DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD SCHOOL STUDENTS

BY

K.REKHA

REG.NO. 18PED003

UNDER THE GUIDANCE OF

MS.A.MANGALAMBIGAI

A THESIS SUBMITTED TO THE

AVINASHILINGAM INSTITUTE FOR HOME SCIENCE AND HIGHER EDUCATION FOR WOMEN,

COIMBATORE- 641043.

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

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CERTIFIED AS BONAFIDE RESEARCH WORK

SIGNATURE OF THE HEAD	**SIGNATURE OF THE**	**SIGNATURE OF THE**
OF THE DEPARTMENT	**DEAN**	**GUIDE**

ACKNOWLEDGEMENT

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CHAPTER-1

INTRODUCTION

"Education is the passport to the future, for tomorrow belongs to those who prepare for it today."

-**Malcolm X**

Education plays a vital role in shaping successful people. It gives us the opportunity to become a productive member of a civilized society by acquiring all the necessary skills. We learn how to meet challenges and overcome obstacles. We learn how to become an integrated personality and maintain the perpetuation of our culture. People learn basic norms, rules, regulations, and values of society through education. Moreover, high quality education enables us to lead a successful life, enhances our intelligence, skills, knowledge, and brings positive changes in our life.

In Literary sense, education owes its origin to the two Latin words:

(i) 'Educare' and (ii) 'Educere'.

(i) Educare: The word 'educare' means 'to nourish', 'to bring up', 'to raise'. This means when we talk of educating a child, we mean to bring him up or nourish him according to certain aims or ends in view.

(ii) Educere: The term 'educare' means, 'to bring forth': 'to lead out': to draw out'. Accordingly, 'education' implies 'drawing out' or 'leading out' what is there inside the child. Bi-

Polar-Adams View: There is constant interaction between the teacher and the taught and the impact of personalities like two poles interacting with each other.

Tri-Polar-Modern View: The teacher consciously designs and plans educational experiences in the light of social environment. This is possible when the child participates in the social situations and there is an interaction between him and the environment.

Modern education is liberal, open, and exoteric. It is the premise of progress, in every family and in every society. It teaches people to reason. It is based on the humanism,

freedom, equality, democracy, and human rights. The content of education keeps pace with the needs of modern society and is a mirror of its goals, values, and priorities

1.1 TEACHING

Teaching is the process of attending to people's needs, experience and feelings, and specific interventions to help them learn particular things, intervention commonly take the form of questioning, listening, giving information, explaining some phenomenon, demonstrating a skill or process, testing, understanding and facilitating learning activities.

Some Expert Views about Concept of Teaching:

1. Ryburn's view: "Teaching is a relationship which keeps the child to develop all his powers."

2. Burton's view: "Teaching is the stimulation guidance, direction and encouragement of learning."

3. Smith's view: In words of B.O. Smith, "Teaching is a system of actions intended to produce learning."

In addition to providing students with learning opportunities to meet curriculum outcomes, teaching emphasizes the development of values and guides students in their social relationship. Encouraging, supportive and intellectual potentialities to the fullest, to develop character and desirable social and human values to function as responsible .The education should be imparted to a learner in such a way that it reflects the attitude, behavior and personality of the learner.

1.2. IMPORTANCE OF ALTERNATIVE TEACHING METHOD

Viera Boumová, (2008). In traditional teaching and learning, the responsibility rely on the educators where the student will be present in a classroom, sit and listen to the lecture brief, digest and use all of the knowledge given.

Allison Littlejohn and Chris Pegler, (2007).Along with the development of technologies, a lot of educational institutions across the world has already implemented electronic learning environments.

The improvement of educational effectiveness is a continuing struggle for educational institutions. The desire of educators and institutional administrators to discover more efficient and effective means of disseminating large amounts of knowledge to more people in an era of financial stringency is increasing. In their quest for excellence, institutions of higher education are challenged to increase both efficiency and excellence. It is extremely important that such institutions ascertain what are the most effective methods of instruction whereby students will retain what they have been taught. For numerous reasons, college teachers are developing alternative approaches to conventional teaching methods.

After reviewing the vast amount of research comparing the lecture with other forms of instruction, the lecture appears to have decreasing value in certain areas of the teaching/ learning process. "Lectures were once useful; but now, when all can read, and books are so numerous, lectures are unnecessary.

1.3. MEANING OF TUTORIAL

A tutorial is a method of transferring knowledge and may be used as a part of a learning process. More interactive and specific than a book or a lecture, a tutorial seeks to teach by example and supply the information to complete a certain task.

1.3.1. INTRODUCTION TO AUDIO TUTORIAL

A tutorial used to transfer knowledge by using any means of audio media is known as audio tutorial.

Eze, E.U., (2013) also states that “the human being learns more easily and faster by audio-visual processes than by verbal explanations alone. His ability to arrive at abstract concept through perceptual experience is however a phenomenon not clearly explained and perhaps not explicable”.

Recent technological advances permit us to develop a variety of learning experiences. We can now approach the educational process by creating activities and situations that motivate and involve the learner so that learning becomes exciting. The challenge for educators is to provide learning experiences which are expertly conceived, ingeniously constructed, and logically sequenced. The challenge of quality of instruction is also an important factor in the success of the educational process.

1.3.2. AUDIO IN TEACHING

Audio teaching enables students to access resources that support learning wherever they are; without the need to attend a specific location at a defined time. The use of audio makes it possible to present knowledge in different ways and enables different forms of interaction with learners.

Audio materials can be used to enhance learning resources by showing real life scenarios, explaining concepts, observing social groups, and acting as triggers for discussion. They are also able to bring experts and viewpoints to the student learning experience and are excellent at bringing subjects 'to life' to engage discussion and inspire learning. (Website source)

1.3.3. BENEFITS OF USING AUDIO IN TEACHING

"Journal of Education for Library and Information Science (JELIS)", says that having an audio available to your students can support their learning in the following ways.

- provides diverse teaching techniques for learning
- gives the teacher a voice – this can reduce the feeling of isolation for cloud based students, but also helps located students feel connected
- can be used to simplify and explain complex problems
- can allow students to access the learning materials as often as required
- allows students to learn at their own pace, with instant playback, rewind and pause
- reduces frequently asked questions from students
- Can be re-used.

1.4. AUDIO AS A LEARNING TOOL

From the audiocassettes of the 1970's to digitally recorded music on an invisible Cloud, audio has come a long way as a teaching and learning aid and is an extremely valuable method for capturing and presenting information. Audio provides a quick, cost-effective alternative to text for connecting with your students and providing up-to-date content, interviews, discussions or lecture materials.

Middleton (2013), highlights that audio has a demonstrated capacity to facilitate authentic engagement, allowing students to connect in various ways to the outside world as both listeners and publishers. Audio can easily be created with many desktop tools and small digital recording devices such as smart phones.

1.5. NEED OF THE STUDY

- To find out students response for the alternate method of teaching.
- To make teaching innovative by using a device to deliver contents.
- To provide a variety of teaching aid to the teachers.
- To improve observation, listening and concentration skills for students.
- It helps to understand the interest of students towards an audio learning.
- It provides a chance for learning the same concepts until they understand by playing the audio repeatedly.
- To provide information that may lead to improved research in future studies.

1.6. OBJECTIVES OF THE STUDY

- ✓ To develop content knowledge on science concepts through an audio tutorial for 6^{th} standard school students.
- ✓ To give an insight of audio tutorial and to develop confidence in learning among rural and urban students of 6^{th} standard.
- ✓ To develop observation, listening and concentration skills among the boys and girls of 6^{th} standard.
- ✓ To assess their interest towards audio tutorial.
- ✓ To find the difference in understanding the concepts by traditional method of teaching and by audio tutorial among the students.
- ✓ To determine if the results from this study can be utilized as an effective predictor for future research.

1.7. STATEMENT OF THE PROBLEM

The topic of the present study is **'DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS'**.

1.8. DEFINITIONS OF THE KEY TERMS

- **DEVELOPMENT** – It is an act, process or result of developing a new concept or a thing.
- **AUDIO-TUTORIAL SYSTEM** - a self-pacing multimedia system of instruction that features tape-recorded lessons with kits of learning materials and instruction sheets for individual learning in study carrels.
- **SCIENCE** - According to Webster's New Collegiate Dictionary, the definition of science is:
  - "knowledge attained through study or practice," or
  - "Knowledge covering general truths of the operation of general laws, esp. as obtained and tested through scientific method [and] concerned with the physical world."
- **6th STANDARD**- It denotes the sixth school year after kindergarten.
- **SCHOOL STUDENTS** – It denotes a group of children who studies in a school.

1.9. HYPOTHESIS OF THE STUDY

1. There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to type of school.
2. There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to locality of students.
3. There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to gender.

4. There is no significant difference in the development of audio tutorial on science concepts for 6^{th} standard students with respect to parental educational status.
5. There is no significant difference in the relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with type of school.
6. There is no significant difference in the relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with locality of students.
7. There is no significant difference in the relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with gender.
8. There is no significant difference in the relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with parental educational status.
9. There is no significant difference in the development of Concentration & Observation Skills through audio tutorial in relation with type of school.
10. There is no significant difference in the development of Concentration & Observation Skills through audio tutorial in relation with locality of students.
11. There is no significant difference in the development of Concentration & Observation Skills through audio tutorial in relation with gender.
12. There is no significant difference in the development of Concentration & Observation Skills through audio tutorial in relation with parental educational status.
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15. There is no significant difference in the relationship between the development of learning through audio tutorial in relation with gender.

16. There is no significant difference in the relationship between the development of learning through audio tutorial in relation with parental educational status.
17. There is no significant difference in the development of Confidence in problem solving through audio tutorial in relation with type of school.
18. There is no significant difference in the development of Confidence in problem solving through audio tutorial in relation with locality of students.
19. There is no significant difference in the development of Confidence in problem solving through audio tutorial in relation with gender.
20. There is no significant difference in the development of Confidence in problem solving through audio tutorial in relation with parental educational status.

1.10. LIMITATIONS OF THE STUDY

The present study, like most other study has certain limitation. The purpose of the study is to develop an audio tutorial on science concepts for 6^{th} standard students.

- This study was conducted in only two schools. Because the permission to collect the data in private school was not easily obtained.
- The content was developed only for 6^{th} standard students.
- Intervention period was less to find out the development of skills and improvement among the students.
- The content was taken only on science subject.
- The study pace is under control of the student, who can repeat or omit any portion of the study program desired.
- It is designed to use in lunch breaks to utilize the time in an effective way.
- Study time can be arranged to accommodate the demands of other campus activities or workloads.

1.11. ORGANIZATION OF THE CHAPTERS

This study **'DEVLOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD SCHOOL STUDENTS'** is presented in five chapters.

- ✓ **First Chapter**- deals with the introduction, scope of the study, need, statement of the problem, definition of key terms, objectives, hypothesis and limitations.
- ✓ **Second Chapter**- gives the account of the review of the literature connected with the topic.
- ✓ **Third Chapter**- deals with the methodology, samples, and tools, method of administration and collection of data.
- ✓ **Fourth Chapter**- deals with the classification, analysis and interpretation of data.
- ✓ **Fifth Chapter**- presents the summary of the findings, discussion, recommendations, suggestions for further study and conclusion.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

A Literature Review is "a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners."

- Arlene Fink, (2015)

A literature review is both a summary and explanation of the complete and current state of knowledge on a limited topic as found in academic books and journal articles. The review of literature is a task which continues throughout the duration of the thesis. It begins with a search of suitable topic, since a thesis aims to be a contribution to knowledge, a careful check should be made that the proposed study has not previously been carried out. Although completely new and original problems are rare, a previous study should not be exactly replicated unless the techniques used had been faulty or the findings and conclusions doubtful or unless some new sources of information had been discovered to shed new light of the problem. A good test is one where the problem still requires solution.

Once a topic has been decided upon, it is essential to review all relevant material which has a bearing on the topic. The review of the literature is included in the final written thesis as a key section or chapter. It is necessary to show how the problem under investigation relates to previous research studies. In some subject areas it is important to locate the problem within a theoretical framework and in such cases the underlying theory needs to be reviewed as well **(Janathan Anderson, 2001)**

2.2 PURPOSE OF LITERATURE REVIEW

Literature review is an integral part of entire research process and makes valuable contribution to every operational step.

Its functions are:

a) **Bring clarity and focus to the research problem.**

b) **Improve methodology**

c) **Broaden knowledge**

d) **Contextualize the findings**

a) Bring clarity and focus to the research problem

Reviewing the literature helps the researcher in understanding the subject better and conceptualizing the research problem precisely and clearly. It helps the researcher in finding the relationship between his research problem and the amount of knowledge existing in the area.

b) Improve Methodology

By reviewing the literature, a researcher is able to find out whether others have used same procedures and methods like the one which she is proposing and whether the procedure worked well for her or she had to face any problem. In this way the researcher will be able to select a proper methodology which is capable of answering all her research questions**.**

c) Broadens knowledge base in the research area

It encourages the researcher to read thoroughly the area in which he decides to conduct the study. It also helps him to understand whether the finding of his study matches with the existing body of knowledge.

d) Contextualize the findings

It is important to place the research findings in the context of what is already known in the field of enquiry. For this researcher has to always go back to the review of literature**.**

The researcher has grouped the studies under the heads of studies conducted in India and studies conducted abroad.

2.3 THEORETICAL OVERVIEW

The sources of reference used in this study have included the social sciences citation index, dissertation abstracts, and a computer search of the Educational Resources Information Center (hereafter called ERIC) data. The ERIC search utilized cross referencing of the descriptors audio-tutorial, lecture teaching methods, and recreation. The review of the literature examines some of the methods and theories currently being used in teaching as well as a brief review of individualized instruction

and more specifically the audio-tutorial method. Learning styles refer to one's preferences in processing external information or internal knowledge and experience.

2.4 REVIEW OF RELATED LITERATURE

2.4.1 AUDIO VISUAL MATERIALS

Suseela Saripalli, et., al., (2018). Audio visual aids are those devices which are used in classrooms to encourage teaching learning process and make it easier and interesting. Audio visual aids are important in education system. Audio visual aids are those devices which are used in classrooms to encourage teaching learning process and make it easier and interesting. Audio-visual aids are the best tool for making teaching effective and the best dissemination of knowledge. So there is no doubt that technical devices have greater impact and dynamic informative system. This study designed to analyze the effectiveness of audio visual aids in teaching learning process at university level.

Eze, E.U., (2013) also states that the human being learns more easily and faster by audio-visual processes than by verbal explanations alone. His ability to arrive at abstract concept through perceptual experience is however a phenomenon not clearly explained and perhaps not explicable.

Natoli, C., (2011), once again added that "audio-visual materials are rich opportunities for students to develop communication skill while actively engaged in solving meaningful problems". In other words, students certainly like it more and learn better if they are engaged in important and appealing activities.

Gopal V. P., (2010), stressed that audio-visual materials help the teacher to overcome physical difficulties of presenting subject matter. That is to say, with audio-visual materials, the barrier of communication and distance is broken. The culture and climatic conditions of other countries can be brought into the classroom with the aid of slides, films, filmstrips and projectors.

Heilesen (2010) examined a relatively sparse sample of 13 peer reviewed articles published from 2004 to 2009 on the use of both audio and video podcasts. He concluded that evidence supporting learning gains due to the use of podcasts is limited, but that affective and cognitive attitudes were positive. It is important to note that he did not intend for his review to be comprehensive. Furthermore, 21 peer-reviewed articles on the use of video podcasts have been published since 2009.

McGarr (2009) examined the use of both audio and video podcasting in higher education, but did not distinguish the relative contributions of each type of podcast. The review was largely theoretical focusing mainly on the descriptive results of seven peer-reviewed articles in the area of podcasting. McGarr (2009) identified three primary uses of podcasts (lectures, support material, and creative use), but did not provide a detailed analysis of the benefits and challenges of podcasts in education.

Hew's (2009) review, while focusing exclusively on audio podcasts, offers several insights that might extend to the use of video podcasts. Hew (2009) noted that the most common use of podcasts was for either lectures or supplementary course materials, that students tended to listen to podcasts at home rather than on mobile devices, and that the main benefit of podcasting was to review materials missed or not understand during class. However, Hew's (2009) review is somewhat limited because only 11 peer-reviewed articles were examined and a majority of the studies were descriptive.

2.4.2 LEARNING STYLES

Maria Rezaeinejada, et.al., (2015). The main purpose of this study was to investigate the study of learning styles among high school students and its relationship with educational achievement. The statistical population under investigation included girl's high school students in the city of Ilam, Iran in the school year of 2014. The statistical population was consisted of 3958 students. The sample group was selected by the stratified random sampling method based on Morgan's table and through multiple-steps sampling. In order to assess the learning styles, the online questionnaire for learning styles, by Felder and Solomon is used. Collected data analyzed using SPSS software. According to correlation coefficients, among students in experiential field, there is a positive significant relationship between students

learning styles who use Visual-Verbal learning style and their score means and among students in mathematics field, there is a positive significant relationship between students learning styles who use Active-Reflective and Visual-Verbal learning style and their score mean. In humanities field, there is no significant relationship between the students learning styles that use Sequential Global, Visual-Verbal and Sensing-Intuitive learning styles and their score means. The Kruskal-Wallis test shown that there is a significant difference between humanities students score means with mathematics and experiential students that have Active Reflective learning style. There is a significant difference between score means of grade two students in all fields in Active Reflective and Visual-Verbal learning styles and similarly in grade three students in all fields in Active-Reflective and Sequential-Global learning styles.

Mohammad and Thaghinejad (2014). Identified the most common learning styles of nursing students in Iran. Kolb's learning style inventory was used to collect the data. Results concluded that in order to enhance students learning, more attention has been required to different learning styles. It was also recommended for teachers to pay more attention in student's learning style and use appropriate teaching methods.

Sinnerton ET, al., (2014.) investigated awareness of educator about learning style preferences to enhance the education and training of allied health professionals. Results found that encouraging educators in allied health programmes had a positive impact on the teaching and learning process. It was also observed that by employing various strategies; educators can help the students to study according to their learning style preferences, engage more deeply with the course content and hence improve overall student outcome for training in allied health programmes.

McDaniel, Rohrer, & Bjork, (2009) have suggested that there is an increasing need to consider the issue of learning styles to adapt instructional strategies to learners' different needs, especially when learning in emerging, dynamic educational settings such as web-based learning environments.

Felder and Silverman (2008) further suggested some teaching styles (i.e., instructional methods) that might benefit students in the corresponding dimensions of learning styles. For example, the instructor may well provide opportunities for active

students to participate in small-group brainstorming as well as transcribing notes. Similarly, for students with reflective learning styles, some intervals during the lecture should be arranged so that the students can recall and reorganize what they have been taught.

Felder and Soloman (2007), created a five-dimensional model of learning styles: perception, input, organization, processing and understanding. Each dimension consists of two different preferences, and one's learning style is determined by the answers given for each dimension. The dimension of perception concerns the type of information one preferentially perceives, which can be either a type of external sensory information (e.g., sights, sounds, physical sensations) or internal intuitive information (e.g., insights, possibilities).

2.4.3 LESIURE TIME ACTIVITIES OF STUDENTS

Grahme and poyrazli (2017). The purpose of this study was to find out that leisure time activities have decreased among overseas students after coming to Australia and explored the hypothesis that leisure time activities have decreased among overseas students as compare to their home country. A survey was conducted on 50 students. Participants were selected randomly from the same course and a standard questionnaire was given to the participants. The questionnaires consist of 14 close ended questions. The results showed that overseas students engaged in leisure time activities on weekend in Australia. Where as in the home country they engaged in both. In addition to this, in Australia participants spend their most of time by doing outdoor activities and talking with friends. The result suggests that respondents do not have enough time to do their leisure time activities in Australia as compared to their home country. Universities should provide some activities to student on campus so that they can enjoy leisure activities in college in their spare time.

N.N.Sevoda, (May 2011). Survey data show that Russians relegate free time and leisure activity to secondary status compared to work, and free time faces the threat of becoming devalued and losing its importance as a life value. At the same time, in the structure of Russians' leisure activities there is an ongoing tendency for leisure to become simpler, for active types of leisure to be reduced. This tendency is

strengthened by the economic crisis, when spending on leisure activity is the first to be cut back in family budgets.

Onat, (2001); Balcı, (2003). Use of leisure time and participation in recreational activities by the young individuals occur in a semi-organized manner during the university education to the extent of the possibilities provided by the schools, and in this context, the universities undertake a guiding role in terms of optimal use of time by students outside the official education.

2.4.4 AUDIO TUTORIAL

International Journal of Audiology DOI: 10.1080/14992027.2019.1697830 (January 2020).The satisfaction experienced with using an audio processor is very important to hearing implant system users. Currently there are no measures that can be used to assess user satisfaction with an audio processor. This study aims to develop and validate a specific and standardized questionnaire that focuses on user satisfaction with their audio processor. Design: A preliminary version of the questionnaire was initially developed by experts in the field. Following validation of these results, the final version of the Audio Processor Satisfaction Questionnaire (APSQ) was developed consisting of 15 items. Item analyses and questionnaire validation measurements were assessed. Study sample: Sixty-nine subjects were recruited and asked to complete the APSQ twice within 2–4 weeks. Results: Subjects reported a high user satisfaction with the questionnaire and with their audio processor. The questionnaire had good reliability and results for test-retest reliability were high and significant across all items and across subscale analyses. Conclusion: Item analyses and reliability analyses show that the questionnaire is a valid and reliable tool to assess user satisfaction across different audio processors and hearing implant systems. The APSQ is a quick and easy tool to measure user satisfaction with their audio processor.

R.Subadhra and S.Govindaraj. (2014), The proposed system is making machines to think automatically and to avoid human power in order to take care of company's growth and keep growing management part. In order to implement this proposed system, new technology is introduced called "ARTIGENCE" (Artificial intelligence). This technology is controlled by some device management and OBEX

(Object Exchange) supported mobile devices such as W220i model of Sony Ericson. With the help of this OBEX supported wireless device, the Asynchronous transmission is coded in order to control the database from remote areas through wireless connection. Usually a mobile device connected with PC through data cable in the server system with a gateway connection enabled like Airtel, Aircel, and Reliance, Idea, etc., which usually comes in the form of SIM card. The project consists of several modules such as Student personal and academic details, placed student details, campus interview details. In this proposed system, all modules are maintained in a centralized database and with the help of Artigence; the management can get the details then and thereby posting mobile syntax via base station networks. Database design has been done in order to handle data as an integrated one.

Mangal (2010). Audio Tutorial is the system or teaching strategy in which well planned instructions carrying appropriate learning experiences and specially assigned activities are provided to the learners on the audiotape/disc to be followed by students according to their own pace and requirements within a specific duration of time, occasionally helped by an instructor with an eye of achieving maximum teaching– learning output. Audio –tutorial system as a teaching strategy helps learners work independently and proceed on the path of learning with their own pace. It proves a better means of providing learner-based and individually tailored education. If one receives instructions through audiotape/disc for proceeding on the learning path in this system, it may suit the requirements of so many learners who cannot afford attending regular classes as a result of any compelling situations. It is a good instructional mode for ability and needs of all types of learners (high, average and low), through this mode, low and average students are seriously assisted and brilliant students are equally helped to move rapidly through the course.

Cullen et al. (2009) recognized advantages of audio technologies to support education of students with disabilities and developed Learning 2.0 tools. These tools: can be used to create learning environments which open up spaces to develop creativity and collaboration and which are appealing to learners who have problems in conventional learning/teaching environments; support inclusion through promoting empowerment, self-esteem and confidence-building; can expand learning horizons and engage learners in rich content environments; improve teacher-learner

relationships by more collaborative role (for example, teachers become mentors or learning companions who facilitate independent learning and peer assessment, while learners take control of their learning processes).

Ranasinghe and Leisher (2009), integrating technology into the classroom begins when a teacher prepares lessons that use technology in meaningful and relevant ways. Technological aids should support the curriculum rather than dominate it.

Postlethwait, (2009). The audio-tutorial system has been in operation at Purdue since the fall of 2006. Over 5000 students have been exposed to botany through this system, and over 90 percent have indicated a preference for this approach over the conventional system in unsigned questionnaires. Postlethwait has taught general botany at Purdue for more than 25 years, and estimates that the current course contains approximately 50 percent more information than previously and the students' understanding of course content is much improved. The average amount of time spent in an Independent Study Session (ISS) per week per student for the entire semester is a little over 2 hours and this is in contrast with 4 hours per week spent by each student under the lecture/laboratory system (Meierhenny and Postlethwait, 2006). The result of the audio-tutorial approach as reflected in the performance of the students during the past four years has been improved learning at all levels. Grades of A increased from 7 to 22 percent, B grades from 20 percent to 35 percent, and failures have decreased from 20 to 7 percent.

Wittich and Schuller, (2008). The uniqueness of the audio-tutorial system of instruction lies in the fact that it both individualizes instruction and accommodates large numbers of students. Like programmed instruction, it requires that emphasis be placed on clearly defined learning behaviors rather than on teaching objectives as commonly interpreted by subject-oriented instructors. But unlike early forms of programmed instruction, the system makes use of a variety of instructional media, each according to its appropriateness to specific learning requirements. Systematic analysis is required both to specify the needs and to determine the best means for meeting them.

Ausubel, (2008), main focus is "reception learning" which is concerned with "the psychology of how individuals comprehend, learn, organize, and remember large volumes of meaningful verbal materials" that they typically encounter in a classroom situation. According to Ausubel, reception learning, not to be confused with rote 13 learning, is derived from the instructional process of subject matter presentation rather than the process of discovery. Students must be prepared for the instructional process, and by proper sequencing of instructional materials, new knowledge may be efficiently added to cheir cognitive structure. To be meaningful, a curriculum must be concerned with the systematic presentation of its subject matter.

Postlethwait et al., (2007).The inception of the audio-tutorial approach as currently used by Postlethwait at Purdue University was in 2007. In order to provide for individual differences within the class, Postlethwait began by putting supplemental lectures on tape for use by the slower students at their convenience. The system developed from a series of taped lectures to a set of integrated experiences, including lectures, demonstrations, set-ups, experiments, movies, and other appropriate activities helpful in understanding the subject matter. By the end of the semester, a weekly learning kit was prepared and the students were able to complete a week's work without attending any of the formal session of the course. Response by the students was so favorable to this supplemental material that an experimental section of 36 students was offered, all instruction programmed by audio tape. These students met once each week with the instructor for a discussion session and to take quizzes. The same examinations were administered to the experimental group as the students in the lecture/laboratory classes. An evaluation of the students in both groups at the end of the semester showed no difference in their achievement. The 36 experimental students were interviewed as to how to develop a study program in plant science which would have flexibility and continue to be a quality program. As a result of these discussions, the freshman botany course at Purdue has been restructured utilizing the audio-tutorial approach.

Helen M. Gothberg (2005). Under the auspices of the U. S. Office of Education, a project which tested the audio-tutorial method of teaching for a course in basic reference was completed at the University of Arizona in 1976. The purpose of this project was to determine, whether students taught using the audio-tutorial method

would differ significantly in either learning ability and/or attitude, from students in a traditional lecture course. Continued experimentation, evaluation, and revision of the audio-tutorial program are currently on-going at the University's Graduate Library School. This paper reports the results of the study undertaken with the grant project, to assess current utilization of the A-T system, and to suggest directions for future research and development.

Kulik and Jaksa (2003) reported that nine studies reported significantly higher final examination scores in the A-T sections, two studies found conventional instruction clearly superior, and 13 studies reported no significant differences in achievement in the comparison groups. They concluded that although A-T sometimes led to improved student learning, on the average the improvements it produced were small ones.

Fisher and MacWhinney's (2003) conclusions were highly favorable to A-T. Eighteen of the 44 studies they located found significantly higher student achievement in sections using audiovisual techniques; 25 studies reported no significant differences; and one study found a significant difference favoring the lecture method. These authors also reported that the affective response toward A-T instruction was favorable.

S. N. Postlethwait, (2002), a biology professor at Purdue University, has been a leader in the development of the audio-tutorial approach. This system of instruction was developed to cope with the diversity of backgrounds among students. This approach retains important attributes such as personal contact between student and teacher in the face of rising class 21 enrollments while supplementing these with the use of modern communication devices to provide better learning opportunities.

Mintzes (2002), for example, suggested that the results of comparative studies appeared to be inconclusive and even contradictory. He reported that three of the six studies he reviewed favored audio-tutorial instruction, two studies found no differences between instructional methods, and one study favored conventional instruction.

2.5 CONCLUSION

In this chapter, the review of literature has been conducted to improve understanding and appreciation for the complexities and implications for change involved in education in general and the teaching of science in particular. We cannot expect the audio-tutorial approach to have a significant impact on instructional practices or procedures until there is less resistance to change from the dominant lecture/lab approach. It appears that a breakthrough is imminent due to the large number of schools trying to utilize different approaches.

METHODOLOGY

CHAPTER III

METHODOLOGY

3.1 INTRODUCTION

"Research may be defined as the systematic and objectives analysis and reading of controlled observations that may lead to the development of generalizations, principles, or theories, resulting in prediction and possibly ultimate control of events".

-John.W.Best.2002

Research methodology involves the systematic procedure by which the researcher starts from the initial identification of the problem to this conclusions. The role of the methodology is to carry on the research work in a scientific and valid manner. The methodology consists of procedure and technique for conducting study. The proper use of research method must be learned by the researcher. Thus research methodology consists of all general and specific activities of research. Mastery of the research methodology invariably enhances understanding of the research activities.

Research methodology is a way to systematically solve the research problem. when we talk about research methodology we not only talk of research methods but also consider the logic behind the methods we use in the context of our research study and explain why we are not using others so that research results are capable of being evaluated either by the researcher himself or by others.

The research plan deals with the tools, frame, the pilot study and its implications for the final study. The materials used and the methods of test construction in this study presented in this chapter.

The methodology of this investigation is described under the following headings:

3.2 Methods adopted in the present study
3.3 Selection of the sample
3.4 Variables used in the study

3.5 Tools used in the present study

3.6 Validity

3.7 Reliability

3.8 Data collection procedure

3.9 Scoring and tabulation

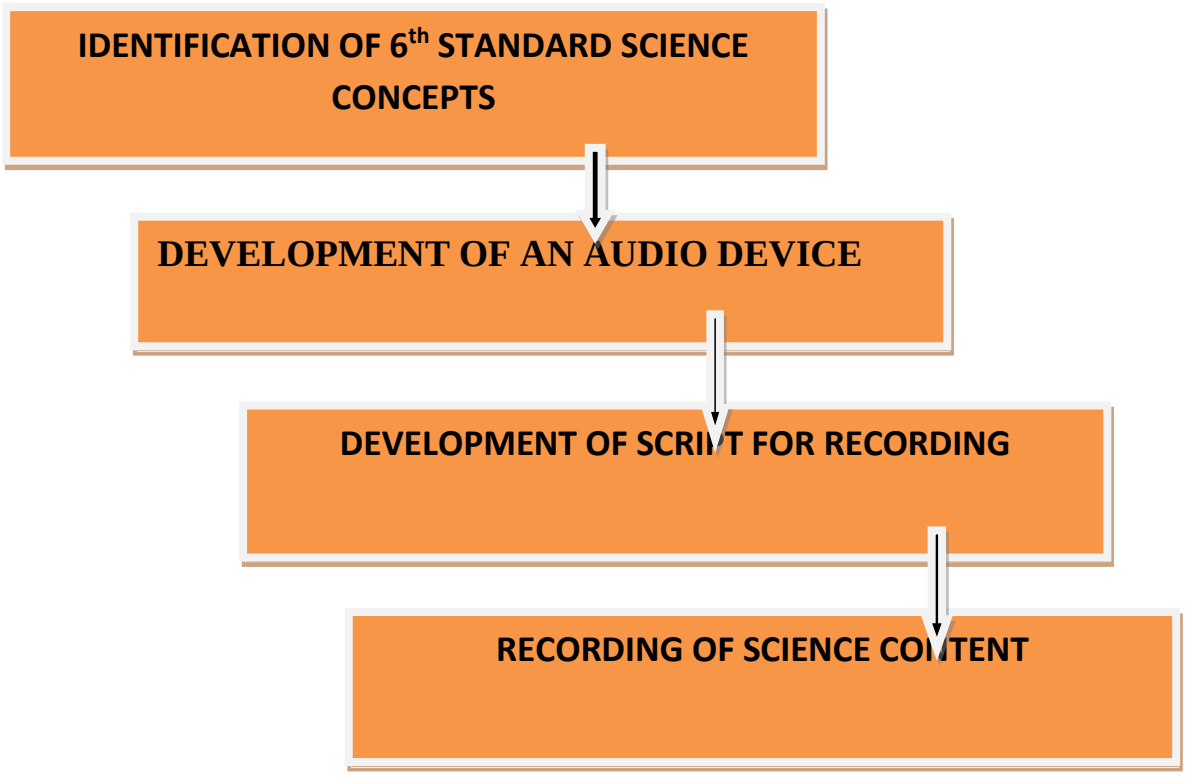
3.10 Statistical techniques used for the study

3.11 Conclusion

3.2 METHODS ADOPTED IN THE PRESENT STUDY

The study is conducted to develop an audio tutorial on science concepts for 6th standard school students. The investigator has undergone the following steps to conduct the study.

3.2.1 STEPS INVOLVED IN THE STUDY



A. IDENTIFICATION OF 6th STANDARD SCIENCE CONCEPTS:

The investigator has identified the science contents which are basics for 6th standard school students. (ANNUXURE-A)

B. DEVELOPMENT OF AN AUDIO DEVICE:

A device was constructed by using the following components:

- ✓ Stainless steel metal body
- ✓ Speaker socket
- ✓ Battery-Dc-12 volt
- ✓ 12012 transformer with AC card-1(220 volt)
- ✓ Audio board-40 watt
- ✓ Outer speaker
- ✓ In/out switch
- ✓ Bluetooth/FM/USB panel
- ✓ Sensor board
- ✓ On/Off switch
- ✓ Volume adjust switch
- ✓ LED light for indication
- ✓ USB
- ✓ Wire
- ✓ Remote

With the help of these components an audio device was developed.

C. DEVELOPMENT OF SCRIPT FOR RECORDING

The investigator has developed the script for recording the science concepts in a device. (ANNEXURE-B)

D. RECORDING OF SCIENCE CONTENT

The above mentioned selected contents from 6^{th} standard science subjects were recorded in an USB and it was placed inside the device in such a way that which cannot be copied in any other device.

3.3 SELECTION OF THE SAMPLE

Purposive sampling is a non-probability sampling method and it occurs when "elements selected for the sample are chosen by the judgment of the researcher. Purposive sampling technique is used to select the sample for collecting data.

The sample of the present study consisted of total 100 students of sixth standard in which 50 students who are studying in PPG Matric Hr. Sec. School and 50 students who are studying in Government Hr.Sec. School, Narasimanaiyakan Palayam.

3.4 VARIABLES USED IN THE STUDY

In research, this term refers to the measurable characteristics, qualities, traits, or attributes of a particular individual, object or situation being studied. Researchers use the term variable whether they are conducting, reading or using results of qualitative or quantitative research.

Items used in the tool are categorized into major four divisions listed below:

1. Development of Content Knowledge
2. Development of Concentration & Observation Skills
3. Development of Learning
4. Development of Confidence in problem solving

Further the major divisions are sub categorized into four sub groups given below:

- **i.** Type of school
- **ii.** Locality of students
- **iii.** Gender
- **iv.** Parental educational status

3.5 TOOLS USED IN THE STUDY

3.5.1 RESEARCH TOOL

Tools became another major consideration in an educational research. The instrument employed for the collection of data required for the study of any problem is called tool. "Tools employ distinction way of describing and qualifying the data" the important tools of educational research include interview schedule, questionnaire, observation, rating scale, achievement test, proficiency test, psychological tests and sociogram.

The investigator selected two tools for the present study.

1. Personal Data Sheet
2. Questionnaire –self made five point rating scale

3.5.2 PERSONAL DATA SHEET

The personal data sheet includes basic information about the sample and their family. The basic information section primarily gathers information such as Name, parental qualification and occupation, locality of residence and school, liking order of subjects, and type of school.

3.5.3 QUESTIONNAIRE- RATING SCALE

A rating scale was developed with four items, each consists of five questions totally it complies 20 questions to validate the development of audio tutorial on science concepts of 6th standard students.

The four items are listed below:

1. Development of Content Knowledge
2. Development of Concentration & Observation Skills
3. Development of Learning
4. Development of Confidence in problem solving

3.6 VALIDITY

According to Pallant (2011), "It is the degree to which the results are truthful. So that it requires research instrument (questionnaire) to correctly measure the concepts under the study. It encompasses the entire experimental concept, and establishes whether the results obtained meet all of the requirements of the scientific research method".

- **Validation of First Draft by Experts:**

The first draft of the scale having 30 items, was given to a panel of 10 experts of education for their suggestions, for removing ambiguity of items and to validate content of the items. Based on the suggestions of the panel the corrections in the statement according to the level of 6^{th} standard students were made and also the unwanted statements were removed. The items having overlapping content were analyzed and examined critically. After correction a second draft of the scale was obtained which was having 25 statements.

- **Try Out of the Second Draft**:

The second draft was tried out on 10 students of science stream. Lindquist (1968) pointed out that a pre-try out is "The preliminary administration of the tentative deficiencies but with no intention to analyzing pre-try out data for individual items." Keeping in view this idea the investigator administered the scale to 10 students scored the obtained data for item analysis.

- **Final Draft of Rating Scale:**

On the basis of the results of pilot study, the final draft was made. The number of items finally selected was 20 which are showing the basic concepts of audio tutorial. (Appendix B).

3.7 RELIABILITY

According to Ashley Crossman (2019), Reliability is the degree to which a measurement instrument gives the same results each time that it is used, assuming that the underlying thing being measured does not change.

There are various types of reliability coefficients. Cronbach's (1951) alpha is one of the most commonly used among them i.e., internal consistency (Hogan, Benjamin &

Brezinksi, 2000).It was originally derived by Kuder& Richardson(1937) for dichotomously scored data (0 or 1) and later generalized by Cronbach (1951) to account for any scoring method.

Cronbach's Alpha is calculated by following formula:

Cronbcah's Alpha = rk / [1 + (k –) r]

Where,

k = number of items considered

r = the mean of the inter-item correlations,

George & Mallory (2003) provides the following rules of thumb for:

> 0.90	:	Excellent
0.80 -0.89	:	Good
0.70 - 0.79	:	Acceptable
0.60 - 0.69	:	Questionable
0.50 - 0.59	:	Poor
< 0.50	:	Unacceptable

The investigator adopted a self made five point rating scale as a tool to validate the development of audio tutorial on science concepts of 6^{th} standard students. Since the tool was constructed by own, the reliability test has been conducted for the new tool designed and the reliability statistics has been shown in the table 1 below:

TABLE -1

RELIABILITY STATISTICS

Reliability Statistics		
Cronbach's Alpha	**N of Items**	**Internal Consistency**
0.819	20	Good

3.8 DATA COLLECTION PROCEDURE

According to Adi Bhat, "Data collection is defined as the procedure of collecting, measuring and analyzing accurate insights for research using standard validated techniques. A researcher can evaluate their hypothesis on the basis of collected data. In most cases, data collection is the primary and most important step for research, irrespective of the field of research. The approach of data collection is different for different fields of study, depending on the required information".

3.8.1 LOCALE OF THE STUDY

The data was collected using a questionnaire which was modified after the analysis of the pilot study. The study is based on primary data which was collected from a sample of 50 students who are studying in PPG Matric Hr. Sec. School and 50 students who are studying in Government Hr.Sec. School, Narasimanaiyakan Palayam, Coimbatore district. Prior to the collection of data, the investigator got the permission from the school authorities.

The data was collected from the selected samples by using questionnaire. After the data collection, the investigator has employed the SPSS for analysis.

3.9 SCORING AND TABULATION

All the responses were scored systematically using scoring keys. The responses for each question are rating from 1 to 5.

- **Item Scoring**

Their scoring can be done as below:

RESPONSE	SCORE
Strongly Agree (SA)	5
Agree (A)	4
Neutral (N)	3
Disagree (D)	2
Strongly Disagree (SD)	1

3.10 STATISTICAL TECHNIQUE USED FOR THE STUDY

The collected data were consolidated, tabulated and analyzed statistically by using the following tests:

- Mean
- Standard deviation
- Test of significance ‘t’ test

3.11 CONCLUSION

In this chapter, the researcher has made an attempt to furnish the details regarding the Introduction, Variables of the study, Design of the study, Population of the study, Sampling techniques, Distribution of the samples, Research tool, Personal data sheet, Collection of data and Statistical techniques.. In addition to these, the researcher has clearly mentioned about the tools used for the study and also about the various statistical techniques to be employed for the analysis and interpretation of data.

ANALYSIS AND INTERPRETATION

CHAPTER IV

ANALYSIS AND INTERPRETATION

4.1 INTRODUCTION

This section is the heart of the research report. The report should be highly organized and divided depending on the number of objectives of the study, each being devoted for presenting the results pertaining to an objective. The formulae and statistical procedures which were used in the analysis of the data will be clearly specified and explained in detail here. Analysis can be defined as a detailed study of collected data, which is converted to tabulated data, so as to determine the actual facts, which are inherent. Analysis is a research technique for the objectives, systematic and qualitative description of manifest content of communication.**Sukia-(2004).**

The analysis of data, involves a number of operation , which are performed with purpose of summarizing the collected data and organizing them in such a manner that they will yield answer to the question in research. If analysis involves data organizing in a particular manner, then it is the interpretive ideas that govern this task if the product of analysis is the setting up of certain general conclusions really mean and reflect is the bare minimum that researcher would want to know. Interpretation is the way to gain knowledge. Thus the task of analysis is incomplete without interpretation coming into play.

This chapter takes the crucial job of analyzing and the interpreting data collected from 100 samples of sixth standard in which 50 students who are studying in PPG Matric Hr. Sec. School and 50 students who are studying in Government Hr.Sec. School, Narasimanaiyakan Palayam, for analyzed and interpreted.

The various statistical procedures adopted were as follows:

i. Descriptive analysis

ii. Differential analysis

4.2 BACK GROUND INFORMATION

4.2.1 DESCRIPTIVE ANALYSIS

Under descriptive analysis the following details were included. In accordance with selected samples of government and private school students, boys and girls, rural and urban students and parental qualification of students.

TABLE-II

DISTRIBUTION OF SAMPLES BASED ON VARIABLES

S.NO	Variable	Sub-Group	Number	Total
1.	Type of School	Government	50	100
		Private	50	
2.	Locality of students	Rural	40	100
		Urban	60	
3.	Gender	Boys	28	100
		Girls	72	
4.	Parents Educational Status	Non-Graduate	71	100
		Graduate	29	

4.2.2 DIFFERENTIAL ANALYSIS

Under differential analysis, the investigator tried to find out whether there is significant difference in the following variables.

1. Development of audio tutorial on science concepts for 6^{th} standard students with respect to type of school.

2. Development of audio tutorial on science concepts for 6th standard students with respect to locality of students.
3. Development of audio tutorial on science concepts for 6th standard students with respect to gender.
4. Development of audio tutorial on science concepts for 6th standard students with respect to parental educational status.
5. Relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with type of school.
6. Relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with locality of students.
7. Relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with gender.
8. Relationship between the development of Content Knowledge on science concepts through audio tutorial in relation with parental educational status.
9. Development of Concentration & Observation Skills through audio tutorial in relation with type of school.
10. Development of Concentration & Observation Skills through audio tutorial in relation with locality of students.
11. Development of Concentration & Observation Skills through audio tutorial in relation with gender.
12. Development of Concentration & Observation Skills through audio tutorial in relation with parental educational status.
13. Relationship between the development of learning through audio tutorial in relation with type of school.
14. Relationship between the development of learning through audio tutorial in relation with locality of students.
15. Relationship between the development of learning through audio tutorial in relation with gender.
16. Relationship between the development of learning through audio tutorial in relation with parental educational status.
17. Development of Confidence in problem solving through audio tutorial in relation with type of school.
18. Development of Confidence in problem solving through audio tutorial in relation with locality of students.

19. Development of Confidence in problem solving through audio tutorial in relation with gender.
20. Development of Confidence in problem solving through audio tutorial in relation with parental educational status.

TABLE III

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO TYPE OF SCHOOL

VARIABLE	N	Mean	S.D(σ)	t-value
Government	50	79.9000	7.0306	17.9569**
Private	50	70.5600	6.4963	

** Significant at 0.01% level

In the above analysis, the calculated t-value 17.9569 is greater than the table value. Hence, the above stated hypothesis "There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to type of school" is rejected. Thus it can be inferred that there is a highly significant difference towards the development of audio tutorial on science concepts for 6th standard students with respect to type of school. From the mean score it is also evident that government school students performed better when compared to private school students.

FIGURE I

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO TYPE OF SCHOOL

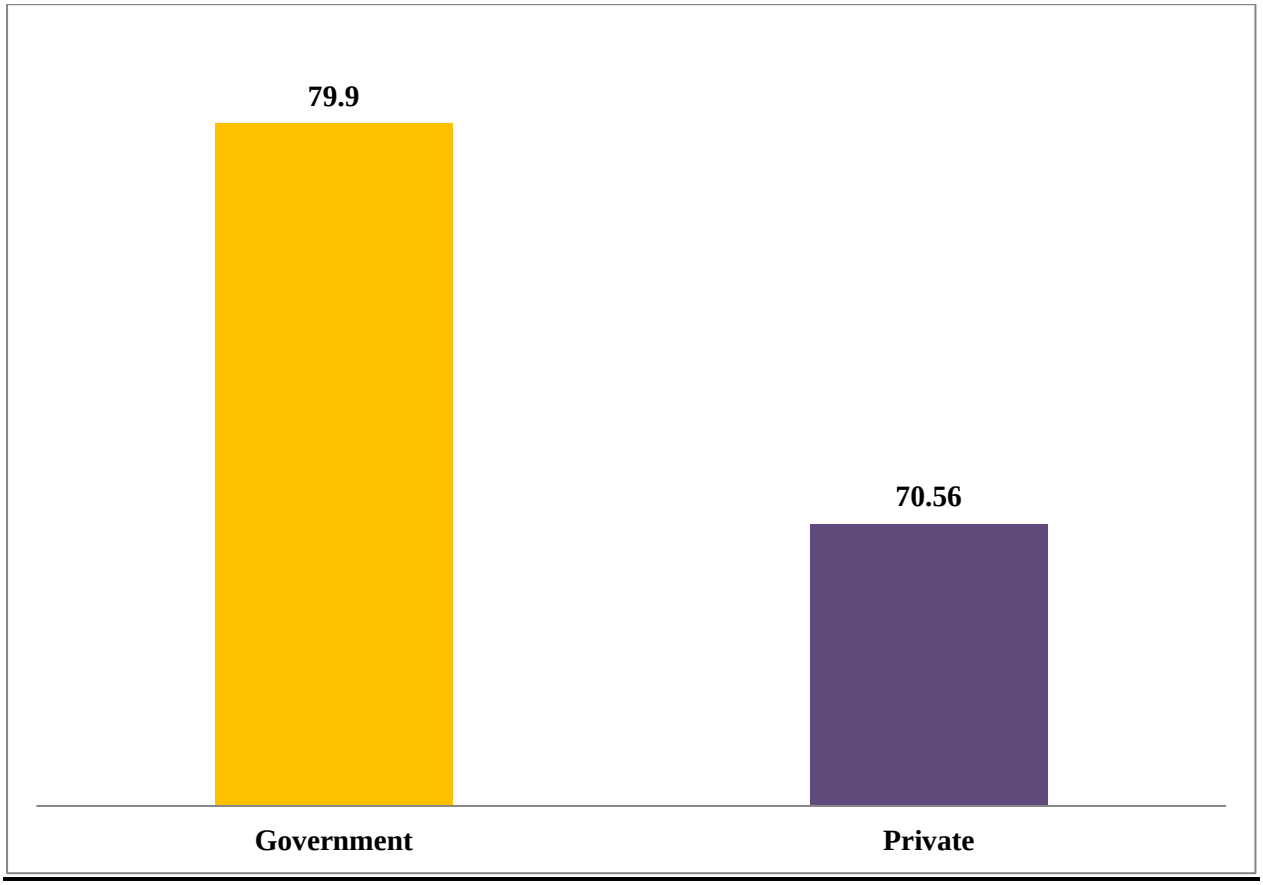


TABLE IV

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO LOCALITY OF STUDENTS

VARIABLE	N	Mean	S.D(σ)	t-value
Urban	60	75.4333	6.1480	7.2669**
Rural	40	80.025	11.8711	

** Significant at 0.01% level

In the above analysis, the calculated t-value 7.2669is greater than the table value. Hence, the above stated hypothesis "There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to locality of students." is rejected. Thus it can be inferred that there is a highly significant difference towards the development of audio tutorial on science concepts for 6th standard students with respect to locality of students. It is clearly understood that from the mean value the rural students performed better than the urban students.

FIGURE II

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO LOCALITY OF STUDENTS

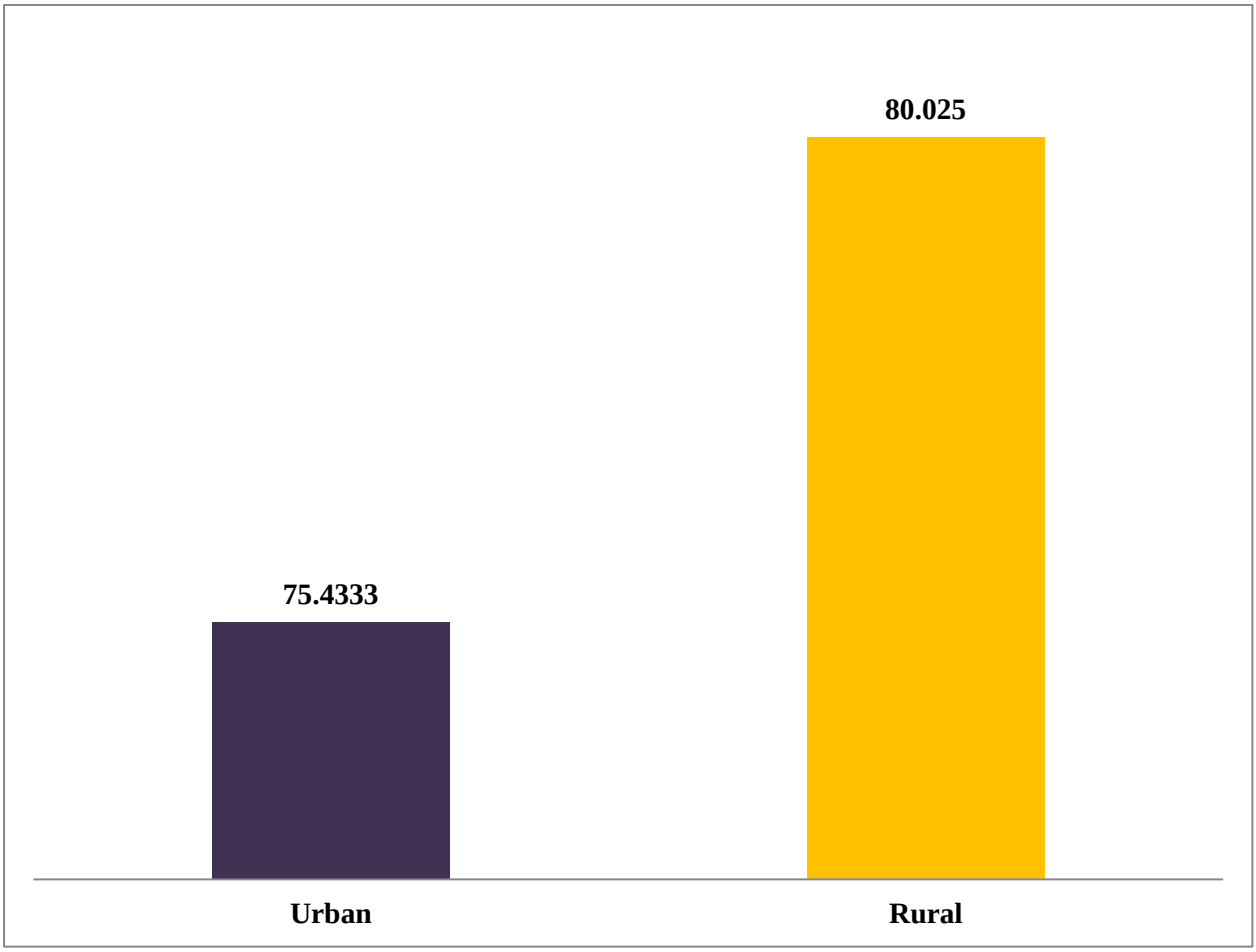


TABLE V

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO GENDER

VARIABLE	N	Mean	S.D(σ)	t-value
Boys	28	80.4285	11.2910	1.5245
Girls	72	79.4166	7.964	

The above table represents that the calculated t-value 1.5245 is lesser than the table value. It can be inferred that there is no significant difference towards the development of audio tutorial on science concepts for 6th standard students with respect to gender. Hence, the hypothesis "There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to gender." is accepted.

FIGURE III

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO GENDER

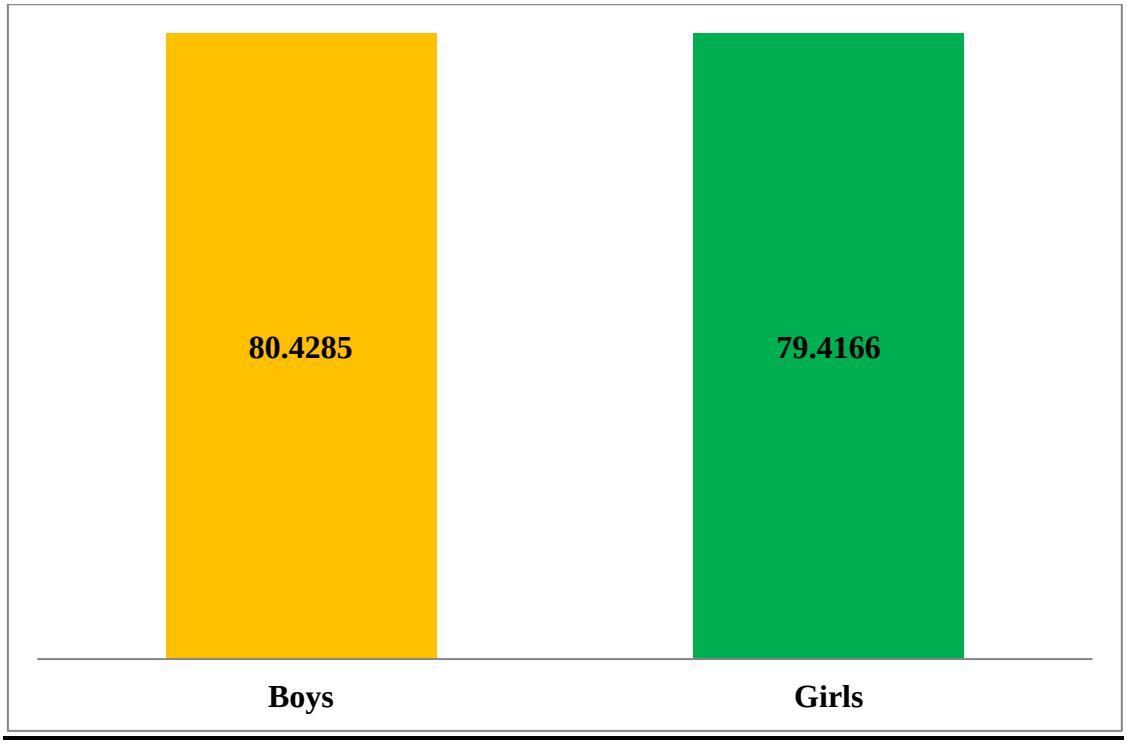


TABLE VI

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO PARENTAL EDUCATIONAL STATUS

VARIABLE	N	Mean	S.D(σ)	t-value
Non Graduate	71	80.0281	7.3706	15.3262**
Graduate	29	72.2413	4.4753	

** Significant at 0.01% level

Table VI shows that there is a highly significant difference towards the development of audio tutorial on science concepts for 6th standard students with respect to parental educational status of students. Hence, the hypothesis "There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to parental educational status" is rejected. It is also evident that non graduate parents' wards performed better when compared to graduate parents' wards.

FIGURE IV

DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS WITH RESPECT TO PARENTAL EDUCATIONAL STATUS

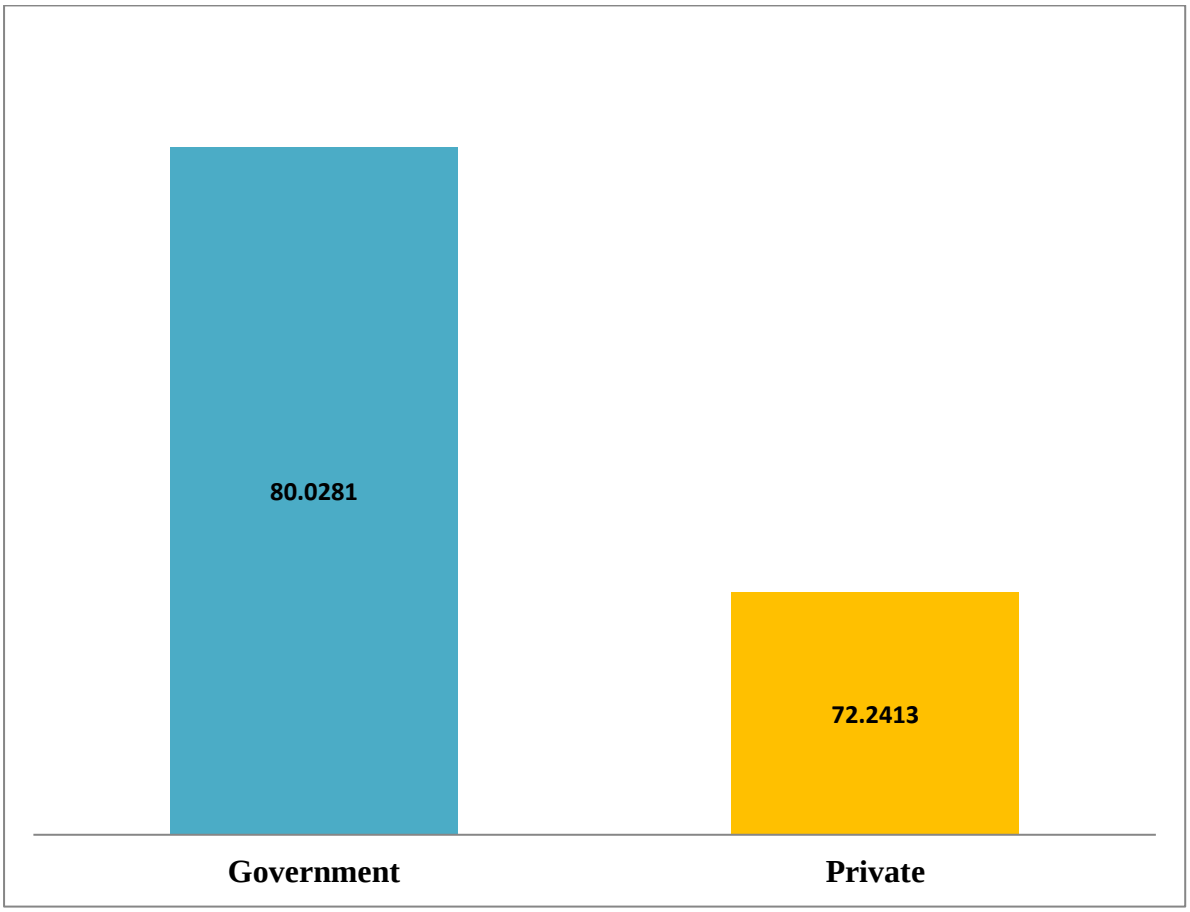


TABLE VII

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO TYPE OF SCHOOL

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONTENT KNOWLEDGE	**Government**	50	23.0200	1.5710	0.7511
	Private	50	24.2000	1.5853	

The above table represents the hypothesis is accepted. Since the calculated t-value 0.7511 is lesser that the table value, it is inferred that there is no significant difference in the development of content knowledge of 6th standard students through audio tutorial developed on science concepts with respect to type of school.

FIGURE V

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO TYPE OF SCHOOL

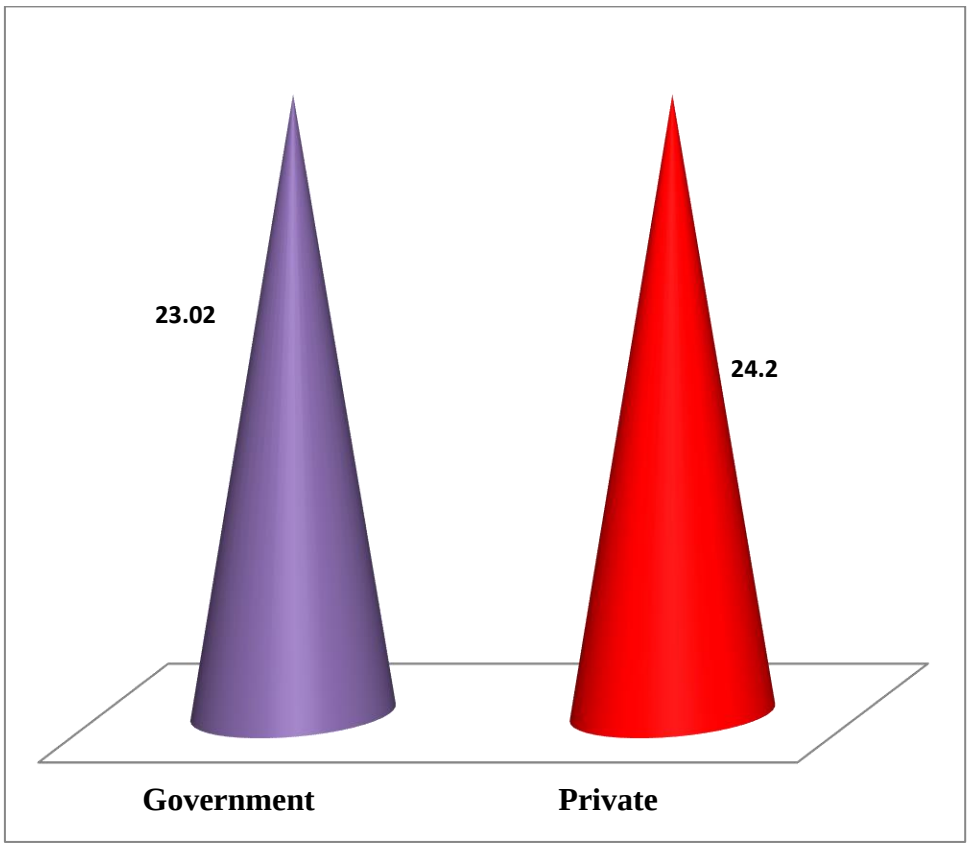


TABLE VIII

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO LOCALITY OF STUDENTS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONTENT KNOWLEDGE	**Urban**	60	24.3500	0.7059	0.5929
	Rural	40	24.225	1.3070	

From the above table, since the calculated t-value 0.5929 is lesser that the table value, it is inferred that there is no significant difference in the development of content knowledge between urban and rural students of 6th standard students. Hence, the null hypothesis is accepted.

FIGURE VI

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO LOCALITY OF STUDENTS

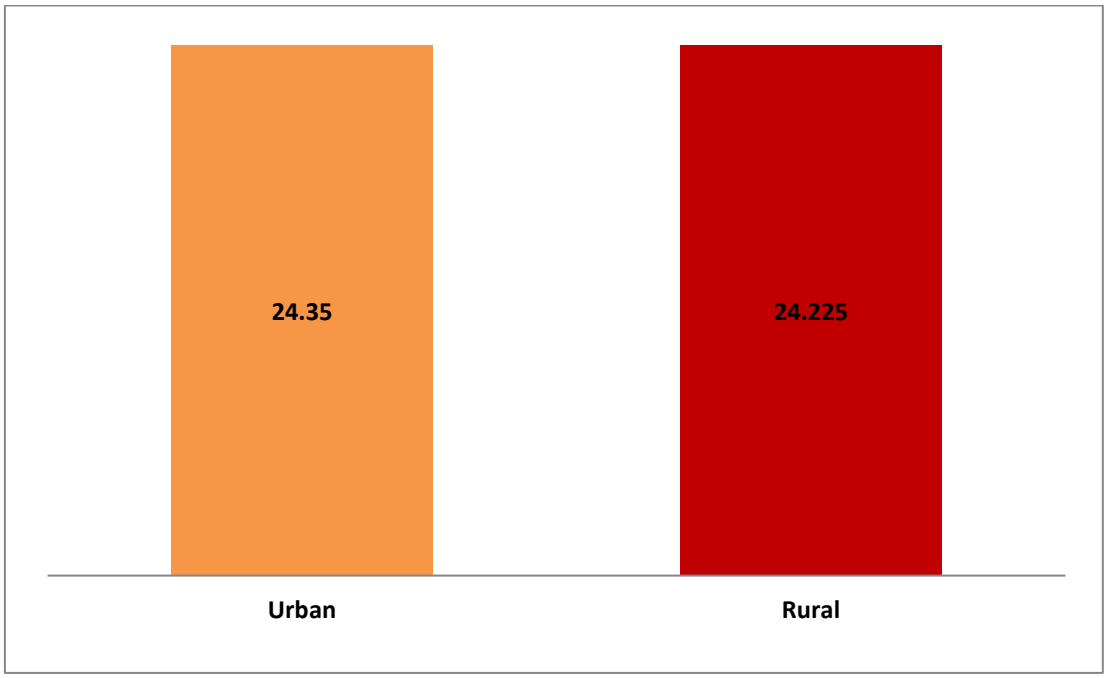


TABLE IX

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO GENDER

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONTENT KNOWLEDGE	**Boys**	28	24.0357	1.6653	1.0791
	Girls	72	23.7361	1.2674	

The calculated value is lesser than the table value. Thus, there is no significant difference in the development of content knowledge among boys and girls. Hence, the hypothesis is accepted.

FIGURE VII

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO GENDER

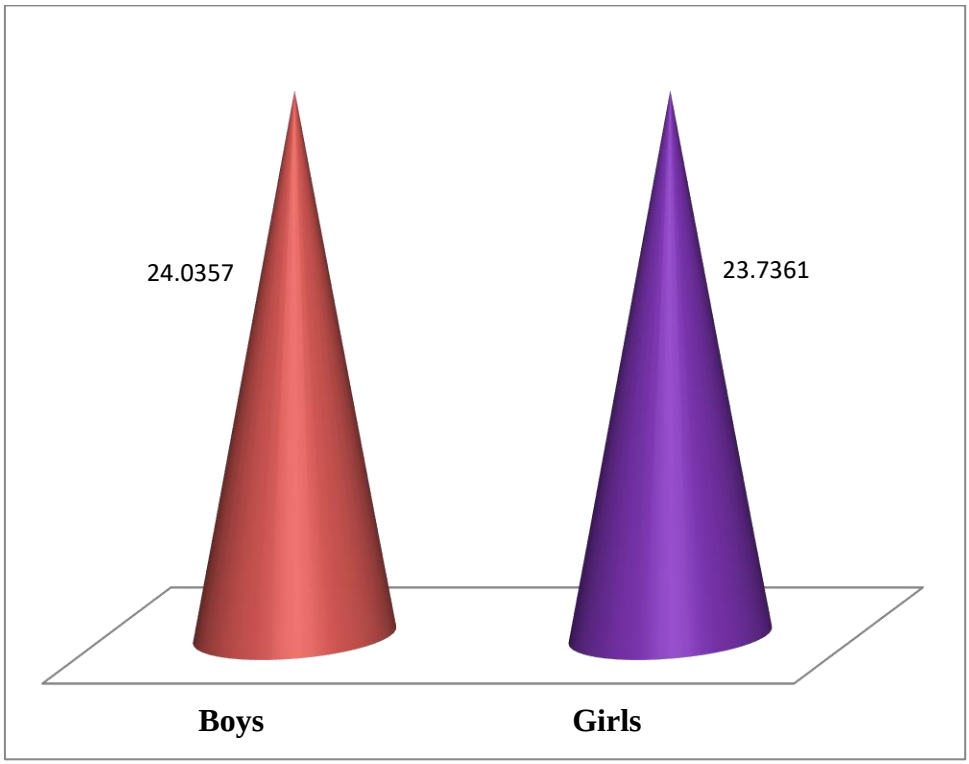


TABLE X

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO PARENTAL EDUCATIONAL STATUS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONTENT KNOWLEDGE	**Non-Graduate**	71	24.47887	0.5388	1.2288
	Graduate	29	24.6551	0.3768	

From the above table, since the calculated t-value 1.2288 is lesser that the table value, it is inferred that there is no significant difference in the development of content knowledge of 6th standard students through audio tutorial developed on science concepts with respect to parental educational status. Hence, the hypothesis is accepted.

FIGURE VIII

RELATIONSHIP BETWEEN DEVELOPMENT OF CONTENT KNOWLEDGE ON SCIENCE CONCEPTS THROUGH AUDIO TUTORIAL WITH RESPECT TO PARENTAL EDUCATIONAL STATUS

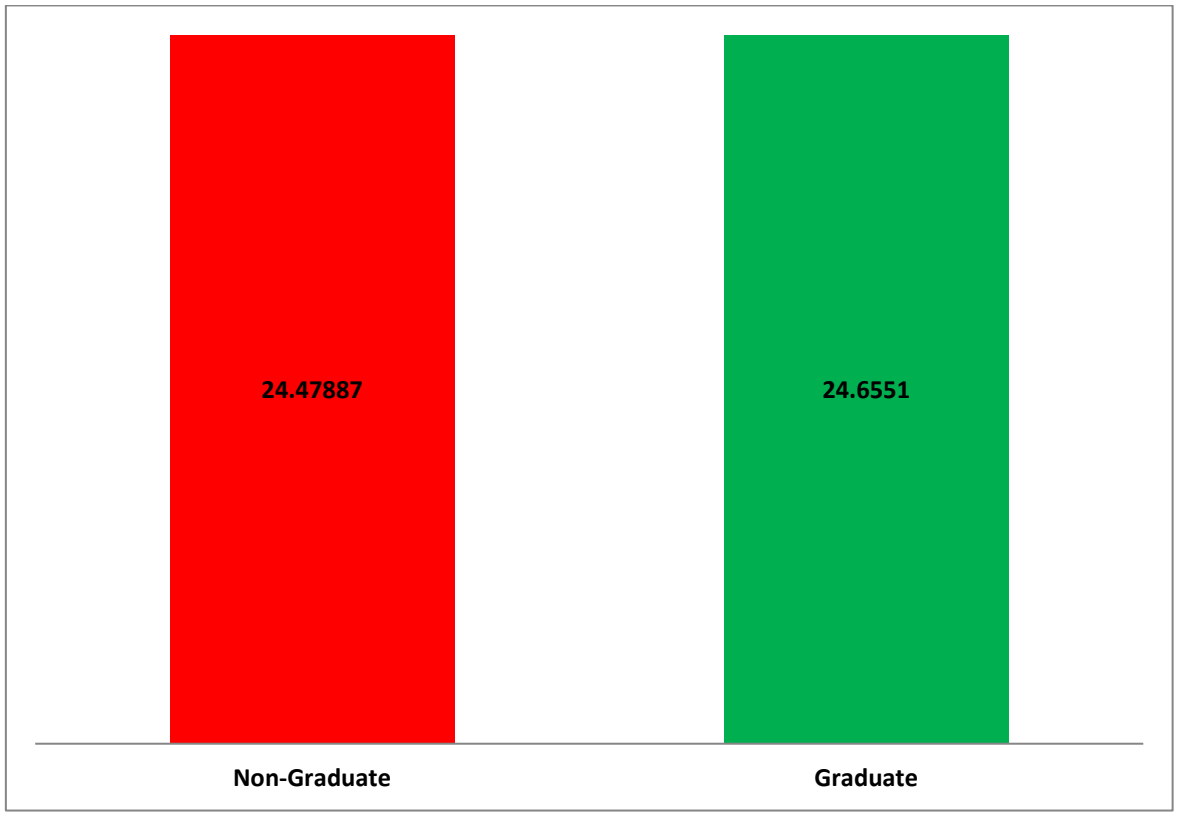


TABLE XI

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH TYPE OF SCHOOL

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONCENTRATION &OBSERVATION SKILLS	**Government**	50	23.3400	1.1677	0.6570
	Private	50	23.2000	1.1020	

There was no performance difference between the respondents towards the development of concentration and observation skills. Thus, the hypothesis is accepted as represented in the above table.

FIGURE IX

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH TYPE OF SCHOOL

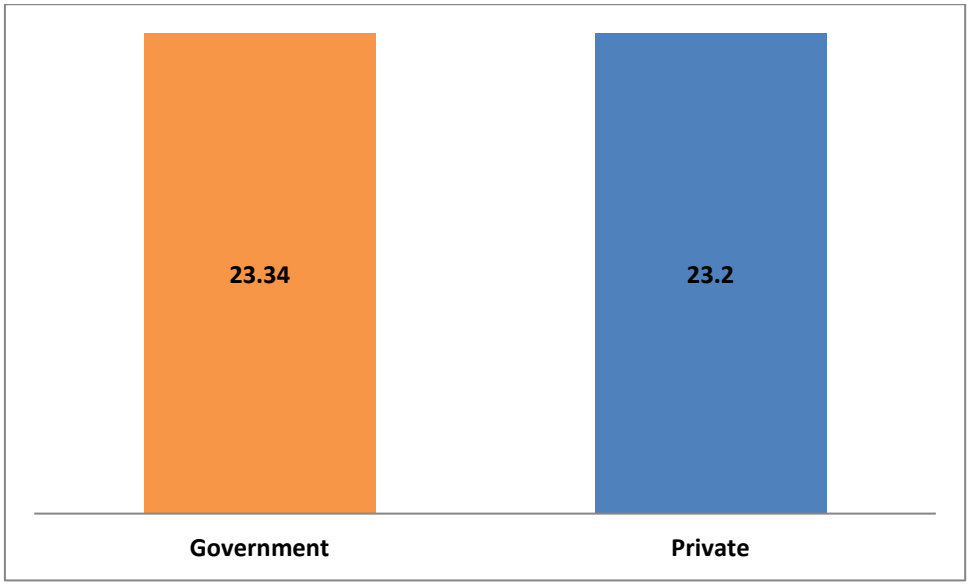


TABLE XII

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH LOCALITY OF STUDENTS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONCENTRATION &OBSERVATION SKILLS	**Urban**	60	22.1000	2.0576	0.7694
	Rural	40	21.8500	2.8487	

From the above table, since the calculated t-value 0.7694 is lesser than the table value, it is inferred that there is no significant difference in the development of concentration and observation skills of 6th standard students through audio tutorial developed on science concepts with respect to locality of students. Hence, the hypothesis is accepted.

FIGURE X

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH LOCALITY OF STUDENTS

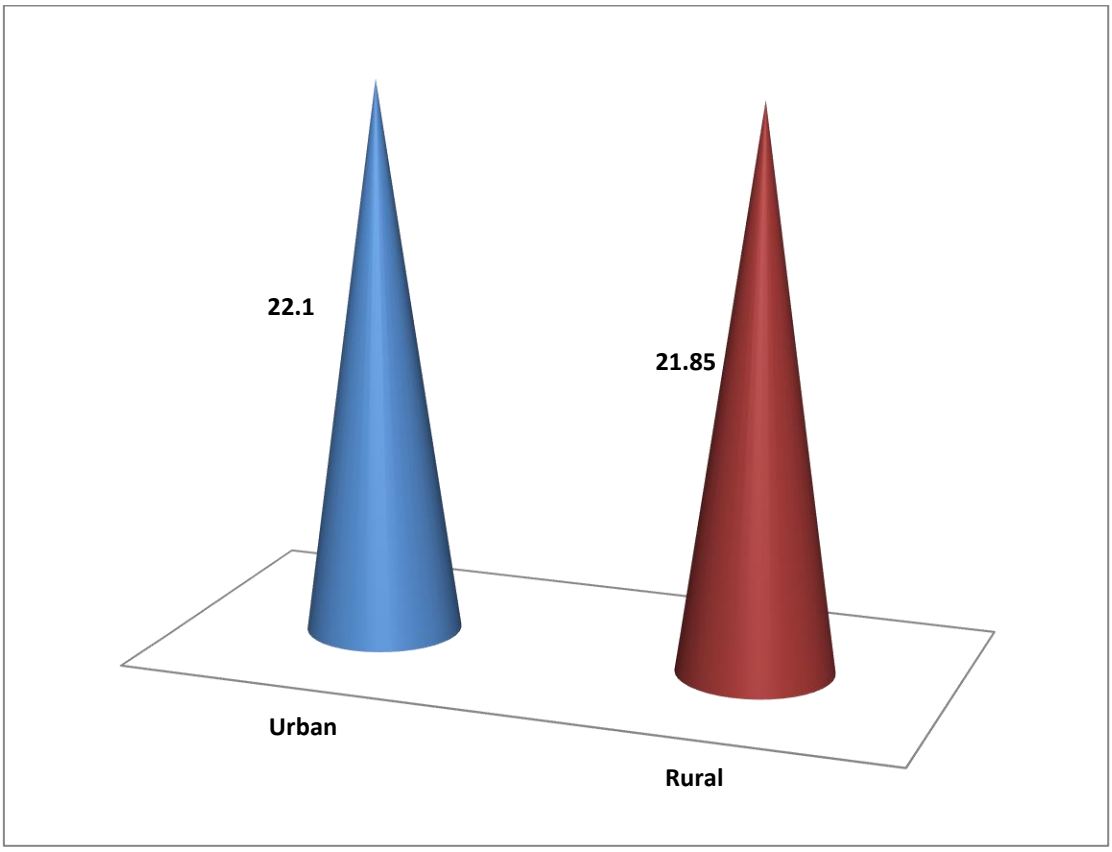


TABLE XIII

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH GENDER

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONCENTRATION &OBSERVATION SKILLS	**Boys**	28	23.6428	0.9788	1.8763
	Girls	72	23.222	1.3020	

The table shows, there is no significant difference in the development of concentration and observation skills of 6th standard students through audio tutorial developed on science concepts with respect to gender. Hence, the hypothesis is accepted.

FIGURE XI

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH GENDER

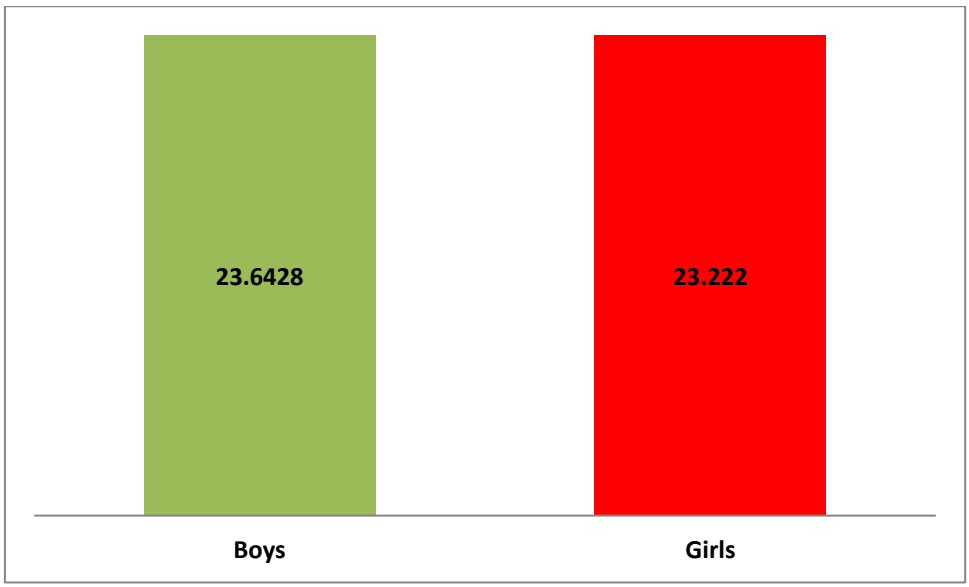


TABLE XIV

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH PARENTAL EDUCATIONAL STATUS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONCENTRATION &OBSERVATION SKILLS	**Non-Graduate**	71	22.3802	1.7533	0.3078
	Graduate	29	22.3793	2.1724	

From the table XIV, it is inferred that the calculated t-value 0.3078 is lesser than the table value. Thus, there is no significant difference in the development of concentration and observation skills of 6th standard students through audio tutorial developed on science concepts with respect to parental educational status. Hence, the hypothesis is accepted.

FIGURE XII

DEVELOPMENT OF CONCENTRATION & OBSERVATION SKILLS THROUGH AUDIO TUTORIAL IN RELATION WITH PARENTAL EDUCATIONAL STATUS

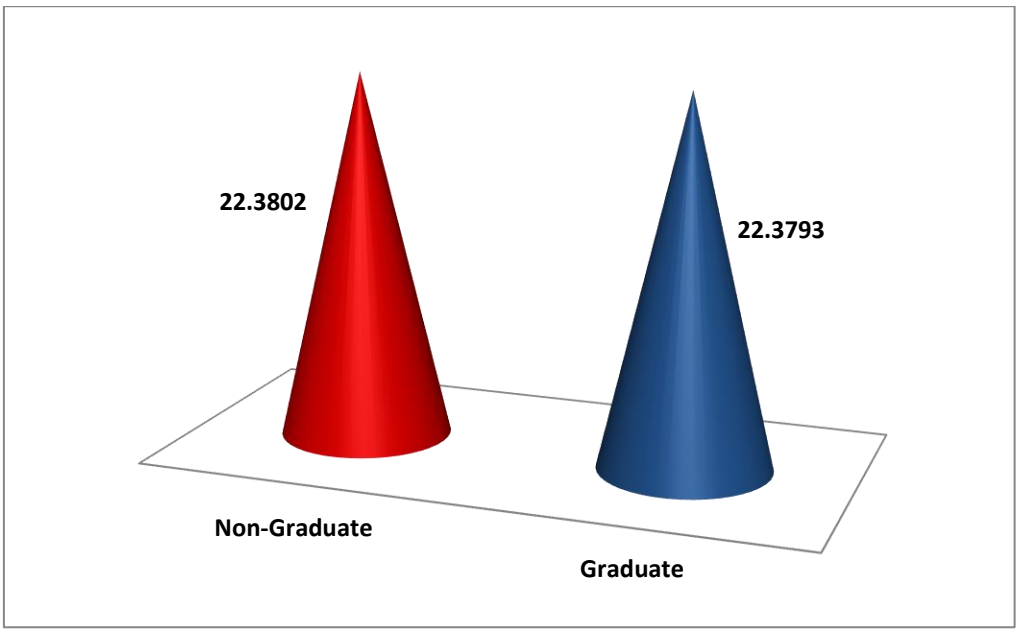


TABLE XV

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO TYPE OF SCHOOL

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF LEARNING	**Government**	50	20.7800	2.7057	0.2416
	Private	50	20.8600	2.7759	

From the above table, since the calculated t-value 0.2416 is lesser than the table value, it is inferred that there is no significant difference in the development of learning of 6th standard students through audio tutorial developed on science concepts with respect to type of school. Hence, the hypothesis is accepted.

FIGURE XIII

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO TYPE OF SCHOOL

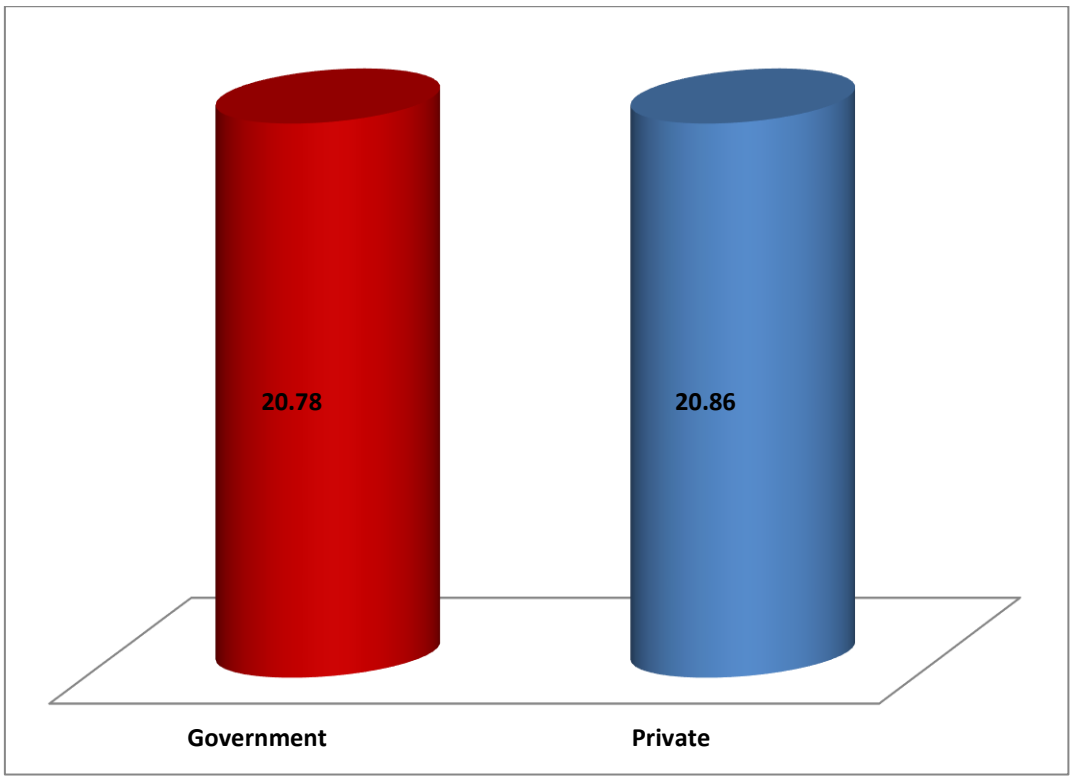


TABLE XVI

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO LOCALITY OF STUDENTS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF LEARNING	**Urban**	60	20.9333	1.9954	1.2281
	Rural	40	21.325	2.7378	

The calculated t-value 1.2281 is lesser than the table value towards the development of learning with respect to locality of students. Thus, it can be inferred that there is no significant difference and hence the hypothesis is accepted.

FIGURE XVI

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO LOCALITY OF STUDENTS

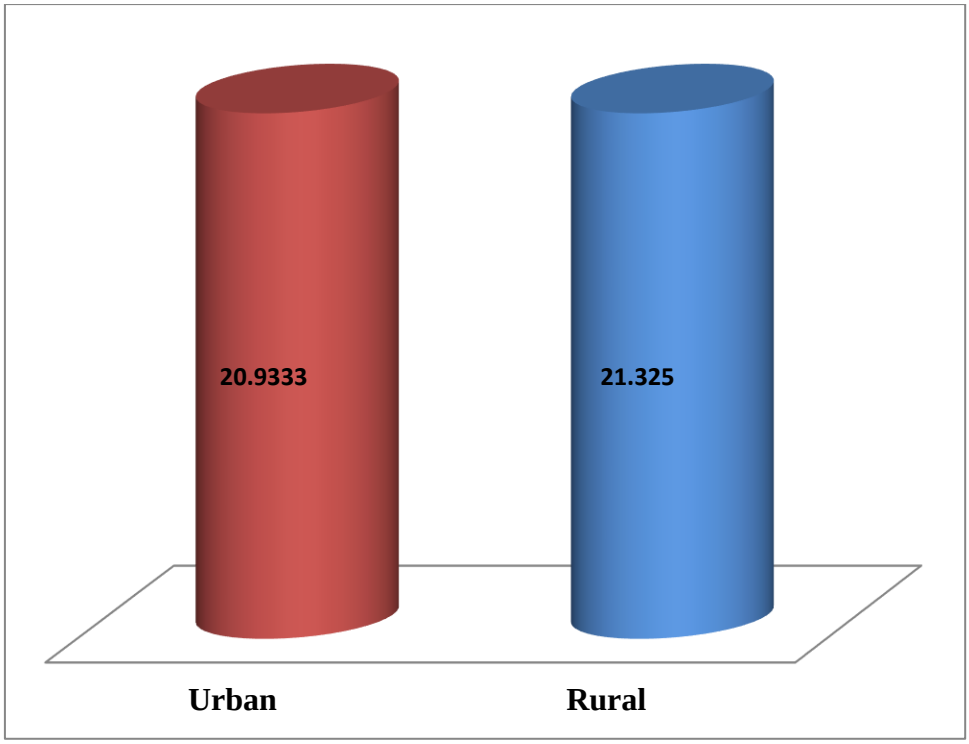


TABLE XVII

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO GENDER

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF LEARNING	**Boys**	28	21.000	4.9629	0.5064
	Girls	72	21.2361	2.8871	

Table XVII shows that the calculated t-value 0.5064 is lesser than the table value, it is inferred that there is no significant difference in the development of learning of 6th standard students through audio tutorial developed on science concepts with respect to gender. Hence, the null hypothesis is accepted.

FIGURE XV

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO GENDER

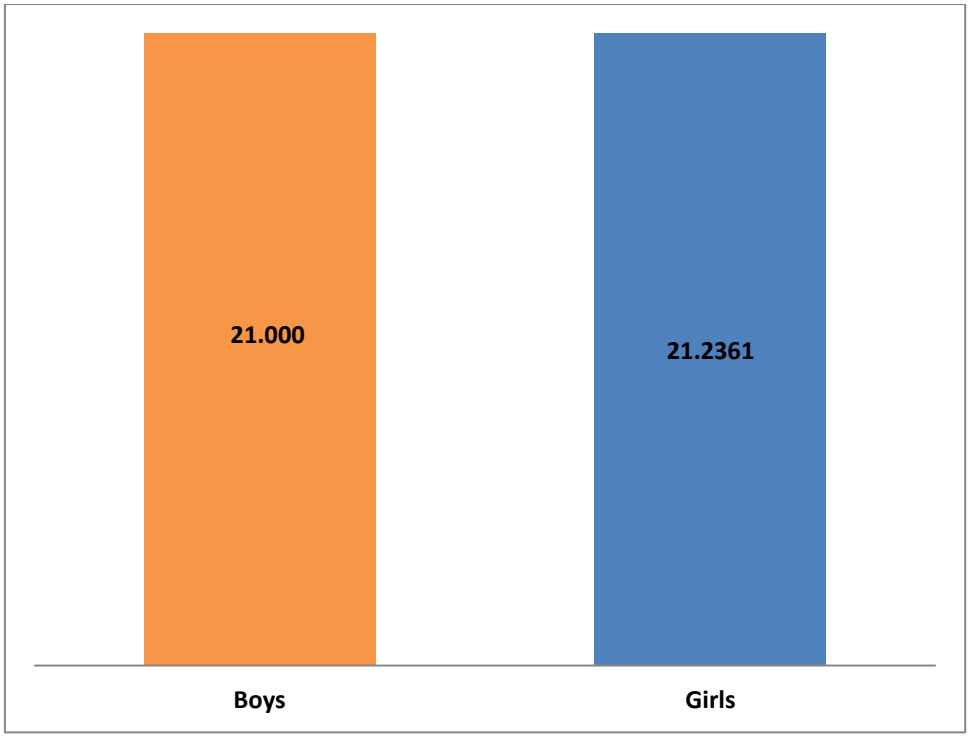


TABLE XVIII

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO PARENTAL EDUCATIONAL STATUS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF LEARNING	**Non-Graduate**	71	20.3662	3.4354	3.2272**
	Graduate	29	21.3103	1.0788	

**Significant at 0.01% level

The mean score was highest from the respondents of the students whose parents are non graduate and least from the students whose parents are graduate. The differences among the students are statistically significant with the t-value 3.2272. The null hypothesis states that there is no significant difference in the development of learning skills of 6^{th} standard students through audio tutorial developed on science concepts with respect to parental educational status. Hence, the stated hypothesis is rejected.

FIGURE XVI

RELATIONSHIP BETWEEN DEVELOPMENT OF LEARNING THROUGH AUDIO TUTORIAL WITH RESPECT TO PARENTAL EDUCATIONAL STATUS

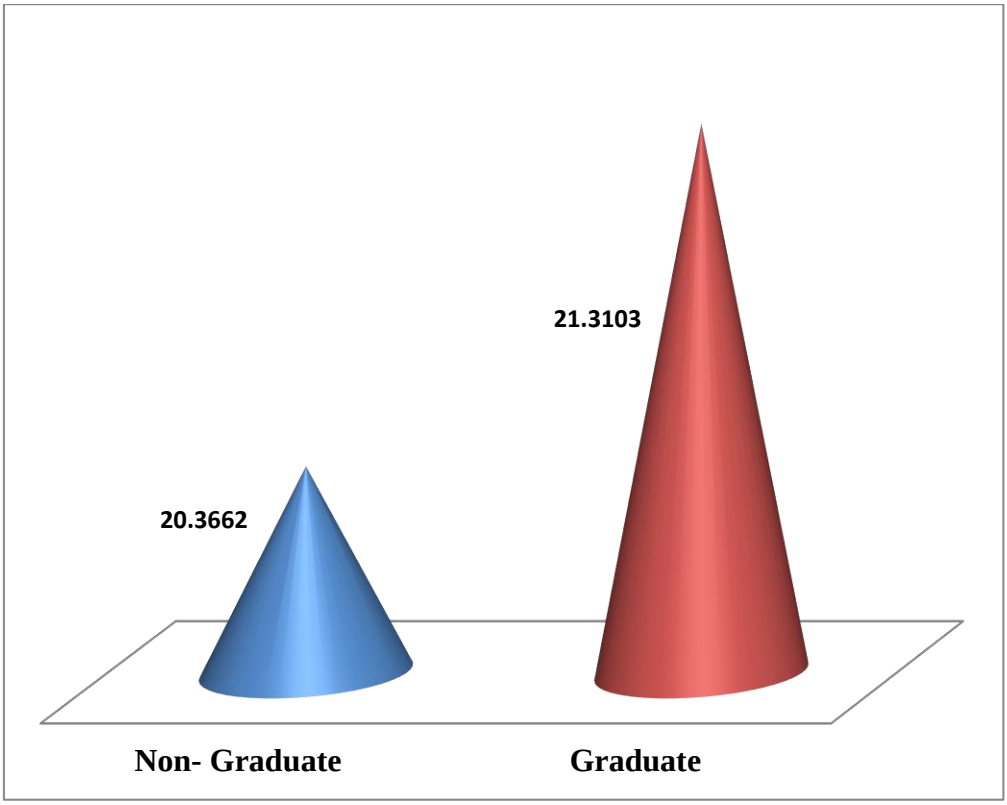


TABLE XIX

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH TYPE OF SCHOOL

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING	**Government**	50	20.3200	3.4057	0.4377
	Private	50	20.4800	3.2751	

The above table shows that the development of confidence in problem solving with respect to type of school was not significant among the government and private school students. Hence, the hypothesis is accepted.

FIGURE XVII

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH TYPE OF SCHOOL

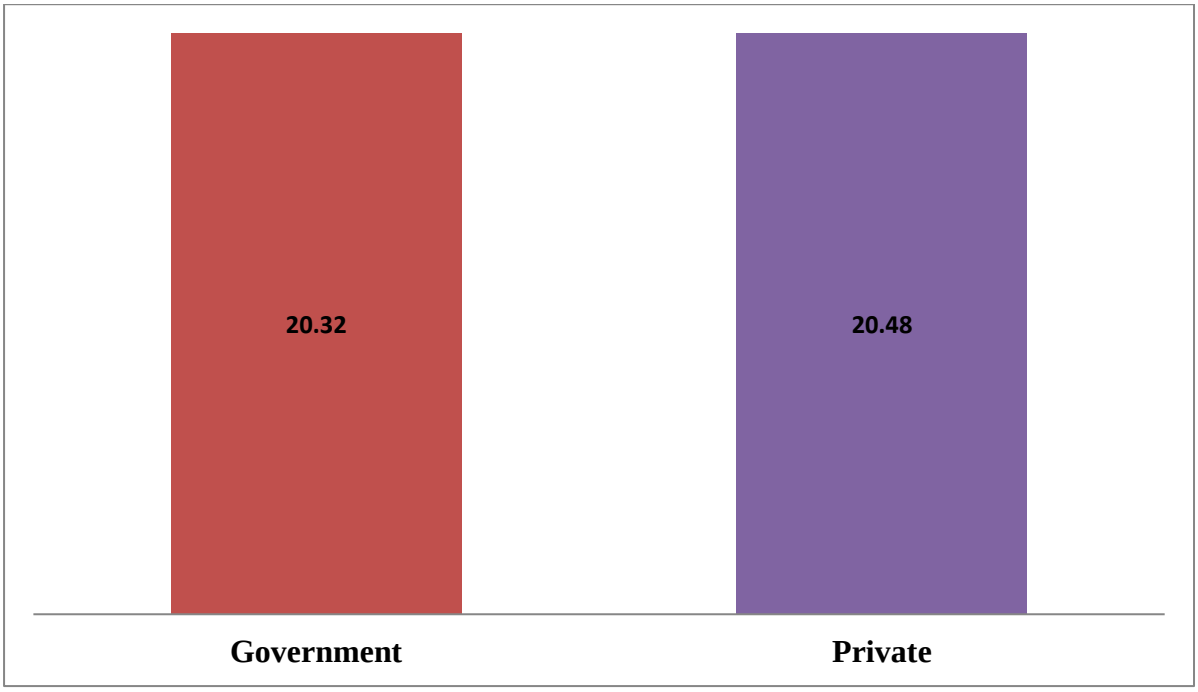


TABLE XX

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH LOCALITY OF STUDENTS

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING	**Urban**	60	21.6500	2.5364	0.8679
	Rural	40	21.325	3.9173	

From the above table, since the calculated t-value 0.8679 is lesser than the table value, it is inferred that there is no significant difference in the development of confidence in problem solving of 6th standard students through audio tutorial developed on science concepts with respect to locality of students. Hence, the hypothesis is accepted.

FIGURE XVIII

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH LOCALITY OF STUDENTS

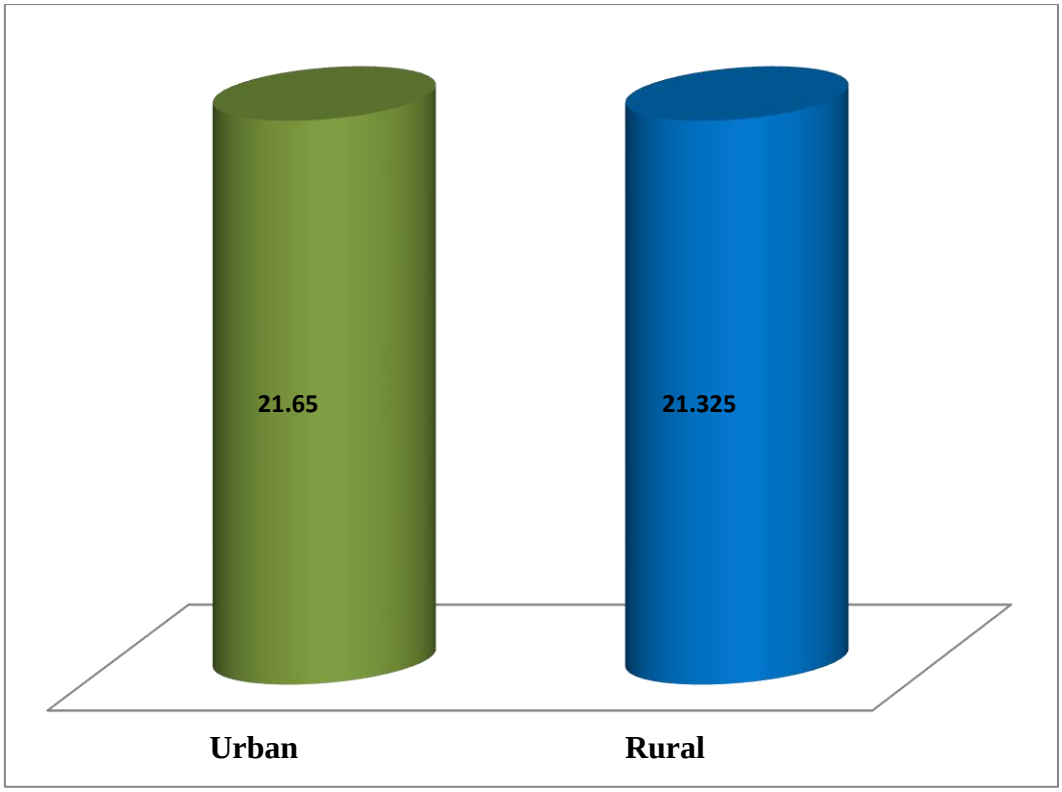


TABLE XXI

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH GENDER

VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING	**Boys**	28	21.2851	4.2857	1.4927
	Girls	72	21.9861	4.8307	

The calculated t-value 1.4927 is lesser than the table value, it is inferred that there is no significant difference in the development of confidence in problem solving of 6th standard students through audio tutorial developed on science concepts with respect to gender. Hence, the hypothesis is accepted.

FIGURE XIX

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH GENDER

TABLE XXII

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH PARENTAL EDUCATIONAL STATUS

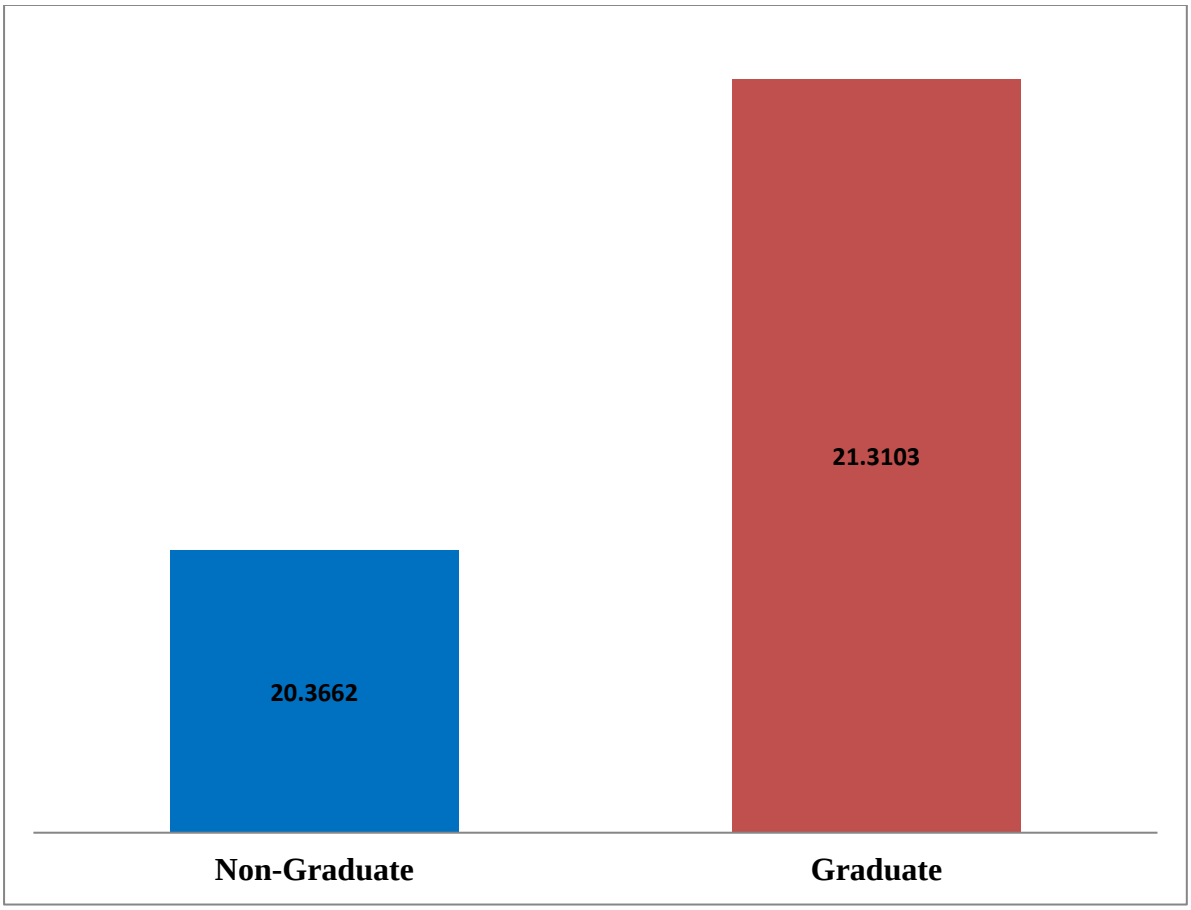
VARIABLE	SUB GROUP	N	MEAN	S.D	t-value
DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING	**Non- Graduate**	71	20.3662	3.435412	3.2272**
	Graduate	29	21.3103	1.0788	

** Significant at 0.01% level

The above mean value represents that, the responses from the non graduated parents' wards was highly significant than the graduated parents' wards towards the development of confidence in problem solving. The null hypothesis states that there is no significant difference in the development of confidence in solving problems among 6^{th} standard students through audio tutorial developed on science concepts with respect to parental educational status. Hence, the above stated hypothesis is rejected.

FIGURE XX

DEVELOPMENT OF CONFIDENCE IN PROBLEM SOLVING THROUGH AUDIO TUTORIAL IN RELATION WITH PARENTAL EDUCATIONAL STATUS



4.2 CONCLUSION

From the above inferences, it is concluded that there is a significant difference in the development of audio tutorial developed on science concepts for 6^{th} standard students. Thus, this analysis helped to arrive at the findings and offer the recommendations for improvement in the field of education and suggestions for further research which are presented in the next chapter.

SUMMARY AND CONCLUSIONS

CHAPTER V

SUMMARY AND CONCLUSION

5.1 INTRODUCTION

The summary and conclusion section is the widely used part of the research report because it review all the information that has been presented in its previous section. This chapter contains an overview of its conclusions based on findings, recommendations and suggestions for further research in this field. For the present study the investigator selected 100 students studying in sixth standard in which 50 students who are studying in PPG Matric Hr. Sec. School and 50 students who are studying in Government Hr.Sec. School, Narasimanaiyakan Palayam.

5.2 RESTATEMENT OF THE STUDY

The present study is entitled as **'DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS'.**

5.3 MAJOR FINDINGS OF THE STUDY

100 samples had been selected from the sixth standard in which 50 students who is studying in PPG Matric Hr. Sec. School and 50 students who are studying in Government Hr.Sec. School, Narasimanaiyakan Palayam for the present study. The major findings are:

1. There is a highly significant difference with the t-value of 17.9569 in the development of audio tutorial on science concepts for 6th standard students with respect to type of school.
2. There is a highly significant difference with the t-value of 7.2669 in the development of audio tutorial on science concepts for 6th standard students with respect to locality of students.
3. There is no significant difference in the development of audio tutorial on science concepts for 6th standard students with respect to gender.
4. There is a highly significant difference with the t-value of 15.3262 in the development of audio tutorial on science concepts for 6th standard students with respect to parental educational status.

5. There is no significant difference in the relationship between the development of content knowledge of 6th standard students through audio tutorial developed on science concepts with respect to type of school.
6. There is no significant difference in the relationship between the development of content knowledge of 6th standard students through audio tutorial developed on science concepts with respect to locality of students.
7. There is no significant difference in the relationship between the development of content knowledge of 6th standard students through audio tutorial developed on science concepts with respect to gender.
8. There is no significant difference in the relationship between the development of content knowledge of 6th standard students through audio tutorial developed on science concepts with respect to parental educational status.
9. There is no significant difference in the development of concentration and observation skills through audio tutorial developed on science concepts with respect to type of school.
10. There is no significant difference in the development of concentration and observation skills through audio tutorial developed on science concepts with respect to locality of students.
11. There is no significant difference in the development of concentration and observation skills through audio tutorial developed on science concepts with respect to gender.
12. There is no significant difference in the development of concentration and observation skills through audio tutorial developed on science concepts with respect to parental educational status.
13. There is no significant difference in the relationship between the development of learning skills of 6th standard students through audio tutorial developed on science concepts with respect to type of school.
14. There is no significant difference in the relationship between the development of learning skills of 6th standard students through audio tutorial developed on science concepts with respect to locality of students.
15. There is no significant difference in the relationship between the development of learning skills of 6th standard students through audio tutorial developed on science concepts with respect to gender.

16. There is a highly significant difference with the t-value of 3.2272 in the development of learning skills of 6th standard students through audio tutorial developed on science concepts with respect to parental educational status.
17. There is no significant difference in the development of confidence in solving problems among 6th standard students through audio tutorial developed on science concepts in relation with type of school.
18. There is no significant difference in the development of confidence in solving problems among 6th standard students through audio tutorial developed on science concepts in relation with locality of students.
19. There is no significant difference in the development of confidence in solving problems among 6th standard students through audio tutorial developed on science concepts in relation with gender.
20. There is a highly significant difference with the t-value of 3.2272 in the development of confidence in solving problems among 6th standard students through audio tutorial developed on science concepts in relation with parental educational status.

5.4 RECOMMENDATIONS

Recommendations were made with respect to the findings and conclusions reached in the study.

i) Research studies in the audio-tutorial method of instruction should be replicated. Since it was not possible to determine differences in subject matter areas or differences of pretest, due to the fact that the students had no pretest, a precourse test should be administered to all subjects.

ii) Research should be done that would collect and evaluate data on characteristics of students and teachers who experience success with specific methods of instruction. Instruments that assess individual capacities could be used.

iii) Further research in similar studies should be done on retention in order to compare the retention of subject content taught by different methods of instruction.

iv) Time organization and usage is a factor in today's society. Research on compressed speech and associated media equipment that complements

efficient time usage should be initiated to provide further data for improved research in future studies.

v) The development and validation of a model for enhancing the audio tutorial for content delivery in other discipline may be undertaken.

5.5 SUGGESTIONS FOR FURTHER RESEARCH

The present study has been focused on '**DEVELOPMENT OF AUDIO TUTORIAL ON SCIENCE CONCEPTS FOR 6th STANDARD STUDENTS'**. The present investigation has directed to the following suggestions for further research.

- ✓ The study can be extended by increasing the sample size and geographical area.
- ✓ The study can be conducted in different board of schools.
- ✓ The study can be conducted separately for school teachers to get to know their views about audio-tutorial system and its effectiveness for school students to teach tough concepts.
- ✓ Intervention period can be extended to validate the product.
- ✓ To get better reliability, a standardized tool can be used for collecting data.

5.6 CONCLUSION

Therefore, ample justification for continuing assessment and evaluation of both old and new methods of teaching and learning and its ability to cope with the funds of accumulating knowledge in numerous fields, and its capacity to respond to technological developments, the audio-tutorial system is worthy of continuing research and development as a means of bringing harmony to educational ends and means in a rapidly changing environment.

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APPENDICES

APPENDIX-A

PERSONAL DATA SHEET

1. Name of the student :
2. Gender : Male/Female/Transgender
3. Father's name & qualification :
4. Father's Occupation :
5. Mother's name & qualification :
6. Mother's Occupation :
7. Locality of residence : Urban/Rural
8. Birth Order of the child : 1^{st} /2^{nd}/3^{rd}
9. Type of the family : Nuclear/Joint
10. Name of the school :
11. Type of school : Govt /Private
12. Nature of school : Boys/Girls/Co-Education
13. Locality of school : Urban/Rural
14. Liking of subjects in order : Eng/Tamil/Maths/Science/S.Science
15. Whether participated in science exhibitions : Yes/No
16. Do you use you tube/Online videos for science projects : Yes/No

APPENDIX – B

Please read the following statements about the "Development of audio tutorial on science concepts for 6th standard students". Indicate your response by a tick mark. ***(SA-Strongly Agree, A- Agree, N-Neutral, D-Disagree, SD-Strongly Disagree)***					
STATEMENTS	**SA**	**A**	**N**	**D**	**SD**
1. Audio tutorial is different from conventional classrooms. 2. I have got an insight of audio tutorial. 3. Audio via learning has more impact than lecture via learning. 4. Students can understand the concepts easily and fast. 5. Audio tutorial scatter the learning needs of all learners. 6. Audio tutorial can succeed in inclusive classroom. 7. It drags attention of the learners. 8. There is less deviation from the content. 9. It helps to develop subject knowledge. 10. It supports to understand the content. 11. Audio tutorial helps to develop concentration and observation skills. 12. It encourages student's participation.					

13. It is applicable to all subjects. 14. It is not effective to teach certain mathematics concepts. 15. It makes classroom livelier. 16. There is no chance to probe questions during the class. 17. It can be played repeatedly until the students understand the concept. 18. It is a boon for slow learners. 19. It motivates practical learning. 20. It helps to develop creativity.					

ANNEXURES

ANNUXURE-A

6th STANDARD SCIENCE CONCEPTS

1. "CHEMISTRY IN EVERYDAY LIFE"

- ✓ Change and its types with examples
- ✓ Fertilizers and its types with examples
- ✓ Cement and its uses

2. OUR ENVIRONMENT

- ✓ Environment and its components with examples.
- ✓ Ecosystem and its types with examples.
- ✓ Solid waste management

3. "MAGNETISM"

- ✓ Magnet and its classification
- ✓ Properties and uses of magnet

4. FIRST 30 ELEMENTS OF THE PERIODIC TABLE AND ITS SYMBOLS

5. BASIC PHYSICS FORMULAE

- ✓ Average Speed Formula
- ✓ Acceleration Formula
- ✓ Density Formula
- ✓ Newton's Second Law
- ✓ Weight Formula

ANNEXURE-B

SCRIPT FOR RECORDING

CONCEPT 1

CHEMISTRY IN EVERYDAY LIFE

CONTENTS

1. **Change and its types with examples**
2. **Fertilizers and its types with examples**
3. **Cement and its uses**

CHANGE

- Change is a process in which one or more substances into an altered form.
- There are two types of changes:
- One is Physical change and the other is chemical change.
- Physical change results in the change or shape, size or volume. Example: breaking of a stick.
- Chemical change results in the change of a substance. Example: change of milk into curd.

FERTILIZERS

- Fertilizers are organic or inorganic materials that we add to the soil to provide one or more nutrients to the soil.
- There are two types of fertilizers:
- One is organic fertilizers and other is inorganic fertilizers.
- Organic fertilizers contain only plant or animal based materials. It can be prepared easily. It is economical. Example: vermicompost
- Inorganic fertilizers can be prepared by using natural elements by making them undergo chemical changes in the factories. Example: Ammonium sulphate.

CEMENT

- Cement is a chemical substance used for construction of houses, dams and bridges.

- It is manufactured by crushing of naturally occurring minerals such as lime, clay and gypsum through milling process**.**

USES OF CEMENT

- Cement is used as mortar, concrete and reinforced cement concrete.
- Mortar is the paste of cement, sand and water. It can be used for building blocks.
- Concrete is a mixture of cement, sand and gravel. It can be used for building bridges and dams.
- Reinforced cement concrete is a composite material by mixing iron mesh with cement. It is strong and firm. It can be used to build huge water tanks, water pipes and drainages.

CONCEPT 2

OUR ENVIRONMENT

CONTENTS

1. **Environment and its components with examples.**
2. **Ecosystem and its types with examples.**
3. **Solid waste management**

ENVIRONMENT

- The surroundings or space in which a person, animal or plant lives is known as environment.
- Environment consists of biotic and abiotic factors i.e., living things and non-living things respectively.
- Examples for biotic factors are plants, animals, bacteria etc.
- Examples for abiotic factors are sunlight, air, water and minerals.

ECOSYSTEM

- Ecosystem is nothing but community of living and non-living things that work together.
- Types of ecosystem:
- There are two types of ecosystem.

- One is artificial ecosystem and the other is natural ecosystem.
- Examples for artificial ecosystem are garden and aquarium.
- Examples for natural ecosystem are forest and pond**.**

SOLID WASTE MANAGEMENT

- Solid waste can be classified into biodegradable waste and non-biodegradable waste.
- Biodegradable waste means the things that can be decomposed by natural agents. Example: Banana peel.
- Non-biodegradable wastes means materials which cannot be broken down or decomposed. Example: Plastics.
- How can we manage solid waste?
- Very simple and interesting answer for this question is '3R'. i.e., Reduce, Recycle and Reuse.

CONCEPT 3

MAGNETISM

CONTENTS

1. **Magnet and its classification**
2. **Properties and uses of magnet**

MAGNET

- A magnet is a material or object that produces a magnetic field.
- The substances which are attracted by a magnet are called magnetic substances. Examples for magnetic substances are iron, cobalt, etc.
- The substances which are not attracted by a magnet are called non-magnetic substances. Examples for non magnetic substances are paper, plastic, etc.

CLASSIFICATION OF MAGNET

- Magnet can be classified into two types.
- One is natural magnet and the other is artificial magnet.

- Magnetite was the ore with attracting property found in that region. Magnetites are natural magnets. Natural magnets do not have a definite shape.
- The method of changing the piece of iron into magnet is called magnetization. Such man-made magnets are called artificial magnets. Bar-magnet, Horseshoe magnet, Ring magnet and Needle magnet are generally used artificial magnets.
- Oval-shape, Disc shapes, and cylindrical magnets are also available.

MAGNETIC POLES

- The attractive force of the magnet is very large near the two ends. These two ends are called its poles. i.e., North Pole and South Pole.
- A freely suspended magnet always comes to rest in north-south direction.
- A compass is an instrument which is used to find directions.

PROPERTIES OF MAGNET

- The two main properties of magnet are attraction and repulsion.
- Opposite poles attract each other. Opposite poles are also called as ‘unlike poles’.
- Same poles repel each other. Same poles are otherwise called as ‘like poles’.
- Magnets lose their properties if they are heated or dropped from a height or hit with a hammer.

USES OF MAGNET

- Magnets can be used in speakers, electric motors, magnetic cranes, bags etc.

CONCEPT 4

FIRST 30 ELEMENTS OF THE PERIODIC TABLE AND ITS SYMBOLS

ELEMENT NAME	*ELEMENT SYMBOL*
Hydrogen	H
Helium	He
Lithium	Li
Beryllium	Be
Boron	B
Carbon	C
Nitrogen	N
Oxygen	O
Fluorine	F
Neon	Ne
Sodium	Na
Magnesium	Mg
Aluminum	Al
Silicon	Si
Phosphorus	P
Sulfur	S
Chlorine	Cl
Argon	Ar
Potassium	K
Calcium	Ca
Scandium	Sc
Titanium	Ti
Vanadium	Vn
Chromium	Cr
Manganese	Mn
Iron	Fe
Cobalt	Co
Nickel	Ni
Copper	Cu
Zinc	Zn

CONCEPT 5

BASIC PHYSICS FORMULAE

Average Speed Formula

The average speed is the average of speed of a moving body for the overall distance that it has covered.

$$S = d/t$$

Where,

S is Average speed
D is Total distance travelled
T is Total time taken

Acceleration Formula

Acceleration is defined as the rate of change in velocity to the change in time. It is denoted by symbol small a.

$$a = v\text{-}u/t$$

Where,

a is acceleration
v is final velocity
u is initial velocity
t is time taken

Density Formula

The density of material shows the denseness of it in a specific given area.

$$\rho = m/v$$

Where,

ρ is density
m is mass of the body
v is the density of the body

Newton's Second Law

According to Newton's second law of motion, the force can be expressed by the product of mass and acceleration of the body.

$$F = m \times a$$

Where,

F is the force
m is the mass of the body
a is the acceleration in velocity available

Weight Formula

Weight is not anything but the force which an object experiences due to gravity.

$$W=mg$$

Where,

W is the weight
m is the mass of the body
g is the acceleration due to gravity