students in the study of History as a discipline for experiential learning.
- ❖ The students will enable students to link the study of the past with the present phenomena and develop critical and analytical thinking.
- ❖ The learning comes from real experiences based on scientific attitude which develops the habit of self-study and self – direction.
- ❖ Develop and prepare materials for heuristic in experiential learning and teaching.
- ❖ This research would benefit the principals of schools for motivating their teachers to undertake training in experiential learning teaching techniques so that they may make use of them to the optimum in their regular teaching.
- ❖ This research would also be of great significance for the teacher education institutes where the teacher

trainees may be trained during their pre-service programme itself to use the heuristic approach of experiential learning so that they are more confident when they join as teachers in schools.

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Chapter II

Review of Related Literature and Research

2.1 Introduction:

The characteristic of a good research includes replicability, reproducible and transparency. This means that for research to be successful, replicability is very important as it allows the researcher to test the study findings and can improve the trustworthiness of the research findings. Similarly, reproducibility is important because it can achieve consistent results from the findings and can confirm its validity and credibility. Transparency is essential to ensure its availability to other researchers and provides comprehensive details to those who study it. In this way, good research can eventually benefit the stakeholders and the society.

The review of related literature allows the researcher to enable herself with the existing knowledge about the new study which she is going to conduct.

Thus, to collect related information regarding achieving maximum learning outcomes in History as a discipline the researcher referred to many sources of information and related research works done under this field.

The reason behind doing a research review is to know about the kind of research that has already taken place and learn from it. Thus, review of related literature constituted an essential step in the process of doing my research.

With the amount of information available from a variety of sources, it required a careful study and understanding the details of the work already done.

In the Literature review the researcher aims to gather information relevant to the research problem in hand.

The research had begun with the aim of improving the learning outcomes of Std. X students by developing their interest in studying History. Thus, reviewing of existing literature, research and study done on various methods to teach and learn History was an important step in devising the course of study for this research project.

This step paved the way for the researcher to start her work on her study and build on the work already done in this regard.

The researcher had read various sources of related literature to acquire as much knowledge as she could to ensure the reliability and credibility of the study, so that this study can be used for the benefit of students, teachers of History and all people who aim to find new ways to achieve better learning outcomes in History as a subject.

2.2 Purpose of Literature Review:

The main purpose of this research review was to provide a background study of research on various methods and approaches for teaching history for developing a desire among learners to study history as a discipline. This research review focussed on study of research done on the effective use of experiential learning and its heuristic approach for learning and teaching of History. This review familiarized me with the theoretical and conceptual basis of my study and all aspects to assess and study the design of the research to ensure that it is new and is relevant to be utilized if successful by avoiding unintentional replication of the work already done and sharpen my research by studying the research possibilities that have already been done in this field.

2.3 Need of Review of Related Literature and Research:

The review of related theoretical and research is an imperative step to conducting a study to understand and create a meticulous good plan for the success of the research.

2.3.1 Need of Review of related Literature:

Reviewing the literature requires the ability to perform multiple tasks, to find and evaluate relevant material to systematically combine and produce information from various sources and study done by others. It requires steps from critical thinking to paraphrasing, evaluating, and citation skills.

This prepares us to form our own study and argument on the topic or for conducting our own original research. The review of related literature involves synthesising and coherently linking the various aspects of knowledge required to perform our own individual study. The knowledge that we gather is from various kinds of scholarly articles, online research papers, books, blogs, and websites which is related to our own study.

Thus, review of related literature is an essential step to prepare ourselves for a new research and study.

2.3.2 Need of Review of Related Research:

Every research is an outcome of the knowledge building and accumulation already done in the past. It can never be an isolated work as it requires a base on which it can hold its arguments that are built upon the prerequisite knowledge and study already done which may be directly or indirectly related to the study.

A careful and detailed study of the reference material, such as, books, periodicals, research journals, dissertations, thesis, and other sources of information on the problem to be investigated is the foremost and essential steps in planning a research study.

The need for review of related research is to support our own research argument. It involves a keen study of the related research already being done to ensure that we are not duplicating the work which has already been done to support our own research argument.

The need is to identify areas of controversy and gaps in the study already done and check on the contested claims to avoid duplication of the work already done on the topic.

Also, it allows the individual to assess the strengths and weaknesses of the study being conducted and identify potential gaps in the knowledge.

Thus, review of related Research is the prerequisite vital step to begin a new research or study which also establishes the foundations for the current and of future research projects.

The researcher can compare the findings with those of previous ones on the topic and build on some recommendations based on them to develop a new path for further research work.

Although it is a time-consuming process, it is very much essential and fruitful.

2.4 Sources of Related Literature:

The sources of related literature that were studied for this research study can be classified into two categories: -

A) Primary Sources

A) Primary Sources: The simplest definition of primary sources is either original information (such as survey data) or a first-person account of an event (such as an interview transcript). Some examples of primary sources are Speeches, statistical data Manuscripts, Diaries, Travelogues, Audio recordings, Transcripts, etc.

B) Secondary Sources: Whereas secondary sources are any published or unpublished works that describe, summarise, analyse, evaluate, interpret, or review primary source materials. Secondary sources can incorporate primary sources to support their arguments. Some examples of secondary sources can be Books, Journals, websites, blogs, Dissertations, Thesis, Research articles, Textbooks, Biographies, Newspapers, Political commentaries etc.

Ideally, good research should use a combination of both primary and secondary sources. For example, if a researcher were to investigate the introduction of a constitutional law and the impacts it had on a community, he/she might look at the transcripts of the parliamentary debates as well as the parliamentary commentary and news reporting surrounding the laws at the time.

For this study the researcher has utilised the above-mentioned sources for studying the related literature.

2.5 Theoretical Review:

2.5.1 Review regarding Constructivism:

This research is focusing on the heuristic approach of experiential learning and Constructivism is the very basic philosophy behind this method of teaching and learning.

Constructivism is a teaching and learning philosophy based on the concept that learning (cognition) is the result of 'mental construction' and students construct their own understanding by reflecting on their personal experiences, and by relating the new knowledge with what they already know.

Giesen, (2004) One of its main principles is that learning is search for meaning, therefore, to be effective; a teacher must help the student in discovering his or her own meaning. Fundamentally, constructivism says that people construct their own understanding and knowledge of the world through experiencing things and reflecting on those experiences.

Piaget, (1977), who is best known for his research on the development of cognitive functions in children, laid the foundation for Constructivism. His theory states that children evolve through specific stages in which cognitive structures become progressively more complex. There are four levels of Cognitive Development – Sensorimotor, Pre-operational, Concrete Operational and Formal Operational. Learning occurs through adaptation to interactions with the environment

Srinivas, (2013) Disequilibrium (mental conflict which demands resolution) gives rise to assimilation of a new experience, which is added to existing knowledge, or accommodation, which is modification of existing understanding to provide the new experience.

Mahoney, (2003)

Five basic assumptions of Constructivism are:

- ❖ Knowledge is actively constructed by the learner, not passively received from the environment.
- ❖ Much human activity is devoted to ordering process the organizational patterning of experience by means of tacit, emotional meaning – making process.
- ❖ The organization of personal activity is fundamentally self – reliant or recursive.
- ❖ Individuals cannot be understood apart from their organic embeddedness in social and symbolic systems.
- ❖ All this active, meaningful, and socially embossed self- organization reflects an ongoing development flow in which dynamic dialectical tensions are essential.

Gautam & Kulshrestha, (2011)

Together, these five themes convey a constructive view of human experiences as one that emphasizes meaningful action by a developing self in complex and unfolding relationships.

2.5.2 Review regarding meaningful Learning:

This research aims to achieve meaningful learning outcomes for the students and thus required and understanding of the main characteristics of meaningful learning.

Ausubel Meaningful Learning Theory, (1962)

Ausubel believes that learning of new knowledge relies on what is already known. That is, construction of knowledge begins with our observation and recognition of events and objects through concepts we already have. We learn by constructing a network of concepts and adding to them. He also stresses the importance of reception rather than discovery learning, and meaningful rather than rote learning.

Ausubel believed that understanding concepts, principles, and ideas are achieved through deductive reasoning. Ausubel was influenced by the teachings of Jean Piaget. According to his theory, to learn meaningfully, individuals must relate new knowledge to relevant concepts they already know. New knowledge must interact with the learner's knowledge structure. He believed in the idea of meaningful learning as opposed to rote memorization. The latter can also incorporate new information into the pre-existing knowledge structure but without interaction. Because meaningful learning involves recognition of the links between concepts, it has the privilege of being transferred to long-term memory. The most crucial element in meaningful learning is how the new information is integrated into the old knowledge structure. Accordingly, Ausubel believes that knowledge is hierarchically organized; that new information is meaningful to the extent that it can be related (attached, anchored) to what is already known.

Table 2.1

Ausubel Model of Meaningful Learning

Phase One Advance Organizer	Phase Two Presentation of Learning task or Material	Phase Three Strengthening Cognitive Organization
Clarify aim of the lesson	Make the organization of the new material explicit	Relate new information to advance organizer
Present the lesson	Make logical order of learning material explicit	Promote active reception learning.
Relate organizer to students' prior knowledge	Present material in terms of basic similarities and differences by using examples, and engage students in meaningful learning activities	

2.5.3. Review regarding Learning History Subject:

Joseph, Brian; Janda, Richard, eds., (2008)

History (from Greek (historía) ‘inquiry; knowledge acquired by investigation’) is the study and the documentation of the past. Studying history helps us understand how events in the past made things the way they are today. With lessons from the past, we not only learn about ourselves and how we came to be, but also develop the ability to avoid mistakes and create better paths for our societies.

Professor Richard J. Evans, (2001)

History is also an academic discipline which uses narrative to describe, examine, question, and analyze past events, and investigate their patterns of cause and effect. History education builds empathy through studying the lives and struggles of others. Studying the diversity of human experience helps us appreciate cultures, ideas, and traditions that are not our own – and to recognize them as meaningful products of specific times and places. Studying history helps us understand how events in the past made things the way they are today. With lessons from the past, we not only learn about ourselves and how we came to be, but also develop the ability to avoid mistakes and create better paths for our societies.

Cosme J. Gómez-Carrasco, Jairo Rodríguez-Medina, Ramón López-Facal, José onteagudo -Fernández, (2022)

The main aim of this research was Developing historical thinking and historical consciousness to provide students necessary intellectual tools for analysing the past and relating it to an understanding of problems in the present time.

Development and shaping of the knowledge domain of history education between 2000 and 2019 in the WoS (Web of Science). To this end, several techniques and tools were used, including R-package Bibliometrix and VOSviewer.

Major Findings of this study was that students will learn the approach that combines the use of historical sources and the work of the historian. The second approach includes the social function of history, identity, memory, and civic and moral education. Historical Thinking and Historical Consciousness have gradually acquired a more central role to the detriment of History Textbooks or topics generally related to History.

2.5.4 Review regarding Experiential Learning:

Kolb, David, 1984

Experiential learning focuses on the learning process for the individual. This experience forms “the basis for observation and reflection” and the learner can consider what is working or failing (reflective observation), formulate a generalized theory or idea about riding a bike in general (abstract conceptualization) and to think about ways to improve on the next attempt made at riding (active experimentation). Every new attempt to ride is informed by a cyclical pattern of previous experience, thought and reflection.

Felicia Patrik, (2011)

Experiential learning is an educational approach propounded by an American educational theorist David Allen Kolb. Experiential learning is the process of learning through experience and is and is more narrowly defined as “learning through reflection on doing”. Hands-on learning can be a form of experiential learning but does not necessarily involve students reflecting on their product.

Beard, Colin, (2010)

Experiential Learning is distinct from rote or didactic learning, in which the learner plays a comparatively passive role .

Itin, C. M., (1999)

It is related to, but not synonymous with, other forms of active learning such as action learning, adventure learning, free-choice learning, cooperative learning, service-learning, and situated learning . Experiential learning can occur without a teacher and relates solely to the meaning-making process of the individual's direct experience. However, though the gaining of knowledge is an inherent process that occurs naturally, a genuine learning experience requires certain elements.

Merriam, S. B., 2007

According to Kolb, knowledge is continuously gained through both personal and environmental experiences. Kolb states that to gain genuine knowledge from an experience, the learner must have four abilities:

- ❖ The learner must be willing to be actively involved in the experience.
- ❖ The learner must be able to reflect on the experience.
- ❖ The learner must possess and use analytical skills to conceptualize the experience; and
- ❖ The learner must possess decision making and problem-solving skills to use the new ideas gained from the experience.

Moon, J.,(2004)

Experiential learning requires self-initiative, an "intention to learn" and an "active phase of learning". Kolb's cycle of experiential learning can be used as a framework for considering the different stages involved. Experiential learning is most effective when it involves: 1) a "reflective learning phase" 2) a phase of learning resulting from the actions inherent to experiential learning, and 3) "a further phase of learning from feedback".

Hutton, M., (1980)

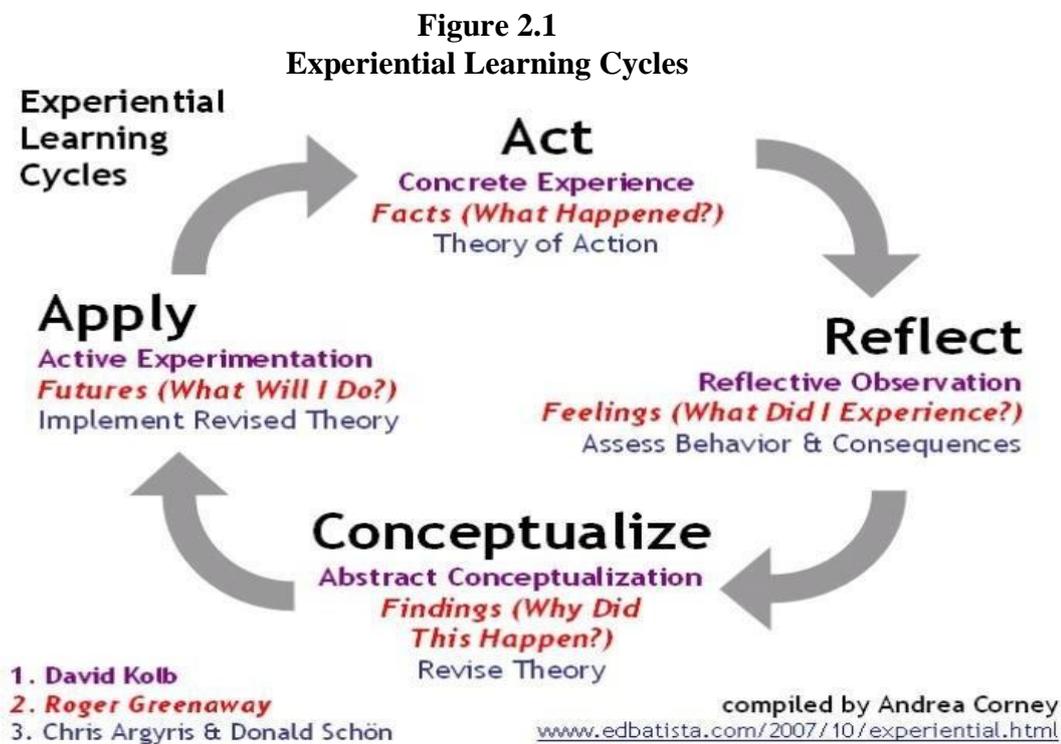
This process of learning can result in "changes in judgment, feeling or skills" for the individual and can provide direction for the "making of judgments as a guide to choose and action". Experiential learning is learning that is rooted in our doing and our experience. It is learning which illuminates that experience and provides direction for the making of judgements as a guide to choose and action.

Kompf, M., & Bond, R., (2001)

Reflection is a crucial part of the experiential learning process, and like experiential learning itself, it can be facilitated or independent. Dewey wrote that "successive portions of reflective thought grow out of one another and support one another", creating a scaffold for further learning, and allowing for further experiences and reflection (Jacobson and Ruddy), building on Kolb's four-stage Experiential Learning Model and Pfeiffer and Jones's five stage Experiential Learning Cycle, took these theoretical frameworks and created a simple, practical questioning model for facilitators to use in promoting critical reflection in experiential learning.

Their "5 Questions" model is as follows:

Did you notice? Why did that happen? Does that happen in life? Why does that happen? How can you use that?



Association for Experiential Education, (1994)

Experiential Learning is a philosophy and methodology in which educators purposefully engage with students in direct experience and focused reflection to increase knowledge, develop skills, and clarify values.

2.5.5 Review about Heuristic Method of Teaching:

H. E. Armstrong, (1888 -1928)

H E Armstrong was a British Chemist who was the proponent of Heuristic. In words of Professor Armstrong, “Heuristic methods of teaching are methods which involve our placing students as far as possible in the altitude of the discoverer – methods which involve their finding out instead of being merely told about things”.

Geoff Rayner – Canham and Marelene Rayner – Canham, (2015)

Though guided-inquiry learning, discovery learning, student-centered learning, and problem-based learning are commonly believed to be recent new approaches to the teaching of chemistry. It was the British chemist, Henry Armstrong, who pioneered this technique, calling it the heuristic method of instruction. This research aimed to trace the origin, success, and later decline of the application of heurism to chemistry laboratory teaching in Britain and highlight the role of women chemistry teachers. Also, to review the independent development of the guided-inquiry method for chemistry laboratory work in the United States.

V.K. Maheshwari, (2016)

The word ‘Heuristic’ has been derived from the Greek word ‘Heurisco’ which means ‘I find ‘or ‘I discover’. This method implies that the attitude of students shall be that of the discoveries and not of passive recipients of knowledge. Heuristic method of teaching science was proposed by H. E. Armstrong (1888-1928).

According to Armstrong, the real spirit of heuristic method is placing the student in the position of original investigator which means involving his ‘finding out instead of being merely told about things’.

Armstrong originally introduced this method for learning of science. Through this method the pupils are made to learn . This method of teaching is of a very recent origin. First it was used in science and its success led it to be adopted in the teaching of all subjects in the school curriculum

2.5.6 Review of Heuristic Approach in Experiential Learning:

Steve Dale, (2015)

The study of heuristics in human decision-making was developed in the 1970s and the 1980s by the psychologists Amos Tversky and Daniel Kahneman. Understanding how heuristics work can give us better insight into our personal biases and influences and (perhaps) lead to better problem-solving and decision-making.

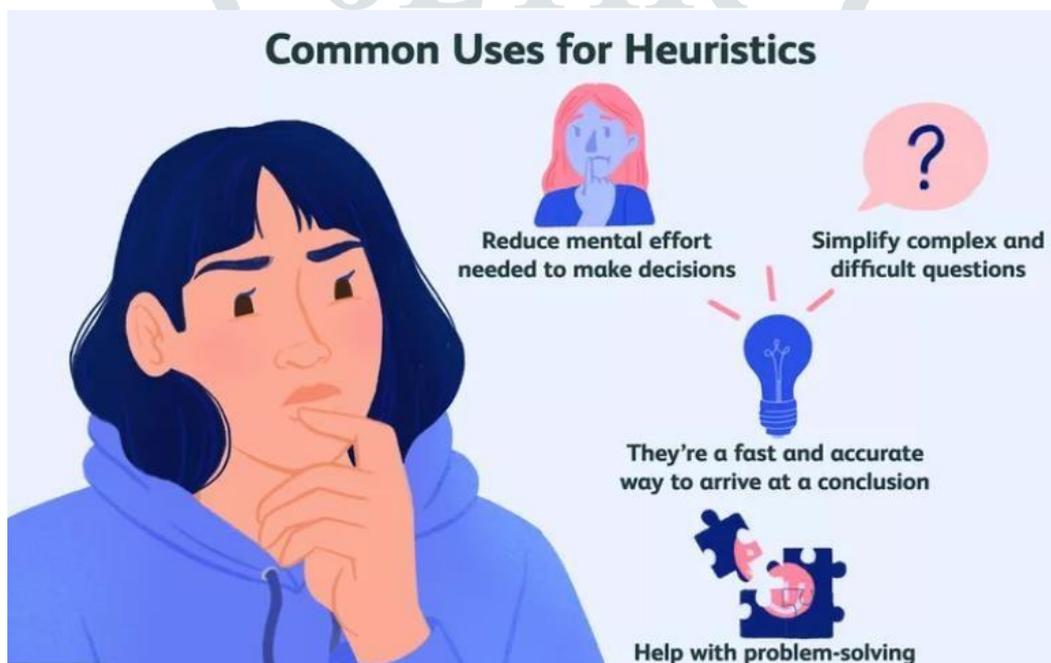
William Clancey, (1985)

The heuristic classification problem-solving model provides a useful framework for characterizing kinds of problems, for designing representation tools, and for understanding non-classification (constructive) problem-solving methods.

Koen Veermans, Wouter van Joolingen, (2003)

Learners reflected on the heuristics, made their own conceptualizations, and based their decisions on these conceptualizations. Including heuristics explicitly in discovery learning environments seems a promising approach to elicit experiential learning that deserves further exploration.

Figure 2.2



Sayma Zia, Farooq – Eazam Cheema, Sobia Shujaat, (2016)

Use of heuristics in the instructional design increases the overall student's performance and gives them practical insights about the topic.

2.5.7 Review of Heuristic Approach for studying History:

Zhimei Yang, (2019)

In recent years, with the deepening of the reform of Ideological and political theory teaching in colleges and universities, the research and practice of applying heuristic teaching mode in Ideological and political theory teaching has achieved certain results. However, it is still in its infancy to discuss the application of heuristic teaching mode during "Outline of Modern and Contemporary Chinese History". Based on the existing research results and years of teaching experience, the author has actively explored the combination of heuristic teaching mode and students' professional characteristics in the teaching of "Outline of Modern Chinese History" and

achieved good teaching results. The main problems in the teaching of public courses are "three deficiencies" and "three substitutions". "Three deficiencies" are lack of self-study, discussion, and problem consciousness. The "three substitutes" are that teachers mostly use ppt instead of textbooks, a few students' reactions instead of the whole students, and teachers' personal inertial thinking instead of students' thinking. The teaching is mainly based on teachers' indoctrination, lacking equality of participation, communication, and interaction.

2.5.8 Review of Heuristic Approach of experiential Learning for Secondary

School Learners:

Kavitha S Joshi, (2015)

The researcher constructed and Developed Kolb's Experiential Learning Model programme for the study. There were four sections in the programme. There were practical based activities and Experiential Learning tasks. T-test was used to find significant differences. The results revealed that the programme was effective among students towards Experiential Learning. Moreover, the activities of the programme were found interesting, relevant, and effective to students Effectiveness of Kolb's experiential learning model for 9th standard students.

J T Madhavan, (2008)

Procedure for using the Heuristic Approach of experiential learning, the following steps are followed:

Planning – Creating of Objectives, Identification of Problem, and Arriving for appropriate solutions for the problem.

Execution – Perceiving and observing for accurate results, recording of the results observed.

Conclusion – Formulation of hypothesis, and Identification /Arriving at the accurate solution.

Saeede Nazari Nooghabi, Hooshang Irvani, Hossein Shabanali Fami, (2011)

Challenges to Experiential Learning:

Results have indicated four components are the main challenges of the experiential learning of the practical courses including (1) Insufficient educational spaces & equipment's (2) less experienced instructors and technicians (3) Not paying attention to parallel and additional experiences and (4) Insufficient class management by the instructors and technicians.

2.5.9 Review Regarding Research Method:

Meaning of Multi Method Research:

Creswell, (2003)

Multi-method approaches refer to the use of multiple methods (typically quantitative and qualitative) in conducting research.

David Collier, Colin Elman, (2008)

Qualitative research methods are eclectic, both and even more so as one considers the links with other research traditions. This leads us to characterize the idea of multi-method in the three different ways just noted: in terms of the increasing diversity of techniques centered in the conventional qualitative tradition; the growing number of interconnections between qualitative and quantitative research tools; and the relationship to interpretative and constructivist approaches.

Creswell, J. W., (2004)

Multimethodology or multimethod research includes the use of more than one method of data collection or

research in a research study or set of related studies. Mixed methods research is more specific in that it includes the mixing of qualitative and quantitative data, methods, methodologies, and/or paradigms in a research study or set of related studies. One could argue that mixed methods research is a special case of multimethod research. Another applicable, but less often used label, for multi or mixed research is methodological pluralism. All of these approaches to professional and academic research emphasize that monomethod research can be improved through the use of multiple data sources, methods, research methodologies, perspectives, standpoints, and paradigms.

Tashakkori & Teddlie, (2003) Spratt, Walker, and Robinson, (2004)

Table 2.2

Difference between Multi method and Mixed Method Designs:

Multi Method	Mixed Method
Use of more than one method but restricted to methods selected from within one worldview (i.e., quantitative, or qualitative approaches)	Use and mix both qualitative and quantitative data and methods.

Morse J, (2003)

Purpose of Multi Method Design:

Multiple methods, or multi-method design, is when two or more research projects are conducted, each complete, to address research questions and/or hypotheses, a topic, or a program. The projects can be implemented concurrently or sequentially. However, unlike mixed methods, each study project is independently planned and conducted to answer a particular sub-question. For example, the purpose statement for multiple methods, or multi-method study might read – “The purpose of this sequential [QUAL → quan] multimethod study is to explore children’s ideas about fear with the intent of using this information to develop and test an instrument. The first phase will be the qualitative exploration of fear using semi-structured interviews. Themes from this qualitative data will then be developed into an instrument to survey children about their fears and pilot tested”.

There are two main principles that guide researchers in using more than one method. The first design principle is to recognize and respect the project’s primary theoretical drive or paradigm and adhere to its methodological assumptions. The primary theoretical drive, which may be either quantitative (deductive) or qualitative (inductive), forms the analytical core of the project. It is determined by the research questions or hypothesis and should drive the approach to the data and the sample. For example, if the primary theoretical drive is qualitative [QUAL], the sample is typically small and purposely selected. If the secondary component is quantitative [quan], external normative values must be available for the interpretation of quantitative data because of sampling violations. If the primary theoretical drive is quantitative [QUAN], and the secondary component is qualitative [qual], then the sample must be purposefully selected from the main study. The primary theoretical drive is typically designated using upper-case letters, QUAN, or QUAL.

The second principle is to recognize the role of the secondary or supplemental component. The role of the secondary component is to elicit a perspective or dimension that cannot be accessed by the first approach, enhance description, or enable further exploration or tentative testing of an emerging conjecture. The data generated from the supplemental data inform the primary data and analysis. The secondary component is typically designated using lower case letters, quan or qual.

Notations used in Multi Method Design:

QUAN or QUAL – abbreviations used to indicate whether the method is quantitative or qualitative.

The plus sign (+) is used to show that the data are collected at the same time.

The arrow (→) is used to show that data are first collected for one project and once this project is complete, data are collected for a second project.

The use of uppercase letters is used to indicate priority given to a particular method. Common Combinations (Morse J, 2003):

QUAL + qual; QUAL→ qual; QUAL + quan; QUAL→ quan; QUAN + quan; and QUAN →quan; QUAN + qual; QUAN → qual

Creswell J W, (2007)

There are five main purposes for using more than one method when studying a phenomenon of interest. These include: 1) triangulation, 2) complementarity, 3) development, 4) initiation, and 5) expansion. Research design options become wider as design purposes move from triangulation to expansion.

Meaning of Triangulation:

Creswell & Miller, (2000)

Validity is one of the strengths of qualitative research and is based on determining whether the findings are accurate from the standpoint of the researcher, the participant, or the readers of an account.

There is a distinct tradition in the literature on social science research methods that advocates the use of multiple methods. This form of research strategy is usually described as one of convergent methodology, multimethod/multi trait (Campbell and Fiske, 1959), convergent validation or, what has been called “triangulation” (Webb et al., 1966). Triangulation is broadly defined by Denzin (1978: 291) as “the combination of methodologies in the study of the same phenomenon.” Triangulation provides researchers with several important opportunities. First it allows researchers to be more confident of their results. This is the overall strength of the multimethod design.

Triangulation refers to the use of more than one approach to the investigation of a research question to enhance confidence in the ensuing findings. Because much social research is founded on the use of a single research method, and as such may suffer from limitations associated with that method or from the specific application of it, triangulation offers the prospect of enhanced confidence. Triangulation is one of the several rationales for multimethod research. The term derives from surveying, where it refers to the use of a series of triangles to map out an area.

Two-Group Design

Pamela J Brink, (2003)

For centuries, the two-group experimental design has dominated research. The experimental and the control or placebo group have always been used to demonstrate the efficacy of a particular treatment or intervention.

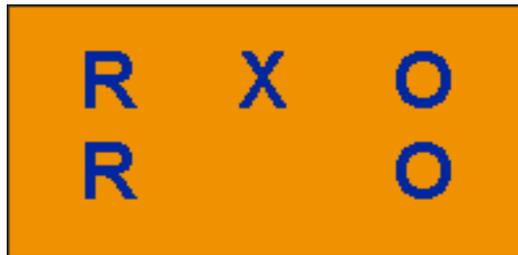
The simplest of all experimental designs is the two-group posttest-only randomized experiment.

Prof William M.K. Trochim, (2001)

In design notation, it has two lines – one for each group – with an R at the beginning of each line to indicate that the groups were randomly assigned. One group gets the treatment or program (the X), and the other group is the

comparison group and doesn't get the program (note that this you could alternatively have the comparison group receive the standard or typical treatment, in which case this study would be a relative comparison).

Figure 2.3
Two Group Design



Notice that a pretest is not required for this design. Usually we include a pretest in order to determine whether groups are comparable prior to the program, but because we are using random assignment we can assume that the two groups are probabilistically equivalent to begin with and the pretest is not required (although you'll see with covariance designs that a pretest may still be desirable in this context).

In this design, we are most interested in determining whether the two groups are different after the program. Typically, we measure the groups on one or more measures (the O's in notation) and we compare them by testing for the differences between the means using a t-test.

2.5.10 Review regarding Statistical Analysis:

t- Test:

Rebecca Bewans, (2022)

A t-test is an inferential statistic used to determine if there is a significant difference between the means of two groups and how they are related. The t-test is a test used for hypothesis testing in statistics.

Calculating a t-test requires three fundamental data values including the difference between the mean values from each data set, the standard deviation of each group, and the number of data values. T-tests can be dependent or independent.

The between groups t-test is used when we have a continuous dependent variable, and we are interested in comparing two groups. An example might be if there is experiment with an experimental and control group, or perhaps a comparison between two non-experimental groups like women and men. Another way to describe the situation in which the between groups t-test is appropriate is to state that t-test involves a dichotomous independent variable and a continuous dependent variable. Remember that the independent variable is the one assumed to be the cause and the dependent variable is the result or the outcome. The independent variable in this case is group membership (e.g., gender is the independent variable). We compare the means of the dependent variable for participants in the two groups. So, the t-test is to see if the independent, grouping variable produces a large difference between the means on the dependent variable. We can think of the formula conceptually as a ratio like this:

$$t = \frac{\text{difference between groups}}{\text{sampling variability}}$$

When the value on the top of the equation is large, or the value on the bottom of the equation is small, the overall ratio will be large. The larger the value of t, the farther out on the sampling curve it will be, and, thus, the more likely it will be significant.

2.6 Research Review:

2.6.1 Review regarding Constructivism:

Robert Jackson, (2006)

Project titled, 'Using Constructivist Methods to Teach Social Studies to Special Education Students' was carried out by Robert Jackson for the Degree of Master of Arts in Teaching in 2006. The personal observations of the researcher revealed that the students had a difficult time maintaining a high level of interest in the subject matter before the constructivist techniques were used. This also resulted in misbehavior and frustration for not being able to learn the subject matter. After one month of instruction using various constructivist techniques, such as scaffolding, collaborative teaching, videos and other techniques, the students' grades improved, along with a marked increase in their attitude toward the subject. (ted.coe.wayne.edu)

Abida Khalid and Muhammad Azeem (2012)

The study carried out by Abida Khalid and Muhammad Azeem highlighted that traditional teaching approach (Lecture Method) is very common and it ignores the students consequently the mental level and interest of the students too. Their study was titled 'Constructivist Vs Traditional: Effective Instructional Approach in Teacher Education' (2012).

It reduces rote memorization on the part of the students and no creative thinking. They stated that most of the times instruction remains unilateral. The purpose of their study was to compare the instructional Module based on constructivist approach with the traditional method in teacher education at science college township campus at Lahore. They had 32 participants in both Experimental and Control groups each. Pre and post tests were conducted on both the groups and t test was used to check the significant difference. The experimental group which was taught English using the constructivist approach scored better as compared to the control group. (ijhssnet.com)

2.6.2 Review regarding History Education in Social Science:

Peter N. Sterns, (1998)

He studied about reasons and importance of studying history in "Why Study History?" and gave insights into how history as a discipline can provide ample opportunities to students and motivate them for self-learning. He believes that studying history gives access to the "laboratory of Human Life". A well-trained student of history, schooled to work on past materials and on case studies in social change can develop the following skills:

- ❖ The ability to assess evidence
- ❖ The ability to assess conflicting interpretations
- ❖ Experience in assessing past examples of change

Historical study, in sum, is crucial to the promotion of that elusive creature, the well-informed citizen. History is useful for work. Its study helps create good businesspeople, professionals, and political leaders. The number of explicit professional jobs for historians is considerable, but most people who study history do not become professional historians. Professional historians teach at various levels, work in museums and media centers, do historical research for businesses or public agencies, or participate in the growing number of historical consultancies. These categories are important—indeed vital—to keep the basic enterprise of history going, but most people who study history use their training for broader professional purposes. Students of history find their

experience directly relevant to jobs in a variety of careers as well as to further study in fields like law and public administration.

2.6.3 Review regarding Teaching Methods in History Learning

Jyothish K, (2021)

The main objective of this study was developing active learning techniques, films, library research, and historical fiction can all be used to make teaching and learning on history more invigorating.

Elaborating what are the teaching methods now being used to make history classes more interesting which aim at: -

- ❖ Student centered learning methods, that include Debate, Simulation, Demonstration, Problem solving methods
- ❖ Teacher centered learning methods, that include, lecture method, storytelling method, Biographical method, Field trips, Study tours, Museum visit, Library visit, Digital library, graphic aids, display boards, 3D aids, Audio Visual aids, Individual study, assignment method, Peer tutoring, project method.

2.6.4 Review regarding Experiential Learning:

Herbert A. Simon, (1968)

The book “How Learning works: Seven Research Based Principles Based Principals for Smart learning” is written by authors who are experts in helping college teachers understand how research in science of learning can improve their teaching, i.e., by learning about experiential learning. The book is organized around seven learning principles — each a gem that is based on research evidence from the science of learning and the science of instruction. The principles concern the role of the student’s prior knowledge, motivation, and developmental level, as well as opportunities for the student to practice, receive feedback, and learn to become a self – directed learner. The book focused on how experiential learning is reflection based and evidence-based learning and can be beneficial for both students and teachers.

Learning results from what the student does and thinks and only from what the student does and thinks. The teacher can advance learning only by influencing what the student does to learn. Thus, teacher plays an important role in facilitating experiential learning for better learning outcomes.

2.6.5 Review of Heuristic Approach in Experiential Learning:

Steve Dale, (2015)

A heuristic is a word from the Greek meaning ‘to discover’. It is an approach to problem-solving that takes one’s personal experience into account. Heuristics provide strategies to scrutinize a limited number of signals and/or alternative choices in decision-making. Heuristics diminish the work of retrieving and storing information in memory and of streamlining the decision-making process by reducing the amount of integrated information necessary in making the choice or passing judgement. However, whilst heuristics can speed up our problem-solving and decision- making processes, they can introduce errors and bias judgements. This article looks at commonly used heuristics and their human psychology origins. Understanding how heuristics work can give us better insight into our personal biases and influences and (perhaps) lead to better problem- solving and decision-making.

Ralph Hertwig and Thorsten Pachur, (2015)

The study of heuristics is an interdisciplinary and time-honoured enterprise, with heuristics being examined across a wide range of fields, some focusing on professionals' decision-making. Their success depends on how they are matched to environmental structures. This view suggests that heuristics, rather than leading to irrationality, enable ecological rationality.

2.6.7 Review of Heuristic Approach for studying History:**Jeffery D. Nokes, Janice A. Dole, Douglas J. Hacker, (2007)**

The purpose of this study was to test the effectiveness of different types of instruction and texts on high schools' students' learning of (a) history content and (b) a set of heuristics that historians use to think critically about texts which highlighted that: -

- ❖ Across all conditions, students who read multiple texts scored higher on history content and used sourcing and corroboration more often than students who read traditional textbook material.
- ❖ Findings highlight the importance of reading multiple texts to deepen content knowledge and facilitate the use of heuristics that historians typically use.

Mohamad Zaenal Arifin Anis, Yetti Supriyati, Gaguk Margono, (2019)

In the research on Model of Problem Statement (MPS): A solution on Heuristic Problem in Teaching of History a heuristic is an approach to find, collect and organize resources to obtain relevant historical materials according to the topics discussed. This research is development research that is meant to develop problem statement as a solution of the heuristic problem faced by the students of History Education Program of Faculty of Teacher Training and Education, Lambung Mangkurat University about History Method. The steps of the model adapted for this research are as follows: (1) need analysis and initial search of information, (2) competence analysis needed, (3) the development of assessment instruments, (4) the development of learning strategies, (5) need analysis on the learning model, (6) conduct of a formative evaluation. The test was attended by 57 students determined from the participants of the Historical Method Subject in Study Program of History Education, Faculty of Teacher Training and Education, Lambung Mangkurat University. The results showed that their heuristic ability increased after the pretest and posttest for three times. MPS makes the students more critical in searching historical sources (heuristic competence) and in interpreting the historical sources. As a result, MPS gives an influence towards the students' learning achievement.

2.6.8 Review of Heuristic Approach of experiential Learning for Secondary School Learners:**Sayma Zia, Farooq Cheema, Sobia Shujaat, (2016)**

As the use of heuristic plays a pivotal role in increasing the theoretical as well as experiential knowledge of the students. Instructor can design the instructional design according to the level of student by using different heuristic tools. The research paper, "Impact of Using Heuristic Instructional Design on Students' Performance" the researchers specifically designed to evaluate the impact of each heuristic tool on different criteria of students' performance like grades, analytical and critical thinking, problem solving skills, and practical understanding of the students. The study is based on Bloom's taxonomy in which different heuristic tools has been tested against each level of the pyramid. The study proved that use of visual aids increases the knowledge efficiency, presentations increase the ability to comprehend, case studies increase the sense of applications, research articles review increase the analytical skills, seminar and guest speaker sessions increase the ability to synthesize, practical

experience/role-plays increase the evaluation ability. In the end use of heuristics in the instructional design increases the overall student' performance and give them practical insights about the topic.

2.6.9 Review Regarding Research Method:

Nanna-Mik-Meyer, (2020)

Multi Method Research

The research chapter focuses on what Creswell (2015) has termed multimethod research. Multimethod research is research that uses multiple forms of qualitative data (e.g., interviews and observations) or multiple forms of quantitative data (e.g., survey data and experimental data) (Creswell 2015:3). When researchers combine the two types of data spanning over two paradigms – qualitative and quantitative – they conduct mixed method research. Both attempts have been – and still are – welcomed and critiqued by scholars for several reasons. The study outlined this debate concerning the combination of different methodological approaches by drawing on the literature on a) mixed methods and b) multimethod qualitative research. Hereafter, it discussed the advantages of combining different qualitative methodologies in two research projects that examine identity negotiations in the field of disability (project 1) and homelessness (project 2).

Yildirim, R. (2013)

Triangulation:

Yildirim, R. (2013) conducted research titled 'The Portfolio Effect: Enhancing Turkish ELT Student-Teachers' Autonomy'. The research was carried out for 14 weeks with 21 3rd grade student teachers in the English Language Teaching Department. For reliability and validity purposes, the data for the study were collected by a triangulation of instruments. To investigate student-teachers' readiness for autonomy, the Autonomy Questionnaire adapted from Chan, Spratt, and Humphreys (2002) was administered to student-teachers before and after the portfolio process. The quantitative data acquired were analyzed by utilizing SPSS 11 computerized analysis. Descriptive statistics were calculated to determine frequencies and percentages for all items in the questionnaire. The quantitative data were supported by qualitative data obtained from the interviews with the student-teachers and three portfolio evidence: graded goal sheets, reflection reports, and cover letters. A semi-structured interview was held with all student-teachers. All the qualitative data were analyzed in the same manner; through a process of qualitative thematic analysis (Miles & Huberman, 1994; Newby, 2010).

2.6.10 Review regarding Statistical Analysis:

Eda & Ayhan (2014)

Effect Size:

The study conducted by Eda & Ayhan (2014) titled 'The Effect of Brain Based Learning on Academic Achievement: A Meta-analytical Study' aimed to measure the effect sizes of the quantitative studies that examined the effectiveness of brain – based learning on students' academic achievement and to examine with the meta-analytical method if there is a significant difference in effect in terms of the factors of education level, subject matter, sampling size and the countries where the students were carried out. Meta-analysis is the method employed to statistically combine the quantitative data collected from many studies of the same topic, and to reach a general conclusion from the results.

2.7 Research Review Matrix:

The research review matrix mentioned below clearly states the similarities and differences the researcher could find the research reviews to refine the study and plan for a good research outcome.

The aim is to find any research gaps which may not have been touched before and could lead to a new study that provides answers to the research questions.

Table 2.3
Research Review Matrix

S. No.	Research Title	Author	Similarities	Differences
1.	Using Constructivist Methods to Teach Social Studies to Special Education Students	Robert Jackson, (2006)	Using Constructivist method proved beneficial for better learning outcomes which is a heuristic approach framework of learning.	The program was meant for SEN students. The research method included pre and post-tests.
2.	Constructivist Vs Traditional: Effective Instructional Approach in Teacher Education	Abida Khalid and Muhammad Azeem (2012)	Comparison with the traditional methods of instruction and similar research design – Two Group	Effectiveness of experiential learning for History secondary school CBSE Students. Also, in this study only post tests were conducted considering the same level of the students of Std. X.
3.	Why study History?	Peter N. Sterns, (1998)	The study shows the how studying history can develop analytical and cognitive skills of the students.	The study focuses on the importance of History Education in professional life.

4	Teaching Methods in History Learning	Jyothish K (2021)	The study focuses on various active learning techniques like those of experiential learning.	Focuses on Student centered learning methods, like Debate, Simulation, Demo, Problem solving methods.
5	How Learning works: Seven Research Based Principles Based Principals for Smart learning	Herbert A. Simon, (1968)	The study focuses on research in science of learning can improve their teaching, i.e., by learning about experiential learning	The study is meant for teachers of college going students
6.	Heuristics and biases: The science of decision-making	Steve Dale, (2015)	Understanding how heuristics work can give us better insight into our personal biases and influences and (perhaps) lead to better problem-solving and decision-making.	This research focused on commonly used heuristics and their human psychology origins and understand how heuristic are quick in problem solving but can lead to errors and biases which can lead to better decisions.
7.	History of Heuristics	Ralph Hertwig and Thorsten Pachur, (2015)	The study suggested that heuristics, rather than leading to irrationality, enable ecological rationality.	The study examined across a wide range of fields, some focused-on professionals' decision-making. The study explained that their success depends on how they are matched to

				environmental structures.
8.	Teaching High School Students to Use Heuristics While Reading Historical Texts	Jeffery D. Nokes, Janice A. Dole, Douglas J. Hacker, (2007)	Findings highlight the importance of reading multiple texts to deepen content knowledge and facilitate the use of heuristics that historians typically use.	The purpose was to test the effectiveness of different types of instruction and texts on high school learning of (a) history content and (b) a set of heuristics. Eight history classrooms were randomly assigned to 1 of 4 interventions: (a) traditional textbooks and content instruction, (b) traditional textbooks and heuristic instruction, (c) multiple texts and content instruction, or (d) multiple texts and heuristic instruction.
9.	Model of Problem Statement (MPS): A solution on Heuristic Problem in Teaching of History	Mohamad Zaenal Arifin Anis, Yetti Supriyati, Gaguk Margono, (2019)	Explores the heuristic approach for teaching History.	This research is developmental research to develop problem statement as a solution of the heuristic problem faced by the students of History Education Program of Faculty of Teacher Training and Education.

10	Impact of Using Heuristic Instructional Design on Students' Performance	Sayma Zia, Farooq Cheema, Sobia Shujaat, (2016)	The study focuses on using heuristic instructional design on students' performance. Instructor designed the instructional design according to the level of student by using different heuristic tools. Students are divided into two groups; control and treatment group.	Sampling population is graduate students Six primary, and one secondary hypothesis are tested against each treatment given to the treatment group to evaluate the impact of each level of Blooms Taxonomy against different heuristic tools. The scores scored by the students were compared in the pre-test as well as in the post-test.
11.	Multimethod Qualitative Research	Nanna-Mik-Meyer (2020)	This study focuses on what Creswell (2015) Multimethod research, i.e., the research that uses multiple forms of qualitative data (e.g., interviews and observations) or multiple forms of quantitative data (e.g., survey data and experimental data)	The study discusses the advantages of combining different qualitative methodologies in two research projects that examine identity negotiations in the field of disability (project 1) and homelessness (project 2).
12	The Portfolio Effect: Enhancing Turkish ELT Student-Teachers' Autonomy	Yildirim, R. (2013)	For reliability and validity purposes, the data for the study were collected by a triangulation of instruments. The quantitative data were supported by qualitative data	The research was carried out for 14 weeks with 21 3 rd Std. student teachers in the English Language Teaching Department.

			obtained from the interviews with the student – teachers and portfolio evidence: graded goal sheets, reflection reports, etc.	
13.	The Effect of Brain Based Learning on Academic Achievement: A Meta-analytical Study	Eda & Ayhan (2014)	The study examined the effectiveness of brain – based learning on students’ academic achievement.	Meta-analysis is the method employed to statistically combine the quantitative data collected from many studies of the same topic, and to reach a general conclusion from the results.

2.8 Similarities and Differences

The research review conducted has shown some similarities and differences with the present study. The similarities noticed in the various related research and studies were related to the constructivist approach towards experiential learning using the heuristic methods and its positive outcomes on the learning outcomes of the students of various age groups. Also, various active learning strategies, science of learning, and exploring the heuristic approach in giving a better insight leading to better problem solving and problem-solving rational strategies in experiential learning in teaching and learning of History. Some similarities were found with the two-group design multi method research as being utilized in this study. Some differences that were noticed were found in the research methods, sampling techniques, subjects studied, age groups and the main theme of this study.

2.9 Research Gap:

A research gap is a question or a problem that has not been answered by any of the existing studies or research within your field. The above research reviews on existing studies have shown a clear research gap on the problem of studying the effectiveness of heuristic approach of experiential learning in History on CBSE secondary school students. The existing research and studies on heuristic approach and experiential learning have shown that heuristic is a scientific approach, and it is a faster and quick method to solve problems, but it may lead to errors due to personal bias and influences while solving them. This question arises specifically towards a certain event being studied in History as a subject while using heuristic as an approach of experiential learning.

In heuristic approach, personal biases and influences leads to better decision making and problem solving as per the existing studies, but this question has not been addressed as a problem in any of the studies done so far on History as a discipline.

The question can be dealt by utilising the heuristic approach in experiential learning so that students are able to analyse events learnt in History discipline by looking at them from various perspectives and eventually are able

to take better decisions in solving the puzzles of the past. This eventually will develop their interest in studying History as a subject and will enable them to achieve better learning outcomes.

2.10 Summary:

A preliminary literature review shows that past studies are primarily focused on understanding and modelling a particular approach towards using heuristics in experiential learning in certain disciplines, topics, and areas of studies like Science, Math, Business Management, engineering etc. Heuristic in experiential learning is used not only in certain disciplines and areas of study but in sciences, social sciences, and history also but for the teaching faculty. This research is a novel approach in using heuristic learning in experiential learning in the discipline of History and finding out the effectiveness and impact on the learning outcomes of the students of History in CBSE schools.

The review of all this related research led the researcher to conduct the educational research in the following manner: -

- ❖ To adopt proper method of educational research for the present study.
- ❖ The researcher could study proper sample.
- ❖ The researcher could study proper tools for the collection of data.
- ❖ It helped the researcher in adopting suitable research design.
- ❖ It helped the researcher to select proper reference material.
- ❖ It gave the guidelines in selecting appropriate statistical tools
- ❖ The review of related research helped the researcher in analysing the data

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Chapter III

Research Methodology

3.1 Introduction:

This chapter is a comprehensive description of the method of research, the source and the nature of data collected in the study.

“Nothing in life is as important as you think it is when you are thinking about it.”
— Daniel Kahneman, Thinking, Fast and Slow

The above statement is a view towards the heuristic approach of solving our day to day and the complex problems that we encounter in life. In the context of this study, it is related to this approach in question and its relevance in the experiential learning model for students of History.

Generally, educational research is defined as research that investigates the behaviour of students, teachers, administrators, parents, and other members of the community who interact with educational institutions. The word behaviour is taken broadly to mean such phenomena as learning, attitudes, aptitudes, abilities, interests, practices, processes, emotions and so forth. (www.peoplelearn.homestead.com/, 2008)

Research design refers to the procedure used by the researcher to explore relationship between variables, to form subjects into groups, administer the measures, apply treatment conditions, and analyse the data. Different research designs are appropriate for the study of different educational problems.

The purpose of this chapter is to describe the methodological framework of this study. This chapter begins with a discussion for implementing a multi method research approach for examining the effectiveness of experiential learning in History for CBSE Secondary School students using the heuristic approach. As the chapter progresses it discusses the context of the study and the participants in the research and ends with the data collection and data analysis procedures. In this chapter the

researcher has presented the design and procedure that has been followed during the study, beginning with the planning stage till the stage of analysis of the data.

3.2 Types of Research:

Experimental Educational Research:

J. W. Best defines educational research as that activity that is directed towards the development of a science of behaviour in educational situations. The aim of such a science is to provide knowledge that will permit the educator to achieve his goals through the most effective methods.

Educational research can be broadly categorized into three types which are descriptive research, correlational research, and experimental research. Each of these has distinct and overlapping features. The present research type is Experimental in nature.

Experimental educational research in the present study sought to establish the causal relationship between two variables in the research environment. It adopted the quantitative research methods to determine the cause and effect in terms of the research variables being studied.

Experimental educational research in this study involved two groups – the control group and the experimental group. The researcher introduced some changes to the experimental group as catalysts, while the control group was left in its natural state.

The introduction of these catalysts allowed the researcher to determine the causative factor(s) in the experiment. At the core of this experimental educational research lies the formulation of a hypothesis and so, the overall research design relied on statistical analysis to approve the hypothesis.

3.3 Method of Research:

3.3.1 Multi Method Research was used for this study.

The idea that multiple methods may be deployed simultaneously in a single study – and that such a study would be less prone to built-in-errors and thus superior to research employing a single method – has its origins in the behavioural revolution of the 1950s (Ahmed & Sil, 2012). The idea of multi-method can be looked at from three different perspectives: in terms of the increasing diversity of techniques centered in the conventional qualitative tradition; the growing number of interconnections between qualitative and quantitative research tools and the relationship to interpretative and constructivist approaches (Collier & Elman, 2008)

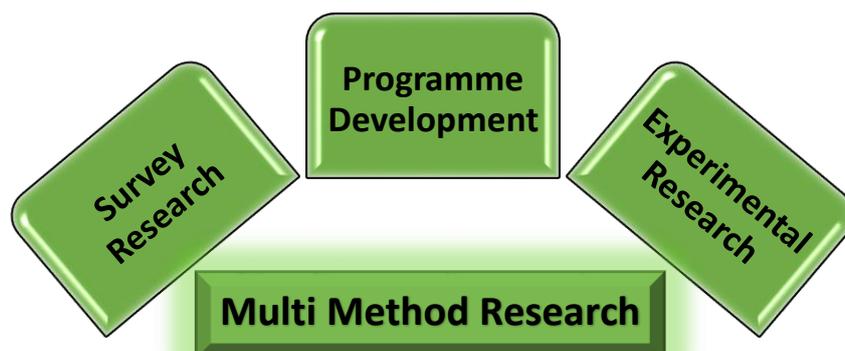


Figure 3.1 Components of the present research as a Multi Method Research

3.3.2 Objective wise Research Methodology:

Main objectives of this research methodology were: -

1. Identify the most difficult topic in standard X history syllabus through survey questionnaire.

2. To developer program based on experiential learning.
3. To test the effectiveness of the experiential learning programme.

In the present study Methodological Triangulation strategy was used. For methodological triangulation, the researcher uses different methods to approach the same research question. This is the most common type of triangulation, and researchers often combine qualitative and quantitative research methods in a single study.

Survey Method:

Survey research involves the collection of information from a sample of individuals through their responses to questions. This kind of research is highly popular due to its versatility, efficiency, and generalizability. There are various types of survey (Implementation options) like: Mailed survey, Group survey, Phone survey, In-person interview and Web survey.

Thus, for the first objective, survey questionnaire (multi method) through google forms was used to collect data from the secondary school teachers to identify the most difficult topics in the standard X history syllabus.

Experimentation Method:

Based on the data collected by using a questionnaire for experts and teachers and taking their feedbacks the researcher selected the topic for the experimentation and developed the program based on experiential learning using the multi method (both quantitative and qualitative) to attain the second objective.

And finally, to test the effectiveness of the product, i.e., experiential learning programme the researcher used the experimental method in the Two group post-test design.

At the core of this experimental educational research lies the formulation of a hypothesis and so, the overall research design relied on statistical analysis to approve the hypothesis.

The effectiveness was tested through the quantitative tools like standard deviation, mean, t -Test and Frequency.

Table 3.1
Research at a Glance

Objective	Objective 1	Objective 2	Objective 3
Research Method	Survey Questionnaire – Multi Method (QUAN +qual)	Programme Development – Multi Method (QUAN +qual)	Experimental Two Group Post Test Design (Control & Experimental Group)
Population	School Teachers of affiliated to CBSE Board in Pune City	Experts and Teachers of Standard X from secondary school affiliated to CBSE	Students of Standard X from secondary schools affiliated to CBSE

Sample	Purposive – 10 Schools, 21 Teachers	Informants: - 2 Experts and 3 History and Social Science Teachers from CBSE Schools	Purposive – I school – {80 Students} {40 Students Experimental} + {40 Control}
Data Collection Tool	Survey Questionnaire for teachers	Usability Testing Questionnaire for experts and teachers	Post -Test Achievement Test; Feedback Sheets for Students and Teachers (during implementation)
Data Analysis Tool	Percentage, Qualitative Analysis	Qualitative Analysis	Mean, Standard Deviation, t – Test, Frequency

3.12 Selection of Method – Experimental Research

For this study the researcher has used experimental method. This method is used to determine and evaluate the adequacy and effectiveness of experiential learning in history among CBSE secondary school students. The method is used to evaluate the effectiveness of the educational objectives through the measurement of outcomes by using the heuristic approach. The researcher defined a problem and the purpose as a tentative answer or hypothesis. The hypothesis was then tested and then it was supposed to be either accepted or rejected in the light of the controlled variable relationship that has been observed.

Experimentations sought to derive verified functional relationship among phenomenon under controlled conditions or more simply identify the conditions underlying the occurrence of a given phenomenon. Experimental educational research in this study involved two group design – the control group and the experimental group. The researcher introduced some changes to the experimental group as catalysts, while the control group was left in its natural state. The introduction of these catalysts allowed the researcher to determine the causative factor(s) in the experiment. Experimentation simply enables one to improve the conditions under which the observations take place in arrive at a more resized result.

3.5 Research Design

Experimental educational research in this study involved two group design – the control group and the experimental group. The researcher introduced some changes to the experimental group as catalysts, while the control group was left in its natural state. The experimental group of students was taught with the experiential learning method, while the control group with the traditional method. The introduction of these catalysts allowed the researcher to determine the causative factor(s) in the experiment. The independent variables are conditions that the experimenter controls in order to ascertain the relationship of observed phenomenon. The dependent

variables are conditions that appear, disappear, or change in the as the experimenter introduces, removes, or changes the independent variables. In the present study, the **Independent Variables are:**

Two groups/sections of Std. X students:

Group A – Teaching with use of heuristic approach in experiential learning in History in class X D.

Group B – Teaching without use of heuristic approach in experiential learning in History in class X A.

In the study, **Dependent Variables** are the Achievement test scores of both Std. X students' groups in History.

There are Extraneous Variables that are the external factors which may have a significant influence upon the result of the study which are controlled by the researcher.

Control of Extraneous Variables:

- ❖ The age group of all the students in the study were in the same range.
- ❖ Both the groups included boys as well as girls as students.
- ❖ The topics selected for the study were the same for the group of students.
- ❖ Tests given to both the groups were the same.
- ❖ The medium of instruction in both the groups was English.

Thus, in the present study two group research design: - All 40 students each of two groups (Sections A and D) of Std. X were the two groups for this experimental research study and testing. Thus, post-test two group design was used.

3.6 Method of Sampling (Probability /Nonprobability)

Methods of sampling can be broadly classified into two categories: -

- a. probability sampling
- b. nonprobability sampling

When the units of population are selected by means of certain procedure which ensures that every unit of population is given equal chance of being included in the sample such a method is called random or properties and in non-probability sampling the units are selected at the discretion of the researcher. The judgement for obtaining samples by the depends upon the researcher. In the present educational research, non-probability purposive sampling technique has been used for collecting responses of the teachers before developing the programme for evaluating the effectiveness of the educational research study.

3.7 Population, Sampling Technique and Sample:

Population:-

- ❖ Students of Standard X from secondary schools affiliated to CBSE (Central Board of Secondary Education)
- ❖ Teachers of schools affiliated to CBSE Board teaching History and Social Science to the students of Secondary Section in Pune city.

Sampling Technique: -

Purposive Sampling method (non-probability)

Sample Size:-

- ❖ Two groups with a total of 80 students from two sections of Std. X in S. B. Patil Public School, Ravet, Pune. {40 (Experimental) + 40 (Control)}

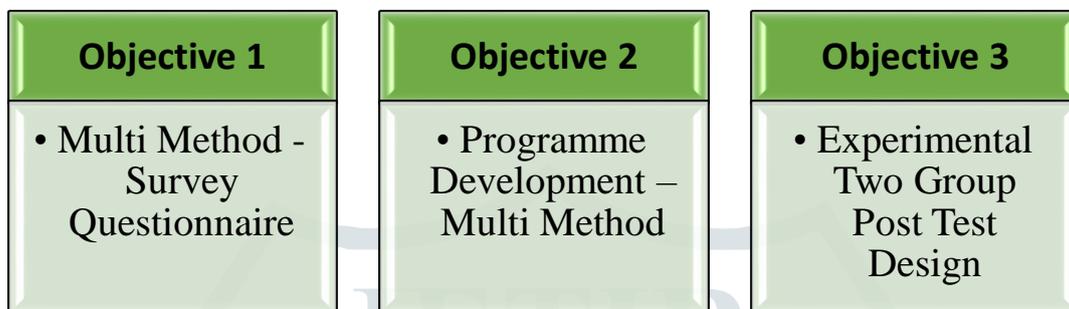
- ❖ 21 History Teachers teaching Std. IX and X from 10 CBSE affiliated Schools for conducting survey to identify the most difficult topic in History.

3.8 Development of the Programme/ Workshop:

Main objectives of this research are:

1. Identify the most difficult topic in standard X history syllabus through survey questionnaire.
2. To developer program based on experiential learning.
3. To test the effectiveness of the experiential learning programme.

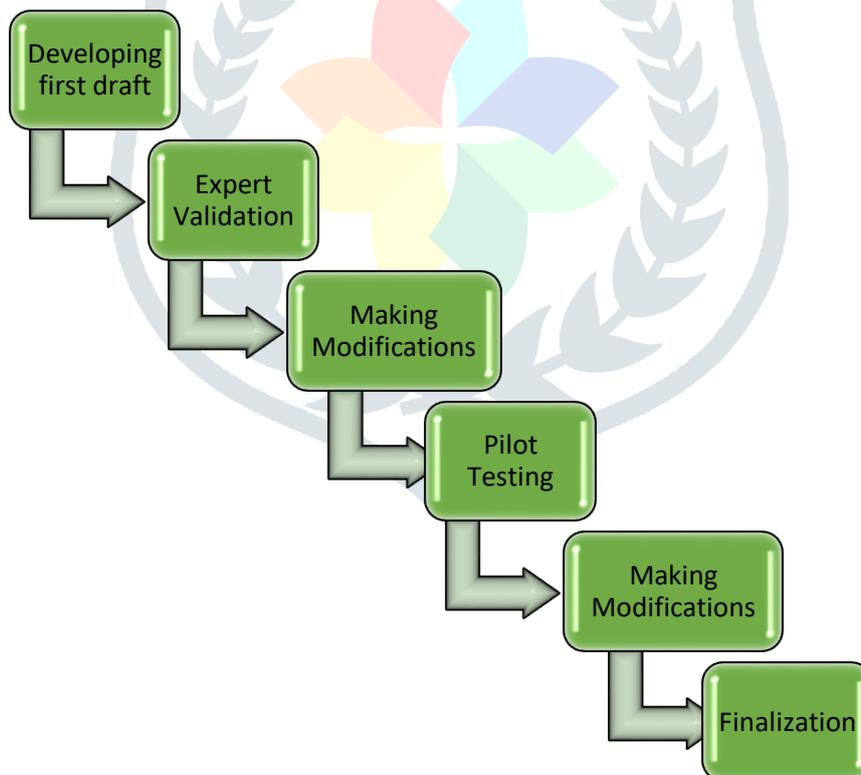
Figure 3.2: Research Design at a Glance



Objective 1: Identify the most difficult topic in standard X history syllabus through survey questionnaire.

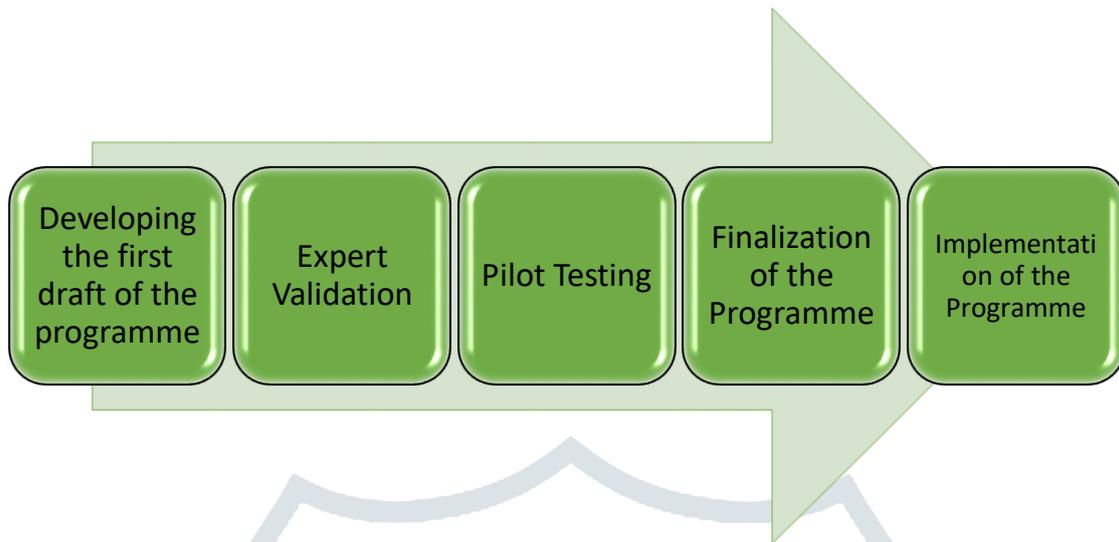
Figure 3.3

Steps in developing Survey Questionnaire



Objective 2: To develop programme based on experiential learning using the heuristic approach to teach selected History topics and concepts.

Figure 3.4

Steps followed by the Researcher for Programme Development**Step 1: The programme developed in the research**

The programme based on evaluating the **Effectiveness of Experiential Learning in History in CBSE Secondary School Students** was developed after conducting the survey which helped in shortlisting the chapters, topics, and concepts. The content was chosen from the CBSE Board History Book of Std. IX and Std. X, out of which four chapters were shortlisted. After taking expert advice, specific concepts from two chapters were finalized which the teachers felt were challenging for the students to learn and were important for the understanding of other chapters which had a linkage to each other. Also, the programme was documented in a compiled booklet (Teacher handbook) comprising of information about meaning and uses of heuristic in classroom for teaching. Lesson Plans, experiential learning Guidelines based on heuristic were explained in detail in the booklet.

Step 2: Objectives of the Programme Development

- ❖ Develop interest in History subject and the ability in the students to analyse the concepts and events taught using the heuristic approach to achieve better learning outcomes.
- ❖ Evaluate the Effectiveness of Experiential Learning in History in CBSE Secondary School Students.

Step 3: Nature and Planning of Programme based on experiential learning in History:

The researcher had used experiential learning methodology in her teaching assignments and had prior training on experiential learning with a background of teaching social sciences and especially history as a discipline.

Step 4: Development of the Programme

Principles of Constructivism, Principle of Experiential Learning, Principles of heuristic approach in History.

Step 5: Description of Programme Development

The Programme developed by the researcher was developed with the aim that students may ‘learn by observing’ and ‘learn by doing.’ The Programme that was developed included the use of key words, colours and pictures that were associated with their daily lives and history subject in a scrapbook and Padlet online Timeline making tool. The developed product included Lesson Plans; experiential learning and heuristic approach Guidelines; and Tests.

Step 6: Pilot Testing of the Programme

After the development of the product, it was pilot tested on a group of students and feedback was taken from the students as well as the observers. Based on the feedback given, the intervention programme was modified.

Step 7: Reliability and Validity of the Programme developed

The Programme based on experiential learning using the heuristic approach was shown to the experts before finalizing it. The modifications suggested by the experts were implemented to ensure content validity of the programme. The achievement test was administered to the same group two times to test the reliability of Post-test using the Parallel forms method.

Step 8: Modifications in the programme after feedback

The suggestions given by the experts and the teachers were based on the technical and the content aspect. These were considered and the product was modified accordingly.

Step 9: Finalisation of the Programme

After considering the suggestions and modifying accordingly the product was finalised by the researcher. The final product consisted of the following: Lesson Plans based on i) four chapters; (ii) Experiential Learning heuristic-based manual for the schoolteachers which contained the meaning of heuristic and experiential learning, its origin, and the principles, the procedure to be followed and the limitations; (iii) Evaluation – Achievement Test, Post Test.

Step 10: Utility

- ❖ The Programme based on experiential learning in History using the heuristic approach was then implemented on the experimental group. The control group was taught using the traditional method of teaching.
- ❖ Post Test was conducted on the students of the groups.

Step 11: Co- relation of the objectives and findings

Feedback sheets were given to the students and teachers during the implementation of the Programme. After the Programme based on experiential learning in History was implemented, three schoolteachers were given Usability questionnaire and they had given their feedback about the Programme. The feedback thus given by the students, schoolteachers (observers) and the social science teachers (for usability) were favourable and showed that the objectives were fulfilled.

Step 12: Conclusion

The Programme based on experiential learning in History using the heuristic approach was effective.

Objective 3: -

To test the effectiveness of the experiential learning programme.

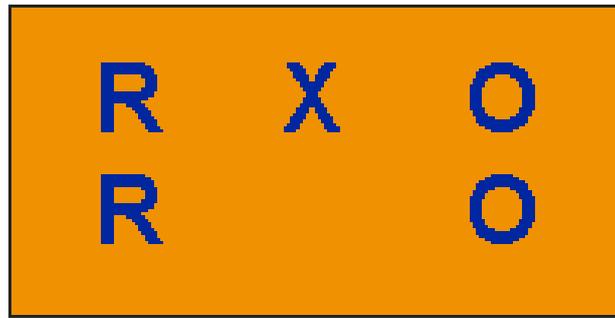
Research Method:

Experimental Method

Research Design – Two Group Post Test Design

Figure 3.5

Two Group Post Test Design



Where,

R = Two Groups

X = Group that is Experimental Group

O = Measurement of comparison

In this design notation, it has two lines – one for each group – with an R at the beginning of each line to indicate that the groups were randomly assigned. One group gets the treatment or program (the X), and the other group is the comparison group and doesn't get the program.

In this design, we are most interested in determining whether the two groups are different after the program. Typically, we measure the groups on one or more measures (the Os in notation) and we compare them by testing for the differences between the means using a t-test .

Figure 3.6

Steps of the Experiment

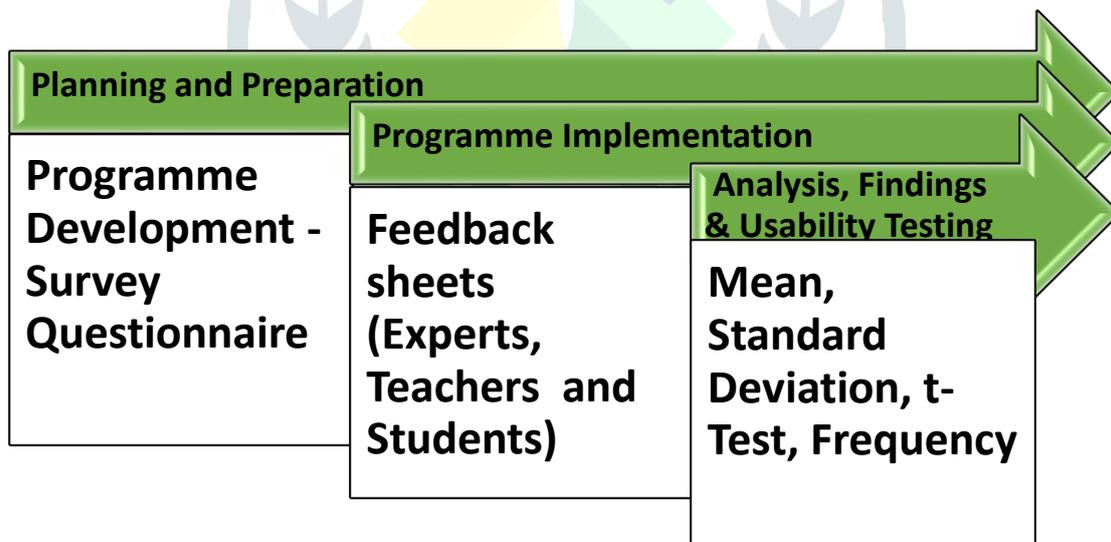


Figure 3.7

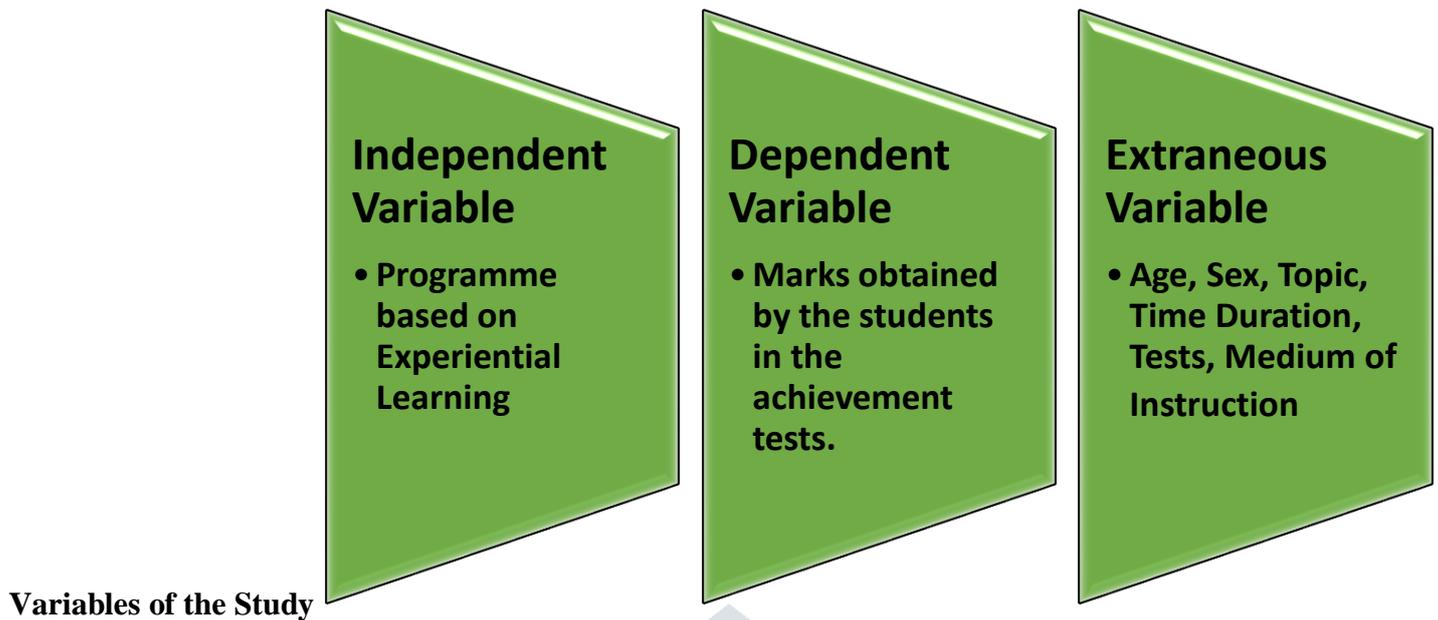
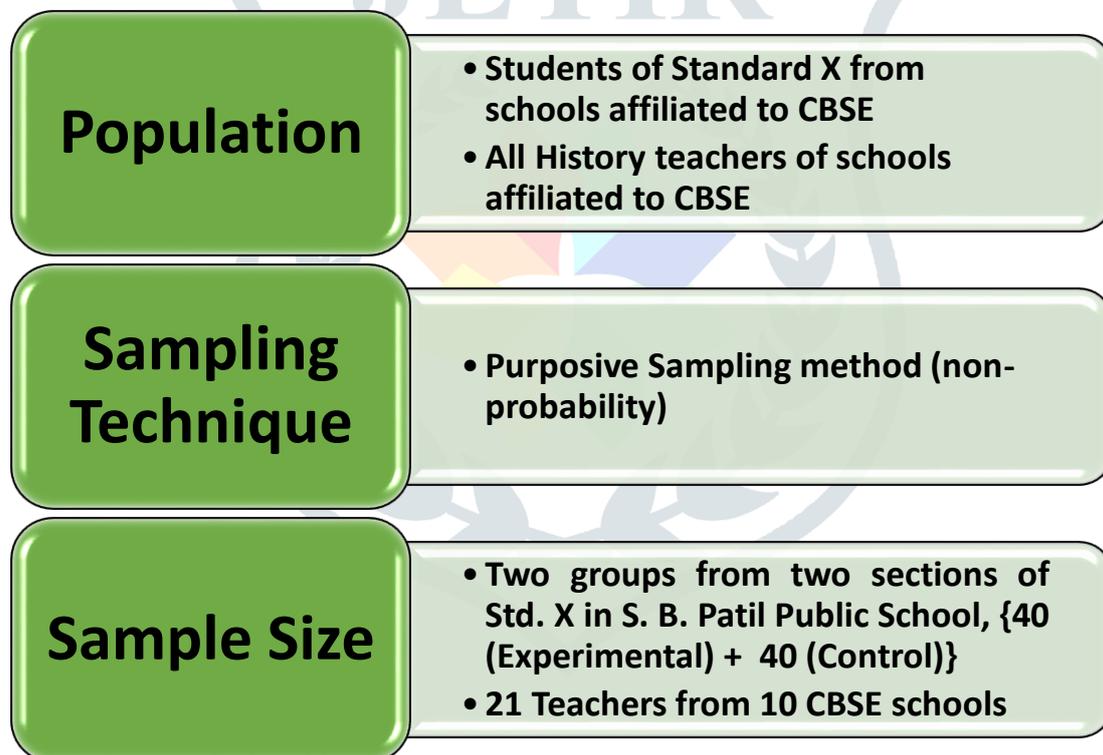


Figure 3.8

Population and Sampling Technique and Sample**Data Collection Tools:****Researcher Developed Test:**

Post Test: The achievement test was developed by the researcher to assess the students understanding with respect to the topics taught using the Programme based on Experiential learning.

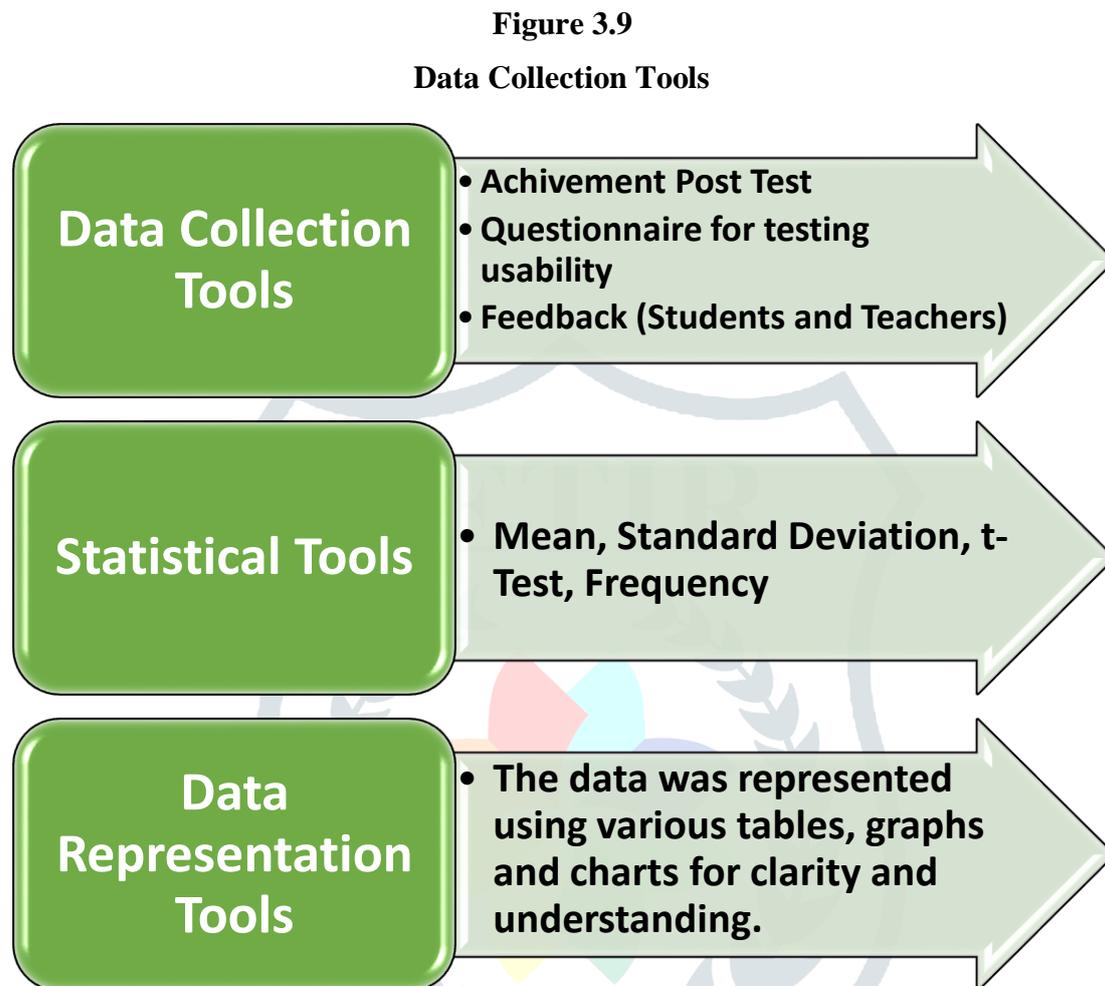
Questionnaire for Testing Usability: Teachers teaching the subject History to the students in the CBSE Board affiliated Schools were provided with the questionnaire to evaluate the usability.

Feedback of Students and Teachers: - Feedback from students was also taken to evaluate the effectiveness of the programme.

Data Representation Tools:

The data was represented using various tables, graphs, and charts for clarity and understanding.

Statistical Tools: Data was analysed using the statistical tools – Mean, Standard Deviation, t- Test, Frequency

**3.9 Tools of Data Collection (Achievement Test, Questionnaire, Rating Scale etc.)****3.9.1 Objective wise Tools of Data Collection**

Objective 1: Identify the most difficult topic in standard X history syllabus through survey questionnaire.

Survey Questionnaire: A questionnaire is a form prepared and distributed to secure certain responses to certain questions which the respondent fills by him. It relies on written information supplied directly by the people in response to questions. Thus, a google form was created to collect the responses from the teachers online. <https://forms.gle/wdRdgyJBUzh4BagM7>

Objective 2: To develop a program based on experiential learning.

Lesson Plans: The programme based on evaluating the **Effectiveness of Experiential Learning in History in CBSE Secondary School Students** was developed after conducting the survey which helped in shortlisting the chapters, topics, and concepts. The content was chosen from the CBSE Board History Book of Std. IX and Std. X, out of which four chapters were shortlisted. After taking expert advice, specific concepts from two chapters were finalized which the teachers felt were challenging for the students to learn and were important for the understanding of other chapters which had a linkage to each other. Also, the programme was documented in a compiled booklet (Teacher handbook) comprising of information about meaning and uses of heuristic in

classroom for teaching. Lesson Plans, experiential learning Guidelines based on heuristic were explained in detail in the booklet.

Objective 3: To test the effectiveness of the experiential learning programme.

Researcher Developed Test:

Achievement Test Post Test: The achievement test was developed by the researcher to assess the students understanding with respect to the topics taught using the Programme based on Experiential learning.

Data Representation Tools:

The data was represented using various tables, graphs, and charts for clarity and understanding.

Questionnaire for Testing Usability: Teachers teaching the subject History to the students in the CBSE Board affiliated Schools were provided with the questionnaire to evaluate the usability.

Feedback of Students and Teachers: - Feedback from students was also taken to evaluate the effectiveness of the programme.

3.10 Selection of Tools (its preparation, procedure of data collection)

Plan and Procedure Objective 1:

A Survey was conducted by the researcher in the first phase of the research for the fulfilment of Objective 1. This survey was conducted to find out most difficult topic in standard X history syllabus in the CBSE Board Schools of Pune city. Further it helped the researcher to identify the challenging concepts in Std. X History and to find whether experiential learning was being used for teaching the subject History in secondary schools.

The questionnaire was developed with an aim to:

- a. Identify which concepts and topics in History subject that were challenging according to the teachers teaching social science.
- b. Get information regarding the participation of the teachers in the training programme on experiential learning based on heuristic.
- c. Secure information regarding the classroom transaction of teachers' teaching Social Science to Std. X.
- d. Assess the awareness among teachers regarding use of experiential learning with heuristic approach.
- e. Find out the readiness of teachers to take training for using the experiential learning with heuristic approach.

Steps involved in making the Questionnaire:-

The questions prepared focussed on getting information from the teachers about:

1. Their background.
2. Topics from Std. X History that the teachers felt were challenging.
3. Training programmes that the teachers had participated in for their professional development.
4. Teaching methods, teaching aids and evaluation techniques that they used for teaching science in the class.
5. Different resources used by the Social Science teachers for classroom interaction apart from the textbooks.
6. Limitations faced by the Social Science teachers while teaching History.
7. Awareness regarding the use of heuristic.

8. Whether the teachers taught History using experiential learning.

9. The readiness of the teachers to take training for using heuristic approach in experiential learning.

Expert Validation: (Appendix)

Once the first draft of the questions was constructed the questionnaire was given to the experts for validation. The selection of the experts was done based on their experience in the field of research and their mastery over social science content. The following experts were given the first draft of the questionnaire:

1. Dr. Pushpa Patil (Professor of Education, Azam College of education)
2. Dr. Bindu Saini (Principal, S. B. Patil Public School, Ravet, Pune)

The suggestions of the experts were extremely valuable and the following recommendations were given by the experts pertaining to the questionnaire: -

- ❖ Rearrange the order of the objectives stated for the questionnaire.
- ❖ The sequence of the questions should be arranged according to objectives of the questionnaire
- ❖ Repetition of questions should be addressed to make coherence in the questionnaire.
- ❖ Check for appropriate terminologies and wordings to address the objective.

Pilot Testing:

After making the necessary modifications, the Survey Questionnaire was given to the 2 teachers of CBSE affiliated S. B. Patil Public school. The question probing the beliefs of the Social Science teachers was excluded after the pilot study as it was not directly related to the objectives.

Finalizing the Questionnaire: (Appendix)

The google survey questionnaire was divided in to five sections with 31 questions as follows: Section I – 5 Questions, Section II - 5 Questions, Section III – 11 Questions

Section IV – 2 Questions, Section V – 8 Questions

Table 3.2

Distribution of Survey Questions based on Objectives

Objective No.	Statement	Question No.	Nature of Question
Section I	Basic information about the Teacher	1 to 5	Closed
Section II	Get information about the participation of the teachers in any training programme.	1 to 5	Closed
Section III	Identify the challenging concepts in History according to the teachers teaching science.	11 to 21	Open Closed
Section IV	Find out information regarding the classroom transaction of teachers' teaching History to Std. IX and X.	22 to 23	Closed and Open (Contingency questions)

Section V	Assess the awareness and readiness among teachers regarding use of experiential learning.	24 to 31	Closed
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Execution of the Survey: (Appendix)

The survey was executed over a period of approximately one year beginning from July 2022 till December 2022. An interaction with a total of 25 teachers from 25 schools' teachers were contacted to collect the responses, out of which 21 teachers of 10 schools cooperated.

Relationship with Experiment:

The analysis of the Survey Questionnaire for the schoolteachers revealed various aspects about the prevalence of teaching methods in the school, the challenging concepts for the students, the various kinds of classroom transactions, the awareness among teachers regarding experiential learning and the readiness of teachers for adopting techniques like heuristics. This analysis was extremely helpful in shortlisting of chapters for the Programme based on experiential learning in History using heuristic. Four chapters thus were shortlisted from the CBSE Board History Textbook (India and the Contemporary World Part I (Std. IX, also relevant for Std. X) Part II (Std. X)) for the programme based on experiential learning with the heuristic approach. From the four shortlisted chapters following concepts were selected for the study:

1. Sense of Collective Belonging – Section IV – Chapter 2 – Nationalism in India as it was linkage to both chapters 1 and 2 of Std. X (refer table 3.3 below)
2. Before the Industrial Revolution - Proto Industrialization and Industrial Revolution – Section II – Chapter 4 – Age of Industrialization as it was linkage to both Chapters 2 – Std. IX and Chapter 4 – Std. X (refer table 3.3 below)

Table 3.3

Chapters shortlisted for evaluating the Effectiveness of Experiential Learning in History among CBSE Secondary School Students

S. No.	Chapter No.	Chapter Name	Page No.
1.	Ls 2 - India and the Contemporary World Part I (Std. IX, also relevant for Std. X)	Socialism in Europe and the Russian Revolution	24 to 48
2.	Ls 1 - India and the Contemporary World Part II – (Std. X)	Rise of Nationalism in Europe	3 to 28
3.	Ls 2 - India and the Contemporary World Part II – (Std. X)	Nationalism in India	29 to 50
4	Ls 4 - India and the Contemporary World Part II – (Std. X)	Age of Industrialization	79 to 102

Plan and Procedure Objective 2:

Programme based on Experiential Learning in History using the Heuristic Approach (Teacher Handbook + Lesson Plans + Achievements Test)

Developing the Teacher Handbook on Heuristic:

A Teacher Handbook was prepared by the Researcher to make the teachers aware about the meaning, uses, benefits, merits, and demerits of heuristic method of Experiential Learning with examples.

Developing the Lesson Plan Drafts based on Heuristic:

Lesson Plans for concepts two selected lessons were prepared. Each lesson plan contained following sections – Learning Objectives, Activity Specifications, Skills Acquired, Experiential Learning Activity, Teachers Activity, and Students Activity. At the end of lesson plans for each chapter the Achievement Post Tests were monitored in sequence for reference.

Expert Validation: (Appendix)

The Teacher handbook including the lesson plans were shown to experts and History teachers for their suggestions. The experts were:

1. Mrs. Padmawati Banda – Vice Principal and History Teacher for Secondary Section, S. B. Patil Public School
2. Mrs. Pravina More – HOD Social Science, S. B. Patil Public School

Suggestions given by experts:

1. Mention learning objectives, Skills acquired and learning outcomes separately.
2. Achievement Post-tests questions will be used as per Blooms taxonomy
3. No achievement tests should be added in the lesson plans.

Finalisation of the Lesson Plans with Teacher Handbook:

The suggestions of the experts were implemented, and the Teacher handbook with lesson plans were finalized.

Pilot Testing of the Programme based on experiential Learning:

After the recommendations given by the experts were implemented by the researcher the Programme based on experiential learning in History using the heuristic approach was pilot tested in Std. X B (Class not a part of the study with 40 students approx.) in S. B. Patil Public School.

The pilot testing helped the researcher to identify following points:

1. The key words were required to be made specific for better understanding of the Sense of Collective Belonging activity to help students collect information pertaining to the four dissimilar categories with examples for scrapbook making with a list of subtopics and was shared with students. (Appendix)
2. For the lesson Age of Industrialisation activity, in case the students are not able to utilize the Padlet online software, they can use PPT or draw the timeline in school notebook and paste pictures of the same.
3. Invention of Telegraph can be done in class itself as a discussion and a timeline for Proto industrialisation and Industrial Revolution can be made to save time.
4. The Achievement tests could be conducted later as each scrapbook presentation required at least 10-15 minutes by each group.

5. Achievement Post-test was divided for both activities, i.e., 10 marks Post Test for Ls 2 Activity and 15 marks for Ls 4 Activity due to unavailability of dates and other planned school activities and evaluations. Finally, both test scores were added for the study.

Finalization of the Lesson Plans for Programme based on Experiential Learning in History using the Heuristic Approach (Lesson Plans + Achievements Test)

Out of the four chapters selected for the study, two were omitted and two lesson plans with two separate activities were prepared on specific sections of the lessons. This decision was taken after interacting with the schoolteachers where the experiment was scheduled to be conducted. This was done due to the time restraint and depending on the number of periods that the researcher was permitted to conduct in the schools.

1. Thus, the activity on Sense of Collective Belonging – Section IV – Chapter 2 – Nationalism in India as it was linkage to both chapters 1 and 2 of Std. X was conducted.
2. Before the Industrial Revolution - Proto Industrialization and Industrial Revolution – Section II – Chapter 4 – Age of Industrialization as it was a linkage to both Chapters 2 – Std. IX and Chapter 4 – Std. X was conducted.

Plan and Procedure Objective 3:

Developing the Achievement Post Tests:

The Achievement post-test was developed in a manner that the same content was evaluated in various question forms. The reliability of the tests was also established after developing the equivalent measures.

The First Draft of Post Test:

Table 3.4

The First Draft of Post Test

Test	First Draft of Questions	No. of Items	Marks Allotted	Chapters Included
Post Achievement Test	Objective Question	10	10 marks	Chapters 2,4
	2 marks question	3	6 Marks	
	3 marks questions	3	9 Marks	
	Source based questions – 4 marks each	2	8 Marks	
	5 Marks question	3	15 Marks	
	Map Based Questions	2	2 Marks	
Total Marks			50 Marks	

***Objective Questions covered = Fill in the Blanks, MCQ, True/False**

Content Validity of the Tests:

Expert Validation: (Appendix)

The Achievement Tests were shown to experts for their suggestions. The experts were:

1. Mrs. Padmawati Banda – Vice Principal and History Teacher for Secondary Section, S. B. Patil Public School
2. Mrs. Pravina More – HOD Social Science, S. B. Patil Public School

Suggestions given by experts:

The recommendations of the experts regarding the test were:

- ❖ Objective type questions alone are sufficient as same content was evaluated in various question forms.
- ❖ Board pattern should have been followed for framing the question paper and also recommended giving options in the question paper.
- ❖ The 50 marks test can be reduced to a 25 marks test so that the marks distribution becomes convenient as per the size of the concept covered.
- ❖ Some questions were also to be rephrased.

Pilot Testing of the Achievement Post Tests

After making the modifications based on the suggestions given by the experts, the Achievement tests were subjected to pilot testing. The pilot test was conducted with a separate group of students who were not a part of the study before implementation of the programme. After the programme was conducted post-test administered on the students of experimental and control group. No change was required to be made in the content.

Finalizing the Achievement Tests: The achievement tests were thus finalized.

Table 3.5

The Final Draft of Post Test

Test	Original Form	Modified form
Achievement	Objective = 10 marks	1*1 = 10 marks
Post Test	1 sentence questions	1*1 = 6 Marks
	2 marks question	2*3 = 6 Marks
	3 marks questions	1*3 = 3 Marks
	Two Source based questions – 4 marks each	Excluded
	5 Marks question	Excluded
	Map Based Questions	Excluded
Total Marks		25 Marks

***Objective Questions covered = Fill in the Blanks, MCQ, True/False**

Table 3.6

Weightage Table and Blueprint for Achievement Post Test:

S. No.	Type of Questions	Total Number of Questions	Marks Allotted
1.	Objective Type	10	10
2.	1 Mark Questions	6	6
3	2 Mark Questions	3	6
4	3 Mark Questions	1	3
Total			25 Marks

Table 3.7

Blueprint for Post Test as per Blooms Taxonomy

Lesson	Knowledge	Understanding	Application	Analysing/ Competency based	Total Marks
Ch 2	4*1 mark=4	2*1 mark=2	2*1 mark=2	2*1 mark=2	10 Marks
Ch 4	3*1 mark=3	1*1 mark=1	1*1 mark=1	1*1 mark=1	15 Marks
		1*2 Mark= 2	1*2Mark= 2	1*2 Mark= 2	
				3*1 = 3m	
Total Marks	7 Marks	5 Marks	5 Marks	8 Marks	25 Marks

Evaluating the Usability of the Programme:

Teachers teaching the subject History to the students in the CBSE Board affiliated Schools were provided with the questionnaire to evaluate the usability of the lesson plan.

Size: 3 History teachers

Purpose:

Testing for usability of the programme helps in locating the mistakes and the difficulties that may arise while using it. This helps in overcoming the shortcomings of the programme before it is circulated among its end users.

Concern:

The following questions were identified as being relevant to the testing process:

1. Can the programme be useful for the schoolteachers while teaching the content to Std. X students?
2. Can the programme supplement the History teachers' regular teaching?
3. Can the developed programme be useful as guidelines for the teachers in developing their own activities while teaching?
4. Can the programme facilitate the students in recalling the content?

5. Can the programme help the teachers to attract the learners and sustain their interest?
6. Will the History teachers agree that the programme is useful for the target students?

Development of the Data Collection Tool:

Questionnaire for Testing Usability

Developing the first draft of the questionnaire for testing Usability:

The first draft of the questionnaire comprised of 10 criteria's to be rated in a five-point rating descriptive rating scale.

Modifications recommended by expert validation:

- ❖ Rephrasing of some key words in the questionnaire was done,
- ❖ Add option for written feedbacks from teachers.

Expert Validation of the questionnaire: (Appendix)

The usability questionnaires were validated by showing it to the following experts:

1. Dr. Pushpa Patil (Professor of Education, H.G.M. Azam College of Education, Pune)
2. Dr. Bindu Saini (Principal, S. B. Patil Public School, Ravet, Pune)

Finalization of the questionnaire for testing usability: (Appendix)

The suggestions given by the experts were implemented and the usability questionnaire was finalized.

Collecting the responses of schoolteachers using the questionnaire: The finalized Questionnaire was given to teachers of three teachers from S. B. Patil Public School:

1. Mrs. Padmawati Banda – Vice Principal and History Teacher for Secondary Section, S. B. Patil Public School
2. Mrs. Pravina More – HOD Social Science, S. B. Patil Public School
3. Mrs. Sucharita Roy – Social Science and History Secondary Teacher, S. B. Patil Public school.

Analysis of the questionnaire for testing usability:

The questionnaire was analysed quality components (QUAN + qual), which include learnability, efficiency, memorability, errors, and user satisfaction.

Table 3.8

Analysis of the Questionnaire to Test the Usability of the Programme

S. No.	Criteria	Excellent	V. Good	Good	Average	Satisfactory
1	Useful to teach the content	2	1			
2	Useful to supplement your regular teaching	1	2			

3	Supportive in managing your teaching time	1		2		
4	Clarity in developing the activities while teaching	2	1			
5	Useful to guide you for generating mind maps & concept maps	2	1			
6	Useful for the learner in learning of the concept	3				
7	Suitable for attracting attention of learner	3				
8	Assists for sustaining interest of learner	1	2			
9	Facilitates to recall and remember the concept	1	2			
10	Helpful for the learner to organize the content	1	2			
	Total	17	11	2		

Interpretation:

The Product experiential learning programme based on heuristic approach (Teacher handbook and lesson plan) was useful for the teachers in classroom transaction.

3.11 Reliability and Validity of the Tools

The reliability and validity of the tools were ensured by expert validations as mentioned below:

Table 3.9

Steps followed for Reliability and Validation of the Tools

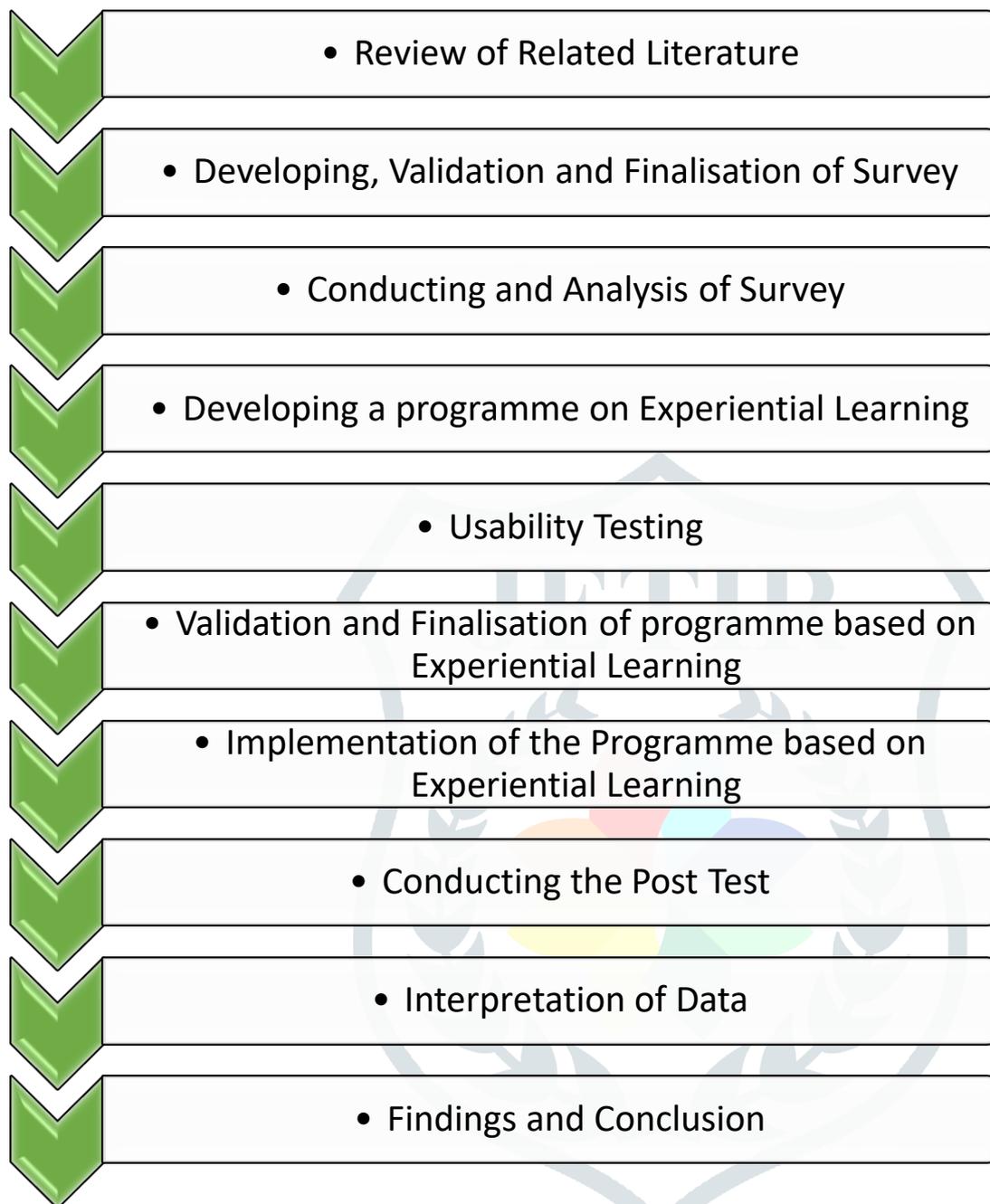
Objective wise Tools	Validation	Validation Done By
1. Survey Questionnaire	<ul style="list-style-type: none"> Survey Questionnaire was shown to two experts 	Experts
2. i. Lesson Plans ii. Teacher handbook iii. Questionnaire for Usability testing iv. Feedback Sheets	<ul style="list-style-type: none"> Lesson plans were shown to 2 experts Teacher handbook was shown to 2 experts Questionnaire was shown to 3 teachers 	Experts Teachers

	<ul style="list-style-type: none"> Feedback sheets were shown to two experts 	
3. Achievement Test Post Test	<ul style="list-style-type: none"> Achievement Test Post Test was shown to two experts 	Experts

- ❖ The researcher took oral feedback (apart from the written feedback) from teachers while conducting the Programme based on experiential learning in History.
- ❖ The researcher also took oral feedback from all the students after every class. While taking the feedback the researcher repeatedly told the students to give their honest opinion about the lecture and the experiential learning used without any hesitation.
- ❖ The researcher maintained a daily diary of all people she met as a part of the research work and kept it updated to keep a record of all the names with whom interaction has taken place along with their suggestions given.



3.12 Steps for conducting Research (Figure 3.10 Flow Chart)



3.13 Plan of Action and Pilot Study:

Objective 1: After making the necessary modifications, the Survey Questionnaire was given to the 2 teachers of CBSE affiliated S. B. Patil Public school. The question probing the beliefs of the Social Science teachers was excluded after the pilot study as it was not directly related to the objectives.

Execution of the Survey: (Appendix)

The survey was executed over a period of approximately one year beginning from July 2022 till December 2022. An interaction with a total of 25 teachers from 15 schools' teachers were contacted to collect the responses, out of which 21 teachers of 10 schools cooperated.

Objective 2:**Pilot Testing of the Programme based on experiential Learning:**

After the recommendations given by the experts were implemented by the researcher the Programme based on experiential learning in History using the heuristic approach was pilot tested in Std. X B (Class not a part of the study with 40 students approx.) in S. B. Patil Public School.

The pilot testing helped the researcher to identify following points:

1. The key words were required to be made specific for better understanding of the Sense of Collective Belonging activity to help students collect information pertaining to the four dissimilar categories with examples for scrapbook making with a list of subtopics and was shared with students. (Appendix)
2. For the lesson Age of Industrialisation activity, in case the students are not able to utilize the Padlet online software, they can use PPT or draw the timeline in school notebook and paste pictures of the same.
3. Invention of Telegraph can be done in class itself as a discussion and a timeline for Proto industrialisation and Industrial Revolution can be made to save time.
4. The Achievement tests could be conducted later as each scrapbook presentation required at least 10-15 minutes by each group.
5. Achievement Post-test was divided for both activities, i.e., 10 marks Post Test for Ls 2 Activity and 15 marks for Ls 4 Activity due to unavailability of dates and other planned school activities and evaluations. Finally, both test scores were added for the study.

Finalization of the Lesson Plans for Programme based on Experiential Learning in History using the Heuristic Approach (Lesson Plans + Achievements Test)

Out of the four chapters selected for the study, two were omitted and two lesson plans with two separate activities were prepared on specific sections of the lessons. This decision was taken after interacting with the schoolteachers where the experiment was scheduled to be conducted. This was done due to the time restraint and depending on the number of periods that the researcher was permitted to conduct in the schools.

1. Thus, the activity on Sense of Collective Belonging – Section IV – Chapter 2 – Nationalism in India as it was linkage to both chapters 1 and 2 of Std. X was conducted.
2. Before the Industrial Revolution - Proto Industrialization and Industrial Revolution – Section II – Chapter 4 – Age of Industrialization as it was a linkage to both Chapters 2 – Std. IX and Chapter 4 – Std. X was conducted.

Finalization of the Questionnaire for testing usability of the programme and Feedback Sheets for teachers and students: (Appendix)

The suggestions given by the experts were implemented and the usability questionnaire and Feedback sheets were finalized.

Feedback sheets were given to the students and teachers during the implementation of the Programme. After the Programme based on experiential learning in History was implemented, three schoolteachers were given Usability questionnaire and Feedback forms and they had given their opinion and feedback about the Programme. The

feedback thus given by the students, schoolteachers (observers) and the social science teachers (for usability) were favourable and showed that the objectives were fulfilled.

Objective 3:

Pilot Testing of the Achievement Post Tests

After making the modifications based on the suggestions given by the experts, the Achievement tests were subjected to pilot testing. The pilot test was conducted with a separate group of students of Std. X B of S. B. Patil Public School who were not a part of the study before implementation of the programme. After the programme was conducted post-test was administered on the students of experimental and control group. No change was required to be made in the content.

3.14 Implementation of the programme based on Experiential Learning

The Control Group in the school was taught using the Traditional Method of teaching by their history subject teacher while for the Experimental group in the school the researcher conducted the Programme based on Experiential Learning.

The following table shows the details about the selection a school for the experimental educational research to develop and test the “Effectiveness of Experiential Learning Programme in History for CBSE Secondary School Students.”:

3.14.1 Selection of School and the Execution of the Experiment

Table 3.10

Experimental Mortality (Two Group Post Test Design)

School Name	Group	Standard	Total Number of Students	No. of Students who dropped out	No. of students as Sample
S. B. Patil Public School	Control	X A	40	5	35
	Experimental	X D	40	5	35

3.15 Post Test Conduction:

S. B. Patil Public School (26th September to 28th November)

Table 3.11

Schedule Of the Experiment Conducted in the Schools:

S. No.	Day and Dates	Period and Timing	Group and Standard (Div.)	Experiential Learning Lessons Conducted
1	26 th September 2022, Monday	8:20 to 9:05	X D	LS 2 – Nationalism in India – Section IV - Sense of Collective

				Belonging – Group Activity Explanation
2.	3rd October 2022, Monday	8:20 to 9:05	X D	Ls 2 – Nationalism in India – Section IV - Sense of Collective Belonging – Scrap Book Making in Class
3	7th October 2022, Friday	10:40 to 11:20	X D	Class Group Discussion and Viva Group A = Figures and Images & Group B = Folklores and Tales
4	8th October 2022, Saturday	10:40 to 11:20	X D	Class Group Discussion and Viva Group C = Use of Icons and Symbols & Group B = Reinterpretation of History
5	10th October 2022, Monday	8:20 to 9:05	X D X A	Post Test (10 Marks) on Sense of Collective Belonging
6.	15th November 2022, Tuesday	8:20 to 9:05	X D	Ls 4 – Age of Industrialization – Section II – Before and after Industrial Revolution - Class discussion on Timeline Making Activity on Inventions that changed the World Activity
7	16th November 2022, Tuesday	10:00 to 10:40 AM & 1:15 to 1:55 PM	X D	Class Group Timeline Making Activity on Proto Industrialisation and after
8.	21st November 2022, Tuesday	8:20 to 9:05	X D XA	Post Test (15 Marks) on Ls 4 – Section II - Age of Industrialization

3.16 Tools of Data Analysis (Mean, Standard Deviation, t-Test/ Descriptive Analysis)

Statistical Tools: Data was analysed using the statistical tools - Mean, Standard Deviation, t- Test, Frequency

3.16.1 Objective Wise Data Analysis Tools:

Objective 1:

Survey Questionnaire:

The questionnaire was analysed quality components (QUAN + qual), which include learnability, efficiency, memorability, errors, and user satisfaction.

The analysis of the Survey Questionnaire for the schoolteachers revealed various aspects about the prevalence of teaching methods in the school, the challenging concepts for the students, the various kinds of classroom transactions, the awareness among teachers regarding experiential learning and the readiness of teachers for adopting techniques like heuristics. This analysis was extremely helpful in shortlisting of chapters for the Programme based on experiential learning in History using heuristic.

Frequency: A **frequency** is the number of times a value of the data occurs. A **relative frequency** is the ratio (fraction or proportion) of the number of times a value of the data occurs in the set of all outcomes to the total number of outcomes. To find the relative frequencies, divide each frequency by the total number of students in the sample.

A percentage frequency distribution, in general, is a display of data that indicates the percentage of observations for each data point or grouping of data points. It is a commonly used method for expressing the relative frequency of survey responses and other data. **Frequency** was used to analyse the responses of the CBSE school teachers in the survey questionnaire.

Objective 2:

Usability Analysis:

The questionnaire was analysed quality components (QUAN + qual), which include learnability, efficiency, memorability, errors, and user satisfaction.

Frequency: Frequency was used to analyse the responses of the students and teachers for the rating scales and multiple-choice questions in the feedback sheets.

Objective 3:

Data was analysed using the statistical tools - Mean, Standard Deviation, t- Test

Mean:

$$\bar{x} = \frac{\sum x}{n}$$

Where, x = each observation and n = number of observations.

Mean Difference = $\sum x_1 n - \sum x_2 n$

Where,

- x_1 = Mean of group one

- \bar{x}_2 = Mean of group two
- n = Sample size

Standard Deviation: The standard deviation formula is:

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$$

Here,

σ = Population Standard Deviation

x_i = Each value from the population

μ = The population mean

N = The size of the population

t-Test: This is the test conducted when samples from two different groups, species, or populations are studied and compared. It is also known as an independent t -Test.

The t-test formula is a statistical equation we use to determine if the difference between the mean (average) of two groups is big enough to be considered significant. It means that if we have the average values for two groups and they are significantly different, we can conclude that there is a considerable difference between the two groups.

The t – Test formula used to calculate this is:

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Here,

t = Ratio of the difference between the mean of the two samples and the variation that exists within the sample sets.

\bar{x}_1 = Mean of Sample 1

\bar{x}_2 = Mean of Sample 2

s_1^2 = Standard Deviation of Sample 1

n_1 = Size of Sample 1

s_2^2 = Standard Deviation of Sample 2

n_2 = Size of Sample 2

3.17: Summary

This chapter explains the methodology of the research conducted. The researcher has used experimental method with Two group post-test design for non-probability sampling. The post-test achievement test were used to evaluate the effectiveness off the program. the chapter also contains the sampling tool construction and data collection procedures.

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Chapter IV

Data Analysis and Interpretation

4.1 Introduction:

Data analysis, is a process for collecting raw data, processing, and analysing it and converting it into useful information required for decision-making. It is collected and examined to answer questions, test hypotheses, or disprove theories.

The collected data in the research project only cannot answer the research question or test reach research hypothesis. Thus, the research data needs to be processed and analysed in some systematic manner so that the trends and pattern of relationship between the programme of and variables of the study can be detected. Data analysis embraces a whole range of activities of both the qualitative and quantitative kind.

In the present research, Multi method Two Group Research Design has been used to study the effectiveness of Experiential Learning in History among the CBSE secondary school students of Std. X. This Multi method research involved a combination of three methods – Survey, Product Development and Experimental. The data collected in this experimental was analysed using quantitative and qualitative procedures.

The statistical method and techniques have a special position in this research because they provide answer to study in question. The data analysis and interpretation consists of tables which represent the data in detail. Raw data was to be recorded in the most convenient form for collecting but in the body of report, data relevant to the hypothesis was, classified, categorized, manipulated, and summarised in ways that provide the pertinent information required for accepting or rejecting the hypothesis.

This chapter includes analysis of data collected during the study. The researcher has collected classified and analysed the data. According to the classification of subject matter, after analysis of data, researcher has interpreted it and made observations in the form of tables. The researcher has drawn the graph for comparing scores of post-tests of the control and experimental groups and on its basis the researcher has drawn the findings and conclusions.

4.2 Objectives of the Study:

The main objective of the study was **“To develop and test the effectiveness of studying history through Experiential Learning for CBSE Secondary School Students.”** The heuristic approach of Experiential learning in History was explored and evaluated by developing a programme for Std. X CBSE secondary school students. The above main objective was based on some underlying research questions. For this, the researcher browsed through various methodologies of teaching History in experiential learning by doing a thorough review of related literature.

4.3 Research Questions:

The researcher identified the following research questions after the preliminary review of related literature about the heuristic approach of experiential learning in History to define what needs to be known about this approach in teaching of History and assess its effectiveness: -

- ❖ Which methods and approaches teachers use to teach History?
- ❖ How can we effectively implement heuristic approach of experiential learning to study History?

The researcher hence decided to undertake the present study. Further the researcher, identified and listed down three objectives to address the main objective of conducting this study.

Objective wise Research Methodology: Main objectives of this research methodology were: -

1. Identify the most difficult topic in standard X history syllabus through survey questionnaire.
2. To developer program based on experiential learning.
3. To test the effectiveness of the experiential learning programme.

In the present study Methodological Triangulation strategy was used. For methodological triangulation, the researcher uses different methods to approach the same research question. This is the most common type of triangulation, and researchers often combine qualitative and quantitative research methods in a single study.

4.4 Hypothesis of the Study:

Research Hypothesis: - There is a significant difference of mean scores in post- test after implementation of experiential learning of History among secondary school students.

Null () Hypothesis: -There is no significant difference of mean scores in post-test after implementation of experiential learning of History among secondary school students.

4.5 Objective wise Data Analysis:

Analysis and Interpretation of Data for Objective 1:

Identify the most difficult topic in standard X history syllabus through survey questionnaire.

Research Methodology: Survey Questionnaire

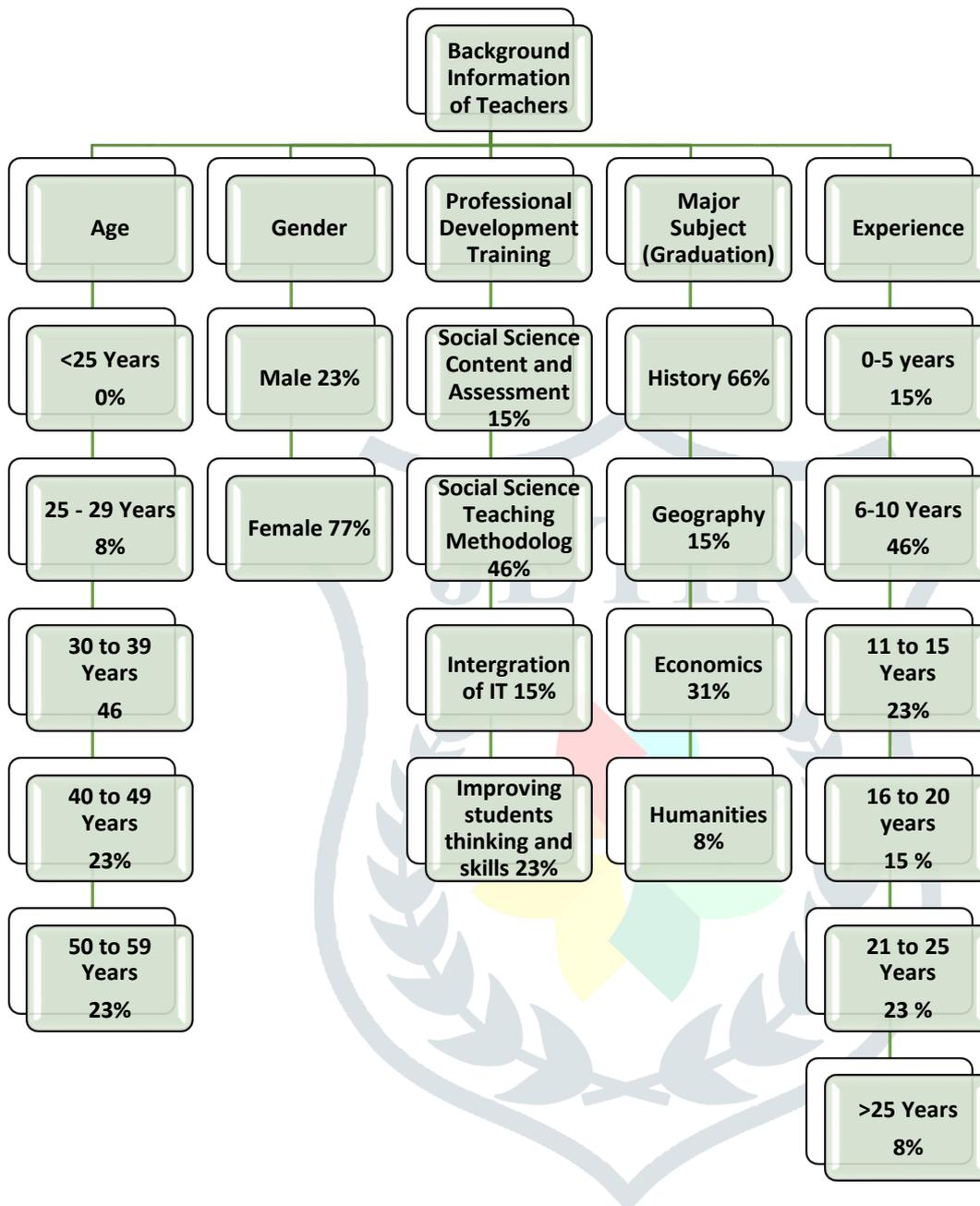
Population: Teachers of schools affiliated to CBSE Board teaching History and Social Science to the students of Secondary Section in Pune city.

Sampling Technique: Purposive Sampling

Sample Size: 21 Social Science Teachers of 10 out of 25 CBSE schools approached for the study. Mixed Data had been collected during the Survey. Both quantitative and qualitative data was collected. Accordingly, the quantitative and qualitative analysis has been done and presented below.

4.5.1 Analysis of Section I of the questionnaire:

Figure 4.1 Background Information of History Teachers



Frequency: Frequency was used to analyse the responses of the teachers in each section of the survey Questionnaire.

Observation:

The above figure 4.1 shows that the sample selected for the survey consisted of teachers as young as 25 years as well as teachers who were 59 years of age; male as well as female teachers; teachers having an experience of less than 5 years as well as teachers having an experience of 25 years and teachers who have graduated and post graduated in various branches of Social Science.

Interpretation: The above figure shows the comprehensiveness of the sample.

4.1.2 Analysis of Section II of the Questionnaire:

Objective 1: Identify the most difficult topic in standard X history syllabus through survey questionnaire.

Table 4.1

Responses of Teachers to Identify the most Challenging Topics from the Syllabus

Chapter No.	Topic	Challenging Topics in %
1	French Revolution	8%
2	Socialism in Europe and The Russian Revolution	15%
3	Nazism and the Rise of Hitler	23%
4	Forest Society and Colonialism	NA
5	Pastoralists and the Modern World	NA
6	Rise of Nationalism in Europe	15% + 8% = 23%
7	Nationalism in India	(Connected Topics)
8	The Making of the Global World	NA
9	Age of Industrialization	31%
10	Print Culture and the Modern World	NA

Observation:

From the above table 4.1 it can be observed that according to the Social Science teachers Chapter Nos. 4 - Std. IX (Forest Society and Colonialism), Ch. 5 – Std. IX (Pastoralists in the Modern World), Ch. 8 – Std. X (The Making of the Global World) and Ch. 10 – Std. X (Print Culture and the Modern World) are found to be least challenging while chapter Nos. Ls 1- Std. IX (French Revolution) was not found to be challenging. The Chapter Nos. 2 Std. IX (Socialism in Europe and the Russian Revolution), Ch. 3 Std. IX (Nazism and Hitler), Ch. 1 – Std. X (Rise of Nationalism in Europe), Ch. 2 – Std. X (Nationalism in India) and Ch. 4 – Std. X (Age of Industrialization) are the chapters which teachers find most challenging.

Interpretation:

Four chapters were shortlisted from the CBSE Board History Textbook (India and the Contemporary World Part I (Std. IX, also relevant for Std. X) Part II (Std. X)) for the programme based on experiential learning with the heuristic approach.

Out of all the challenging chapters, following four were shortlisted: -

Std. IX – Ls 2 - Socialism in Europe and the Russian Revolution

Std. X – Ls 1 - Rise of Nationalism in Europe

Std. X – Ls 2 – Nationalism in India

Std. X – Ls 4 – Age of Industrialization

1. Out of all lessons from Std. IX and X, the challenging lessons were more from Std. X.

2. Also, the Std. X lessons were more challenging, considering the new concepts of study, and the need for a good preparation for Std. X board examinations due to increase in syllabus.
3. The lesson 4 – Age of Industrialization was part of rationalized syllabus but only as an activity lesson in the previous years for Std. X Board examinations.
4. More number of chapters were included for History subject for the academic year 2022-23.
5. Std. IX – Ls 3 – Nazism in Hitler was not considered as it was not linked with Std. X lessons even though it was found challenging too for Std. IX.
6. Thus, as per the expert guidance Std X was given priority for the programme based on experiential learning.

Based on the above information, the experts selected two lessons with the following concepts for the study considering the time constraints and schedule for other activities and examinations. From the listed in below table chapters following concepts were selected for the study:

1. Sense of Collective Belonging – Section IV – Chapter 2 – Nationalism in India as it was linkage to both chapters 1 and 2 of Std. X (refer table 4.1 above)
2. Before the Industrial Revolution - Proto Industrialization and Industrial Revolution – Section II – Chapter 4 – Age of Industrialization as it was linkage to both Chapters 2 – Std. IX and Chapter 4 – Std. X. (refer table 4.1 above)

Analysis and Interpretation of Data for Objective 2:

To developer program based on experiential learning.

Usability Analysis:

The questionnaire on usability of the programme was analysed quality components (QUAN + qual), which include learnability, efficiency, memorability, errors, and user satisfaction. (Appendix)

Frequency: Frequency was used to analyse the responses of teachers for the rating scales and multiple-choice questions in the usability questionnaire.

Table 4.2

Analysis of the Teacher Questionnaire to Test the Usability of the Programme based on Experiential Learning

S. No.	Criteria	Excellent	V. Good	Good	Average	Satisfactory
1	Useful to teach the content	2	1			
2	Useful to supplement your regular teaching	1	2			
3	Supportive in managing your teaching time	1		2		
4	Clarity in developing the activities while teaching	2	1			

5	Useful to guide you for generating mind maps & concept maps	2	1			
6	Useful for the learner in learning of the concept	3				
7	Suitable for attracting attention of learner	3				
8	Assists for sustaining interest of learner	1	2			
9	Facilitates to recall and remember the concept	1	2			
10	Helpful for the learner to organize the content	1	2			
	Total	17	11	2		

Interpretation:

The experiential learning programme based on heuristic approach (Teacher handbook and lesson plan) was useful for the teachers in classroom transaction as can be observed from table 4.2.

Feedback Analysis:

Frequency: Frequency was used to analyse the responses of students and teachers for the rating scales and multiple-choice questions in the Feedback forms. (Appendix)

Table 4.3

Analysis of Students Rating Scale for Ls 2 - Concept 1 – Sense of Collective Belonging and Ls 4 - Concept 2 – Proto Industrialization and Industrial Revolution - Inventions that Changed the World

	S. B. Patil Public School			
	Strongly Disagree	Disagree	Agree	Strongly Agree
Statements	Students Response			
The Activity was interesting			6	18
The research on the topic was motivating			10	14
I could recall the content with ease			10	14
This method developed interest in the topic, and I could easily understand the abstract ideas better in History			3	21
I would prefer experiential learning than textbook material			8	16

I would like other topics to be taught in the same manner			7	17
I would myself explore topics like these through finding facts on my own.			11	13
No. of Students who gave the feedback	24			

Observation:

From the above Table 4.3 it can be stated that the most important aspects of the Experiential Learning liked by the students were that it makes the session interesting and motivating.

Interpretation:

Students found the use of Scrapbook making and Timeline activity interesting and motivating when their teachers taught them.

Table 4.4

Analysis of Teachers Rating Scale for Ls 2 - Concept 1 – Sense of Collective Belonging and Ls 4 - Concept 2 – Proto Industrialization and Industrial Revolution - Inventions that Changed the World

	S. B. Patil Public School			
	Strongly Disagree	Disagree	Agree	Strongly Agree
Statements	Students Response			
The session was interesting			1	1
Experiential learning is better than regular note taking and reading in Class				2
I would prefer teaching with Experiential learning than textbook material				2
I would use experiential learning for other topics in social science disciplines				2
No. of Teachers who gave the feedback	2			

Observation:

Two parallel teachers of Social Science and History teaching Std. X gave the feedback. One of the teachers agreed that they would start using experiential learning with the heuristic for better learning outcomes while the other teacher preferred using the experiential learning with heuristic for teaching more than the textbook material. None of the teachers responded in the 'Disagree' and the 'Strongly Disagree' category. **Interpretation:** Teachers preferred teaching using experiential learning method in History and they have stated they would prefer using the heuristic approach than textbooks as it drives students' interest towards the subject and is a faster and better way to teach abstract concepts.

Analysis and Interpretation of Data for Objective 3:

To test the effectiveness of the experiential learning programme: Data was analysed using the statistical tools - Mean, Standard Deviation, t- Test, Frequency.

Variables of Study:

Independent Variable: Two groups/sections of Std. X students.

Group A - Teaching with use of heuristic approach in experiential learning in History in class X D.

Group B - Teaching without use of heuristic approach in experiential learning in History in class X A.

Dependent Variable: Achievement test scores of both Std. X students' groups in History.

The Hypothesis for the Achievement Post Test:

Research Hypothesis: - There is a significant difference of mean scores in post- test after implementation of experiential learning of History among secondary school students.

Null () Hypothesis: -There is no significant difference of mean scores in post-test after implementation of experiential learning of History among secondary school students.

The Achievement Post Test was conducted in two parts as two different concepts from two selected chapters was conducted at different times. The scores were added for data analysis for the is study. The total marks for Achievement Post Test was 25.

Following are the Achievement Test Post Test Scores of students of Std. X D (Experimental Group) and students of Std. X A (Control Group) groups of 35 students each: -

Table 4.5
Post Test Scores

S. No	X A (Control Group)	X D (Experimental Group)
1	23.5	22.5
2	18.25	21.25
3	16.5	19.25
4	22	21.25
5	21.75	18.25
6	22.75	15.5
7	18.5	18.5
8	19.25	19
9	19.25	16.25
10	24	21.75
11	18.25	17.25
12	20.25	20.5
13	12	19.5
14	18.5	17.5
15	11.25	21.75
16	15.25	15.75
17	9.75	17.75
18	12.75	18.5
19	22.25	25
20	16.75	18.5
21	22.5	20
22	16.75	18.75

23	7.75	18
24	15	15.5
25	16.75	19
26	18.5	22
27	19.25	20.75
28	20.25	20.25
29	18.25	18.5
30	15.75	19.5
31	21.75	23
32	14.5	21.5
33	16.5	23
34	12	21.5
35	15.25	19.5
Sum	613.5	686.25

Mean:

$$\bar{x} = \frac{\sum x}{n}$$

Where, x = each observation and n = number of observations.

Where,

- x1 = Mean of group one
- x2 = Mean of group two
- n = Sample size

$$X A \text{ Mean} = \frac{\text{Total Marks Scored by All Students}}{\text{Total Number of Students}}$$

$$= \frac{613.5}{35} = 17.52$$

$$X D \text{ Mean} = \frac{\text{Total Marks Scored by All Students}}{\text{Total Number of Students}}$$

$$= \frac{686.25}{35} = 19.60$$

$$\text{Mean Difference} = \sum x_1 n - \sum x_2 n$$

$$= 19.60 (\text{X D - Group A Experimental Group}) - 17.52 (\text{X A Group B - Control Group})$$

$$= 2.08$$

Standard Deviation:

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}}$$

Here,

σ = Population Standard Deviation

x_i = Each value from the population

μ = The population mean

n = The size of the population

Post Test Evaluation:

X_D (Group A - Experimental) = Mean – Individual scores (S1)

X_A (Group B - Control) = Mean – Individual Scores (S2)

Following are the details of the Post Test evaluation scores of both groups: -

Table 4.6
Achievement Post Test Evaluation

S. No	X A (Control Group) D = Mean – Individual Scores		X D (Experimental Group) D = Mean – Individual Scores	
		D ²		D ²
1	-2.9	8.41	-5.98	35.7604
2	-1.65	2.7225	-0.73	0.5329
3	0.35	0.1225	1.02	1.0404
4	-1.65	2.7225	-4.48	20.0704
5	1.35	1.8225	-4.23	17.8929
6	4.1	16.81	-5.23	27.3529
7	1.1	1.21	-0.98	0.9604
8	0.6	0.36	-1.73	2.9929
9	3.35	11.2225	-1.73	2.9929
10	-2.15	4.6225	-6.48	41.9904
11	2.35	5.5225	-0.73	0.5329
12	-0.9	0.81	-2.73	7.4529
13	0.1	0.01	5.52	30.4704
14	2.1	4.41	-0.98	0.9604
15	-2.15	4.6225	6.27	39.3129
16	3.85	14.8225	2.27	5.1529
17	1.85	3.4225	7.77	60.3729
18	1.1	1.21	4.77	22.7529
19	-5.4	29.16	-4.73	22.3729
20	1.1	1.21	0.77	0.5929
21	-0.4	0.16	-4.98	24.8004
22	0.85	0.7225	0.77	0.5929
23	1.6	2.56	9.77	95.4529
24	4.1	16.81	2.52	6.3504
25	0.6	0.36	0.77	0.5929
26	-2.4	5.76	-0.98	0.9604
27	-1.15	1.3225	-1.73	2.9929
28	-0.65	0.4225	-2.73	7.4529
29	1.1	1.21	-0.73	0.5329
30	0.1	0.01	1.77	3.1329
31	-3.4	11.56	-4.23	17.8929
32	-1.9	3.61	3.02	9.1204
33	-3.4	11.56	1.02	1.0404
34	-1.9	3.61	5.52	30.4704
35	0.1	0.01	2.27	5.1529
	Sum	174.912		548.099

For each group $D = \text{Mean} - \text{Individual Scores}$

$$S_1 = \frac{\text{Total Sum of } D^2 \text{ Values}}{\text{Total Number of Students}} = \frac{174.912}{35} = 4.99$$

$$S_2 = \frac{\text{Total Sum of } D^2 \text{ Values}}{\text{Total Number of Students}} = \frac{548.099}{35} = 15.65$$

$$\text{Square root of } S_1 = \sqrt{4.99} = 2.23$$

$$\text{Square root of } S_2 = \sqrt{15.65} = 3.95$$

t- Value:

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Here,

t = Ratio of the difference between the mean of the two samples and the variation that exists within the sample sets.

\bar{x}_1 = Mean of Sample 1

\bar{x}_2 = Mean of Sample 2

s_1^2 = Standard Deviation of Sample 1

n_1 = Size of Sample 1

s_2^2 = Standard Deviation of Sample 2

n_2 = Size of Sample 2

Where,

$$\bar{x}_1 = 19.60$$

$$\bar{x}_2 = 17.52$$

$$s_1^2 = \frac{\text{Sqrt of } S_1}{\text{Total Number of Students}} = \frac{2.23}{35} = 0.0638$$

$$s_2^2 = \frac{\text{Sqrt of } S_1}{\text{Total Number of Students}} = \frac{3.95}{35} = 0.113$$

$$n_1 = 35$$

$$n_2 = 35$$

$$= \frac{19.60 - 17.52}{\sqrt{\frac{4.99}{35} + \frac{15.65}{35}}}$$

$$\text{Sum of Denominator} = 0.0638 + 0.113 = 0.17685$$

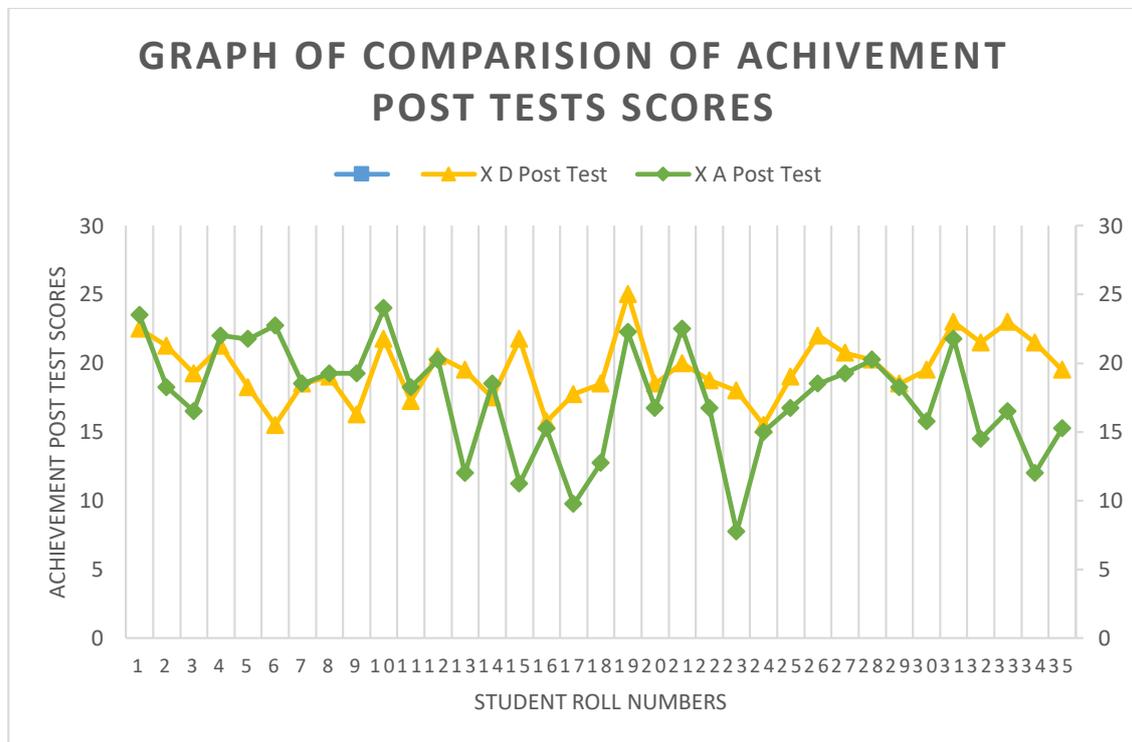
$$t = \frac{2.08}{0.1768} = 11.76$$

Table t – Value is 1.69

Degree of Freedom for t -Test: Size of Sample -1 = 35-1 = 34

Graph Representation:

Graph 4.1
Graph Representation of Achievement Post Scores



Interpretation:

Since calculated t value for degrees of freedom 34 is 11.76 which is greater than table 't' value 1.69 at 0.05 level of significance. It shows that the program is effective. Hence the researcher has accepted directional hypothesis and rejected null hypothesis.

4.6 Major findings:

Rebecca Bewans, 2022, A t-test is an inferential statistic used to determine if there is a significant difference between the means of two groups and how they are related. The t-test is a test used for hypothesis testing in statistics.

Calculating a t-test requires three fundamental data values including the difference between the mean values from each data set, the standard deviation of each group, and the number of data values. T-tests can be dependent or independent.

The analysis of the post-test using the – Test hence prove that experiential learning method with heuristic approach for teaching is effective.

The researcher has analysed and interpreted the data and the major conclusions drawn are from comparison of the post test scores using mean, Standard Deviation, and t -Test.

Following are the major findings:

- ❖ The scores of the Post Test of Experimental Group were higher than the Post Test scores of the Control Group. Refer to Tables 4.5 (pg. 83) and 4.6 (pg. 85) and Graph 1 (pg. 87) to notice the difference in the mean scores.
- ❖ The t – Test clearly indicates that the degrees of freedom 34 is 11.76 which is greater table 't' value 1.69 at 0.05 level of significance.
- ❖ The performance of the students of Experimental group was found to be better after the implementation of the experiential learning programme for Std X.
- ❖ This shows that the programme on experiential learning based on heuristics is effective. The directional research hypothesis is accepted, and Null hypothesis is rejected.

4.7 Summary:

This chapter explained the analysis of methodology of the research conducted for evaluating and developing the effectiveness of experiencing learning programme in history among the CBSE secondary school students.

The findings clearly reflect that experiential learning method with heuristic approach is effective and can be implemented to achieve better learning outcomes for students of history in CBSE secondary school level

This project has helped the researcher immensely in understanding the method and direction of conducting research.

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Chapter V

Summary, Conclusions and Recommendations

5.1 Introduction:

The only good is knowledge, and the only evil is ignorance. – Socrates

The only thing which makes humans different from other species of animals on this planet is their intelligence and inquisitiveness. With their intelligence, humans have developed knowledge and skills that led them to discoveries and inventions that changed the world that we know about today. The only discipline that takes us through the timeline of past to present is the study of History. History is not only the study of the past but is a study of the present. To make our present better than past, it is necessary to know the who, what, why, when, and where. The study of human History gives us the opportunity to know about the unknown and opens the doors to abstract and hidden stories that can bring out solutions to the problems of today's society.

But it has been found that the subject has not been given the kind of importance and relevance it deserves. The school education is not very successful in exploring the fullest of potential of a discipline such as History which can bring about transformation in society to bring about progress and development. If people are more aware about the past, they may not commit the same mistakes they did to make better choices for future.

The present study focussed on developing a programme based on experiential learning using the heuristic approach, which is scientific, faster and give better results in decision making. The aim was to develop interest in the subject with better learning outcomes by utilising a new approach and teaching method.

The researcher developed a programme for the CBSE secondary school students based on experiential learning and evaluated the effectiveness on the learning outcomes of the students.

The researcher did a thorough theoretical and research review of related literature to come up with the research questions and the statement of the problem.

5.2 Statement of Problem:

To develop and test the effectiveness of studying history through Experiential Learning for CBSE Secondary School Students.

The above main objective was based on some underlying research questions. For this, the researcher browsed through various methodologies of teaching History in experiential learning by doing a thorough review of related literature.

5.3 Objectives of the Study:

The main objective of the study was “**To develop and test the effectiveness of studying history through Experiential Learning for CBSE Secondary School Students.**”

The above objective was further divided into three sub objectives based to address the research questions:

1. Identify the most difficult topic in standard X history syllabus through survey questionnaire.
2. To developer program based on experiential learning.
3. To test the effectiveness of the experiential learning programme.

5.4 Research Questions:

Research questions are an imperative and vital prerequisite for any researcher to begin a study. The researcher identified the following research questions after the preliminary review of related literature about the heuristic approach of experiential learning in History to define what needs to be known about this approach in teaching of History and assess its effectiveness: -

- ❖ Which methods and approaches teachers use to teach History?
- ❖ How can we effectively implement heuristic approach of experiential learning to study History?

The researcher hence decided to undertake the present study.

5.5 Hypothesis of the study

At the core of this experimental educational research lies the formulation of a hypothesis and so, the overall research design relied on statistical analysis to approve the hypothesis.

Research Hypothesis: - There is a significant difference of mean scores in post- test after implementation of experiential learning of History among secondary school students.

Null () Hypothesis: -There is no significant difference of mean scores in post-test after implementation of experiential learning of History among secondary school students.

5.6 Scope of study

In the scope of the study were: -

4. All secondary schools affiliated to CBSE.
5. The present study focuses on secondary school students of Std. X.
6. Primary focus on using heuristic approach in experiential learning for improving learning outcomes of History Subject.

5.7 Delimitations and Limitations:

5.7.1 Delimitation:

1. This research was delimited to the use of heuristic approach of experiential learning.
2. This research delimited to Std. X students of CBSE Affiliated S. B. Patil Public School, Ravet Pune.
3. This research was delimited to all CBSE board affiliated schools.
4. This research was delimited to secondary school subject of History curriculum in CBSE schools.
5. This research is for the academic year 2022-23.
6. The survey includes responses of only those teachers who teach Social Science to the students of Std. IX, and X in CBSE Board Schools.

7. The study includes only the co-educational schools for the purpose of experiment.
8. The study considers chapters of Std. IX and X History from Social Science CBSE History Textbook.

5.7.2 Limitations:

1. The success of this study depended upon the response of Std. X students.
2. The responses of Std. X students depended upon the maturity levels, age, interest, and mental state.
3. Aspects like attitude, interest, motivation, fatigue, etc. of the teachers are beyond the control of the researcher.
4. Aspects like attitude, interest, span of attention, motivation, fatigue, etc. of the students are beyond the control of the researcher.

5.8 Procedure for Data Collection

Following were the tools for data collection:

Survey Questionnaire:

Survey Questionnaire was developed and administered as Pre research.

Post Test:

Post-tests for students to test the effectiveness of the method for achieving the desired learning outcomes.

Usability Testing Questionnaire:

Questionnaire for experts and teachers. (After Implementation)

Teachers Handbook and Lesson Plan

Teachers' handbook for on heuristic method of experiential learning for lesson delivery.

Feedback Sheets:

Feedback Sheets for Students and Teachers.

The tools were collected in a planned manner objective wise:

Objective 1: Identify the most difficult topic in standard X history syllabus through survey questionnaire.

Survey Questionnaire: A questionnaire is a form prepared and distributed to secure certain responses to certain questions which the respondent fills by him. It relies on written information supplied directly by the people in response to questions. Thus, a google form was created to collect the responses from the teachers online. <https://forms.gle/wdRdgyJBUzh4BagM7>

Objective 2: To develop a program based on experiential learning.

Lesson Plans: The content was chosen from the CBSE Board History Book of Std. IX and Std. X, out of which four chapters were shortlisted. After taking expert advice, specific concepts from two chapters were finalized which the teachers felt were challenging for the students to learn and were important for the understanding of other chapters which had a linkage to each other. Also, the programme was documented in a compiled booklet (Teacher handbook) comprising of information about meaning and uses of heuristic in classroom for teaching. Lesson Plans, experiential learning Guidelines based on heuristic were explained in detail in the booklet.

Objective 3: To test the effectiveness of the experiential learning programme.

Researcher Developed Test:

Achievement Test Post Test: The achievement test was developed by the researcher to assess the students understanding with respect to the topics taught using the Programme based on Experiential learning.

Data Representation Tools:

The data was represented using various tables, graphs and charts for clarity and understanding.

Questionnaire for Testing Usability: Teachers teaching the subject History to the students in the CBSE Board affiliated Schools were provided with the questionnaire to evaluate the usability.

Feedback of Students and Teachers: - Feedback from students was also taken to evaluate the effectiveness of the programme.

5.9 Research Methodology

The researcher used Experimental Research Method with Multi method.

Main objectives of this research methodology were: -

1. Identify the most difficult topic in standard X history syllabus through survey questionnaire.
2. To developer program based on experiential learning.
3. To test the effectiveness of the experiential learning programme.

In the present study Methodological Triangulation strategy was used. For methodological triangulation, the researcher uses different methods to approach the same research question. This is the most common type of triangulation, and researchers often combine qualitative and quantitative research methods in a single study.

Survey Method:

Survey research involves the collection of information from a sample of individuals through their responses to questions. This kind of research is highly popular due to its versatility, efficiency, and generalizability. There are various types of survey (Implementation options) like: Mailed survey, Group survey, Phone survey, In-person interview and Web survey.

Thus, for the first objective, survey questionnaire (multi method) through google forms was used to collect data from the secondary school teachers to identify the most difficult topics in the standard X history syllabus.

Experimentation Method:

Based on the data collected by using a questionnaire for experts and teachers and taking their feedbacks the researcher selected the topic for the experimentation and developed the program based on experiential learning using the multi method (both quantitative and qualitative) to attain the second objective.

And finally, to test the effectiveness of the product, i.e., experiential learning programme the researcher used the experimental method in the Two group post-test design.

At the core of this experimental educational research lies the formulation of a hypothesis and so, the overall research design relied on statistical analysis to approve the hypothesis.

The effectiveness was tested through the quantitative tools like standard deviation, mean, t -Test and Frequency.

Refer to the table 3.1 from chapter III as mentioned below:

Research at a Glance

Objective	Objective 1	Objective 2	Objective 3
Research Method	Survey Questionnaire – Multi Method (QUAN +qual)	Programme Development – Multi Method (QUAN +qual)	Experimental Two Group Post Test Design (Control & Experimental Group)
Population	School Teachers of affiliated to CBSE Board in Pune City	Experts and Teachers of Standard X from secondary school affiliated to CBSE	Students of Standard X from secondary schools affiliated to CBSE
Sample	Purposive – 10 Schools, 21 Teachers	Informants: - 2 Experts and 3 History and Social Science Teachers from CBSE Schools	Purposive – I school – {80 Students} {40 Students Experimental} + {40 Control}
Data Collection Tool	Survey Questionnaire for teachers	Usability Testing Questionnaire for experts and teachers	Post Test Achievement Test; Feedback Sheets for Students and Teachers (during implementation)
Data Analysis Tool	Percentage, Qualitative Analysis	Qualitative Analysis	Mean, Standard Deviation, t – Test, Frequency

5.10 Tools used for Data Collection

Survey Questionnaire:

Survey Questionnaire was developed and administered as Pre research.

Post Test:

Post-tests for students to test the effectiveness of the method for achieving the desired learning outcomes

Questionnaire:

Questionnaire for experts and teachers. (After Implementation)

Teachers Handbook and Lesson Plan

Teachers' handbook for on heuristic method of experiential learning for lesson delivery.

Feedback Sheets:

Feedback Sheets for Students and Teachers.

5.11 Data Analysis Tools and Techniques:

The main tools of data analysis were:

- ❖ Mean
- ❖ Standard deviation
- ❖ t-Test
- ❖ Frequency

The data analysis techniques were used objective wise in the following manner:

Objective 1:**Survey Questionnaire:**

The questionnaire was analysed quality components (QUAN + qual), which include learnability, efficiency, memorability, errors, and user satisfaction.

The analysis of the Survey Questionnaire for the schoolteachers revealed various aspects about the prevalence of teaching methods in the school, the challenging concepts for the students, the various kinds of classroom transactions, the awareness among teachers regarding experiential learning and the readiness of teachers for adopting techniques like heuristics. This analysis was extremely helpful in shortlisting of chapters for the Programme based on experiential learning in History using heuristic.

Frequency was used to analyse the responses of the CBSE school teachers in the survey questionnaire.

Objective 2:**Usability Analysis:**

The questionnaire was analysed quality components (QUAN + qual), which include learnability, efficiency, memorability, errors, and user satisfaction.

Frequency: A **frequency** is the number of times a value of the data occurs. A **relative frequency** is the ratio (fraction or proportion) of the number of times a value of the data occurs in the set of all outcomes to the total number of outcomes. To find the relative frequencies, divide each frequency by the total number of students in the sample.

A percentage frequency distribution, in general, is a display of data that indicates the percentage of observations for each data point or grouping of data points. It is a commonly used method for expressing the relative frequency of survey responses and other data.

Frequency was used to analyse the responses of the students and teachers for the rating scales and multiple-choice questions in the usability questionnaire and feedback sheets.

Feedback Analysis:

Frequency: Frequency was used to analyse the responses of students and teachers for the rating scales and multiple-choice questions in the Feedback forms. (Appendix)

Objective 3:

Data was analysed using the statistical tools - Mean, Standard Deviation, t- Test, Frequency

Mean:

$$\bar{x} = \frac{\Sigma x}{n}$$

Where, x = each observation and n = number of observations.

Mean Difference = $\Sigma x_1n - \Sigma x_2n$

Where,

- x_1 = Mean of group one
- x_2 = Mean of group two
- n = Sample size

Standard Deviation: The standard deviation formula is:

$$\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$$

Here,

σ = Population Standard Deviation

x_i = Each value from the population

μ = The population mean

N = The size of the population

t-Test: This is the test conducted when samples from two different groups, species, or populations are studied and compared. It is also known as an independent t -Test.

The t-test formula is a statistical equation we use to determine if the difference between the mean (average) of two groups is big enough to be considered significant. It means that if we have the average values for two groups and they are significantly different, we can conclude that there is a considerable difference between the two groups.

The t – Test formula used to calculate this is:

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Here,

t = Ratio of the difference between the mean of the two samples and the variation that exists within the sample sets.

\bar{x}_1 = Mean of Sample 1

\bar{x}_2 = Mean of Sample 2

s_1^2 = Standard Deviation of Sample 1

n_1 = Size of Sample 1

s_2^2 = Standard Deviation of Sample 2

n_2 = Size of Sample 2

5.12 Significance of the study

This research study proved to be effective for achieving the learning outcomes of the students of CBSE Secondary schools. This study is significant in the following areas:

- ❖ Enable students to realize the importance of studying History as a discipline.
- ❖ This study will help develop lesson plans and activities for history using heuristic approach in experiential learning in History
- ❖ This study will help in engaging the students in the study of History as a discipline for experiential learning.
- ❖ The students will enable students to link the study of the past with the present phenomena and develop critical and analytical thinking.
- ❖ The learning comes from real experiences based on scientific attitude which develops the habit of self-study and self-direction.
- ❖ Develop and prepare materials for heuristic in experiential learning and teaching.
- ❖ This research would benefit the principals of schools for motivating their teachers to undertake training in experiential learning teaching techniques so that they may make use of them to the optimum in their regular teaching.
- ❖ This research would also be of great significance for the teacher education institutes where the teacher trainees may be trained during their pre-service programme itself to use the heuristic approach of experiential learning so that they are more confident when they join as teachers in schools.

5.13 Major Findings

This study can contribute immensely to the teaching and learning of History for CBSE secondary school students. This experiential learning model proved to be effective by using the heuristic approach for better learning outcomes of students. Also, it was effective in developing an interest in the learning of history among the students. Experiential learning in History with heuristic approach can be a game changer and a powerful method to bring about a transformation in teaching of History. This method encompasses a constructivist approach and scientifically proven techniques to enhance the learning experiences of the students.

Nevertheless, as many of the reviews of the related literature have mentioned, that the use of heuristic can lead to bias and errors in judgement, but at the same time can lead to better and effective decision making while solving the clues of historical facts and events.

Following are the major findings:

- ❖ The scores of the Post Test of Experimental Group were higher than the Post Test scores of the Control Group. Refer to Tables 4.5 (pg. 83) and 4.6 (pg. 85) and Graph 1 (pg. 87) to notice the difference in the mean scores.
- ❖ The performance of the students of Experimental group was found to be better after the implementation of the experiential learning programme for Std X.

- ❖ This shows that the programme on experiential learning based on heuristics is effective. The directional research hypothesis is accepted, and Null hypothesis is rejected.

5.14 Conclusions

From this study the researcher concluded that there is a scope for improvement in the teaching and learning practices in History as it is a discipline which has remained side-lined for many years due to lack of awareness about its importance and relevance for bringing out a societal transformation by making it more interesting and approachable.

The programme of study was proved to be effective and so its scope can be taken to the next level in both rural and urban areas, state, national and global level also to bring about a transformation in History teaching and learning practices.

5.15 Recommendations and Suggestions

The programme was effective for the CBSE Secondary school students. It can be conducted for:

- ❖ Other topics of History
- ❖ State and ICSE, IB and other board schools.
- ❖ Other Standards to teach History.
- ❖ Other disciplines of Social Science, viz, Geography, Political Science, and Economics
- ❖ Different subjects other than social science as it is based on scientifically proven techniques.
- ❖ In both rural and urban areas for better learning outcomes among the students.
- ❖ Teacher can adopt this method to simplify the content for better understanding and grasping of the students.
- ❖ Students can benefit by clarifying their doubts in a better way using this method.

References

- Janet Giesen (2004), *Constructivism: A Holistic Approach to Teaching and Learning*
- Jean Piaget and Lev Vygotsky (2004), *Parallel Paths to Constructivism*
- J.Mahoney (2003), *Constructive Psychotherapy: A Practical Guide*
- Vijaykumari K & Jinu M. K. (2011), *Constructivism in Classrooms: An Evaluation of Group Activities by the Stakeholders*
- Ausubel, D. P. (1962), *A Subsumption Theory of Meaningful Verbal Learning and Retention. The Journal of General Psychology*
- Richard D. Janda (2008), *The Handbook of Historical Linguistics*, Brian D. Joseph
- Richard J. Evans, (2001), *In Defence of History*
- Cosme J. Gomez Carrasco, Jairo Rodriguez-Medina, Ramon Lopez Facal, Jose onteagudo Fernandez, (2022), *Handbook of Research on Teacher Education in History and Geography*
- Kolb, David, (1984), *Experiential Learning: Experience As The Source Of Learning And Development*
- Patrick Felicia (2011), *Handbook of Research on Improving Learning and Motivation Through Educational Games: Multidisciplinary Approaches, Volume 1*
- Colin (2010), *The Experiential Learning Toolkit: Blending Practice with Concepts by Beard*

- Itin, C. M., (1999), Reasserting the philosophy of experiential education as a vehicle for change in the 21st century, *Journal of Experiential Education*
- Merriam S. B., (2007), *Learning in adulthood: A comprehensive guide*, 3rd ed.,
- Baumeister R. F., Tice, D. M., & Hutton, D. G. (1989), Self-Presentational Motivations and Personality Differences in Self- Esteem. *Journal of Personality*
- Kompf, M., & Bond, R. (2001), Critical Reflection in Adult Education. In T. Barer-Stein, & M. Kompf (Eds.), *The Craft of Teaching Adults*
- Geoff Rayner Canham and Marelene Rayner – Canham, (2015), Association for Experiential Education, (1994) *The Heuristic Method, Precursor of Guided Inquiry: Henry Armstrong and British Girls' Schools, 1890–1920*
- V.K. Maheshwari, (2016), *The Heuristic Strategy*
- Steve Dale, (2015), *Heuristics and biases: The science of decision-making*,
- William Clancey, (1985), *Heuristic Classification*,
- , Koen Veermans, Wouter van Joolingen, (2003)
- Koen Veermans, Wouter van Joolingen, (2003), *Use of Heuristics to Facilitate Scientific Discovery Learning in a Simulation Learning Environment in a Physics Domain*
- Sayma Zia, Farooq – Eazam Cheema, Sobia Shujaat, (2016), *Impact of Using Heuristic Instructional Design on Students' Performance*
- Zhimei Yang, (2019), *Exploration of Heuristic Teaching Model of the Course "Outline of Modern and Contemporary Chinese History" Combining with Specialty*
- Kavitha S Joshi, (2015), *Effectiveness of kolbs experiential learning model for 9th standard students*
- J T Madhavan, (2008), *Heuristic Method*
- Saeede Nazari Nooghabi, Hooshang Irvani, Hossein Shabanali Fami, (2011), *A study on present challenges on experiential learning of university students (University of Tehran, The Colleges of Agriculture and Natural Resources, Iran)*
- Creswell, (2003), *Research Design: Qualitative, Quantitative, and Mixed Method Approaches*
- David Collier, Colin Elman, (2008), *Qualitative and Multi-Method Research: Organizations, Publication, and Reflections on Integration*
- Tashakkori, A., & Teddlie, C. (2003), *Handbook of Mixed Methods in Social and Behavioral Research*
- Morse J, (2003), *Principles of mixed methods and multi-method research design*
- Creswell J W, (2007), *Qualitative Research Designs: Selection and Implementation*
- Creswell & Miller, (2000), *Determining Validity in Qualitative Inquiry. Theory into Practice*
- Pamela J Brink, (2003), *Western Journal of Nursing Research*
- Prof William M.K. Trochim, (2001), *The Research Methods Knowledge Base*
- Rebecca Bewans, (2022), *Types of Variables in Research & Statistics | Examples*
- Robert Jackson, (2006), *Using Constructivist Methods to Teach Social Studies to Special Education Students*
- Abida Khalid, and Muhammad Azeem (2012), *Constructivist Vs Traditional: Effective Instructional Approach in Teacher Education*
- Peter N. Sterns, (1998), *Why study History?*

Jyothish K (2021), Teaching Methods in History Learning

Herbert A. Simon, (1968), How Learning works: Seven Research Based Principles Based Principals for Smart learning

Steve Dale, (2015), Heuristics and biases: The science of decision-making

Ralph Hertwig and Thorsten Pachur, (2015), History of Heuristics,

Jeffery D. Nokes, Janice A. Dole, Douglas J. Hacker, (2007), Teaching High School Students to Use Heuristics While Reading Historical Texts

Mohamad Zaenal Arifin Anis, Yetti Supriyati, Gaguk Margono, (2019), Model of Problem Statement (MPS): A solution on Heuristic Problem in Teaching of History

Sayma Zia, Farooq Cheema, Sobia Shujaat, (2016), Impact of Using Heuristic Instructional Design on Students' Performance

Nanna-Mik-Meyer (2020), Multimethod Qualitative Research

Yildirim, R. (2013), The Portfolio Effect: Enhancing Turkish ELT Student-Teachers' Autonomy

Eda & Ayhan (2014), The Effect of Brain Based Learning on Academic Achievement: A Meta-analytical Study,

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NAAC Accredited
'B' Grade

Maharashtra Cosmopolitan Education Society's
H. G. M. AZAM COLLEGE OF EDUCATION

(English Medium) D.El.Ed., B.Ed., B. A. B. Ed., B.Sc. B.Ed., M. Ed., M. Phil., Ph.D. Centre
IGNOU & MANUU (Courses In Education)

Approved by NCTE Bhopal, Recognised by the Govt. of Maharashtra
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2390-B, K. B. Hidayatullah Road, Azam Campus, Camp, Pune - 411 001.
Phone No : (020) 26447257, email : prin-bed@azamcampus.org

DR. ANITA M. BELAPURKAR
M.Sc., M.Ed., SET. Ph.D.
Principal

Dr. P. A. INAMDAR
President
M. C. E. Society Pune

HGM/M.ED/2022-23

Date: 19/10/2022

To,

The Principal, **Appendix I - Letter for Permission of Data Collection**

S B Patil Public School

Ravet, Pune

Subject: Permission for data collection

Respected Sir/ Madam,

Kindly permit our students of M.Ed. second year to collect the data required for their research work. As per the NCTE 2014 revised rule and M.Ed. syllabus, under course M.Ed.311 they have to conduct one research. Data collection is one of the part of their research work.

We respect your co-operation in enabling our students to get permission for their work.

Expecting positive and cooperative response from your side.

Yours sincerely,

Approved
B. S. Saini

Principal
S. B. Patil Public School
CBSE Affiliation No. : 1130534
S. No. 110, Gat No. 1,
Ravet, Pune - 412 101



[Signature]

PRINCIPAL

Maharashtra Cosmopolitan Education Society's
H.G.M. Azam College of Education
2390 B, K.B. Hidayatullah Road,
Camp, Pune-411 001.

APPENDIX II - Survey Questionnaire History (Social Science) Secondary Teachers online Google Form

Hello Respected Teacher! This questionnaire is a survey to know about your experiences while teaching History to your students. The data shall be used only for the purpose of research work and benefit of students and teachers. Thank you for your cooperation!

* Indicates required question

1. Email *
2. What's your full name? *
3. Date: - * *Example: January 7, 2019*
4. Your email address? *
5. What is the name of the school/institution you work with? *

Section I - Background Information

6. Age (in numbers) *
7. Gender * *Check all that apply.*
 - Male
 - Female
 - Prefer not to say
8. Your Teaching Experience *
9. Educational Qualification *
10. During your college or university education what was your major or main area(s) of study? * *Check all that apply.*
 - History
 - Geography
 - Political Science
 - Economics
 - Humanities
 - Environmental Science
11. Which grades do you teach? *
12. Which discipline in social science do you teach? *

Section II: Teaching Information

13. In your opinion, how important do you think is studying History as a discipline in social science for CBSE secondary school learners? *Mark only one square.* *
 - Very Important
 - Important
 - Neutral
 - Little important
 - Not important at all

14. How often did you have the freedom to try innovative methods for better learning and teaching of History? *
15. Which chapters for History in the CBSE NCERT books from the list below do you find challenging?
* *Mark only one square.*
- The French Revolution
 - Socialism in Europe and the Russian Revolution Nazism and the Rise of Hitler
 - Forest Society and Colonialism
 - Pastoralists and the Modern World
 - Rise of Nationalism in Europe
 - Nationalism in India
 - The Making of the Global World Age of Industrialization
 - Print Culture and the Modern World
16. In your opinion, how important do you think is the Logical structure (Chronology/Timeline) and content for teaching and learning of History? * *Mark only one square.*
- Very Important
 - Important
 - Neutral
 - Little important
 - Not important at all
17. In the past two years have you participated in professional development (workshop, seminar, in service training, etc.) with respect to any of the following? Please specify. * *Mark only one square.*
- Social Science content
 - Social Science Teaching Methodology Social Science Curriculum
 - Integration of IT in Social Science
 - Improving students thinking and skills
 - Social Science Assessment
18. Which methods do you use for teaching History for CBSE secondary school learners? *
19. Do you know about experiential learning methodology for teaching social science and History? *
- Yes
 - No
20. Have you used the heuristic approach (learning by doing) of experiential learning for teaching History in social science? *
- Yes
 - No
21. Mention the areas/topics students find difficult to learn in History for CBSE secondary school learners. Why? *
22. Mention the areas/topics students find easier to learn in History for CBSE secondary school learners.

Why? *

23. What is your method of evaluating your students learning outcomes? *

Section III - Teaching Methodology

24. How will you prepare to teach the following topics (Click Continue) to the students of grade X? Mention teaching methodology, teaching aids and evaluation method for teaching History.

1. Rise of Nationalism in Europe *
2. Nationalism in India *
3. The Making of the Global World *
4. The Age of Industrialization *
5. Print Culture and Modern World *

25. Which additional books/references/resources do you use for teaching History to the students of grade X? *

Section IV - Classroom Activities

26. In teaching History, how often do you ask the following questions from your students?

Discussing global issues * *Mark only one square.*

- Regularly
 Often
 Sometimes
 Rarely

Encouraging students to talk to experts, find answers on their own from various sources of history, and talk to family and community members*

Mark only one square.

- Regularly
 Often
 Sometimes
 Rarely

Work together in groups to find answers * *Mark only one square*

- Regularly
 Often
 Sometimes
 Rarely

Reading from other sources of information and materials * *Mark only one square.*

- Regularly
 Often
 Sometimes
 Rarely

Designing historical experiments, model making, project work, role play, dramatization * *Mark only one oval.*

- Regularly
- Often
- Sometimes
- Rarely

27. Others, please specify *

28. In your opinion what are the limitations you face when you teach History you your class? * *Mark only one square.*

- Inadequate time
- High student/ teacher ratio
- Inadequate physical facilities (IT/ Hardware)
- Shortage of equipment (Map/ Models)
- Students' absence in school
- Uninterested and disruptive students
- Diverse students background
- Different academic abilities
- Other

29. Will you be ready to take training regarding use of heuristic approach for teaching History? *

- Yes
- No

30. Rate your experience in teaching History as a discipline in Social Science * *Mark only one oval.*

- *****
- ****
- ***
- **
- *

Thank you for your valuable time to give this survey! Please share this survey with other schools and teachers.

List of Schools taken for online Survey with Teacher Names

S. No	Teacher Name	School Name
1	Aparna Pandey	S. B. Patil Public School, Pune
2	Bhawana Chhagnani	Euro School, Kharadi
3	Labheshree Kawoor	S. B. Patil Public School
4	Samruddhi Samir Jadhav	S. B. Patil Public School
5	Suzan Steven Laurence	Dr. (Mrs.) Erin N. Nagarwala (Boarding) School
6	Vandana Ramesh Sangle	S. B. Patil Public School,
7	Ancy Manoj	St. Arnold Central School
8	Padmavati Banda	S. B. Patil Public School
9	Nazneen Ibrahim Golandaz	Erin N. Nagarwala Day School
10	Yogesh Ghaitadak	Holy Spirit Convent School Lonikand
11	Mahmood Husain Rizvi	Simpkins School Agra
12	Dr. Srividya Muthuvel	Sarhad School, Pune
13	Sanjay Saitwal,	KV Sangathan New Delhi.
14	Rita Francis	Euro School Kharadi
15	Ram Sudamrao Gabale	S. B. Patil Public School
16	Mohini Nair	S. B. Patil Public School
17	Parvathi Sagar Sonawane	S. B. Patil Public School
18	Swaleha Mujawar	S. B. Patil Public School
19	Pranita Shitole	Dr. Dada Gujar English Medium School
20	Pravina More	S. B. Patil Public School
21	Sucharita Roy	S. B. Patil Public School

Appendix III – Achievement Post Test, Blueprint, Activity Schedule, Usability Questionnaire/ Teacher, and Student Feedback Forms

Ls. 2 – Nationalism in India – Section IV – Sense of Collective Belonging

QUIZZZ

History - Sense of collective belonging
10 Questions

NAME : _____

CLASS : _____

DATE : _____

1.



Who painted this image of Bharat Mata?

- A Abanindranath Tagore B Rabindranath Tagore
- C Alluri Sitarama Raju D Natesha Shastri
2. Vande mataram was sung widely during which movement in Bengal?
- A During Satyagraha B Civil Disobedience Movement
- C Swadeshi movement D Rowlatt Act
3. Which of the following Describes the painting painted by Abanindranath Tagore of bharat mata.
- A None of the above B b - Divine, spiritual
- C a - calm, composed D Both a and b
4. Which colours are used in the tricolour flag in Bengal Swadeshi movement?
- A Orange, white and green B Red, green and yellow
- C Red, blue and white D None of the above

5.  Natesa Sastri published a massive four-volume collection of Tamil folk tales which was
- A Vande Mataram B The Folklore of Southern India
 C Anandamath D None of the above
6. It was essential to preserve this folk tradition in order to discover
- A one's caste B one's national identity
 C restore a sense of pride in one's present
7.  In the Swadeshi Flag what does the eight lotuses represent
- A they represent Hindus and Muslims B they represent the eight provinces
 C 8 lotuses represent bhara mata D they represent the month of independence
8. Gandhiji had designed _____ flag, a tricolour (red, green and white) and had a spinning wheel in the centre
- A Swaraj B Swadeshi
9. The Swaraj flag became a symbol of
- A Equality B Defiance
 C unity D Enthusiasm
10. The glorious time in India was followed by a history of decline, when it was colonised. State true or false
- A Flase B True

Achievement Post Test - Part II

Ls. 4 – Age of Industrialization – Section II – Before Industrial Revolution

Subjective Test - 15 Marks

Q1. Name the book published by E. T. Paul. 1m

Q2. What does the term 'Orient' mean? 1m

Q3. Who were the two magicians in the 1901 picture published in Inland Printers magazine?

1m

Q4. Whose invention was improved by James Watt? 1m

Q5. Which were the first dynamic industries of Great Britain? 1m

Q6. Who established the world's first water powered cotton mill? 1m

Q7. What do you understand by the term "Proto – Industrialization"? 2m

Q8. What were the problems faced by the merchants during the period of "Proto- Industrialization"?

2m

Q9. What were the drawbacks of new technologies for the Industrialists? 2m

Q10. How did cotton production boomed in the late 19th century? 3m

OR

Explain the meaning of the following terms:-

- i) Stapler
- ii) Fuller
- iii) Carding

JETIR

Blueprint and Programme Schedule The Final Draft of Post Test

Test	Original Form	Modified form
Achievement	Objective = 10 marks	1*1 = 10 marks
Post Test	1 sentence questions	1*1 = 6 Marks
	2 marks question	2*3 = 6 Marks
	3 marks questions	1*3 = 3 Marks
	Two Source based questions – 4 marks each	Excluded
	5 Marks question	Excluded
	Map Based Questions	Excluded
Total Marks		25 Marks

*Objective Questions covered = Fill in the Blanks, MCQ, True/False

Weightage Table and Blueprint for Achievement Post Test:

S. No.	Type of Questions	Total Number of Questions	Marks Allotted
1.	Objective Type	10	10
2.	1 Mark Questions	6	6
3	2 Mark Questions	3	6
4	3 Mark Questions	1	3
Total			25 Marks

Blueprint for Post Test as per Blooms Taxonomy

Lesson	Knowledge	Understanding	Application	Analysing/ Competency based	Total Marks
Ch 2	4*1 mark=4	2*1 mark=2	2*1 mark=2	2*1 mark=2	10 Marks
Ch 4	3*1 mark=3	1*1 mark=1	1*1 mark=1	1*1 mark=1	15 Marks
		1*2 Mark= 2	1*2Mark= 2	1*2 Mark= 2	
				3*1 = 3m	
Total Marks	7 Marks	5 Marks	5 Marks	8 Marks	25 Marks

Post Test: S. B. Patil Public School (26th September to 28th November)

Schedule Of the Experiment Conducted in the Schools:

S. No.	Day and Dates	Period and Timing	Group and Standard (Div.)	Experiential Learning Lessons Conducted
1	26 th September 2022, Monday	8:20 to 9:05	X D	LS 2 – Nationalism in India – Section IV - Sense of Collective Belonging – Group Activity Explanation
2.	3 rd October 2022, Monday	8:20 to 9:05	X D	LS 2 – Nationalism in India – Section IV - Sense of Collective Belonging – Scrap Book Making in Class
3	7 th October 2022, Friday	10:40 to 11:20	X D	Class Group Discussion and Viva Group A = Figures and Images & Group B = Folklores and Tales
4	8 th October 2022, Saturday	10:40 to 11:20	X D	Class Group Discussion and Viva Group C = Use of Icons and Symbols & Group B = Reinterpretation of History

5	10 th October 2022, Monday	8:20 to 9:05	X D X A	Post Test (10 Marks) on Sense of Collective Belonging
6.	15 th November 2022, Tuesday	8:20 to 9:05	X D	Ls 4 – Age of Industrialization – Section II – Before and after Industrial Revolution -Class discussion on Timeline Making Activity on Inventions that changed the World Activity
7	16 th November 2022, Tuesday	10:00 to 10:40 AM & 1:15 to 1:55 PM	X D	Class Group Timeline Making Activity on Proto Industrialisation and after
8.	21 st November 2022, Tuesday	8:20 to 9:05	X D XA	Post Test (15 Marks) on Ls 4 – Section II - Age of Industrialization

**Questionnaire for Testing Usability of the Experiential learning Method in History
Subject (School Teachers)**

I kindly request you to rate the Experiential learning method based on heuristic approach in History on the basis of the following criteria.

S. No.	Criteria	Excell ent	V. Good	Good	Average	Satisfactory
1	Useful to teach the content					
2	Useful to supplement your regular teaching					
3	Supportive in managing your teaching time					
4	Clarity in developing the activities while teaching					
5	Useful to guide you for generating mind maps & concept maps					

6	Useful for the learner in learning of the concept					
7	Suitable for attracting attention of learner					
8	Assists for sustaining interest of learner					
9	Facilitates to recall and remember the concept					
10	Helpful for the learner to organize the content					

What did you like the most about experiential learning method for teaching history?

What do you think are the limitations of experiential learning method for teaching history?

What do you think are the limitations of experiential learning method for teaching history?

Student Feedback Form on Experiential Learning Activities in History for Grade X (2022-23)

The technique that was used to teach you the lesson is called the Heuristic Approach of Experiential Learning for the lessons Rise of Nationalism in Europe and India (Sense of Collective Belonging) and Age of Industrialization (Proto Industrialization and Industrial Revolution - Inventions that changed the world). With respect to the session and the way it was taught, please answer the following:

Name: _____ Std. _____

School Name: _____

E-mail address: _____

	S. B. Patil Public School			
	Strongly Disagree	Disagree	Agree	Strongly Agree
Statements	Students Response			
The Activity was interesting				
The research on the topic was motivating				
I could recall the content with ease				
This method developed interest in the topic, and I could easily understand the abstract ideas better in History				
I would prefer experiential learning than textbook material				

I would like other topics to be taught in the same manner				
I would myself explore topics like these through finding facts on my own.				

Which aspect of the Experiential Learning Activity did you like the most?

- Explanation
- Research and preparation of scrap books and timelines on Padlet
- Experiential Learning Interaction Activity in the class

Which aspect of the session helped you to remember the topics most?

- Use of colours and pictures for scrap books and timelines
- Historical Pictures and images
- Padlet Timeline
- Use of Keywords for doing your research (Folklores, icons and symbols, Timeline stages for Industrial Revolution)
- Arrangement of Scrapbooks and Timelines on Padlet

Which way of learning would you prefer most?

- From notes given by teachers
- Reading only from History Textbooks
- Experiential Learning Activities

List any strong points of the of the experiential learning activities.

List any limitations of the experiential learning activities.

Teacher Feedback Form on Experiential Learning Activities in History for Grade X (2022-23)

The technique that was used to teach the lesson is called the Heuristic Approach of Experiential Learning for the lessons Rise of Nationalism in Europe and India (Sense of Collective Belonging) and Age of Industrialization (Proto Industrialization and Industrial Revolution - Inventions that changed the world). With respect to the session and the way it was taught, please answer the following:

	S. B. Patil Public School			
	Strongly Disagree	Disagree	Agree	Strongly Agree
Statements	Students Response			
The session was interesting				
Experiential learning is better than regular note taking and reading in Class				
I would prefer teaching with Experiential learning than textbook material				
I would use experiential learning for other topics in social science disciplines				

On a scale of 1 to 5 how would you rate the experiential learning activities (1 – Bad, 2 – Satisfactory, 3 – Average, 4 – Good, 5 – Excellent):

- 1
- 2
- 3
- 4
- 5

I would prefer to teach a concept in social science using:

- Experiential Learning activities which involves students' self-exploratory activities and using ICT and offline classroom activities, debates, skits, mind maps etc.
- Notes taking as I explain the students
- Reading and marking notes in the textbook

What did you like about the session? Why?

Appendix IV Teacher Handbook and Lesson Plan, Activity Details

Teacher Handbook on Experiential Learning based on Heuristic for History



Name: Anjali Chetan Gugale

Class: M.Ed. Final Year

Year: 2022-23

Subject: Teaching of History Using Heuristic in Experiential Learning

Table of Contents

Heuristic Problem Solving in History: A comprehensive guide with Examples from History Discipline

- ❖ What are Heuristics?
- ❖ Advantages of Using Heuristic problem solving in History
- ❖ Limitations of Using Heuristic problem solving

- ❖ Heuristic problem-some techniques
- ❖ Three types of Heuristics
- ❖ Stages of heuristics in solving problems
- ❖ Examples from History Lessons from CBSE Grade X Textbook
- ❖ Conclusion

Introduction:

“History is who we are and why we are the way we are.” – David McCullough

History is the study of change in the Political, Social, Cultural, Economic, Geographical, Scientific, Technological, Medical, Intellectual, religious and life existing on earth since the prehistoric times, i.e., since time immemorial. It covers all aspects of human society and life on earth. The study of history is crucial to learn from the past and avoid making mistakes to create a better, progressive, and prosperous futuristic society.

The scope of studying and teaching History has been going through constant changes with the shift in philosophical thinking and changes in the society especially during the 18th, 19th and 20th centuries due to the Industrial Revolution.

Also, Social Science curriculum in India has undergone several changes, both in approach and content, during the last forty years due to the various committees like Kothari Commission (1964-1966), Ishwarbhai Patel Committee (1977), The Framework of 1975, National Policy on Education (1986), NCF (1988), NCF for School Education (2000), NCF (2005) to name a few. These changes that also reflected in the textbooks were based on the global trends in Social Science education and the needs of the society. History as a social science does not have the luxury of a single Truth, but diverse truths, open to a variety of interpretations.

The secondary school students consider studying history as a study of the past, politics, great stories, fiction, and narrative writing. They are unable to link it with present times and phenomena. This becomes a challenge for the educator as the students consider the study of History as learning about the dates and chronological order of past events and thus start lacking interest in the subject. The most neglected aspect of teaching History is the ability to develop interest in History among students. For majority of the students, History has a poor track record in the effective learning outcomes and without motivation, interest, and engagement there will be little achievement.

In the study of History, Heuristic is an approach to search, collect and organize sources of history and analyse them to obtain relevant historical facts and information according to the topic discussed. Heuristic for discovery is an approach of experiential learning that can simplify complex questions in studying historical concepts and link it with present times and phenomenon.

This approach in experiential learning for CBSE secondary school students sought to develop the abilities of students as an independent discoverer. So, there is no teacher help or guidance in this method of experiential learning. The objective of this study was to encourage students to learn through doing and discovering things themselves rather than telling them about things.

To conduct this study, the students were made to do collect, research, organize, and analyse the facts about the concept “Sense of Collective Belonging” for the History lessons for class X on Rise of Nationalism in Europe and Nationalism in India to enable them to realise the role of cultural movements during the 18th and 19th centuries

that paved the way to the making of the Nations of the world. Similarly, they learnt about various inventions during the period of proto-Industrialization and Industrial Revolution, i.e., 18th century onwards in the History Chapter 4 - “Age of Industrialization” for Class X from their CBSE textbook without the teacher guidance. The teacher only facilitated the heuristic approach, i.e., learning by doing. This led them to better learning outcomes and develop their interest in studying History as a discipline.

What is Heuristic?

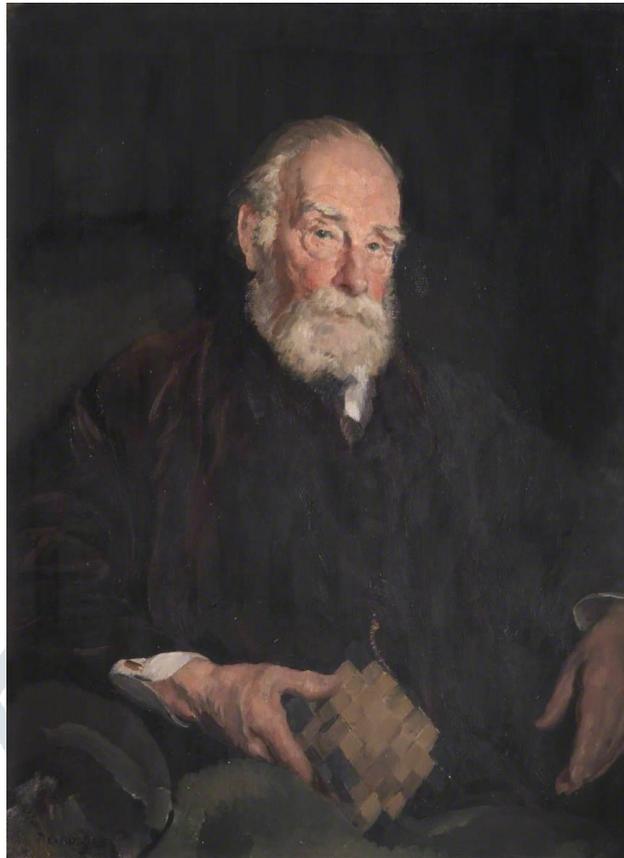


When it comes to education, there are many different methods and approaches that teachers can use to help students learn and grow. One of these approaches is the heuristic method of teaching, which empowers students to take control of their own learning.

Heuristic teaching is utilized in a variety of ways, such as hands-on activities, group work, and project-based learning.

One of the most important aspects of the problem-solving approach to children's development in scientific thinking is the teacher's attitude.

Henry Edward Armstrong (1848–1937)



H E Armstrong was a British Chemist who was the proponent of Heuristic. In words of Professor Armstrong, "Heuristic methods of teaching are methods which involve our placing students as far as possible in the altitude of the discoverer - methods which involve their finding out instead of being merely told about things".

In Heuristic method {The word `Heuristic` means to discover}, the student be put in the place of an independent discoverer. Thus, no help or guidance is provided by the teacher in this method. In this method the teacher sets a problem for the students and then stands aside while they discover the answer. In words of Professor Armstrong, "Heuristic methods of teaching are methods which involve our placing students as far as possible in the altitude of the discoverer methods which involve their finding out instead of being merely told about things"

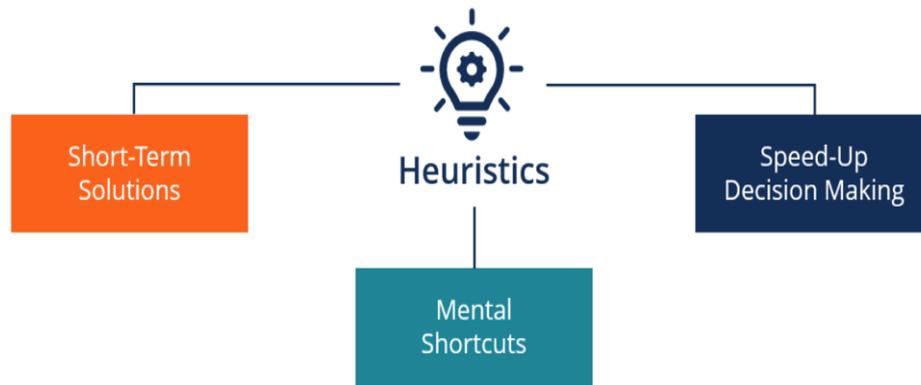
Advantages of Using Heuristic problem solving

Heuristic problem-solving strategies are the ones that use practical and intuitive methods to find solutions quickly, efficiently, and effectively.

Here are some advantages of using heuristic problem solving:

- **Speed:** Heuristics are designed to find solutions quickly, saving time in problem solving tasks. Rather than spending a lot of time analysing every possible solution, heuristics help to narrow down the options and focus on the most promising ones.
- **Flexibility:** Heuristics are not rigid, step-by-step procedures. They allow for flexibility and creativity in problem solving, leading to innovative solutions. They encourage thinking outside the box and can generate unexpected and valuable ideas.
- **Simplicity:** Heuristics are often easy to understand and apply, making them accessible to anyone regardless of their expertise or background. They don't require specialized knowledge or training, which means they can be used in various contexts and by different people.

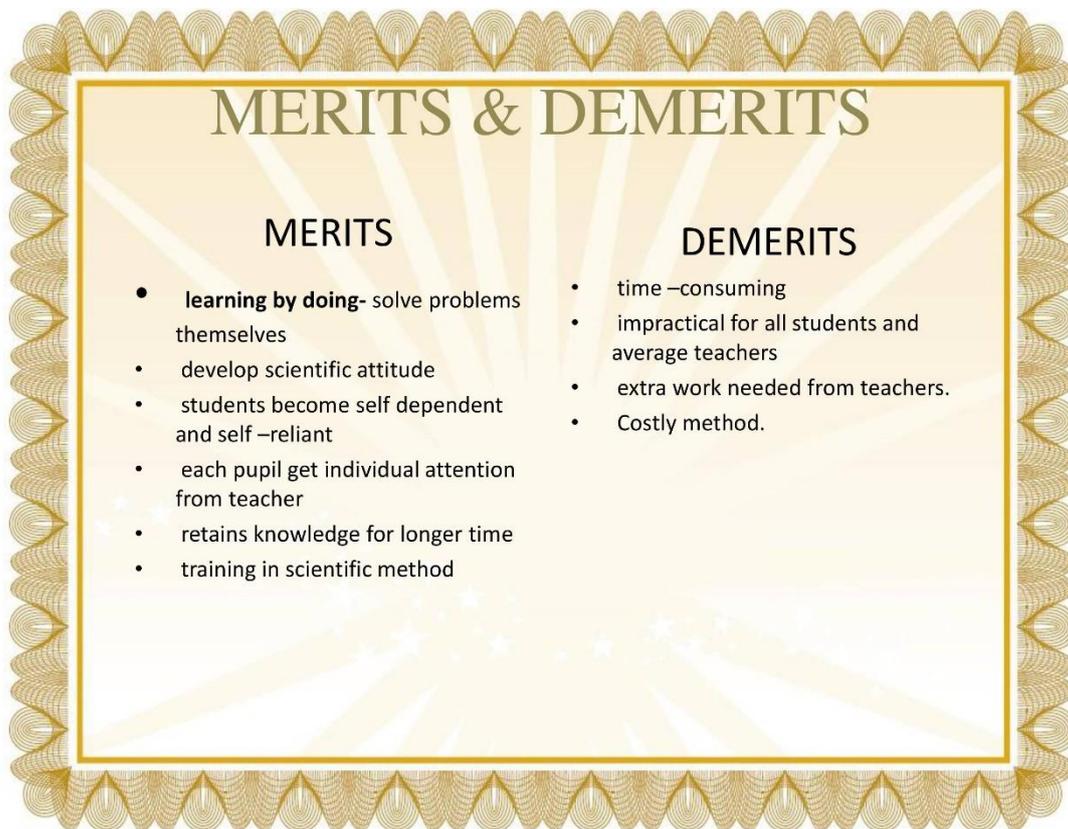
- **Cost-effective:** Because heuristics are simple and efficient, they can save time, money, and effort in finding solutions. They also don't require expensive software or equipment, making them a cost-effective approach to problem solving.
- **Real-world applicability:** Heuristics are often based on practical experience and knowledge, making them relevant to real-world situations. They can help solve complex, messy, or ill-defined problems where other problems solving methods may not be practical.



Disadvantages of Using Heuristic problem solving

While this approach can be effective in certain situations, there are also several disadvantages to using heuristic problem solving, including:

- **Potential for errors:** Heuristic problem solving relies on generalizations and assumptions, which may lead to errors or incorrect conclusions. This is especially true if the heuristic is not based on a solid understanding of the problem or the underlying principles.
- **Limited scope:** Heuristic problem solving may only consider a limited number of potential solutions and may not identify the most optimal or effective solution.
- **Lack of creativity:** Heuristic problem solving may rely on pre-existing solutions or approaches, limiting creativity and innovation in problem-solving.
- **Over-reliance:** Heuristic problem solving may lead to over-reliance on a specific approach or heuristic, which can be problematic if the heuristic is flawed or ineffective.
- **Lack of transparency:** Heuristic problem solving may not be transparent or explainable, as the decision-making process may not be explicitly articulated or understood.

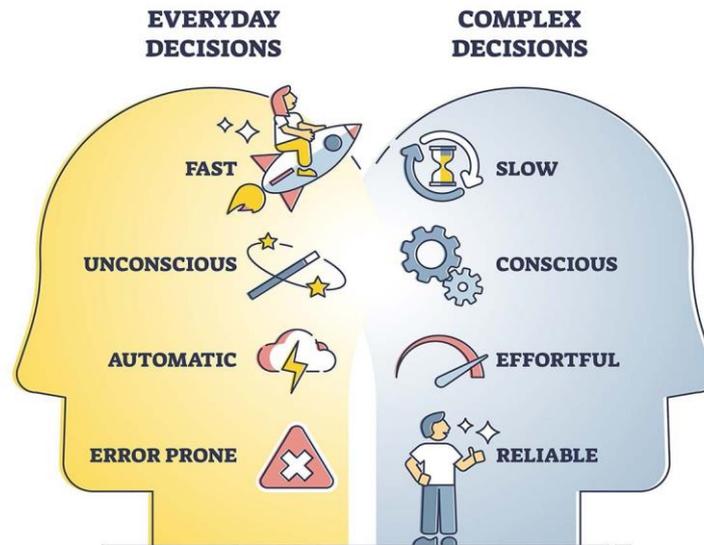


Heuristic Problem - Some Techniques

Here are five examples of heuristics in problem solving:

- **Trial and error:** This heuristic involves trying different solutions to a problem and learning from mistakes until a successful solution is found.
- **Working backward:** This heuristic involves starting at the goal and then figuring out what steps are needed to reach that goal.
- **Breaking a problem into smaller parts:** This heuristic involves breaking down a complex problem into smaller, more manageable pieces that can be tackled individually.
- **Using analogies:** This heuristic involves finding similarities between a current problem and a similar problem that has been solved before and using the solution to the previous issue to help solve the current one.
- **Simplifying the problem:** This heuristic involves simplifying a complex problem by ignoring details that are not necessary for solving it. This allows the problem solver to focus on the most critical aspects of the problem.

HEURISTICS



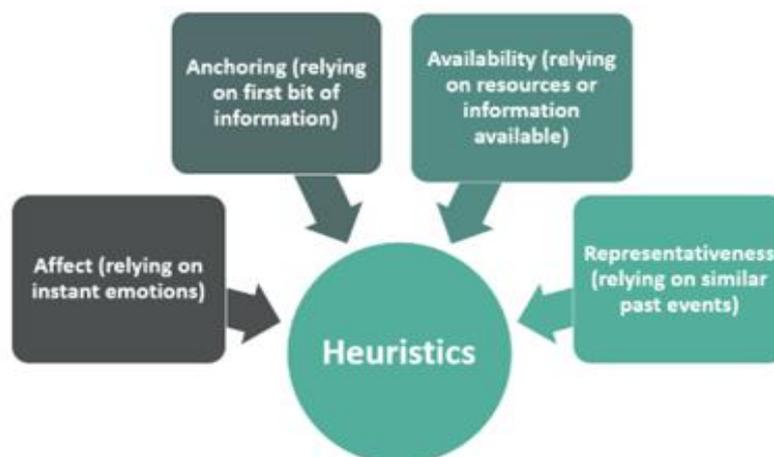
What are the three types of heuristics?

The three types of heuristics are: -

- ❖ availability heuristic,
- ❖ representativeness heuristic,
- ❖ and anchoring and adjusting heuristic.

The availability heuristic is the tendency to make decisions quickly based on what comes to mind. The representativeness heuristic makes judgments based on similarity to a prototype or a stereotype. Finally, the anchoring and adjusting heuristic is the tendency to make decisions based on initial information, which serves as an anchor, and then adjusting from that starting point.

Heuristics Types



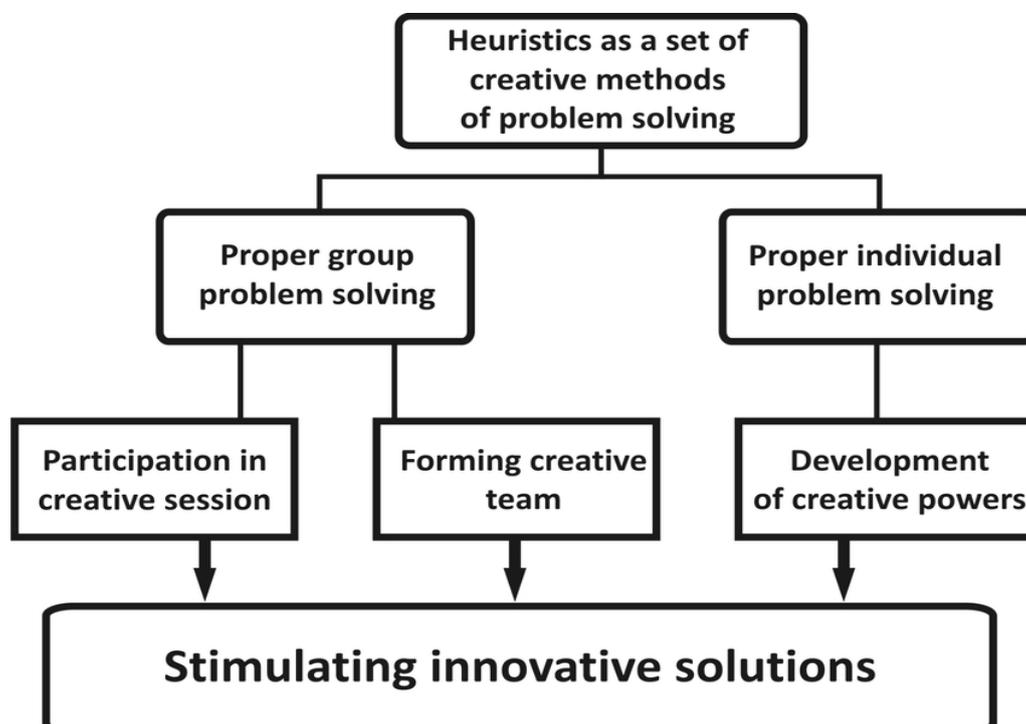
What are the four stages of heuristics in problem solving?

The four stages of heuristics in problem solving are as follows:

1. Understanding the problem: Identifying and defining the problem is the first step in the problem-solving process.
2. Generating solutions: The second step is to generate as many solutions as possible. It's important not to evaluate them at this stage; just list as many as possible.
3. Evaluating solutions: Evaluate each solution based on its potential risks, advantages, and disadvantages. Choose the most appropriate solution.
4. Implementing solutions: Take action to implement the chosen solution and monitor and evaluate the results to ensure they meet your expectations.

Procedure to be followed by Teachers:

- ❖ Teacher should give the work sheets (Information Sheets) to each student to solve the problems written or depicted in it. Students themselves solve the problems given in the work sheet through the appropriate experiments.
- ❖ The experiments can be done with the help of hints given in the work sheet or with the guidelines provided by the teachers.
- ❖ In this method, it is not mandatory that the student must carry out the experiments instantly. Teachers should give appropriate help or guidelines to the students whenever felt necessary.
- ❖ The students have to do the experiments as detailed in the work sheet and record the events or effects occurred during the experimentation.
- ❖ The recorded information during and at the end of experiments must be analysed for final results. This the final stage of this method. In this method the child behaves like a research scholar and discovers the truth.
- ❖ Hence, the heuristic method is a method which can give adequate training for discovery and experimentation or research.
- ❖ This method prefers the discovery and practice than knowing the concepts.



Teachers Attitudes & Responsibility in Heuristic Method

- ❖ Teachers must develop sensitiveness to children and to the meanings of their behaviour.
- ❖ Teachers should be ready to accept any suggestion for the solution of problems regardless of how irrelevant it may seem to him, for this is really the true spirit of scientific problem solving.
- ❖ By testing various ideas, it can be shown to the child that perhaps his suggestion was not in accord with the information available
- ❖ It can then be shown that this failure gets as much closer to the correct solution by eliminating one possibility from many offered by the problem.
- ❖ In this method teacher should avoid the temptation to tell the right answer to save time.
- ❖ The teacher should be convinced that road to scientific thinking takes time.
- ❖ Children should never be exposed to ridicule for their suggestions of possible answers otherwise they will show a strong tendency to stop suggestions.
- ❖ For success of this method a teacher should act like a guide and should provide only that much guidance as is rightly needed by the student.
- ❖ He should be sympathetic and courteous and should be capable enough to plan and devise problems for investigation by pupils.
- ❖ He should be capable of good supervision and be able to train the pupils in a way that he himself becomes dispensable.

Examples from History Lessons from CBSE Grade X Textbook

Lesson Plan – Ls 2 – Nationalism in India – Section IV - Sense of Collective Belonging



EXPERIENTIAL LEARNING USING HEURISTIC APPROACH:

1. Learning Objectives: Student will be able to:

- ❖ familiarize with the writings and ideas of different political groups and individual
- ❖ appreciate the ideas promoting Pan Indian belonging.
- ❖ recognize the causes for the sense of collective belonging.
- ❖ work effectively as a team member.

2. Specifications:

Topic - The Sense of Collective Belonging

Time: -40 Minutes

Nature of Activity: - Group Activity

3. Skills Acquired: Understanding, analysing, Evaluating, Expressing, presenting ideas, Creating, preserving cultural heritage, and Displaying love for the country.

4. Experiential Learning Activity: -

What will the student do?

To do research work and complete the observation table

What does he/she require?

Newspaper, textbook, scrap book, coloured pen, paper, glue, pictures, and internet

What does he/she need to know?

Meaning of colonialism and India was a colony of England for 190 years.

5. Teacher's Activity- Teacher will: explicate the students- how a variety of cultural processes developed a sense of collective belongingness in India during 19th century through images and illustrations given in the textbook.

She will divide the class into groups of four.

She will ask each group members to research on following topics, analyse and discuss how they contributed in India's freedom struggle.

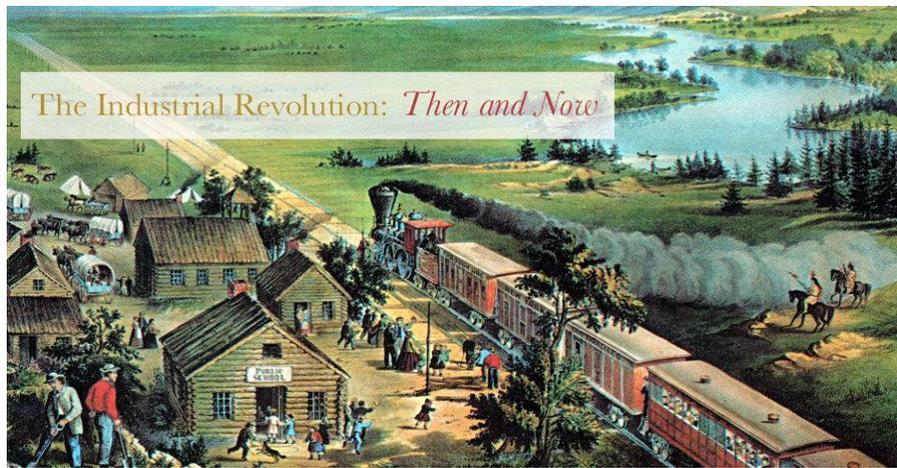
- ❖ Figures or Image
- ❖ Indian Folklore
- ❖ Use of Icons and Symbols
- ❖ Reinterpretation of History

6. Student's Activity-

- ❖ follow the instructions given by the teacher
- ❖ do research work on the topics allotted to them.
- ❖ Teacher will conduct a class discussion on the above tasks.
- ❖ Achievement Post Test will be monitored

<u>Cultural Processes</u>	<u>Contribution in India's freedom struggle</u>
Figures and Images	
Indian Folklore	
Use of Icons and symbols	
Reinterpretation of History	

Lesson Plan – Ls 4 – Age of Industrialization – Section II – Before Industrial Revolution – Proto Industrialization and Industrial Revolution



EXPERIENTIAL LEARNING USING HEURISTIC APPROACH:

1. Learning Objectives: Student will be able to:

- ❖ Explains the concept of proto-industrialization and industrialization
- ❖ Understand the early process of production and marketing
- ❖ Identifies the great personalities and their inventions and assess the contribution in respect of social and economic transformation of society.
- ❖ Critically analyse the idea of inventions for the mass production of goods by industrial Countries for the economic prosperity.
- ❖ Critically analyse how industrialization affected on the lively hood of workers, labourers, Weavers, merchants, and small-scale industries.
- ❖ Identify and locate the industrial cities and trade route on the world map before industrialization and after.
- ❖ Compare and contrast the industrial goods produced in imperial countries with that of Colonies.
- ❖ Identify the various factors responsible for the beginning of industrialization in England.
- ❖ Appreciate the role played by the Indian merchants emerged as industrialists.

2. Specifications: -

Topic - Inventions that changed the world

Time: - 40 Minutes

Nature of Activity: - Group Activity

3. Skills Acquired: Understanding, Analysing, Evaluating, Expressing, presenting ideas, Creativity

4. Experiential Learning Activity: -

A. School to Home - Adaptive Teaching Activity:

Students are assigned the task to collect information from their parents regarding availability of goods in their childhood and compare with present time of availability in the market.

They will note:

- ❖ Changes in availability of the goods.
- ❖ Consuming pattern.
- ❖ New Items which were not available in their parents' childhood.
- ❖ Changes in Job opportunities.

B. Learning by doing class activity-Industrial Revolution-Communicating by Wire - Create a timeline of invention of the telegraph and Morse Code on (Padlet)

5. Teacher's Activity: - Teacher will divide the class into groups of four or five students. In these groups, students will take the following roles:

- a. An investigator – This group searches the articles and information for data
- b. A recorder – writes down the data in chronological order
- c. A fact checker – checks the articles to see that the investigator and recorder are accurate.
- d. A timeline creator – take the data and enters it on a timeline
- e. An editor (this role is dispensable if there are not five people in a group)

6. Student Activity: -

A. Home assignment: - Make a Timeline of Inventions that changed the world from the period before and after industrial revolution (From Proto Industrialization to Industrial Revolution)

Conclusion

Heuristic problem solving is a cognitive approach that helps you make quick decisions based on past experiences, rules of thumb, and common judgment. It simplifies complex problems by breaking them down into more manageable chunks. It's a game-changing approach to decision-making that can help you save time and resources. While it has advantages and disadvantages, heuristic problem solving can be leveraged to solve real-world problems, from business to personal life. This approach can make your decision-making process more effective and productive. To learn more about how you can use heuristic problem-solving in your decision-making process, check out our blog for heuristic problem-solving examples.

References:

1. https://www.researchgate.net/publication/238310959_Teaching_High_School_Students_to_Use_Heuristics_While_Reading_Historical_Texts
2. <https://homework.study.com/explanation/what-is-heuristic-method-of-teaching.html>
3. [verywellmind.com/what-is-a-heuristic-2795235](https://www.verywellmind.com/what-is-a-heuristic-2795235)
4. <https://blog.teachmint.com/heuristic-method-of-teaching/>
5. Association for Experiential Education, (1994) The Heuristic Method, Precursor of Guided Inquiry: Henry Armstrong and British Girls' Schools, 1890–1920, Geoff Rayner Canham and Marelene Rayner – Canham, (2015)
6. The Heuristic Strategy, V.K. Maheshwari, (2016)
7. Heuristics and biases: The science of decision-making, Steve Dale, (2015)
8. Heuristic Classification, William Clancey, (1985)
9. Use of Heuristics to Facilitate Scientific Discovery Learning in a Simulation Learning Environment in a Physics Domain, Koen Veermans, Wouter van Joolingen, (2003)
10. Impact of Using Heuristic Instructional Design on Students' Performance, Sayma Zia, Farooq – Eazam Cheema, Sobia Shujaat, (2016)
11. Exploration of Heuristic Teaching Model of the Course "Outline of Modern and Contemporary Chinese History" Combining with Specialty, Zhimei Yang, (2019)

12. Heuristic Method, J T Madhavan, (2008)

Appendix V Student Post Test Scores and Students' Activities**School Name: S. B. Patil Public School, Ravet, Pune****Std. X D – Experimental Group**

Roll. No	Name of Student	X D (Experimental Group)
1	Aakanksha Mahendra Bhosale	22.5
2	Amruta Gurudas Patil	21.25
3	Ananya Arunkumar Bongale	19.25
4	Diksha S.	21.25
5	Prisha Jimish Shah	18.25
6	Sai Shelar	15.5
7	Sanskruiti Rahul Shelar	18.5
8	Shreya Aniket Jadhav	19
9	Shruti Dhananjay Bodke	16.25
10	Shweta Girish Desai	21.75
11	Smruti Vinod Sawant	17.25
12	Sneha Jadhao	20.5
13	Spruha Sachin Badgujar	19.5
14	Srushti Nilesh Katkar	17.5
15	Supriya Ravikant Shrivastav	21.75
16	Tanu Singh	15.75
17	Tejal Sachin Chaudhari	17.75
18	Alok Punjabi	18.5
19	Aashay Kaushik Patel	25
20	Aditya Kailash Takalkar	18.5
21	Anant Kiran Khaire	20
22	Aryan Mukesh Kate	18.75
23	Chaitanya Pravin Chaudhari	18
24	Deevesh Kushal Nemade	15.5
25	HiteshKumar Suresh Das	19
26	Ishan Jha	22
27	Omkar Vijay Shinde	20.75
28	Pruthviraj Hanumant Gole	20.25
29	Raid Imran Shaikh	18.5
30	Saarth Vipin Borole	19.5
31	Sharva Shashikant Mahadik	23
32	Shwet Shashikant Kinge	21.5
33	Siddhant Sachin Bhondve	23
34	Suryansh Narender Rathi	21.5
35	Swayam Santosh Kate	19.5

School Name: S. B. Patil Public School, Ravet, Pune

Std. X A – Control Group

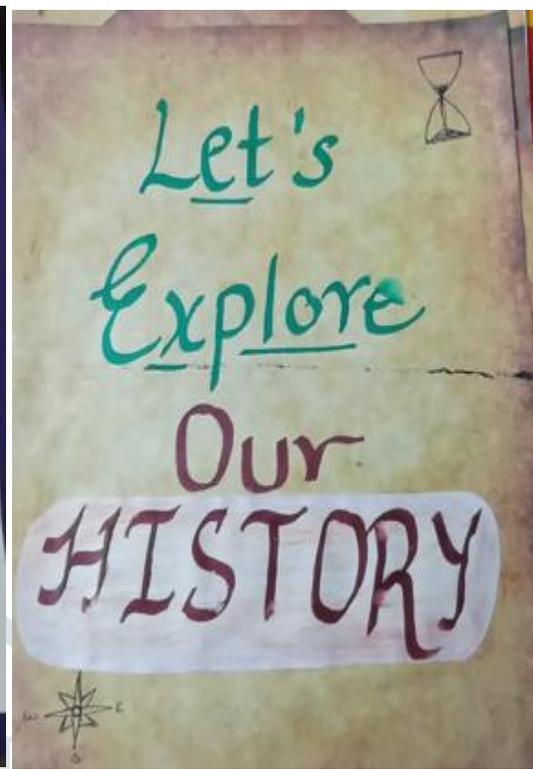
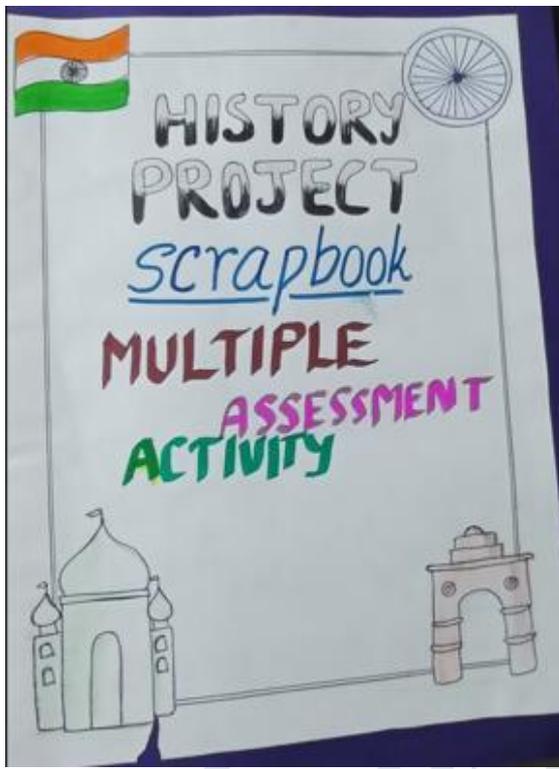
Roll. No	Name of the Student	X A (Control Group)
1	Aadya Vilas Bawaskar	23.5
2	Aarya Yogesh Kirange	18.25
3	Aishwarya Vinod More	16.5
4	Ananya Jayant Gawande	22
5	Anushri Amar Dustakar	21.75
6	Avni Rupesh Khandelwal	22.75
7	Harshita Kakade	18.5
8	Mrunali Mallikarjun Awate	19.25
9	Prisha Gajendra Ranka	19.25
10	Rujuta Chandrashekhar Gokhale	24
11	Sanskruti Kailas Sapkal	18.25
12	Trisha Avinash Mohite	20.25
13	Veena Sachin Kambli	12
14	Zainab Abeed Shaikh	18.5
15	Abhiraj Ramesh Sasane	11.25
16	Aadesh Dnyaneshwar Mhetre	15.25
17	Abhishek Deepak Mali	9.75
18	Aditya Vinod Rasal	12.75
19	Aryan Singh	22.25
20	Atharva Goraksh Jadhav	16.75
21	Dhananjaysingh Tomar	22.5
22	Harshavardhan Yuvraj Kokne	16.75
23	Malojiraje Ghule	7.75
24	Manthan Mahendra Shirsath	15
25	Om Bapu Sonawane	16.75
26	Piyush Sanjay Sonawane	18.5
27	Pratik Avinash Tawal	19.25
28	Pruthviraj Pandurang Gulve	20.25
29	Sanatkumar Vijay Pol	18.25
30	Sanshray Santosh Thorat	15.75
31	Saurabh Prashant Jadhav	21.75
32	Tanishk Mayur Naidu	14.5
33	Vedant Ajeetkumar Madgi	16.5
34	Vedant Ganesh Nandedkar	12
35	Utkarsh Raut	15.25

Workshop Part I -Students Scrap Book Activity – Ls 2

X D Multiple Assessment Scrap Book Activity: - History - Nationalism In India – Sense of Collective Belonging – Class Discussion Group Wise Research Topics

	Group 1. Figures & Images	Group 2. Folklores and Tales	Group 3. Use of Icons & Symbols	Group 4. Reinterpretati on of History
Cultural Process	National flower, Bird, Flag,	Mahabharata, Ramayana,	Vande Mataram Flag, Evolution	Ancient Indian

	Emblem, Swastika, Charkha, Varaha, Rudraksha, Bharat mata	Hitopadesha, Tales of Krishna, Jataka Tales, Folk Dances, Panchatantra, Tale of Hiranyakashap .	of Coins, Bharat Mata, Poems & Folktales, Charkha, Gandhi's 3 monkeys, Evolution Of Indian Flag, Azad Hind Flag, National Animal, Picture depictions.	medicine, mathematicians , Indian architecture , Vedas , Din-I ilahi, Reinterpretation by 19 th and 20 th centuries
Contribution in the freedom struggle	These symbols were originated from the religious or social culture of the Indian people. As most people were illiterate, the people could understand the symbols and figures and could link and relate with them better. They helped Indians to create a link of bondage and bring a sense of collective belonging among the Indians in the freedom struggle of India against the Britishers.	The above tales and folklores were originated from cultural and religious history of India. These tales and folklores brought the sense of collective belonging amongst the Indians during freedom struggle. The morals, customs, stories, and beliefs that were passed from one generation to another brought the sense of collective belonging	These icons and symbols are of the pre-independent India. All of the above symbols reflected a sense of collective belonging. We could see how unity took different turns over the phases of India's past. Poems, Stories, coins, flags etc. were from different subdivisions of India. But the sole message was to produce and feel a sense of togetherness and collective belonging.	The above information is about Ancient Indians who developed methods and advancement which made the life of the common people. The above information was re-interpreted by historians to bring a sense of collective belonging in the people of India and to prove that India was not uncivilised as stated by the Europeans, mainly the Britishers.



The Indo- Greeks:
 Coinage of Indo-Greek Kingdoms began to increasingly influence coins from other regions of India by the 1st century BCE. By this time a large number of tribes, dynasties and kingdoms began issuing their coins. Folklore legends began to appear. The extensive coinage of the Kushan Empire (1st-3rd centuries CE) continued to influence the coinage of the Guptas (310 to 550 CE) and the later rulers of Kashmir.



King on prancing horse in military dress.
 - King PHILOXENUS.
 Helmatted, diadem'd & draped philoxenus GREEK LEGEND

Mauryan Empire:
 The Mauryan Empire coins were punch marked with the royal standard to ascertain their authenticity. The Arthashastra, written by Kautilya, mentions minting of coins but also indicates that the violation of the Imperial Maurya standards by private enterprises may have been an offence. The Mauryan currency was nearly entirely made up of silver karshapana weighing around 3.4 gm. The Mauryan rule also saw a steady emergence of inscribed copper coins in India as evidenced by Tripari coins in Ashokan brahmi script and various pre Satavahana coins dated 3rd and 2nd century BC in Deccan.

Bull, elephant & horse played a very meaningful role in early BUDDHIST art & literature.
 NDRADHVAI - Flag of God Andhra.



COINS IN THE FREEDOM STRUGGLE-

- Coins are important primary sources of history. They convey the names of kings with their titles and portraits, events, places, dates, dynasties, achievements and logos. The composition of metals in the coins gives us information on the economic condition of the empire.
- Muhammad Ghori had stamped the figure of Goddess Lakshmi on his gold coins and had his name inscribed on it. This tells us that he was liberal in religious outlook. Copper coins called Jitals helps us to study the period of the Delhi Sultans. Ala-ud-din Khalji's gold coins, Muhammad bin-Tughluq's copper token currency, silver Tankas introduced by Ilutmish, are indicative of coinage and economic prosperity of Delhi Sultans.

Since the ancient era, coins in India have depicted the kings, gods, goddesses, and other motifs while medieval ones issued by kings in North India bear inscriptions in Arabic or Persian and the ones in South India depict beautiful motifs coupled with legends.



Bharat Mata (Mother India in English) is a national personification of India (Bharat) as a mother goddess. In the visual arts she is commonly depicted dressed in a red or saffron-coloured sari and holding a national flag; she sometimes stands on a lotus and is accompanied by a lion. Lion symbolises power and authority, red/saffron symbolises courage and sacrifice while white is for truth and peace and green is for faith. She stands on lotus which shows divinity, fertility, and wealth. The blooming lotus shows triumph as she grows up through the mud but she is still beautiful. It tells us that even if there are hardships her people must face them and come out to be stronger.

This concept of personifying India came into existence in late 19th century, especially after the revolt of 1857 against British. As the depiction was a Hindu goddess, it is not just the patriotic but also the religious duty of all Hindus to participate in the national struggle. Hence, many mottoes arose like BHARAT MATA KI JAY, VANDE MATARAM etc.

EVOLUTION OF INDIAN FLAG

According to the Flag code of India, the Indian flag has a width:height aspect ratio of 3:2. All three horizontal bands of the flag (saffron, white and green) are equally sized. The Ashoka Chakra has twenty-four evenly-spaced spokes.^[3]

The size of the Ashoka Chakra is not specified in the flag code, but in section 4.3.1 of "IS1: Manufacturing standards for the Indian Flag", there is a chart that describes specific sizes of the flag and the chakra (reproduced alongside).^[4]

Flag size ^[5] (6)	Width and height (mm)	Diameter of Ashoka Chakra (mm) ^[4]
1	6300 × 4200	1295
2	3600 × 2400	740
3	2700 × 1800	555
4	1800 × 1200	370
5	1350 × 900	280
6	900 × 600	185
7	450 × 300	90 ^[7]
8	225 × 150	40
9	150 × 100	25 ^[7]

A sketch from 'Famine' series by Zainul Abedin, 1943:

The influence by the great famine of Bengal in 1942. He was the memory of the starving people during the man-made famine the World War II. Bengal in 1943 touched him deeply. He showed the people's situation in Bengal and other parts that how the people were starving and being dead by starvation. Zainul Abedin depicted this inhuman story with very emotions of peoples. This was all because of the policies made by British government. With the help of his images the freedom fighter were able to gain freedom from the colonial rule.



"Bapuji" by Nandlal Bose, 1930:

Nandlal Bose was the one who illustrated the construction of "Bapu". He was classified "Artist of Indian Constitution". In 1930, Bose created a black on white linocut print of Mahatma Gandhi walking with a stick. Released on the occasion of Gandhi's arrest for protesting the British tax on salt. In no time, this image became an icon of sorts for the Non-Violent Freedom Movement and Gandhi himself.



CHARKHA

Charkha symbolises self-reliance, perseverance and determination

CHARKHA which was once the source of livelihood of artisans and the companion and helpmate of woman, acquired a mystique during the freedom struggle when it became the symbol of Swadeshi movement which sought to bring about an economic revolution by discarding machine made goods and replacing them with Indian hand made cloth. The emphasis on charkha was aimed both at removing poverty of villagers who could supplement their income by working at home and at impeding the flow of Indian money to the British industries.



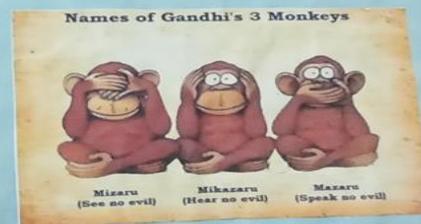
GANDHI'S THREE MONKEY

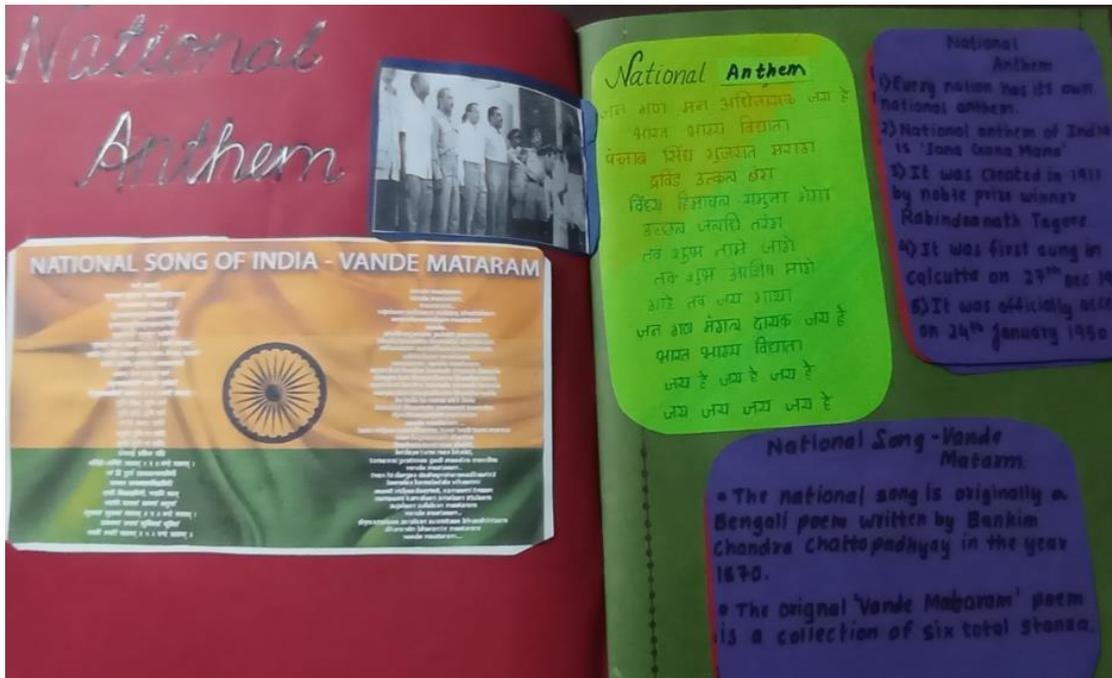
Gandhi's three monkeys is a sculpture of three monkey sitting together, one covering his eye, one covering his ear and other covering his mouth.

It is representation of the proverb: "see no evil, hear no evil, speak no evil".

In India, the sculpture was a symbol of ignoring the harsh and oppressive rule of the British.

Although the three monkeys were popularised by Gandhi in India, they were actually originated from Japan. Their names are Mizaru, Kikizaru and Iwazaru.





HOW DID THE REINTERPRETION OF HISTORY STARTED?

The nationalistic ideas in India developed through the reinterpretation of the history in the following:-

- i) The British thought Indians to be primitive and also backward.
- ii) Therefore, Indians started to search their glories past and discovered that art, architecture, science and mathematics, religions were flourished.




"MOHENJO-DARO"

MOHENJO-DARO is an archaeological site in the province of Sindh, Pakistan. Built around 2500 BCE, it was the largest settlements of the ancient Indus Valley Civilization, and one of the world's earliest major cities, contemporaneous with the civilisations of ancient Egypt, Mesopotamia, Minoan Crete and Norte Chico. Mohenjo-daro was abandoned in the 19th Century BCE as the Indus Valley Civilization declined, and the site was not rediscovered until the 1920's. Significant excavation has since been conducted at the site of the city, which is designated as a UNESCO World Heritage site in 1980, the first site in South Asia to be so designated. The site is presently threatened by erosion and improper restoration.



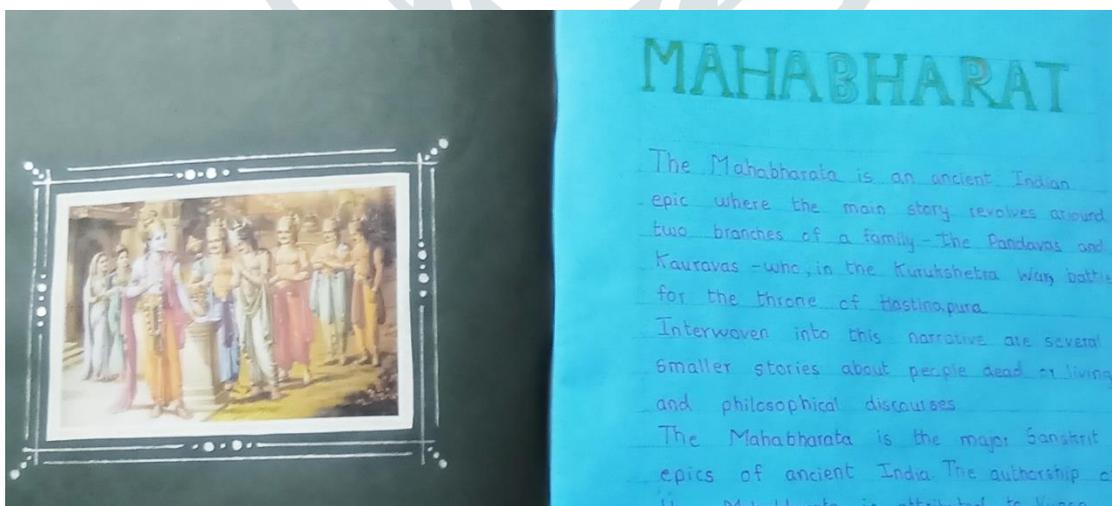
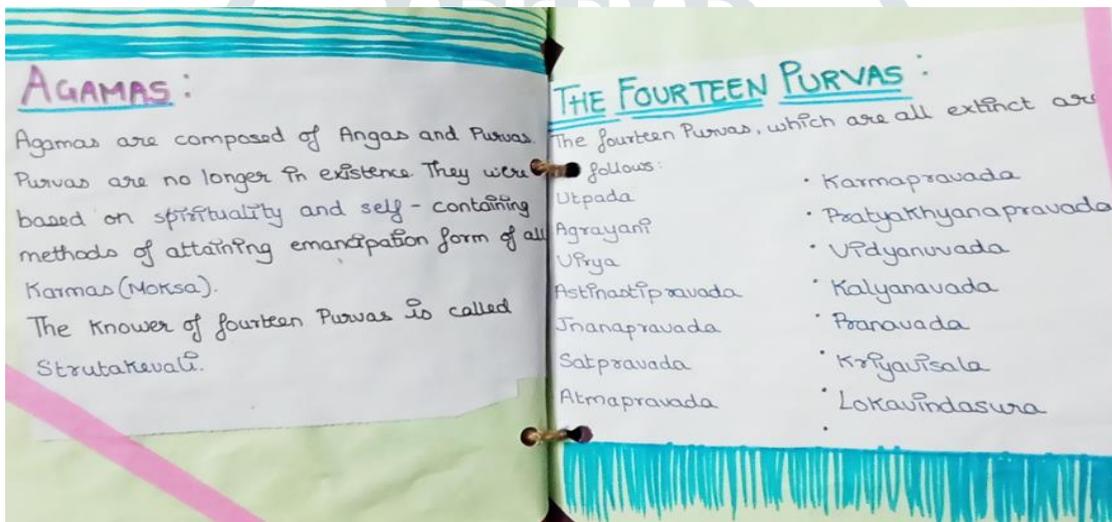


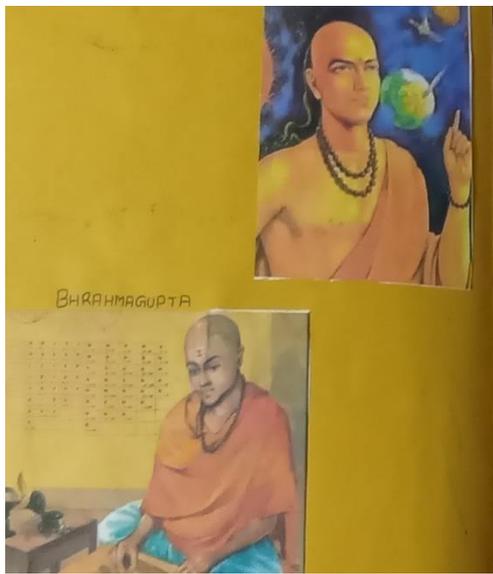

UPANISHADS

Upanishads are the late-vedic Sanskrit texts that supplied the basis of later Hindu philosophy. They are the most recent part of the Vedas, the oldest scriptures of Hinduism, and deal with meditation.

MAIN Purpose of upnishads.
 ∴ Deal with rituals observance and the observance an individual's place in the universe and, in doing so, develop the fundamental concepts of the Supreme over Soul (God) known as Brahman.

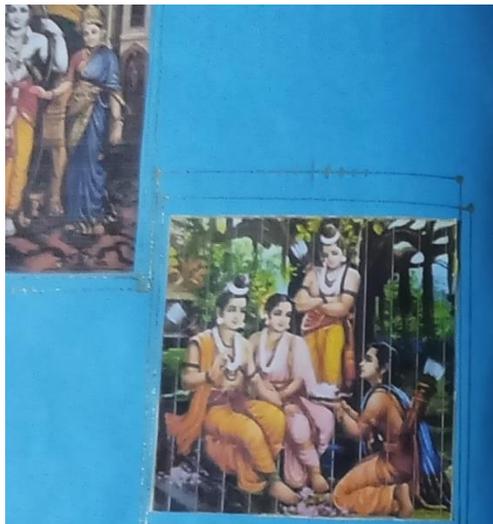
Fact To Be Known
 These are 108 UPANISHADS and 12 are the Main Upanishads.





Contribution Of Indian Mathematicians

- Great mathematicians were born in India who discovered invention which changed the world for good
- Some famous Indian s are Aryabhata, Bhāskarāchārya , Brahmagupta
- Aryabhata discovered an approximation of pi, $62832/20000 = 3.1416$. He also correctly believed that the planets and the Moon shine by reflected sunlight and that the motion of the stars is due to Earth's rotation.
- Bhāskarāchārya was a 7th-century mathematician and astronomer, who was the first to write numbers in the Hindu decimal system with a circle for the zero, and who gave a unique and remarkable rational approximation of the sine function in his commentary on Aryabhata's work.
- Brahmagupta (ad 628) was the first mathematician to provide the formula for the area of a cyclic quadrilateral. His contributions to geometry are significant. He is the first person to discuss the method of finding a cyclic quadrilateral with rational sides



RAMAYANA

The Ramayana is an ancient Sanskrit epic which follows prince Rama's quest to rescue his beloved wife Sita from the clutches of Ravana with the help of an army of monkeys. It is traditionally attributed to the authorship of the Sage Valmiki and dated to around 500 BCE to 100 BCE.

Rama is the hero of the Ramayana epic, an incarnation of the God Vishnu. The eldest son



AKBAR

- The name Din-i Ilahi literally translates to God's religion. It was a new syncretic religion or spiritual leadership program propounded by the Mughal emperor Akbar in 1582 intending to merge some of the elements of the various religions practiced by his subjects and create a new religion for his empire, and thereby

Workshop Part II – Ls 4 – Timeline Making Activity – Proto Industrialization to Industrial Revolution (Inventions that Changed the World)

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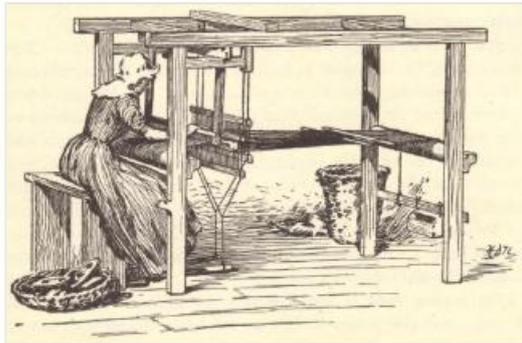
padlet.com

RISE OF INDUSTRIAL REVOLUTION

FROM LS-THE AGE OF INDUSTRIALISATION

BEFORE THE INDUSTRIAL REVOLUTION

Before the Industrial Revolution, most people in Europe worked either as farmers or artisans making hand-crafted goods. The ways in which people lived had not changed significantly since the Middle Ages. Once industrialization began, however, work and family life would be transformed forever.



PROTO-INDUSTRIALISATION

The period of industrialisation before that the first factories came up in Europe is termed as proto-industrialisation. This period was marked by merchants from towns getting products in villages



1907- Electric Washing Machine

Produced by the Chicago-based Hurley Electric Laundry Equipment Company, the 1907 Thor is believed to be the first electrically powered washer ever manufactured, crediting Hurley as the inventor of the first automatic washing machine. Designed by Hurley engineer Alva J.

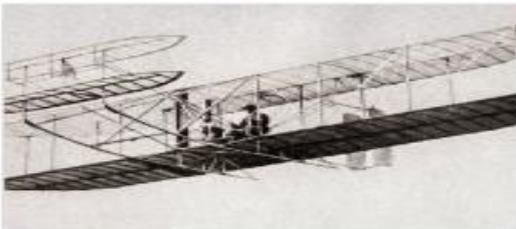
1879- Light Bulb

Thomas Edison used this carbon-filament bulb in the first public demonstration of his most famous invention the light bulb, the first practical electric incandescent lamp.



1903- Aeroplane

The Wright Brothers invented and flew the first aeroplane in 1903 which is recognized as the "first sustained and controlled heavier than air powered flight".



1908- Cars

Karl Friedrich Benz's Benz Patent Motorcar from 1885 is considered to be the first practical automobile put into the series production. He received his first patent for motorcar in 1886.



INDUSTRIAL REVOLUTION

FROM 1700s TO LATE 20TH CENTURY

Proto-industrialization is the regional development, alongside commercial agriculture, of rural handicraft production for external markets.[1] The term was introduced in the early 1970s by economic historians who argued that such developments in parts of Europe between the 16th and 19th centuries created the social and economic conditions that led to the Industrial Revolution.

Proto Industrialization



Industrial Revolution, in modern history, the process of change from an agrarian and handicraft economy to one dominated by industry and machine manufacturing.



The Industrial Revolution begins in Great Britain. About 1764 James Hargreaves conceives the idea for a yarn-spinning machine called the spinning jenny .

1760s



Edmund Cartwright invents a crude power loom, first patented in 1785. This is the predecessor of the modern power loom. . In 1789 he patented the first wool-combing machine.

1780s

HISTORY CLINCH
 NEW: APRIL 24, 1785
 PATENTED: 1785
 DIED: OCTOBER 24, 1823
 105 YEARS LATER
 INVENTION: POWER LOOM & OTHER TEXTILE MACHINES

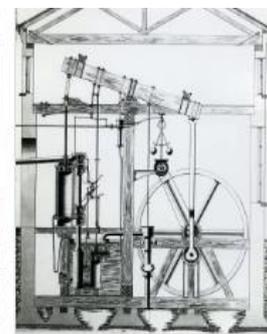
EDMUND CARTWRIGHT (1764-1823)
 STUDIED AT STURTON SCHOOL (LESTERSHIRE) & TRINITY COLLEGE, DUBLINO

POWER LOOM (1785 & 1789)
 ALLOWED TO WEAVE FABRICS FASTER & AT A LOWER COST
 Significant to the textile industry during the industrial revolution.

POWER LOOM INVENTION

1800	2,000
1810	10,000
1820	50,000
1830	100,000
1840	250,000

Inspired by cotton mills in England during the industrial revolution, he designed the power loom.



Samuel Slater a former apprentice to Jedediah Strutt , constructs versions of Arkwright's machinery and establishes a cotton mill in Pawtucket, Rhode Island, the first successful cotton mill in the United States.

Samuel Slater's spinning frame (1793)



Two Englishmen, William and John Cockerill, brought the Industrial Revolution to Belgium by developing machine shops at Liège. Belgium became the first country in continental Europe to be transformed economically.

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Age Of Industrialization

EVA-3 Multiple Assessment

TRIVENI/HASHKED6 FEB 06, 2022 02:21PM UTC

1712

The first practical steam engine is invented by Thomas Newcomen. Steam would become an important source of power for the Industrial Revolution.



1760

The first Industrial Revolution begins around 1760 in the textile industry in Great Britain. Over the next decade, manufacturing will move from hand production in the home to machine production in factories.



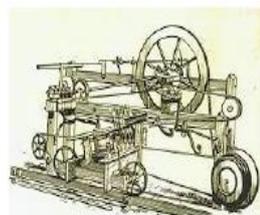
1764

James Hargreaves invents the spinning jenny allowing a worker to produce multiple spools of thread at the same time.



1779

The spinning mule is invented by Samuel Crompton.



1781

James Watt patents an improved steam engine making it useful as a power source in factories and other applications such as steam boats and trains.



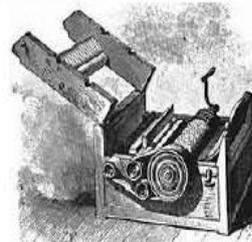
1793

The Industrial Revolution spreads to the United States when Samuel Slater opens the first textile mill in Rhode Island.



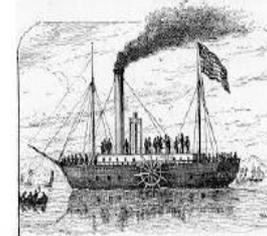
1793

Ell Whitwoy invents the cotton gin greatly increasing the productivity of processing cotton.



1807

Robert Fulton starts the first successful steamboat operation with his boat the Clermont.



1824

Trade unions are legitimized in Great Britain.

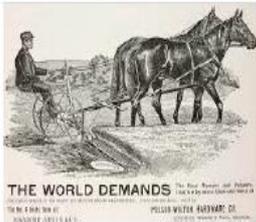


1825

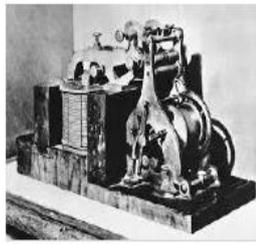
The Erie Canal is completed opening a water route from the Great Lakes to New York City and the Atlantic Ocean.



1831
The mechanical reaper is invented by Cyrus McCormick.



1844
The telegraph is invented by Samuel Morse. This changes the way people can communicate from long distances.



1844
Charles Goodyear receives a patent for vulcanized rubber.



1846
The sewing machine is invented by Elias Howe.



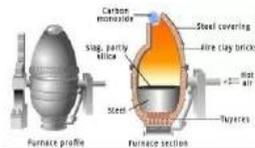
1856
The Bessemer Process for making steel is invented by Henry Bessemer. This allowed for the mass production of inexpensive steel.



1876
Alexander Graham Bell invents the telephone.



1879
Thomas Edison invents the first practical incandescent light bulb. It will allow factories to remain open after dark.



1870
Around this time the Second Industrial Revolution begins. This phase of the Industrial Revolution is characterized by rapid expansion of new technologies such as the telephone, railroads, and electrical power.



1891
The first modern electrical power station is completed to provide power to central London.

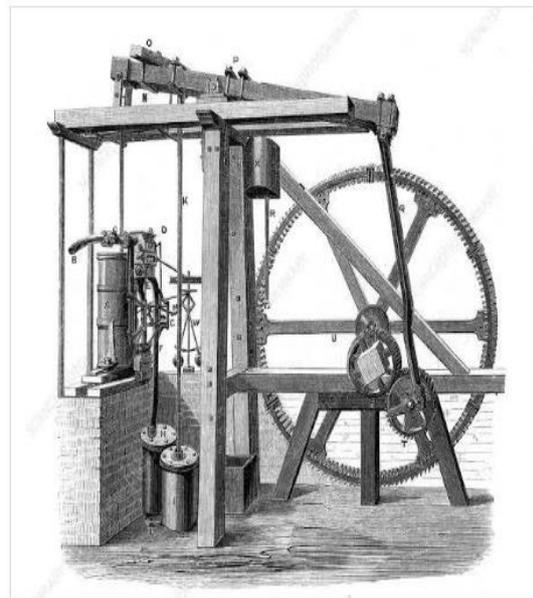
Proto industrialization is the phase of industrialization that was not based on the factory system. Before the coming of factories, there was large-scale industrial production for the international market. However, the pace of this production was not on the level as seen during the industrial revolution.



1764- Invention of Spinning Jenny

The spinning jenny is a multi-spindle spinning frame and was one of the key developments in the industrialization of textile

Watt patented the device in 1769. In 1776 Watt and his business partner, Matthew Boulton, installed two steam engines with separate condensers.



1785- Invention of Power Loom

Appendix VI - Achievement Post Test Answer Sheets

Industrial Revolution - Test

- 1) Name the book published by F.T. Paull.
- 2) What does orient mean?
- 3) What do you understand by Proto-Industrialization?
- 4) Who were the two magicians?
- 5) Whose invention was improved by James Watt?
- 6) Which were the first dynamic industries of Great Britain?
- 7) What was the problem faced by merchants during Proto-Industrialization?
- 8) Who created the cotton mill?
- 9) What were the drawbacks of new technology for industrialists?
- 10) How did the cotton production boom in the late 19th century.

OR

What do you understand by below terms -
(i) stapler (ii) fuller (iii) carding.

Answers -

- 1) → The book published by F.T. Paull was a music book whose cover page announced 'The Dawn of Century.'
- 2) → The countries towards eastern sides of Mediterranean sea, usually Asia. The term was given by western people to the East people & calling them old-minded & traditional.
- 3) → (i) Before 18th century a large amount of production was done for the international market.

- (ii) But this production was not in factories but in Farms.
 - (iii) The production was controlled by guilds & they had complete control over production & labour.
 - (iv) This era of before Industrial Revolution is called Proto-Industrialization.
- 4) → In 1901, the two magicians were shown on trade magazine. One was Aladdin who represented orient people & the other was a factory worker signifying modernity.
- 5) → James watt improved the invention of Newcomen, the steam engine.
- 6) → cotton textile industry & and mining industry were first dynamic industries of Great Britain.
- 7) →
- (i) During Proto-Industrialization guilds were very powerful & had complete control over the production.
 - (ii) The demand for goods was increasing in international market. To fulfill this demand merchants had to tie up with the peasants & artisans of countryside and persuade them to produce for international market.
 - (iii) Also, guilds restricted entry of new merchants in the market. So new merchants had to set up production in countryside.
- 8) → The cotton mill was first created by Richard Arkwright.
- 9) → The drawbacks of new technology were -
- (i) It was very expensive than labour.
 - (ii) The cost of repairing and maintainance was very high.
 - (iii) The productivity of machines was slowly realised by industrialists.
- 10) → cotton production boomed in the late 19th century with the coming up of factories by Richard Arkwright.
The import of cotton increased from 2.5 millions to 22 million pounds.

- 1) The book published by E.T. Paul is 'Dawn of the century' in 1900.
- 2) Orient means under developed Eastern countries, culture and tradition.
- 3) The time between 16-1700th centuries, where mass production was done in the countryside and not in factories is referred as proto-industrialisation.
- 4) The two magicians were Alladin from Orient, who had made a palace, and a Eastern mechanic who made bridges, buildings and industries.
- 5) James Watt improved the steam engine made by ~~the~~ Thomas Newcomen.
- 6) The first dynamic industries of Britain were Cotton and Metal.
- 7) The problems faced by Merchants in Proto industrialisation were long time production of goods and no real watch over quality. This was not suitable for the international market.
- 8) The cotton mill was created by Richard ~~Arkwright~~ Arkwright.
- 9) ① It was very costly to maintain the new machines.
② The machines were not as efficient as the inventors claimed.
- 10) ① stapler - a person who sorts the wool according to its type
② Fuller - Gathers cloth by pleating
③ Carding - The process of preparing fibers to spin them together.

Google form link to Responses of Questionnaire and Feedback Forms

1. Survey Questionnaire Responses:

https://docs.google.com/spreadsheets/d/1kH_z7orhTJboDNrF0AUL11uye_oRwSIHGKgE9gVkxf0/edit?usp=sharing

2. Usability Testing Questionnaire:

https://docs.google.com/spreadsheets/d/17uL4soZ8ZcCBjf_mPpOv2udjxmxvl6aK30rfC4v3_tA/edit?usp=sharing

3. Student Feedback:

https://docs.google.com/spreadsheets/d/1osN7Rvgx47c8gmrtvYZCl-v8jO14SRMG_1Xzex13e7k/edit?usp=sharing

4. Teacher Feedback:

<https://docs.google.com/spreadsheets/d/1icXM0u7O48YjKffkEiAYb7HSyaQvGwMmEoX4dnQo40A/edit?usp=sharing>

Appendix VII Statistical Calculations

Achievement Post Test Evaluation

S. No	X A (Control Group) D = Mean – Individual Scores		X D (Experimental Group) D = Mean – Individual Scores	
		D ²		D ²
1	-2.9	8.41	-5.98	35.7604
2	-1.65	2.7225	-0.73	0.5329
3	0.35	0.1225	1.02	1.0404
4	-1.65	2.7225	-4.48	20.0704
5	1.35	1.8225	-4.23	17.8929
6	4.1	16.81	-5.23	27.3529
7	1.1	1.21	-0.98	0.9604
8	0.6	0.36	-1.73	2.9929
9	3.35	11.2225	-1.73	2.9929
10	-2.15	4.6225	-6.48	41.9904
11	2.35	5.5225	-0.73	0.5329
12	-0.9	0.81	-2.73	7.4529
13	0.1	0.01	5.52	30.4704
14	2.1	4.41	-0.98	0.9604
15	-2.15	4.6225	6.27	39.3129
16	3.85	14.8225	2.27	5.1529
17	1.85	3.4225	7.77	60.3729
18	1.1	1.21	4.77	22.7529
19	-5.4	29.16	-4.73	22.3729
20	1.1	1.21	0.77	0.5929
21	-0.4	0.16	-4.98	24.8004
22	0.85	0.7225	0.77	0.5929
23	1.6	2.56	9.77	95.4529
24	4.1	16.81	2.52	6.3504
25	0.6	0.36	0.77	0.5929
26	-2.4	5.76	-0.98	0.9604
27	-1.15	1.3225	-1.73	2.9929
28	-0.65	0.4225	-2.73	7.4529
29	1.1	1.21	-0.73	0.5329
30	0.1	0.01	1.77	3.1329
31	-3.4	11.56	-4.23	17.8929

32	-1.9	3.61	3.02	9.1204
33	-3.4	11.56	1.02	1.0404
34	-1.9	3.61	5.52	30.4704
35	0.1	0.01	2.27	5.1529
	Sum	174.912		548.099

Mean:

$$\bar{x} = \frac{\sum x}{n}$$

Where, x = each observation and n = number of observations.

Where,

- x1 = Mean of group one
- x2 = Mean of group two
- n = Sample size

$$X A \text{ Mean} = \frac{\text{Total Marks Scored by All Students}}{\text{Total Number of Students}}$$

$$= \frac{613.5}{35} = 17.52$$

$$X D \text{ Mean} = \frac{\text{Total Marks Scored by All Students}}{\text{Total Number of Students}}$$

$$= \frac{686.25}{35} = 19.60$$

$$\text{Mean Difference} = \sum x_{1n} - \sum x_{2n}$$

$$= 19.60 \text{ (X D - Group A Experimental Group)} - 17.52 \text{ (X A Group B - Control Group)}$$

$$= 2.08$$

Standard Deviation:

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{n}}$$

Here,

σ = Population Standard Deviation

x_i = Each value from the population

μ = The population mean

n = The size of the population

Post Test Evaluation:

X D (Group A - Experimental) = Mean – Individual scores (S1)

X A (Group B - Control) = Mean – Individual Scores (S2)

For each group $D = \text{Mean} - \text{Individual Scores}$

$$S_1 = \frac{\text{Total Sum of } D^2 \text{ Values}}{\text{Total Number of Students}} = \frac{174.912}{35} = 4.99$$

$$S_2 = \frac{\text{Total Sum of } D^2 \text{ Values}}{\text{Total Number of Students}} = \frac{548.099}{35} = 15.65$$

$$\text{Square root of } S_1 = \sqrt{4.99} = 2.23$$

$$\text{Square root of } S_2 = \sqrt{15.65} = 3.95$$

t- Value:

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Here,

t = Ratio of the difference between the mean of the two samples and the variation that exists within the sample sets.

\bar{x}_1 = Mean of Sample 1

\bar{x}_2 = Mean of Sample 2

s_1^2 = Standard Deviation of Sample 1

n_1 = Size of Sample 1

s_2^2 = Standard Deviation of Sample 2

n_2 = Size of Sample 2

Where,

$$\bar{x}_1 = 19.60$$

$$\bar{x}_2 = 17.52$$

$$s_1^2 = \frac{\text{Sqrt of } S_1}{\text{Total Number of Students}} = \frac{2.23}{35} = 0.0638$$

$$s_2^2 = \frac{\text{Sqrt of } S_1}{\text{Total Number of Students}} = \frac{3.95}{35} = 0.113$$

$$n_1 = 35$$

$$n_2 = 35$$

$$= \frac{19.60 - 17.52}{\sqrt{\frac{4.99}{35} + \frac{15.65}{35}}}$$

$$\text{Sum of Denominator} = 0.0638 + 0.113 = 0.17685$$

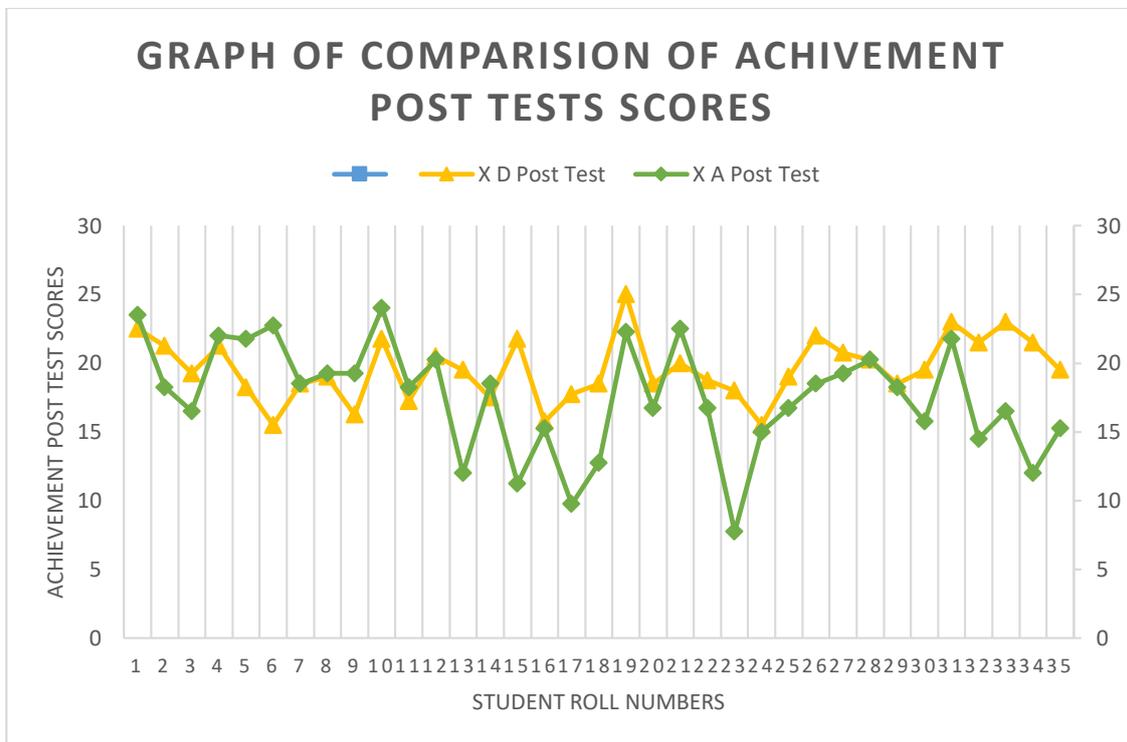
$$t = \frac{2.08}{0.1768} = 11.76$$

Table t - Value is 1.69

Degree of Freedom for t -Test: Size of Sample -1 = 35-1 = 34

Graph Representation:

Graph 4.1
Graph Representation of Achievement Post Scores



Interpretation:

Since calculated t value for degrees of freedom 34 is 11.76 which is greater than table 't' value 1.69 at 0.05 level of significance. It shows that the program is effective. Hence the researcher has accepted directional hypothesis and rejected null hypothesis.

Appendix VIII List of Pilot Study Respondents

List of Experts for Tool and Programme Development:

1. Dr. Pushpa Patil (Professor of Education, Azam College of education)
2. Dr. Bindu Saini (Principal, S. B. Patil Public School, Ravet, Pune)

List of Pilot Study Respondents for Survey Questionnaire:

S. No	Teacher Name	School Name
1	Aparna Pandey	S. B. Patil Public School, Pune
2	Bhawana Chhagnani	Euro School, Kharadi
3	Labheshree Kawoor	S. B. Patil Public School

4	Samruddhi Samir Jadhav	S. B. Patil Public School
5	Suzan Steven Laurence	Dr. (Mrs.) Erin N. Nagarwala (Boarding) School
6	Vandana Ramesh Sangle	S. B. Patil Public School,
7	Ancy Manoj	St. Arnold Central School
8	Padmavati Banda	S. B. Patil Public School
9	Nazneen Ibrahim Golandaz	Erin N. Nagarwala Day School
10	Yogesh Ghaitadak	Holy Spirit Convent School Lonikand
11	Mahmood Husain Rizvi	Simpkins School Agra
12	Dr. Srividya Muthuvel	Sarhad School, Pune
13	Sanjay Saitwal,	KV Sangathan New Delhi.
14	Rita Francis	Euro School Kharadi
15	Ram Sudamrao Gabale	S. B. Patil Public School
16	Mohini Nair	S. B. Patil Public School
17	Parvathi Sagar Sonawane	S. B. Patil Public School
18	Swaleha Mujawar	S. B. Patil Public School
19	Pranita Shitole	Dr. Dada Gujar English Medium School
20	Pravina More	S. B. Patil Public School
21	Sucharita Roy	S. B. Patil Public School

Appendix IX List of Respondents for Final Study

List of Experts for Programme Development and Usability Testing

1. Dr. Pushpa Patil (Professor of Education, Azam College of education)
2. Mrs. Padmawati Banda – Vice Principal and History Teacher for Secondary Section, S. B. Patil Public School
3. Mrs. Pravina More – HOD Social Science, S. B. Patil Public School
4. Mrs. Sucharita Roy – Social Science and History Secondary Teacher, S. B. Patil Public school.

Appendix X – Photographs



