Available online at www.jlls.org

JOURNAL OF LANGUAGE AND LINGUISTIC STUDIES

ISSN: 1305-578X

Journal of Language and Linguistic Studies, 16(4), 2282-2288; 2020

A Study On Audio Based Tactile Model (ABT) In Learning Human Organ System Among Children With Visual Impairment

Nivethana Elangovan[1*], Dr.K.Sambath Rani[2]

[1*,2]Avinashilingam Institute for Home Science and Higher Education for women
Nivethana Elangovan[1*], Dr.K.SambathRani[2]

[1] *Ph.D. Research Scholar, Avinashilingam Institute for Home Science and Higher Education for women, Coimbatore, Tamil Nadu, India, Email:nivinivh@gmail.com

[2]Research Supervisor, Associate Professor, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, Tamil Nadu, India, Email: sampathranek@gmail.com

APA Citation:

Elangovan, N., Rani, K.S. , (2020), A Study On Audio Based Tactile Model (ABT) In Learning Human Organ System Among Children With Visual Impairment, *Journal of Language and Linguistic Studies, 16*(4), 2282-2288; 2020

Submission Date: 26/08/2020

Acceptance Date: 04/11/2020

Abstract

A study was conducted among 30 secondary level students with visual impairments in four special schools inChennai to facilitate learning science concepts. Traditionally, Science was considered a complex subject, and it is more difficult for the students who have difficulties in vision.The aim of this study was to develop an adaptive teaching-learning material, namely the Audio-Based Tactile (ABT) Model, to teachthe Human organ System.Purposive sampling technique was used to identify and assign the participants. The Audio Based Tactile Material was prepared in both English and Tamil language with the detail of a human organ (Digestive System). The students were allowed to learn it individually for a period of 2 months. A tool was developed and standardized to conduct pre and post test scores, and Quasi-Experimental method was followed. The t-test results for pre and post test evaluation were significant at 0.05 level,revealing that the ABT Model was effective in learning Human Organ System (Digestive System) among students with visual impairments. The Audio Based Tactile teaching materialpositively impacts learning achievements with high enjoyment and curiosity.

Keywords: Visual Impairment, Science concept, Human Organ System, Secondary level students.

Introduction

Teaching Science is a pedagogical approach in secondary levels that actively involves students. Science as a subject covers a range of concepts and is classified in terms of three major aspects, i.e., Biology, Chemistry, and Physics. Teaching Science includes both theory and practical approaches. Science can be taught as learner-centered, inquiry-based, or laboratory-based learning. Active engagement in the teaching-learning process of Science is one of the primary requirements.It aims to develop and sustain interest, active engagement, curiosity, and build confidence among the students. The practical engagement in learning science concepts illustrates the knowledge, increases the power of observation, predicts, collects evidence, and move towards a logical deduction.Innovations in technology have restructured the concepts from the centuries, reframed many concepts, and established new theories. Traditionally, the subjects were taught with visual inputs accessible for any student, enhancing their knowledge and reasoning skills. Teachers have to play the role of facilitators and enhance their interests in exploring each concept from their perspectives. The teachers need to understand, plan and implement the strategies necessary to learn each concept.

Email:nivinivh@gmail.com

Hands-on learning can be one of the most acceptable teaching methods for science that allows students to actively engage in the learning process rather than be a simple audience in the classroom.

Unlike their peer group, students with visual impairmenthave the same range of cognitive abilities as sighted students (Kumar, Ramasamy & Stefanich, 2001). They experience difficulties learning the concepts because the only explanation is not enough for a student to learn a concept without any visual exposure. Although there are prevailing resources available in schools, such as tactile models or braille printed materials, there is a lack of complete exposure to learning the concepts. It is especially in learning the concepts of Biology; they may not have clear knowledge about the body parts, specifically the internal organs. An innovative three-dimensional (3D) structure can be more effective for learning and getting a clear idea about any concept. It can be more useful if some Artificial Intelligence (e.g., auditory inputs) is combined withinit.

Research has revealed a severe shortage in preparing instructional materials and strategies for teaching science concepts to students with visual impairments.Science as a subject needs practical exposure to understand the concepts. Unfortunately, the students with total or partial sight loss experience difficulties in learning such concepts due to their limited sense of vision. The teachers commonly use visual instructions in the classrooms may not be sufficient. They mainly depend on the sense of touch and auditory for their perception. Thus, the classrooms should be adapted, and instruction should be accommodated to provide better experiences in learning Science concepts that are related to our natural world.Inventions in technology have been increased the learning opportunities for the students. Teaching Biology can be more effective with adaptations and modifications in the teaching-learning materials. Human Organs can be classified as external organs and internal organs. The students may have exposure to the external organs of their body such as ears, mouth, neck, nose etc., but it is difficult for them to have a clear idea about the internal organs. It is indispensable to learn about the internal organs because they work together to perform the tasks of the body – to keep it healthy – from birth to death. Examples of internal organs of the human body include the respiratory system, nervous system, blood circulation system, excretory system, and digestive system.

'Blindness' refers to a condition where a person has any of the following conditions,–i) Total absence of sight; or (ii) visual acuity less than 3/60 or less than 10/200 (Snellen) in the better eye with correcting lenses; or limitation of the field of vision subtending an angle of less than 10 degrees (PWD Act, 1995).Low vision refers to "A person with low vision has impairment of visual functioning even after treatment and standard refractive correction, and has a visual acuity of less than 6/18 to light perception, or a visual field of less than 10 degrees from the point of fixation, but who uses, or is potentially able to use, vision for planning and execution of a task." (World Health Organization).

Need

Science is a pedagogical approach that is taught through visually-oriented content.An individual can experience all functions within themselves but may feel difficulties in understanding how the organs actually function and their contribution to keeping us healthy.The oral instruction used in teaching science, in general, may not effectively enhance comprehension of these basic aspects, which is vital. Students with visual impairment can only have a better learning experience through tactile and auditory methods. So, the investigator thoroughly reviewedthis area, got expert opinions,and concluded combining both methods to provide an enhanced and inquiry-based learning experience in this particular aspect. Hence, the investigator attempted to develop the ABT (Audio-Based Tactile) Model to teach the selected Human Organ System (Digestive System).

Objectives

The major objectives of the study were to

- Identify the student with Visual Impairment and assess the current level of knowledge on the function of the human system.
- Develop Audio Based Tactile (ABT) Model to impart knowledge on selected system of Human Body (Digestive System) and provide intervention.
- Analyze the effectiveness of the Audio-Based Tactile (ABT) Model in teaching the selected system of the Human Body (Digestive System).

Research Questions

Following two research questions were framed

1. What affects the Students to learn Human Organ System?

2. Will the ABT model impactdeveloping the Human Organ System concept among Students with Visual Impairment?

Hypothesis

- There is no significant difference between the pre and post test scores of in learning Human Organ system through the ABT model among visually impaired students with respect to variables.

Theoretical framework

Moreland (2014) investigated the attitudes, perceptions, and knowledge of Accessible technology used by science teachers of the visually impaired from the Mid-Atlantic and how they are incorporated in the classroom. The survey method was used for data collection. Eightsamples were selected for this study by different grade-level schools. The results revealed that the teachers in visually impaired schools need more training to use Accessible technology to increase proficiency and use in the classroom.

Kızılaslan(2019)examined instructional design's effectiveness in teaching science concepts to visually impaired students. The study was conducted through a case study. Purposive sampling was used. Significant differences in the academic performances indicated that instructional design had positive effects in teaching and learning science concepts for visually impaired students. As a result, students with visual impairment need appropriate adaptations and individual instructional design to compete and advance in learning the science concepts.

De Freitas *et al*. (2009) conducted a study with 134 teachers in public schools in three municipalities of the state of São Paulo, Brazil. Data was collected through the descriptive survey method. The result revealed a significant differencein the specificities and applicability of assistive technology for blind and low-vision students in their classrooms, thereby improving the quality of life and facilitating the learning process.

Suhin and Yorek (2009) investigated how teachers teach science to visually impaired students. Descriptive and Exploratory methodswere used. The result revealed that visually impaired students need instructional and environmental accommodation to learn science, and they need more tactual and audio experience than visual instruction.

Material and Methods

Locale

The present study was conducted in 4 special schoolsclustered in the main cities of the districts of Tamil Nadu, catering services to the visually impaired students.The purposive nonprobability sampling technique was used to select the samples. Thirty (n=30, 14 boys and 16 girls) students with visual impairments in the Ninth standard were identified and assigned in the study.The independent variables for the study were Age, Gender, Nature of Disability, and Socioeconomic status of the selected students. The dependent variable was the impact of the ABT (Audio-Based Tactile) Model on learningthe ‘Human Organ System’ among students with visual impairments at the secondary level.

Tool

A questionnaire was developed and standardized to collect the pre and post test data to measure the impact of the ABT Model in teaching the Human Organ system (Digestive System). A checklist was developed and grouped under 5 categories: choose the correct answer, fill in the blanks, true or false, label the parts, and answer in one word.While evaluating, for each correct answer, a score of 1 was given, and for the wrong answer, a score of 0 was given; thus, the maximum score of the evaluation procedure was 25.

Intervention Package

The ABT Model for Digestive System was done in English and regional languages. The digestive system's parts and functions were made so that the students could learn through tactile sense. In addition, if they press the embossed buttons located in the concerned part, it will give an audio description. Hence it will enable them to learn and relearn the parts and functions through audio and tactile description till they comprehend it holistically. Each detail has been given in simplified language to easily comprehend it. Apart from this, the additional features in the explanations were given both in the Tamil and English versions. This paved the way to explore and comprehend the digestive system details easily.

A total of 5 groups were formed, with six students in each group. The intervention was given for 2 months in a prescheduled time, the first day was for assisting, and the consecutive days were for learning the concept. A model schedule for a week is given below:

Table 1. Schedule of Training

Schedule	Group 1	Group 2	Group 3	Group 4	Group 5
Monday	Teaching				
Tuesday	Learning	Teaching			
Wednesday		Learning	Teaching		
Thursday			Learning	Teaching	
Friday				Learning	Teaching
Saturday					Learning

Result and Discussion

The results were analyzed both qualitatively and quantitatively. The background details were analyzed qualitatively and presented in Table 2. The pre-test and post-test mean scores and probability values were analyzed using Independent t-tests.

Table2. Background Details of the Samples

Variables	Levels	Number	Percentage
Age	12 years	14	47
	13 years	16	53
Gender	Boy	14	47
	Girl	16	53
Socio-economic Status	Middle	13	43
	Low	17	57
Nature of Disability	Total Blind	11	37
	Low Vision	19	63

It was found that 53% of the selected samples belonged to 13 years and were girls, while 47% of them were boys and belongedto 12 years of the selected participants. According to the socio-economic status of the selected samples, 57% of them belonged to the low-income group; in contrast, 43% of them were from themiddle-income group. Thirty-sevenpercent of them were total blind, and 63% had low vision.

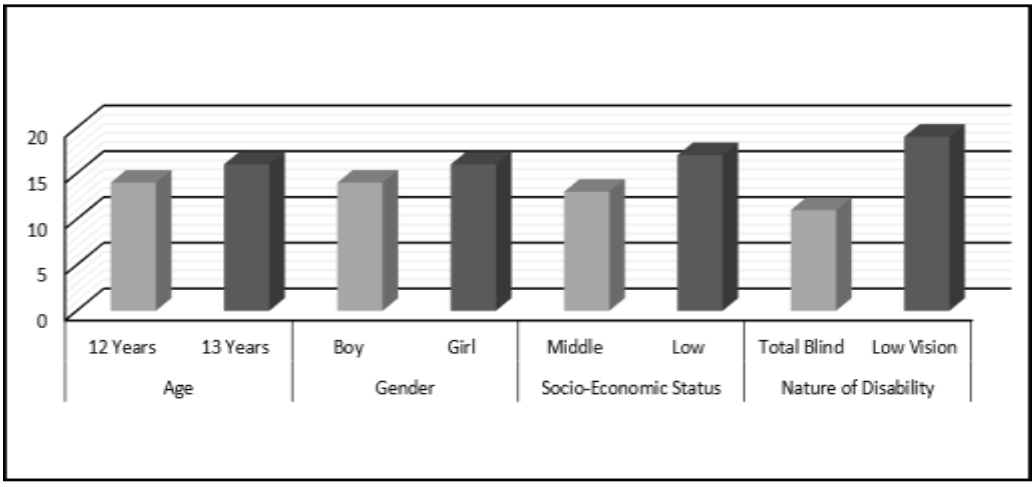

Figure 1. Background details of the selected samples

Table 3. Mean, SD, and t-value of the pre and post test scores of the selected samples in learningHuman Organ System with respect to Age Group

Variable		N	DF	Tests	Mean	Standard Deviation	t-value
Age	12 years	14	28	Pretest	13.80	1.52	.128*
				Posttest	22.20	1.32	
	13 years	16	28	Pretest	13.73	1.33	.926*
				Posttest	21.67	1.79	

*p>0.001

N= Number of Samples, DF=Degrees of Freedom.

The above Table reflects that the co-related t- value is 0.128 and 0.926 with df 28 for the sample's pre and post-test score is significant. It indicates that visually impaired students' pre and post test scores differ significantlyin learning Human Organ System. Itwas evident that the Age group influenced the pre and post test scores in learning Human Organ System. It may therefore be said that the understanding and learning potential differs. Hence the null hypothesis stated that "there is no significant difference in the mean score of pre and post test scores of the selected samples in learning Human Organ System with respect to Age Group" is rejected.

Table 4. Mean, SD, and t-value of the pre and post test scores of the selected samples in learning Human Organ System with respect to Gender

Variable		N	DF	Tests	Mean	Standard Deviation	t-value
Gender	Boy	14	28	Pretest	14.00	1.30	.846*
				Posttest	21.64	1.98	
	Girl	16	28	Pretest	13.56	1.50	.944*
				Posttest	22.19	1.10	

*p>0.001

N= Number of Samples, DF=Degrees of Freedom

From Table 4, it was evident that the t-value for boys is .846 and for girls is 0.944, which is significant at 0.001 level in learning Human Organ System. The ABT Model has a significant impact on teaching Science concepts that incorporate explicitknowledge amongvisually impaired students. It was helpful for them in enhancing knowledge regarding the human digestive system. Hence the null hypothesis stated that "there is no significant difference in the mean score of the pre and post test scores of the selected samples in learning Human Organ System with respect to Gender" is rejected.

Table 5. Mean, SD, and t-value of the pre and post test scores of the selected samples in learning Human Organ System with respect to Socioeconomic status.

Variable		N	DF	Tests	Mean	Standard Deviation	t-value
Socioeconomic Status	Middle	13	28	Pretest	13.62	1.66	.509*
				Posttest	21.15	1.57	
	Low	17	28	Pretest	13.88	1.21	2.58*
				Posttest	22.53	1.32	

*p>0.001

N= Number of Samples, DF=Degrees of Freedom

Table 5. depictsthat the t-value is 0.509 for students belonging to the middle-income group and 2.58 for students from the low-income groups.It was suggested that the ABT Model positively impacts learning the

Human Organ System. As Suhin and Yorek (2009) recommended, instructional and environmental accommodation is essential to learning science. They need more tactual audio experience than visual instruction.Hence the null hypothesis stated that "there is no significant difference in the pre and post test mean score of the selected samples on learning Human Organ System with respect to Socioeconomic status" is rejected.

Table 6. Mean, SD, and t-value of the pre and post test scores of the selected samples in learning Human Organ System with respect to Type of Condition.

Variable		N	DF	Tests	Mean	Standard Deviation	t-value
Nature of Disability	Low Vision	19	28	Pretest	13.63	1.57	1.02*
				Posttest	22.16	1.16	
	Total Blind	11	28	Pretest	14.00	1.09	.685*
				Posttest	21.55	2.11	

*p>0.01

N= Number of Samples, DF=Degrees of Freedom

The above Table revealed that the pre and post test mean score is significant at 0.01 level in learning Human Organ System among students with visual impairments with respect to the nature of the disability. This shows that they are at the same level irrespective of the nature of the condition. It may be due to gaining equal learning experience in learning the Human Organ system. Hence the null hypothesis stated that "there is no significant difference in the mean score of the pre and post test scores of the selected samples in learning Human Organ System with respect to Nature of Disability" is accepted.

Findings

The study was aimed to teach Human Organ System (Digestive System) through the adopted Audio-Based Tactile Model among students with visual impairment. The findings suggested that the simple, combined tactile model of the digestive system with voice outputs wasinfluential in developing knowledge and increased the level of comprehension. The use of the ABT Model significantly contributed to academic excellence and promoted knowledge sharing in special schools for visual impairment.

The study was limited to the special schools, and the model was designed only for students with visual impairment. It was emphasized only on teaching the human organ system as a part of Biology at the secondary level.

The study recommended that combined artificial intelligence be adopted and implemented in inclusive schools to provide a better inquiry-based learning experience. Furthermore, the model can be useful for students with other disabilities with need-based modification.Special educators can use a similar model while teaching any other scientific concept.

Conclusion

Science as a subject can be taught more effectively by using technology rather than the traditional method. It is vital for teachers to plan and implement effective strategies while teaching students with visual impairments. The objectives of science teaching are to develop the knowledge about their surrounding nature and increase curiosity among students. Moreover, the combination of technology and theory to teach science concepts can enhance the skills of observation, critical thinking,and logical reasoning by ensuring the facilities they need.

References

Arlinwibowo, J.&Retnawati, H. (2015). Audio, tactile teaching material of visual impairment students, International Journal on New Trends in Education and Their Implications, **6**(4),1-25 ISSN: 1309-6249.

DeFreitas Alves, C. C., Monteiro, G. B. M.,Rabello, S.,Gasparetto, M. E. R. F. &de Carvalho, K. M. (2009). Assistive Technology Applied to Education of students with visual impairment. Rev PanamSalud Publica/Pan Am J Public Health**, 26**(2),148-152

Kızılaslan, A. (2019). Linking Theory to Practice: Science for Students with Visual Impairment,Journal of Science Education International,**30**(1), 56-50.

M.Suhin&Yorek, N. (2009).Teaching Science to Visually Impaired Students: A small-scale Qualitative Study,US-China Education Review, **6**(4)ISSN1548-6613.

McCarthy, C. (2005). Effects of Thematic-Based, Hands-On Science Teaching versus a Textbook Approach for Students with Disabilities. Journal of Research in Science Teaching, **42**, 245-263.

Moreland, L. M. (2015), Science for Visually Impaired students and Accessible Technology. Theses, Dissertations, and Capstones. Paper 978.

Stefanich, G. P. & Norman, K. I. (1996). Teaching science to students with disabilities: Experiences and perceptions of classroom teachers and science educators. A special publication of the Association for the Education of Teachers in Science.

Swarup, S &Bhan, S. (2006). Information Processing and Knowledge Representation in Persons with VisualImpairment. Retrieved September 3, 2014 from dari http://icevi.org/publications/.

https://iopscience.iop.org/article/10.1088/1742-6596/1227/1/012035

https://scielosp.org/article/rpsp/2009.v26n2/148-152/en/

http://pantaneto.co.uk/science-for-students-with-visual-impairments-teaching-suggestions-and-policy-implications-for-secondary-educators-david-d-kumar-rangasamy-ramasamy-and-greg-p-stefanich/.