ON GOING RESEARCH PROJECT OF AYJNISHD (D)

Name of Principal Investigator: **Dr Gayatri Ahuja**

Name of Co-Investigator: **Dr Mathew Martin P J**

Title of the Research Project: "**Development of Accessible E-Content on Basic Concepts in Environmental Science using Multi-Modal Communication Approach"**

Total approved budget: Rs. 9,00,000/-

Duration: 13 Months [Expected to completed by August 2023]

Introduction:

Though students learn most efficiently through play and with hands-on experience activities, this is possible only when students are in an appropriate learning environment, wherein, they receive various learning opportunities. Yet, we may not be able to go back to teaching and learning environment in the same ways as we did before COVID-19 pandemic. It is, therefore, necessary to provide students with deafness with various diverse opportunities and skills for such online teaching-learning processes as an educational method that takes place over the internet as a form of distance education which has now become universal as a result of the COVID-19 pandemic in 2020 and/or 2021. Online teaching and learning have a vital role in education programs, even though debates continue whether or not it is advantageous for students with different hearing levels. The online teaching-learning process requires various responsibilities at different phases of the teaching-learning process to include, amongst others, planning, implementation, and reflection for teachers as well as all stakeholders.

Skills like critical thinking, originality, creativity, collaboration, association, and main communication is always required no matter whether the class is taught online or offline. Student with deafness who experiences difficulties in conceptual clarity may be supported by appropriate instructional strategies in accessible formats especially using a multimodal method of communication. In fact according to the research by Savvas Argyropoulos et al.,(2008). The integration of the multimodal interfaces into a game application serves both as an entertainment and a pleasant education tool to the users. The best solution is multimodal communication for Students who are Deaf, as it provides a choice of language and modality for concept learning. The application of the **'uses and gratification theory of communication'** by Blumler and Katz (1974), is the point of departure in this research study.

In the early stages of the students who are deaf, if the focus is on the provision of teaching-learning materials in accessible formats, this will ensure sustainability, quality of the

teaching-learning process for students with different hearing levels as well as with different learning styles. In this research, this is being applied to the learning of geographic concepts.

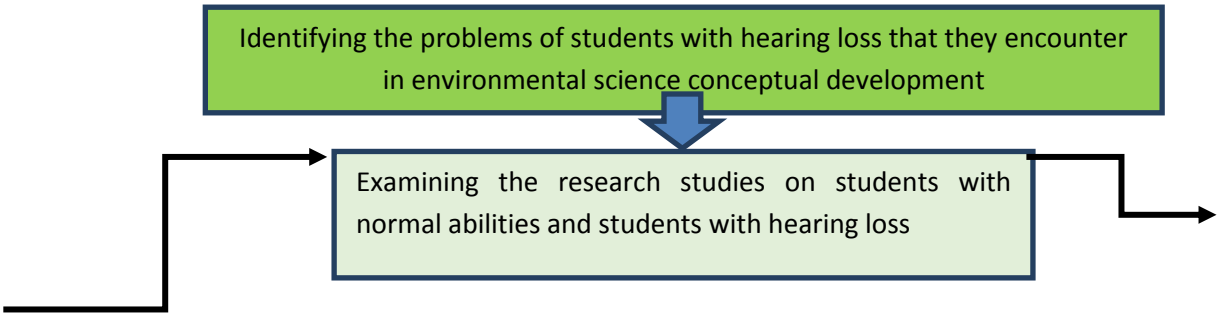
Parents and teachers can lay the foundations for environmental science concepts by understanding what is developmentally appropriate for the early years of childhood and then encourage rich and playful activities that build skills and knowledge which in turn helps in developing conceptual clarity. Environmental science is a subject that supports children apprehend and appreciate the world children live in; it allows them to make thoughtful decisions and take responsible actions towards sustainable living. Environmental science may contribute towards citizenship education in primary as well as secondary social studies by providing students with the necessary knowledge about the world around them, developing their skills in inquiry, map reading and its interpretation as well as other skills, and honing their dispositions to be conscious of the impact of their decision making and actions on themselves, other people and the environment. Through the learning of environmental science concepts and skills in school, students can learn to be better informed, concerned, and participative citizens.

Conceptual Map

After identification of basic concepts of environmental science from the experts who will be identified by the researcher, the tool will be designed and developed by the researchers after the process of professional validation, pilot study, and as per suggestions given by the experts. First, the experts will choose the most appropriate 10 basic concepts in environmental science from the grade 3rd standard of one state board for students with deafness, and then planning of e-content will be done.

The e-content will be prepared in a Multi-Modal Communication approach so that students with various hearing levels can access the learning material. As defined in the key concepts, environmental science concepts in the present study mean a set of 10 commonly used concepts to be identified from the environmental science textbooks (grade 3rd) of one state board.

Figure No. 1: Conceptual Framework of the Research



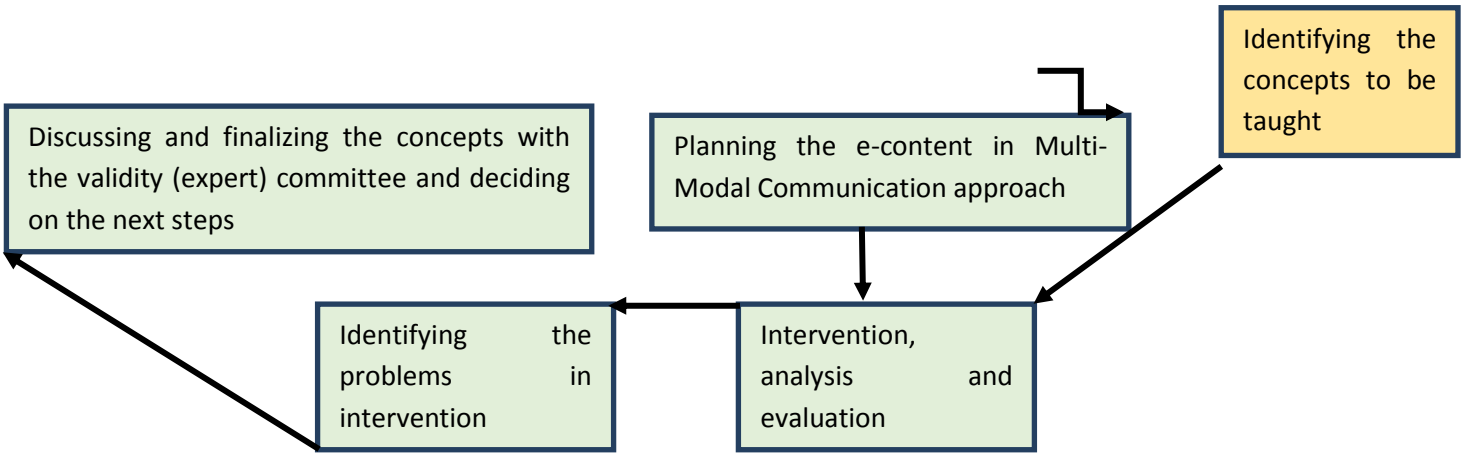


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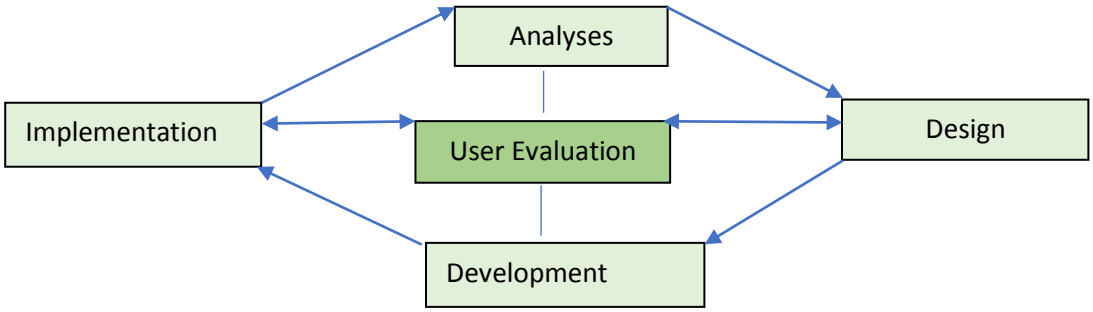
Figure No. 2 Instructional Design Methodology



An instructional design methodology is adapted from ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model as given by Dick (2005). These stages with ongoing and interactive activities that will continue throughout the research. This model analyses the needs designs the instruction and presentation, develops materials, implements activities, and assesses and appraises the effectiveness of instructional material.

Key Concepts and their Operational Definitions

a) **Multi-Modal Communication Approach:** For the present research study, the Multi-Modal Communication approach refers to the implementation of Indian Sign Language and English/Hindi as a spoken language in presenting environmental science concepts to grade 3rd of Maharashtra state board used for students with deafness along with Video, Captions, and Audio modalities.

b) **e-Content**: e-content refers to the lesson plans prepared on 10 basic environmental science concepts presented on YouTube.

c) **Basic Concepts of environmental science**: Basic concepts in environmental science in the present study mean a set of 10 commonly used concepts to be identified from environmental science textbooks (grade 3rd) of one state board. It is hypothesized that understanding environmental science depends on understanding these concepts using the multi-modal communication approach, with ISL, Video, Captions and Audio in the same frame.

Rationale and Need of the Research

Students with deafness in higher education increasingly encounter education through online learning environments and socially acquire knowledge in digital discourse communities (Keating & Mirus, 2003; Maiorana-Basas & Pagliaro, 2014). The digital revolution of education systems at all levels has allowed incorporating a new teaching-learning ecosystem called e-learning. The COVID-19 pandemic caused the closing of classrooms all over the world and forced approximately 1.5 billion students and 63 million educators to suddenly modify their face-to-face academic practices, wherever possible (UNESCO, 2020). This situation showed the strengths and areas for improvement of education systems that need to adapt and evolve in facing the challenges of digitalization.

One such area for development is in the field of transfer of knowledge in social studies classes, where the students with hearing loss encounter concerns that are mainly related to (a) acquiring the meaning of concepts, (b) perceiving time, and (c) instituting critical reasoning. Social studies aim to provide basic citizenship skills, and in teaching the subjects contained within the social studies course at the school level. In education, terms and concepts are extremely important in the description of a variety of facts and events. Concepts are considered the building blocks of knowledge and are important in the teaching-learning process.

Environmental studies help students understand the physical and cultural characteristics of the world. This education provides the values, knowledge, concepts, and skills to better understand ourselves, our relationship to the earth, and our interdependence with other peoples of the world. It provides a framework for learning the physical, social, and historical phenomena studied in both elementary and secondary schools. Primary and secondary school students have the ability to learn environmental skills in observation, classification, organization, and map reading and interpretation. There is a great need to increase the quantity and quality of

environmental science education in primary schools to overcome ignorance of environmental science concepts. Hence, this study will be conducted with an aim to develop an e-content of basic concepts in environmental science for grade 3rd of one state board. In line with this purpose, a total of 10 concepts will be selected from grade 3rd of one state board and e-content will be developed in a Multi-Modal Communication approach.

There is an apparent dearth of studies related to the Multi-Modal Communication approach for students with deafness in the Indian context and the valuable results of previous studies focused researcher to investigate, Is Multi-Modal Communication approach using e-learning content effective on learning outcomes in environmental science subject for students with deafness in Indian scenario?

Statement of the Problem: The present study is aimed to develop accessible and pedagogically appropriate e-learning content which is expected to facilitate understanding environmental concepts among students with deafness from the perspective of multimodal communication approach.

Objectives:

Following objectives are proposed:

1. To design and develop accessible, shareable e-content using the Multi-Modal Communication approach for students with deafness studying in grade 3rd of one board.
2. To study the effectiveness of e-content using the Multi-Modal Communication approach on achievement in basic concepts in environmental science amongst students with deafness in comparison to the conventional method of teaching.
3. To study the effectiveness of e-content using the Multi Modal Communication approach on retention of basic concepts in environmental science amongst students with deafness in comparison to the conventional method of teaching.

Hypothesis

1. There will be significant effects of e-content using the Multi-Modal Communication approach on achievement in basic concepts in environmental science amongst students with deafness.

2. There will be a significant difference between the effect of e-content using the Multi Modal Communication approach and conventional method of teaching on achievement in basic concepts in environmental science among students with deafness.
3. There will be a significant effect of e-content using the Multi-Modal Communication approach on the retention of basic concepts in environmental science amongst students with deafness.
4. There will be a significant difference between the effect of e-content using the Multi-Modal Communication approach and the conventional method of teaching on retention of basic concepts in environmental science among students with deafness.

Research question/s:

1. What are the effects of accessible and shareable e-content using the Multi-Modal Communication approach for students with deafness for improvement of learning outcomes in basic concepts in environmental science as compared to the conventional method?
2. What is the significance of e-content using the Multi-Modal Communication approach and conventional method of teaching on achievement in basic concepts in environmental science among students with deafness.?
3. What is the significance of e-content using the Multi-Modal Communication approach on retention of basic concepts in environmental science amongst students with deafness.?
4. What is the significance difference in the e-content using the Multi-Modal Communication approach and conventional method of teaching on retention of basic concepts in environmental science among students with deafness.?

Variables: Accessible e-Content developed by using Multi-Modal Communication Approach is the independent variable and comprehension of basic concepts in environmental science is a dependent variable.

Delimitations of the Study

a) This research study does not include offline self-assessment learning environment. These limitations are more evident for students with deafness who may not have online access or who have had limited experience with online teaching-learning tools, such as computers. An additional limitation to consider is that for students' online learning, as well as online access, this needs adult supervision (parents or teachers) and, therefore,

adult availability and meaningful participation as well are essential. Moreover, online learning modality may not give adequate or appropriate opportunities to involve students with deafness that need more interactions and hands-on experiences in activities to focus and learn as compared to adult learners.

b) For the present research study, only 10 basic concepts in environmental science were taken for grade 3rd of one state board.

c) Online learning may vary depending on the teachers' or students' technological abilities to access online websites and use of online mode.

Review of Literature

There are various researchers and educators who are convinced that the use of ICT in preschool, primary and secondary education is necessary and that it can support both the teachers' and student's overall development. However, few researchers have pointed out that technology can also come with risks and limitations (McPake et al. 2013; Plowman et al., 2011). Notwithstanding these disagreements, the numbers of young children who are now using online digital tools is increasing swiftly due to touch screen technologies, internet accessibility and due to COVID-19 pandemic government rules with regard to online education. ICT in contemporary education offers potential to provide creative and communicative activities for students. Therefore, it is important to draw educators' consideration to critical concerns on how to provide safe and healthy online digital environments which are appropriate for children including disabilities, to develop their thinking skills and understanding of technologies for learning in the 21st century; this has also been suggested by researchers who highlighted on these cognitive skills (Edwards et al. 2018, Maches and Plowman 2017; McPake el al., 2013).

Guided communications and exchanges may encourage and sustain children's yearning to obtain knowledge and skills, and develop positive temperaments about distance education; usually children learn assistances from observing a varied range of digital technologies. How teachers enhance children's encounters with technologies through guided interactions is a crucial consideration to support children's engagement and participation with online learning process (NAEYC 2012; Plowman and McPake 2013; Stephen and Plowman 2008).

The purpose of studying environmental science in primary social studies are many and they contribute towards the development of children to be informed, concerned and participative citizens (MOE, 2012). Pedagogy facilitates students to utilize sense of their own experiences of

the world, that is, to develop their everyday environmental science concepts. Everyday environmental concepts refer to the knowledge and skills that is the foundation that students build up over time through their interactions with a variety of landscapes on a daily basis; it develops students' consciousness of other individuals and their cultures, and places and environments in the wider world (Catling & Willy, 2009). It involves students in inquiry about the spatial matters and concerns about the world they live in by using a variability of approaches and tools such as maps and photographs. It nurtures an attitude in students that values the Earth as their home and assists them to better understand the importance of sustainable living. It also progresses students to be thoughtful and accountable global citizens who are conscious of the influences of their decisions and actions on their own lives and others as well as on places far and near (Catling & Willy, 2009).

There are several challenges that teachers face in providing a better age-appropriate environmental science education; these can be divided into two categories, namely, system-related problems and problems encountered in the field of environmental science education. One of the examples to offset the problems encountered in the field of environmental science education is that educators' widely practice teaching methods that are based on explaining concepts, in turn facilitating students in conceptual clarity (Artvinli, 2010). One of its chief underlying details is the over population of classrooms and behavioral training that teachers formerly receives either through pre-service or in-service programs. Though in special education we have smaller number of students yet the training of teachers is the challenge. There is a lack of in-service training support model for environmental science teachers and a short-term training educational program that will present them with proper direction and activity (hands on experience) using the necessary, relevant materials which are age appropriate that can be given among the examples of qualitative concerns faced in environmental science education. In special schools, usually a special educator takes the pedagogy classes or the class teacher only takes all the classes with an assumption that it helps in speech reading and language development.

Students can better obtain environmental science competencies of spatial characteristics of places if they are well equipped with certain environmental science skills and conceptual clarity; these could be skills related to the use of pictures, photograph, maps and globes for understanding environmental science concepts (Catling & Willy, 2009; Mackintosh, 1998). According to researcher like Lambert (2007), these environmental science skills should be

secondary to the development of student conceptual understanding of environmental science. In 2013, government of India launched the National Policy on Universal Electronic Accessibility to facilitate equal access to electronic and other information and communication technologies to individual with disabilities. It is high time that during and in post pandemic era, we now accelerate the process of e-learning in the field of special education.

In addition to the traditional approaches and methodologies in education, social studies pedagogies require the use of complex cognitive skills to overcome limits in the development of critical thinking skills in students with different hearing levels who are enrolled in public schools (Boucher, 2010). Along with these concerns, insufficient use of the hearing sense as a sensory sense to accommodate all the information during the critical period development affects the overall functioning of the personality as suggested by Bolognini and colleagues (2012). Researchers (Mayberry, 2002; Eden, 2008) state that limitations on hearing as a sense and language as an input have a negative impact on the extension of many allied and related skills namely; creativity, abstract thinking, event sequencing, explanation, summarizing, understanding of alternative perspectives, critical reasoning, and time perception. As a result of this, the conceptual development of students with different hearing levels fails to fulfil with the conceptual development of students with a hearing ability, as explained by researchers (Geers et al., 2008; Punch el al., 2010). This concern gives rise to complications in students in terms of critical reasoning between historical or economic proceedings in the past and present proceedings, as well as implementation of gradual projects (Woolsey et al., 2009).

Thus, it is critical that to learn and better understand abstract topics in social studies classes, students with different hearing levels require a more individualized education programs than their peers with regular hearing abilities (Shepherd and Acosta-Tello, 2015). As such, students with hearing loss require to be encouraged and reinforced to discuss characteristics of the concepts and their places in their lives using any teaching learning materials like; photos, pictures, real objects, documentaries and movies (Akay, 2018). Lam (2001) reported that when an educator is teaching in a Multi Modal Communication approach, the learning environment makes an effort to learn his / her students' language development, the motivation levels within the class are likely to increase. Hence the current research topic is undertaken to scaffold the pre-basic concepts of environmental science for students with deafness studying in grade 3rd of one state board.

Multi-Modal Communication Approach

The language barrier is the most common reason for the communication gap for the Deaf. In India, language changes after few miles with respect to the education and culture of that territory. This is the condition with spoken language then condition becomes worst for the Deaf. The Deaf students use multimodal interfaces for communication such as image, video, Lip reading, air writing, finger spelling and body gestures in addition to the spoken and written language. Multimodal communication is using more than one mode to communicate, with all forms of communication used are valued equally. It is different from Total communication. Total Communication (TC) is the philosophy of educating children with hearing loss that incorporates all means of communication; formal signs, natural gestures, fingerspelling, body language, listening, lip-reading and speech. In fact, multimodal communication according to Michael E. Skyer (2016) illuminates dynamic communication practices and reveals new tools for researchers and practitioners to design and reflect upon pedagogical practice. The students with deafness in contexts of higher education increasingly rely on different languages and different communication configurations in multimodal information environments accessed through Internet technology (Valentine & Skelton, 2009; Beal-Alvarez & Cannon, 2014).

D. Research Design:

The research design in the current research study will be descriptive and quasi-experimental methods of research which will be used since the study involves the development of e-content. In this study, a quasi-experimental design with pretest, post-test and delayed post will be used by the researcher. Descriptive and Inferential Data analyses of the data gathered through a research tool design

METHODOLOGY

Details of Subjects: Students with deafness studying in grade 3rd of Maharashtra state board with an understanding of Marathi spoken language and Multi-Modal Communication approach will be selected from schools of Maharashtra state. 64 students with deafness studying in grade 3rd of Maharashtra state board will be taken.

Tool: e-content development in basic concepts of environmental science will be developed in the Multi-Modal Communication approach with equal importance to both modalities be it sign/caption or spoken (Indian Sign Language, and Marathi spoken language) and multi-stage validation (Content validation and Language validation) will be undertaken.

Sampling Procedure: Purposive and convenient sampling method .

a) Instruments/ Equipment's: Nil

b) Procedure: The study will be conducted in four phases.

Phase 1: Includes the identification of basic concepts of environmental science. 10 basic environmental science concepts will be selected. 8 Subject Matter Experts (SME) will be given the list of concepts and as per their recommendations, the 10 concepts will be selected.

The content development will be done in following steps:

a) Identification of concepts
b) Selection of concepts with consultation with subject experts
c) Lesson Plan will be made for each concept will be developed with e-content in multimodal communication approach.
d) The lesson plan for each concept will be based on the teaching methodology and techniques of teaching environmental science.
e) Content validation to be conducted with the help of 8 SME in the field of special education, Indian Sign Language experts, and pedagogy experts

Phase 2: Includes Pilot testing of the e-content of basic environmental science concepts

a) In this phase, a total of 32 students with deafness studying grade 3rd of one state board will be provided with the developed e-content in Multi Modal Communication approach
b) Pre and post-test will be undertaken
c) The data received will be evaluated and, if required, appropriate modifications will be carried out in the content.

Phase 3: Finalization of tool and data collection

a) Final tool will be administered on 64 students with deafness (control and experimental group 32 each)
b) Pre and post-test will be undertaken
c) Actual teaching on 64 students (32 control and 32 experimental group) for standardization of tool (e-content)
d) Phase 3 procedure will be delineated in the final research tool
e) Data analysis will be done using SPSS package

Phase 4: e-Content on digital media platform

a) E- CONTENT Videos developed with Multi Modal Communication approach will be presented on you tube channel of AYJNISHD (D).
b) Monitoring will be done through e-assessment
c) Feedback will be taken through google forms
d) E-CONTENT will be open to all on you tube channel of AYJNISHD (D)

c) Analysis:

Proposed Analyses: The marks for a group of students with deafness before (pre) and after (post) a teaching intervention will be recorded and tabulated. Marks received will be in continuous (scale) data. Continuous data will be abridged and summarized by giving their average and standard deviation (SD), and the paired t-test will be used to compare the means of the two samples of related data in terms of attention and achievement using SPSS. The e-content developed with Multi Modal Communication approach of concepts presented on you tube channel will be monitored and its effectiveness will be seen after one month and accordingly changes will be made in e-content if required.

e. Protecting rights of the participants:

a) Is there any risk or inconvenience in participating in your research? No
b) Will you ensure confidentiality of data? Yes
c) Will you ensure the dignity of participants? Yes

f. Nature of end product/ outcome:

Students with various hearing levels enrolled in special schools or mainstream schools have concerns in acquiring the meaning of concepts in environmental science classes with perceiving time, and critical reasoning. For conceptual development in classroom, it requires more time and resources. Increasing the duration of support services in form of online educational videos may enable students with hearing loss use the strategies explained in YouTube videos for conceptual clarity. One of the reasons to incorporate YouTube video into classroom teaching is that it is an apt form of instruction that most students will find familiar and interesting. This e-teaching tool is especially valuable in environmental science classes, as teachers can share on the spot the other resources like charts and graphs detailing complex processes during current and post COVID-19 situation. The final product will be disseminated using social media and institute website. Guidelines will be prepared for dissemination of the project output-developed materials.

g. Future application of the research

It is a well-known fact that e-learning via YouTube videos is a persuasive method of learning with choice of modality; This research application will add a dynamic component to the classroom teaching learning process, improves the transmission of knowledge, makes complex procedures more accessible to understand, with choice of modality for communication and helps in the explanation of concepts in various domain areas providing choice to the user in terms of modality used for communication.

Status of the Research Project till 23-03-2023

1. The identification of basic concepts of environmental science already done
2. 8 Subject Matter Experts (SME) selected for the project done.
3. 10 basic environmental science concepts selected from Marathi medium state board books of Maharashtra done
4. Identification of schools from Mumbai and Pune done as per the inclusive criteria . Inclusive criteria are medium of instruction as Marathi and students who are studying in 3rd standard.
5. Multi stage validation done with experts for content as well as language.
6. The content development of traditional method done with Lesson Plans (10 environmental science concepts) approved by subject experts.
7. Pre test prepared for each concept approved by the experts completed.
8. The lesson plan for each concept made on the basis of the teaching methodology and techniques of teaching environmental science.
9. Traditional lessons:
    a. Pre test undertaken
    b. Traditional lessons taught in schools from Mumbai and Pune

10. Multi Modal Lessons prepared for 10 concepts given for content validation.

11. Content for validation is given to experts from the field of special education, Indian Sign Language, and pedagogy experts and validation is in process

12. **Research Project was submitted by July 2023 to AYJNISHD and after the approval the project started in the same month July 2023.**

13. **Expenditure of the budget: Till Date expenditure done on one Research Assistant (Individual with Deafness) salary – Rs 35000/- pm (from July 2022 till date).**

14. **Existing Research Challenge: In this academic year 2022-23 Schools under Maharashtra board are getting closed for summer vocation and delay in testing the module developed is expected.**

15. **Solution to the Research Challenge: We need to wait for the reopening of schools under Maharashtra Board in the next academic year 2023-24**

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