ENHANCING THE UNDERSTANDING OF THE CONCEPT "CELL STRUCTURE" AMONG VII STD STUDENTS THROUGH ICT

ACTION RESEARCH REPORT

Submitted
to

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
CHENNAI - 600006

Submitted
by
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Principal
District Institute of Education and Training
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CERTIFICATE

It is certified that the Action Research report entitled "ENHANCING THE UNDERSTANDING OF THE CONCEPT "ENHANCING THE UNDERSTANDING OF THE CONCEPT "CELL STRUCTURE" AMONG VII STD STUDENTS THROUGH ICT" is an original and independent research work done by Dr. R. Gobalakrishnan, Lecturer, DIET Pudukkottai in Government Higher Secondary School, Thiruvarankulam, Thiruvarankulam Block, Pudukkottai District and it has not previously formed basis for any research work or any award.

Signature
(**M. Punitham)**

DECLARATION

I hereby declare that the Action Research entitled “Enhancing the understanding of the concept “ENHANCING THE UNDERSTANDING OF THE CONCEPT “CELL STRUCTURE” AMONG VII STD STUDENTS THROUGH ICT” is an original and independent work done by me in Government Boys Higher Secondary School, Thiruvarankulam, Thiruvarankulam Block, Pudukkottai District and it has not previously formed basis for any research work or for award.

Signature

(**Dr. R. Gobalakrishnan)**

Acknowledgements

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First of all, I am extremely grateful to Director and Joint Directors, SCERT, for their valuable direction and laudable support.

I thank **Mrs. M. Punitham,** Principal, DIET, Pudukkottai for his kind support throughout my action research work.

I am highly indebted to **Dr. G. Murugan, Vice Principal**, **Dr. V. Narayanan,** Senior Lecturer and **all the other faculty** of this Institution, for their encouragement, advice and affection.

I thank, The Head Master, Government Higher Secondary School, Thiruvarankulam, for his additional support throughout my action research work to implement in class room.

I extend my sincere thanks to the Class teacher, Staffs and Students, Government Higher Secondary School, Thiruvarankulam, Thiruvarankulam Block, Pudukkottai District, for their support.

I thank all the other **teaching faculty** and **non-teaching** staff of the Institute, for their help to complete my study successfully.

Dr. R. Gobalakrishnan

CONTENTS

1. Introduction

All are known of someone who has been ill with a disease or disorder such as meningitis, malaria, diabetes, a type of cancer, cystic fibrosis, or Alzheimer's disease. All these diseases and disorders are caused by problems at a cell or molecular level. Physical damage such as a burn or broken bone also causes damage at cell level. By understanding how cells work in healthy and diseased states, cell biologists working in animal, plant and medical science will be able to develop new vaccines, more effective medicines, plants with improved qualities and through increased knowledge a better understanding of how all living things live. Eventually it will be possible to produce a 'health forecast' by analysing our database of genetic and cell information. Using this you will be able to take more control over our health in a preventive way.

In addition to that, classrooms teaching will be excellent if a teacher could arrange direct first-hand experience for each and every topic. But this is nearly impossible. So, we should provide them with some other substitute experience to accelerate learning. How closely the substitute experience resembles the direct first-hand experience decides the effectiveness of learning. The substitute experience may be provided in various ways including using the ICT tool in learning method. These methods to help students become more engaged and retain more material and also strengthen problem solving and critical thinking skills from education to real-world approach.

At the same, teacher must be fulfilling the students' learning outcome during the course of time. It means, learning outcome makes clear the intended result of the learning rather than what form the instruction will take. A good learning outcome states what a student will know or be able to do at the end of

instruction. Having those in mind, the present action researcher aims at investigates, enhancing the understanding of the concept “Cell Structure” among VII standard students through ICT.

2. What is Action Research?

Action research is one of those terms that we hear quite often in today’s educational circles. But just what does it mean? If you ask three people to define action research, you may find yourself with three different responses.

Typically, action research is undertaken in a school setting. It is a reflective process that allows for inquiry and discussion as components of the “research.” Often, action research is a collaborative activity among colleagues searching for solutions to everyday, real problems experienced in schools, or looking for ways to improve instruction and increase student achievement. Rather than dealing with the theoretical, action research allows practitioners to address those concerns that are closest to them, ones over which they can exhibit some influence and make change.

Practitioners are responsible for making more and more decisions in the operations of schools, and they are being held publicly accountable for student achievement results. The process of action research assists educators in assessing needs, documenting the steps of inquiry, analyzing data, and making informed decisions that can lead to desired outcomes.

Action research is a process in which participants examine their own educational practice systematically and carefully, using the techniques of research. It is based on the following assumptions:

- Teachers and principals work best on problems they have identified for themselves

- Teachers and principals become more effective when encouraged to examine and assess their own work and then consider ways of working differently
- Teachers and principals help each other by working collaboratively Working with colleagues helps teachers and principals in their professional development

3. Background of the study

The investigator has discussed with the Class teacher regarding the difficult concept in science of class VII in Government Boys Higher Secondary School, Thiruvarankulam (Lab school), Thiruvarankulam Block, in Pudukkottai District. Most of the students feed difficult to understand the concept "Cell structure". The investigator discussed with the teacher concerned and identified this concept for research. Make the students to attain the complete achievement in that competency the investigator selected multimedia technique for an easy way of understanding the competency.

4. Need and Significant of the study

Studying cell structure is crucial for school students for several reasons:

Foundation of Biology: Cells are the basic units of life. Understanding their structure provides the foundation for comprehending more complex biological concepts. It's like learning the alphabet before writing sentences.

Understanding Life Processes: Cells carry out various life processes such as respiration, digestion, and reproduction. Knowing their structure helps students understand how these processes occur at a microscopic level.

Health and Medicine: Many diseases and medical conditions involve abnormalities at the cellular level. Learning about cell structure can help students

understand the causes of diseases and how treatments work, leading to better health literacy.

Evolutionary Perspective: Exploring the diversity of cell structures across different organisms provides insights into evolutionary relationships. Students can understand how cells have evolved over time to adapt to different environments and functions.

Technological Advancements: Advances in biotechnology and medicine often rely on understanding cellular structures and functions. Knowledge of cell biology can inspire students to pursue careers in STEM fields and contribute to future innovations.

Overall, studying cell structure is essential for providing students with a fundamental understanding of life and its processes, as well as preparing them for further studies and careers in science and healthcare.

5. Identification of the problem

The investigator frequently visits the primary, middle, higher and higher Secondary Schools in the Pudukkottai district. During those visits, Investigator observed most of the VII standard students feed difficulty or lack of knowledge to understand the concept “Cell Structure”. The investigator discussed with the teacher concerned and identified this concept for action research. To make the students attain the complete learning outcomes in that competency the investigator selected an integrated of ICT in teaching learning methodology for an easy way of understanding and achieving the learning outcomes of the concept.

6. Statement of the problem

Enhancing the understanding of the concept “Cell structure” among VII standard students through ICT

7. Causes of the problem

- Lack of participation of all students
- Lack of student’s independence
- Lack of freedom for the learner
- Lack of interaction among students
- Non-adoption of innovation techniques to teach the concept
- Due to difficulty in understanding the concept students avoid that concept
- Time constraint for teachers to teach of the concept in view of completing syllabus
- Lack of students interests in learning difficult concept.

8. Objectives of the study

1. To identify the current level of understanding in the concept of “Cell Structure” to the VII standard students.
2. To design the strategy using ICT tools to the concept of Cell Structure.
3. To enhance the understanding in the concept of “Cell Structure” to the VII standard students.
4. To measure understanding in the concept of “Cell Structure” to the VII standard students after the implementation of strategy.

9. Probable remedies for the problem

- Organizing new techniques to develop interest
- Using innovative aids to help the students to understand the concept
- Introducing more materials for learning
- Motivating the child to learn new things
- Stimulating interest by creating a condition of challenge
- Encouraging the students to search, to enquire, to look for materials and to evaluate them critically in order to arrive the solution
- Practicing the concept through activities

10. Methodology

The investigator adopted single experimental group for this research.

i. Sample (Fig. 1)

52 students of male studying in class VII of Government Higher Secondary School, Thiruvarankulam, Thiruvarankulam Block, Pudukkottai District were taken as sample for analysis.

Fig.1. The photograph of the Government Higher Secondary School, Thiruvarankulam, Thiruvarankulam Block, Pudukkottai District.

ii. Tools used

Teacher made achievement test-tool was used. The same test tool was used for both pre-test and post-tests. The investigator conducted pre-test at the beginning of the study and a post-test was conducted after providing a suitable teaching learning experience.

iii. Variables of the study

The criterion variable in the study is effectiveness of the interactive method and the achievement of VII standard students in science competency.

iv. Design of the study (Table. 1)

<table>
<tr><th>Sl. No</th><th>Type</th><th colspan="4">Source</th></tr>
<tr><td>1</td><td>Nature of experiment</td><td colspan="4">Single group experiment treatment</td></tr>
<tr><td>2</td><td>Variables</td><td colspan="4">Dependent variables</td></tr>
<tr><td>3</td><td>Tools used</td><td colspan="4">Teacher made achievement test</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">Samples selected</td><td>School</td><td colspan="3">No. of children</td></tr>
<tr><td rowspan="2">GHSS, Thiruvarankulam</td><td>Boys</td><td>Girls</td><td>Total</td></tr>
<tr><td>28</td><td>24</td><td>52</td></tr>
<tr><td>5</td><td>Data Analysis</td><td colspan="4">Simple statistical analysis such as mean score and graphical representation.</td></tr>
</table>

11. Planning and Intervention

- ✓ Conducting pre-test
- ✓ Planning teaching design
- ✓ Preparing learning materials by the investigator
- ✓ Execution of activities by the investigator
- ✓ Frequent visit of the investigator to the school
- ✓ Conducting post test
- ✓ Analysis of data to find out the different between the pre and post test

12. Execution of the intervention

I. Administration of pre-test (Fig. 2)

The pre-test was conducted to the all the students of class VII in the selected school to assess the achievement of the students`. The pre-test questions paper is attached in Annexure.

Fig. 2. The pretest was conducted by investigator in VII students of the GHSS, Thiruvarankulam, Thiruvarankulam Block.

II. Multimedia presentation using ICT (Fig. 3)

Implementation on the concept to students through multimedia. The researcher developed a multimedia presentation slides (Microsoft Power Point slide) related to the cell structure concepts using ICT. Then investigator was handled the session to the students at regular intervals by the class teacher and the researchers.

Fig. 3. Photographs showing a performance of the researcher during ICT integrated teaching activity.

III. Implementation on the concept to student through online 3D models. (Fig. 4)

An online variety of application was available to teach the science concepts to learners. In this aspect, an online portal www. Efficos.com are an independent company based in Leipzig that develops digital solutions for the healthcare sector. With high-quality 3D models in their own software, they offer to customers the opportunity to present products and expertise in an innovative way. Impressive quality and performance in an easily accessible web application. They simply show the online 3D model for the concepts of the cell structure. The investigator utilized these online 3D model for the student's study and explained in detailed to the students for their activities.

Fig. 4. Photographs showing a performance of the researcher during online 3D model teaching activity.

IV. Project Method activity (Fig. 5)

The investigator adapted a project method activity also to implement the cell structure concept to the students. Varity of raw teaching learning material (TLM) was purchased and issued to all the students. Based in the materials the

project work was assigned to the students by investigator and the class teacher. After the distribution of TLM a title was given to each student with respect to the plant and animal cell organelles. After a course of days project work activities was presented by the students.

Fig. 5. Photographs showing a distribution of TLM to students by the researcher.

V. Group discussion activities (Fig. 6)

During the course, the investigator designed the group discussion activities and to implement the students. All 52 students were divided in to small groups and the related to the cell structure concept, the work was given to each group. Finally, allowed to submit their results in the open platform of the class room.

Fig. 6. Photographs showing, students were worked together for their theme.

VII. Lottery method for Individual activity (Fig. 7).

The researcher designed the activities for each individual student. Totally 52 number of paper token was prepared by investigator and inside of each paper token have a title with respect to the cell structure concept. This paper token was

shuffled in pot and then distributed to each student using lottery method. Finally, student to allowed explain the respective title from their paper token.

Fig. 7. Photographs showing, students were worked together for their theme.

End of all above the activities, students group presentation was given by team, designed by investigator and class teacher. All the students were together based on their title of cell structure concept and they presented in team among the students with the help of investigator.

Fig. 8. Photographs showing, students were worked together for their theme.

VIII. Administration of post-test (Fig. 9)

The post test was conducted to the all the students of class VII in the selected school to assess the achievement of the students`. The post test questions paper is attached in Annexure.

Fig. 9. The post test was conducted by investigator in VII students of the GHSS, Thiruvarankulam, Thiruvarankulam Block.

13. Data collection and analysis

After giving the activities mentioned in the experimental design the pre and post test was conducted to assess the achievement. The marks are tabulated in Table 2 and the comparative graph also depicted in Fig. 10.

Table. 2. The pre and post test score are obtained by VII students of the GHSS, Thiruvarankulam.

S.NO	STUDENT NAMES	Pre Test Marks (Out of 20)	Post Test Marks (Out of 20)	Difference
1	ASILA S	9	10	1
2	BHARATHIDASAN P	6	10	4
3	BHATHMASRI K	9	11	2
4	BIRUNTHANA P	9	14	5
5	BOSE	3	10	7
6	DIVYA THARSHINI M	10	13	3
7	HAJEETH M	10	11	1
8	HARIHARAN A	9	11	2
9	HEMA M	9	11	2
10	JAYAKISH K	4	7	3
11	KAMALESH R	12	15	3
12	KARTHIKA P	9	10	1
13	KESAVAN K	8	9	1
14	KUPENDIRAN M	9	12	3
15	LOGADHARSHINI J	13	13	0
16	MADHAN U	8	12	4
17	MAGASRI K	15	16	1
18	MANIKANDAN M	4	8	4
19	MANIKANDAN M	5	9	4
20	MANIKANDAN P	8	13	5
21	MATHESH S	7	12	5
22	MATHUMITHA R	7	13	6
23	MEYYAR K	5	7	2
24	MONIKA L	4	9	5

25	NITHYA P	7	10	3
26	PAVITHRA P	9	9	0
27	PRAGASH K	7	12	5
28	PRAGATHESHWARAN M	8	12	4
29	PRAVEEN S	8	8	0
30	PRIYADHARSHINI N	12	15	3
31	PUNITHA S	5	11	6
32	PUZHALARASU S	7	12	5
33	RAGAVAN R	13	13	0
34	RATHIKA M	5	9	4
35	RUBESH K	8	9	1
36	SAGAYARAJ R	5	9	4
37	SAKTHIVEL K	6	6	0
38	SANGEETHA M	9	11	2
39	SANJAI S	8	12	4
40	SANTHIYA P	5	7	2
41	SATHANA R	8	12	4
42	SHOBANA K	11	15	4
43	SIVAHARSHINI A	6	11	5
44	SIVASAKTHI L	8	11	3
45	SUBASH J	8	10	2
46	SUGANESH R	6	12	6
47	SUNDARAMBAL A	4	10	6
48	SUWETHA P	7	10	3
49	THIVAN K	8	9	1
50	VARSHINI M	9	11	2
51	VISHALINI S	6	8	2
52	YAMUNA C	11	15	4
	TOTAL	406	565	159

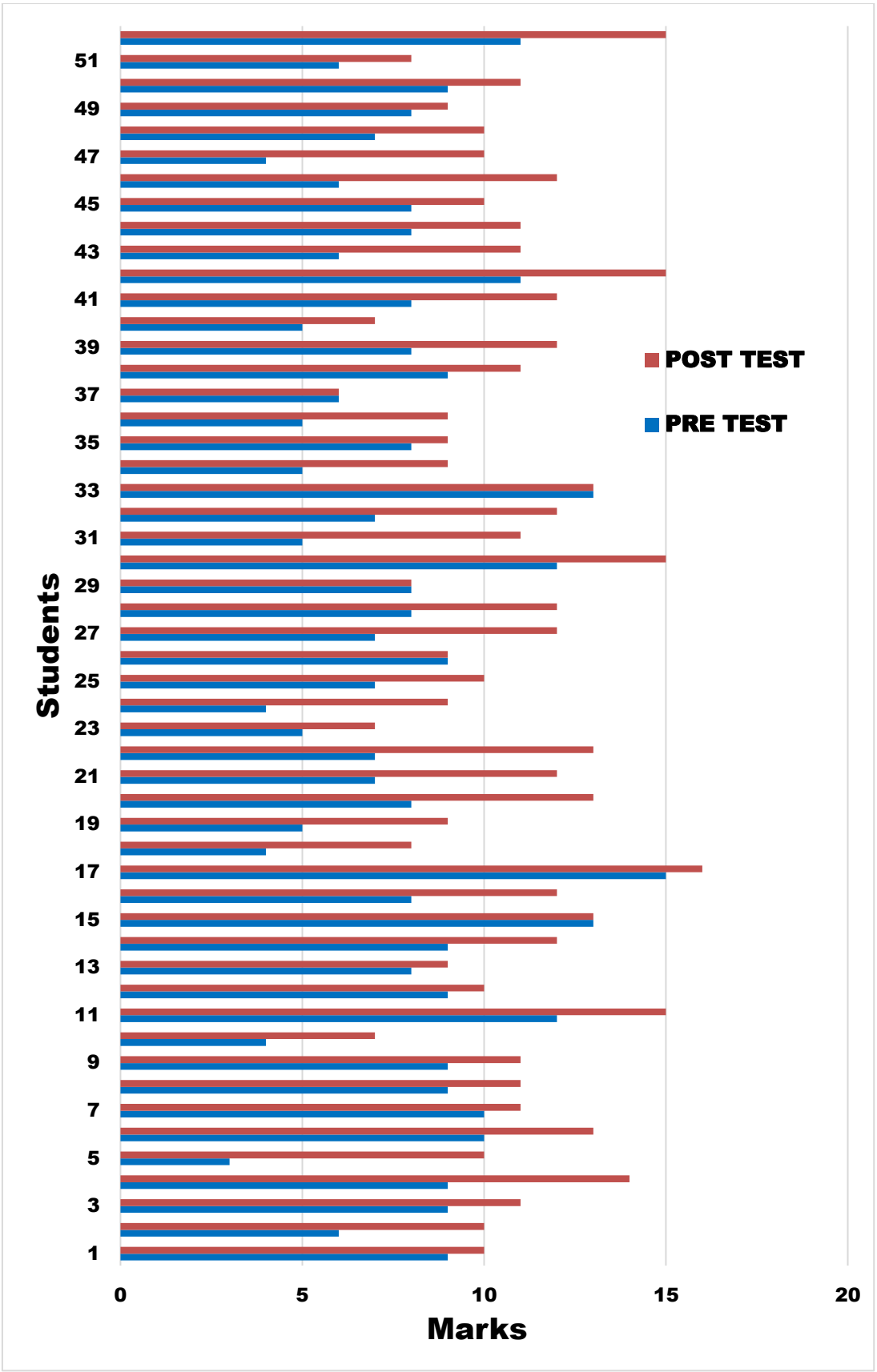

Fig. 10. The pre and post test score are obtained by VII students of the GHSS, Thiruvarankulam.

i. Descriptive analysis

The students' achievements were analyzed and the mean and SD values are tabulated and are shown in Table 3.

The table 3 and figure 11 indicates that the post test score is at a maximum level, while compared with pre-test scores. The pre test means score is 7.81 and the standard deviation is 2.56. The post test means score is 10.87 and the standard deviation is 2.28. The pre test marks sum is 406 and post test marks sum is 565. All the above data was obtained from 52 number of VII students. It is inferred that the post test achievement is greater than the pre test achievements.

Table.3. Descriptive data and scores were obtained from the pre and post test.

Test	SUM	N	Mean	SD
Pre Test	406	52	7.81	2.56
Post Test	565	52	10.87	2.28

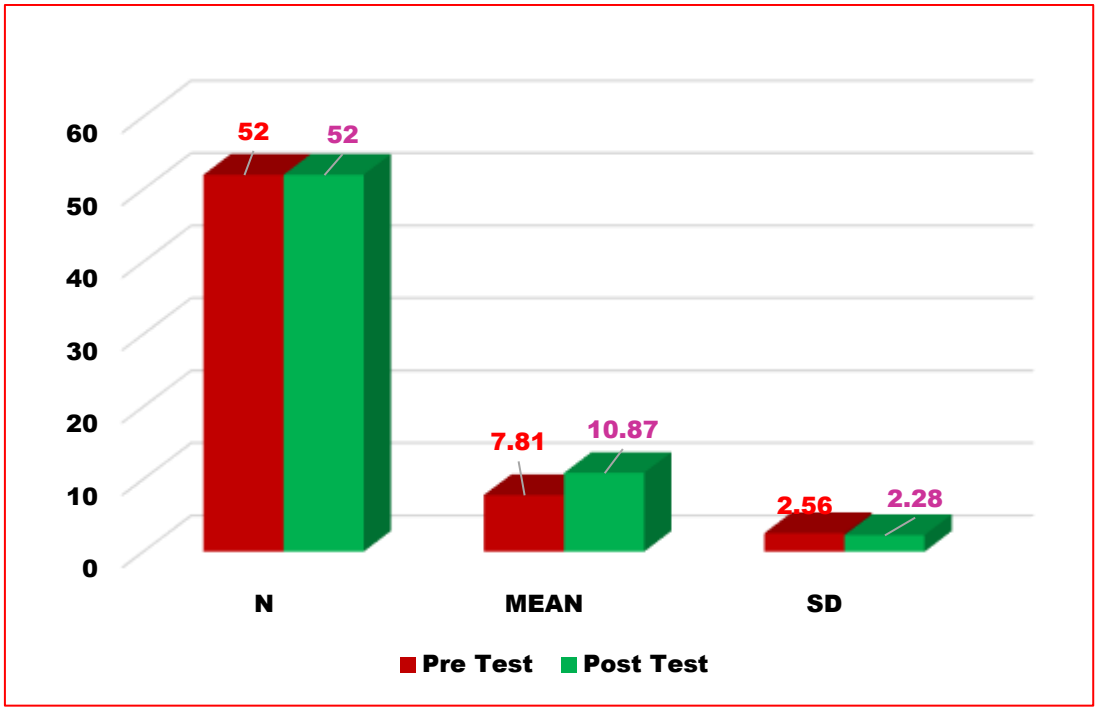

Fig. 11. Descriptive data and scores were obtained from the pre and post test.

a. Average difference

The table 4 and figure 12 indicates that the post test average score are at a maximum level, while compared with pre-test scores. The difference of the average between the pre and post test is 58.65 %. All the data was obtained from 48 number of VII students. It is inferred that the post test average percentage achievement is greater than the pre test average percentage achievements.

Table.4. Descriptive data and scores were obtained from the pre and post test.

No. of students	Pre test average	Post test average	Difference in average
52	39.04	54.33	15.29

Fig. 12. Graph depicted the achievement average percentage of pre and post test scores.

ii. Box plot range between the pre and post test scores.

Box plots are used to show overall patterns of response for a group. They provide a useful way to visualize the range and other characteristics of responses for a large group. They enable us to study the distributional characteristics of a

group of scores as well as the level of the scores. To begin with, scores are sorted. Then four equal-sized groups are made from the ordered scores. Usually, these groups labelled 1 to 4 starting at the bottom. In pre-test box plot median value is 8 and mean value is 7.81, compared to that the post-test box plot median value is 11 and mean value is 10.87. In addition, Boxplot, pre-test interquartile range (IQR) between 3 to 13 and post-test interquartile range (IQR) between 6 to 16. Therefore, after the treatment students were performed better than the pre-test attainment (Fig.13).

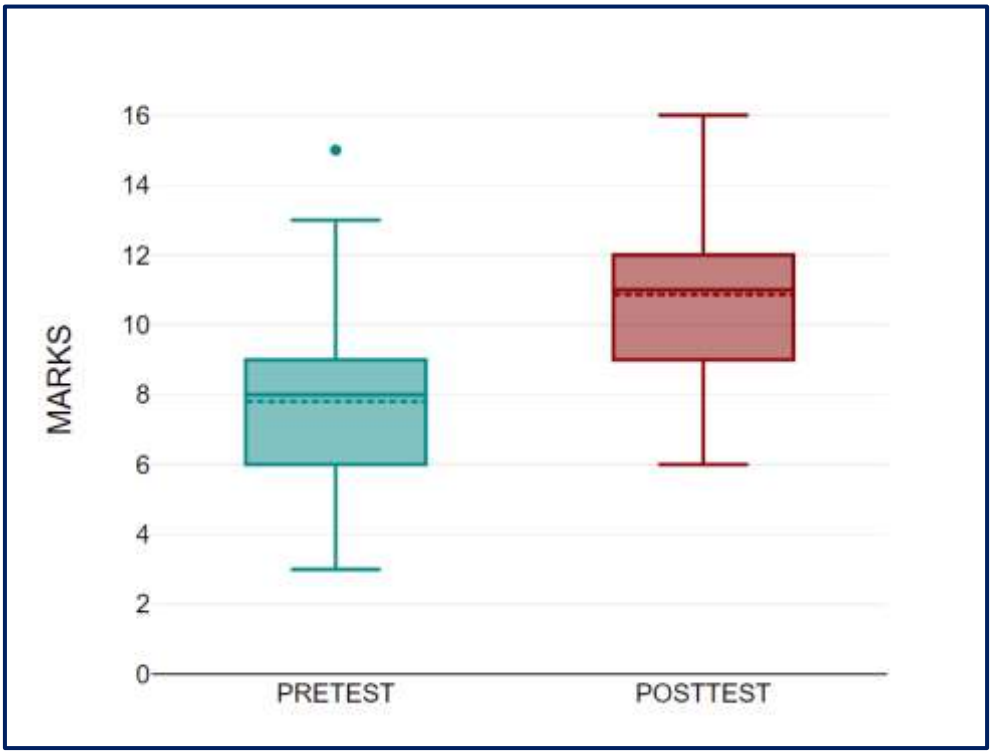

Fig.13. The box plot range between the pre and post test score are obtained by VII students of the GHSS, Thiruvarankulam.

iii. Effect size between pre and post tests

Effect sizes are the most important outcome of empirical studies or the quantitative measure of the magnitude of the experimenter effect and it is widely used in meta-analysis. Researchers want to know whether an intervention or experimental manipulation has an effect greater than zero, or (when it is obvious

an effect exists) how big the effect is. The larger the effect size the stronger the relationship between two variables. The effect size when comparing any two groups to see how substantially different they are. Typically, research studies will comprise an experimental group and a control group. The experimental group may be an intervention or treatment which is expected to affect a specific outcome.

The meaning of effect size varies by context, but the standard interpretation offered by Cohen (1988). Typically, this is reported as Cohen's *d*, or simply referred to as *"d*. Cohen's d is an appropriate effect size for the comparison between two means. It can be used to accompany the reporting of t-test results.

Cohen's *d* is determined by calculating the mean difference between your two groups, and then dividing the result by the *pooled* standard deviation.

The formula is:

$$d = \frac{\textbf{\textit{M2}} \text{ (group or treatment 1)} - \textbf{\textit{M1}} \text{(group or treatment 2)}}{\textbf{\textit{[pooled] SD}}}$$

Where

M_1 = mean of group 1

M_2 = mean of group 2

pooled ***SD*** is = $\sqrt{[SD1^2+SD2^2/2]}$

The result of Cohen's *d* means, use these general "**rule of thumb**" guidelines is below:

Relative size	Effect size	% of control group below the mean of experimental group
	0.0	50%
Small	0.2	58%
Medium	0.5	69%
Large	0.8	79%
	1.4	92%

In this present study effect size was computed to assess the between the pre and post-test. In pre-test, average Mean= 7.81, average SD= 2.56 are values are interpreted with the post-test average Mean= 10.87, average SD= 2.28. Result, Cohen's *d* value *(d)* found to be 1.2623 (Table. 5). As per **Cohen`s rule of thumb** guidelines, which is considered as a large effect size (< 79%) the between the pre and post-test.

Table. 5. Effect size data obtained between the pre and post test.

Phase	Mean	SD	Cohen's *d* value *(d)*	Effect size
Pre Test	7.81	2.56	1.2623	Larger (< 79%)
Post Test	10.87	2.28		

14. Findings

The following are the main findings of the study.

- As per the statistical data, the average means score of the pre-test was 7.81 and that the post-test was 10.87 and achievement difference percentage was 3.06.
- The pretest results percentage is 39.04 and after the achievement results percentage is 54.33. The enhancement variation between pre and post tests percentage is 15.29
- In addition, Boxplot pre-test interquartile range (IQR) between 3 to 13 and post-test interquartile range (IQR) between 6 to 16. Therefore, after the treatment students were performed better than the pre-test attainment.
- Present action research study achieved a large effect size (< 76%) between the pre and post-test statistically as per Cohen`s rule of thumb guidelines.

- The pre-test and post-test differ significantly in their achievements. It means, after the integrated of ICT into teaching and learning method students are understood the Cell structure concept more compare than the pre-test knowledge.

15. Educational implication

- It helps to cultivate the scientific attitude among students.
- The students achieve their academic objectives by this teaching learning strategy.
- The students find learning easy. As a result, students learn faster, remember longer and understand the concept easier.
- It helps to develop their curiosity and creativity.
- It helps to train the students to acquire the habit of observation.

16. Net Gains of the present effort

- ✓ It compels more attention.
- ✓ Due to child centered teaching performed by the teacher concerned, the students are able to understand the senses and effort relationship of each activity.
- ✓ Qualitative expansion and quantitative improvement can be facilitated and accelerated. It modified the learner's environment and learning activities.
- ✓ Students show their interest and curiosity.

17. Conclusion

The findings of this investigation reveal that the learners understanding ability and level of academic achievement have been improved and enhanced by applying the specially designed multimedia approach into teaching and learning

technique. The present-day traditional method of teaching has failed to achieve the required out comes. Hence, the present action research report was concluded that the integrated of ICT into teaching and learning technique would help to compensate the learning loss and also to learn the concept effectively and would their academic achievement and meaningful learning.

18. Bibliography

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2.Kothari, C.R., Research Methodology: Methods and Techniques. 2004. Pages: 401.

செயல் ஆராய்ச்சி - 2024

அடைவுச் சோதனை முன் / பின் தேர்வு

மதிப்பெண்கள்:	
	20

பெயர்:

பள்ளி:

பாடம் : அறிவியல் வகுப்பு : VII மதிப்பெண் : 20

I. சரியான விடையை தேர்வு செய்து வட்டமிடுக. (10x1=10)

1. மனிதனுக்கு மூளை போன்று, செல்லிற்கு மூளையாக செயல்படுவது எது?

a. செல் சுவர் b. செல் சவ்வு

c. செல் உட்கரு d. செல் பகுப்பு

2. அனைத்து உயிரிகளின் அடிப்படை அலகு என அழைக்கப்படுவது எது?

a. செல் b. நரம்பு

c. உட்கரு d. எலும்பு

3. தாவர செல்லின் வெளிப்புற அடுக்கு _____ ஆகும்.

a. செல் சுவர் b. உட்கரு

c. ரைபோசோம் d. செல் சவ்வு

4. விலங்கு செல்களில் ஒழுங்கற்ற வடிவத்திற்கு காரணம் அவைகளில் _____ கிடையாது?

a. கோல்கை உறுப்புகள் b. உட்கரு

c. செல் சுவர் d. செல் சவ்வு

5. செல்லினுள் காணப்படும் ஜெல்லி போன்ற பொருள் _____ ஆகும்.

a. உட்கரு b. சைட்டோசால்

c. லைசோசோம் d. மைட்டோகாண்ட்ரியா

6. தாவரத்தில், சூரிய ஆற்றலை உட்கிரகித்து உணவு உற்பத்தி செய்யும் செல் நுண்ணுறுப்பு எது?

a. மைட்டோகாண்ட்ரியா

b. பசுங்கணிகம்

c. கோல்கை உறுப்புகள்

d. எண்டோபிளாஸ்மிக் வலை

7. உயிரினங்களின் அனைத்து வளர்ச்சிதை மாற்றங்களுக்கு பயன்படுத்தப்படும் ஆற்றலை உற்பத்தி செய்யும் செல் நுண்ணுறுப்பு எது?

a. மைட்டோகாண்ட்ரியா

b. பசுங்கணிகம்

c. லைசோசோம்

d. சென்ட்ரியோல்

8. _____ இணைந்து இருப்பதால், சொரசொரப்பான எந்த பிளாஸ்மிக் வலை பின்னல் என அழைக்கப்படுகிறது?

a. குரோமோசோம்கள்

b.லைசோசோம்கள்

c. ரைபோசோம்கள்

d. கோல்கை உறுப்புகள்

9. செல் பகுப்பின்போது, குரோமோசோம்களை பிரிக்க உதவும் செல் நுண்ணுறுப்பு.

a. சென்ரியோல்

b. வாக்கியோல்

c. லைசோசோம்

d. கோல்கை உறுப்புகள்

10. கீழ்கண்டவற்றில் எது எண்டோ பிளாசா வலை பின்னலின் முக்கிய பணி ஆகும்?

a. வைட்டமின்கள், புரதம் தயாரித்தலில் ஈடுபடுதல்

b. அமினோ அமிலம், புரதம் தயாரித்தல் தயாரித்தலில் ஈடுபடுதல்

c. புரதம், கார்போஹைட்ரேட் தயாரித்தலில் ஈடுபடுதல்

d. கொழுப்பு, ஸ்டைராய்டுகளை தயாரித்தலில் ஈடுபடுதல்

II. பொருத்துக: (5x1 = 5)

1. மைட்டோகாண்ட்ரியா	-	a. செல்லின் மூளை	[ ]
2. லைசோசோம்	-	b. நொதிகளை சுரத்தல்	[ ]
3. கோல்கை உறுப்பு	-	c. உணவு தயாரித்தல்	[ ]
4. பசுங்கனிகம்	-	d. தற்கொலை பைகள்	[ ]
5. உட்கரு	-	e. ஆற்றல் மையம்	[ ]

III. சரியா அல்லது தவறா என கூறு? (5x1 = 5)

1. உட்கருவானது, ஒரு தலைமுறையில் இருந்து அடுத்த தலைமுறைக்கு மரபுவழி பண்புகளை கடத்துகிறது. [ ]
2. தாவர செல்லில் ஒழுங்கான வடிவத்திற்கு காரணம் செல்சுவர் ஆகும். [ ]
3. விலங்கு செல்லின் வெளிப்புற அடுக்கு செல் சுவர். [ ]
4. ஒரு செல்லின் உட்கருவினை தவிர்த்து மற்ற பகுதிகள் புரோட்டோபிளாசம் ஆகும். [ ]
5. செல் நுண்ணுறுப்புகளை சாதாரண ஆய்வக நுண்ணோக்கியால் காண முடியும். [ ]