CHAPTER-II: REVIEW OF RELATED LITERATURE

2.1.0 Introduction Review of related literature is an overview of the previously published works on a specific topic. The term can refer to a full scholarly paper or a section of a scholarly work such as a book,or an article. It is a comprehensive summary of previous research on a topic.It helps to determine the nature of research and provides theoretical base for the same.

2.2.0 The Impact of Interest on Academic Achievement: Charry, Myrna B. suggested there is ample theoretical and experimental evidence showing the positive impact of interest on academic achievement to suggest that college administrators might be well advised to include "expressed interest" in test batteries designed to facilitate the accurate placement of students in particular courses and curricula. J. Dewey was the first to attempt to define interest, asserting that it came from within a person, resulting from the connection of the self to an object. E. Thorndike, agreeing with Dewey that interest was a self-expressed activity, proposed that using the learner's interest was the key to learning. Followers of Thorndike surveyed students' interest in particular subjects, correlating results with academic achievement to find a strong correlation between the two.

2.3.0 Effectiveness of ICT integration in Teaching-Learning Simin Ghavifekr*, Wan Athirah Wan Rosdy found that ICT integration has a great effectiveness for both teachers and the students. Findings indicate that teachers' well-equipped preparation with ICT tools and facilities is one the main factors in success of technology-based teaching and learning. . It was also found that professional development training programs for teachers also played a key role in enhancing students' quality learning. For the future studies, there is a need for consideration

of other aspects of ICT integration especially from management point of view in regard to strategic planning and policy making in malysian context.

2.4.0 Application of ICT in teaching biology in higher classes Senthilkumar R, Sivapragasam C and Senthamaraikannan B conclude science education plays a vital role, in higher education sector. ICT is the best way to convey the information to the students in biology, because of the easy understanding and attractive experience to the students. ICT can change traditional classroom into smart classroom. So, ICT integrated instruction is the best way to improve the quality learning in higher education. Learning of biology can be made easier and more comfortable by integrating ICT tools in instructional stratagies for teaching biology. The students of biology can make use of ICT for easy understanding. ICT can change traditional classroom into smart classroom and improve teaching-learning process in biology.

2.5.0 Use of ICT and its effect on Academic Achievement Huppert et al. (1998) conducted an experimental study of the effect of using computer simulations on students' ability to apply their knowledge of the growth curve of microorganisms. The use of computer simulations was integrated as short episodes in the existing biology curriculum. The post-test results on academic achievement indicated that students in the experimental group achieved significantly higher mean scores than the control group. A significant use of ICT in science education is the incorporation of specific simulations into the existing curriculum.

2.6.0 Computer Assisted Teaching leads to high score in achievement test Barnea and Dori (1999) conducted an experimental study with three 10th-grade classes who used a discovery approach based on computerised molecular modelling, which enabled animation of three-dimensional representations of

molecules of any size and colour in a number of presentation styles. Students in the experimental group performed better than control group students on their spatial ability, understanding of new concepts related to geometric and symbolic representations, and perception of the model concept. Students in the experimental group scored higher than students in the control group in the achievement test on structure and bonding.

2.7.0 Use of ICT tools for improved teaching-learning process in science classrooms Michelle M. Mukherjee (2013) described technological tools for science classrooms: choosing and using for productive and sustainable teaching and learning experiences.

2.8.0 Correlation between student's interest and achievement Yuliana Yuliana, Firdaus Sale, La Ode Nggawu found out the correlation between student's learning interest and their english schievement at SMAN 10 Kendari.The purpose of the research is to find out a significant correlation between students' learning interest and their English achievement in SMAN 10 Kendari. The method used in conducting this research is correlation study. The results of the research show that there is significant correlation between students' learning interest and their English achievement. It can be seen by the results of analysis using *Correlation Product Moment* with help program SPSS Version.It was concluded that there was significant correlation between students' learning interest and their English achievement at SMAN 10 Kendari in academic year 2016/2017.

2.9.0 Sum-Up

Technology-based teaching and learning is more effective in compare to traditional classroom. This is because, using ICT tools and equipment will prepare an active learning environment that is more interesting and effective for both teachers and students. The results are in line with a research findings by Macho (2005) that proved using ICT in education would enhance students' learning. Interest in learning, could most probably be a very powerful affective psychological trait and a very strong knowledge emotion as well as an overwhelming magnetic positive feeling, a sense of being captivated, enthralled, invigorated and energized to cognitively process information much faster and more accurately in addition to most effective application of psychomotor traits like self-regulatory skills, self-discipline, working harder and smarter with optimum persistence" (Kpolovie, 2010). He recommended the need of conducting more researches for ascertaining the actual role that interest in learning plays in students' academic attainment at all levels of the educational system.

Currently, ICT plays an important role in promoting new instructional methods for teaching and learning, such as: self-paced learning (Roberts, 2003), network learning (González, 2009) and online discussion (González, 2010). Moreover, effective use of ICT can facilitate student- cantered active learning (Ellis et al., 2008), engage students in collaborative learning as well as enhance their social interaction (Dodge et al., 2003). Previous practice in using computers and positive attitudes towards technology are variables that favour success in teachers' integration of ICT (Drent and Meelissen 2008; Mueller et al. 2008). In addition, research shows that ICT is no generating the expected significant changes (Cuban 2001; Cuban, Kirkpatrick, and Peck 2001; Robertson 2003). On the other

hand, it is clear that educational changes addressed through ICT may result in effective changes in student learning (Wong and Li 2008).

CHAPTER-III RESEARCH METHODOLOGY

3.1.0 Introduction

Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. The methodology section answers two main questions: How was the data collected or generated? How was it analyzed?

In this study, quantitative methodology was used to collect and analyze the data obtained from all the respondents.

3.2.0 Sample

A sample is a small portion of a population selected for observation and analysis. It is a collection consisting of a part of subset of population.The sampling technique to be used for present study will be 'Purposive Sampling' because it is focussed on class 9 students of a secondary school situated in Bhopal.

The sample comprised of 40 students of a public school of class 9.

3.3.0 Research Design

Experimental Research Design is used for the present study. The experimental research is a scientific approach to research, where one or more independent variables are manipulated and applied to one or more dependent variables to measure their effect on the latter. The effect of the independent variables on the dependent variables is usually observed and recorded over some time, to aid researchers in drawing a reasonable conclusion regarding the relationship between

these 2 variable types.A pretest-posttest design is usually a quasi-experiment research design where participants are studied before and after the experimental manipulation. **Quasi-experimental** simply means participants are not randomly assigned. It is possible to have a control group, or a group who doesn't receive the manipulation. In a pretest-posttest design, there is only one group and all of them are in the experimental condition.

3.4.0 Research Method

Quantitative research method is used to determine the cause and effect relationship between the variables. It is easier to interpret or infer relationships between the independent and dependent variables as they can manipulate the independent variable and its effect on dependent variable can be seen.

3.5.0 Research tools

The research tools were developed by the researcher in order to fulfill the criterion of the research being conducted. Data is collected by presenting quiz and questionnaire to the students after intervention of the ICT as a pedagogical tool to measure and compare their achievement and interest in the subject biology.

3.5.1 **Quiz:** The quiz consisted of 25 questions including fill in the blanks, multiple choice questions and one words from the 3 chapters from biology i.e. Fundamental unit of Life, Tissues, Diversity in living organisms in order to measure the level of achievement of learners.

Instructions for the quiz: Each question carries one mark. It is compulsory to attempt all questions. There will be no mark to be given on wrong answers. Tick a mark on the correct answer for each question.

3.5.2 **Questionnaire**: Self-made questionnaire to determine the interest of learners in teaching-learning biology through ICT as a pedagogical tool. It consist of 10 no. of inventories based on 3 point Likert scale i.e. Yes, No, Can't say.

Instructions: There is no right or wrong answers. The learners are requested to respond in Yes, No or Can't say.

3.6.0 Procedure of data collection

Data collection defines the procedure for collecting data by the researcher. Primary data is collected to the group of students and the results were analyzed.

The data was collected with the help of research tools. Various ICT pedagogical tools such as videos, multimedia tests quizzes etc act as a treatment presented before the participant students. A pre-test is conducted to obtain their scores through quiz with multiple choice questions was conducted.

Treatment was given for a month and post-test was conducted to obtain their scores.

3.7.0 Statistics for data analysis

The techniques for data analysis were qualitative and quantitative both. The instruments that used were questionnaire with Likert-scale model. The scores of student's learning interest were taken by filling the questionnaire and scores of achievement were taken from the pre-test post-test method.

The population of the study was students of class 9^{th} of a school in Bhopal consisting of 40 students. A 'Purposive Sampling' technique was used to

determine the samples. The study used a survey/questionnaire method and correlation study.

For the purpose of data analysis, the following statistical techniques will be used:

1. To compare mean scores of Achievement in Biology at pre-test and post-test correlated t-test/ Paired sample t-test was used.
2. Questionnaire is used to determine the interest in the subject biology.

2.8.0 Data Analysis

Once data is collected, the next step is to get insights from it to find patterns, connections and relationships. In the present study, the achievement score is calculated by determining the difference between pretest-posttest mean scores. Paired sample t-test is performed to determine the mean scores of the data.

2.8.1 **To compare mean scores** : A **paired-samples** (**correlated-samples** or **dependent-samples**) is used when you have one sample of subjects who are tested several times, but under different conditions, that is, under different levels of an independent variable. Each subject is measured on the same dependent variable, but under different levels of an independent variable and you compare performance of the subjects between the different levels of this independent variable (with-subjects design). For the paired *t*-test, we need two variables. One variable defines the pairs for the observations. The second variable is a measurement. Sometimes, we already have the paired differences for the measurement variable. Other times, we have separate variables for "before" and "after" measurements for each pair and need to calculate the differences.

Degree of freedom: Freedom commonly means the total available options or alternatives. People cannot have infinite options. The options will be limited.So, total available options or alternatives are always finite. By adding degree, the freedom should get reduced. The Degree of Freedom can be expressed as:

Degree of Freedom(df)= Total available options/alternatives-Total restrictions imposed

The degree of freedom for the two samples are:

df1=40-1=39

df2= 40-1=39

Table 1.

S.No.	Pretest Score of Students(X)	Difference of Mean (X-M)	Mean	Squared Difference of Mean $(X-M)^2$
1	10	-3.25		10.56
2	14	0.75		0.56
3	18	4.75		22.56
4	12	-1.25		1.56
5	11	-2.25	13.25	5.06
6	10	-3.25		10.56
7	9	-4.25		18.06
8	20	6.75		45.56
9	21	7.75		60.06
10	15	1.75		3.06
11	17	3.75		14.06
12	11	-2.25		5.06
13	12	-1.25		1.56
14	14	0.75		0.56
15	18	4.75		22.56
16	9	-4.25		18.06
17	15	1.75		3.06
18	12	-1.25		1.56
19	14	0.75		0.56

20	13	-0.25		0.06
21	12	-1.25		1.56
22	16	2.75		7.56
23	10	-3.25		10.56
24	20	6.75		45.56
25	13	-0.25		0.06
26	8	-5.25		27.56
27	10	-3.25		10.56
28	13	-0.25		0.06
29	17	3.75		14.06
30	19	5.75		33.06
31	9	-4.25		18.06
32	8	-5.25		27.56
33	14	0.75		0.56
34	16	2.75		7.56
35	11	-2.25		5.06
36	15	1.75		3.06
37	12	-1.25		1.56
38	6	-7.25		52.56
39	11	-2.25		5.06
40	15	1.75		3.06
Total=40	530		13.25	519.50

Pre-test

N_1: 40

$df_1 = N - 1 = 40 - 1 = 39$

M_1: 13.25

SS_1: 519.5

$s^2_1 = SS_1/(N - 1) = 519.5/(40\text{-}1) = 13.32$

Standard Deviation calculation for Pre-test

Count, N: 40

Sum, Σx: 530

Mean, $\bar{x}$: 13.25

Variance, s^2: 13.320512820513

Steps:

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \bar{x})^2},$$

$$s^2 = \frac{\Sigma(x_i - \bar{x})^2}{N - 1}$$

$$= \frac{(10 - 13.25)^2 + \ldots + (15 - 13.25)^2}{40 - 1}$$

$$= \frac{519.5}{39}$$

$$= 13.320512820513$$

$$s = \sqrt{13.320512820513}$$

$$= 3.64$$

Table 2.

S.No.	Post-test scores of students	Difference of Mean(X-M)	Mean	Squared Difference of Mean$(X-M)^2$
1	12	-4.23	16.23	17.85
2	16	-0.23		0.05
3	20	3.77		14.25
4	14	-2.23		4.95
5	12	-4.23		17.85
6	12	-4.23		17.85
7	12	-4.23		17.85
8	23	6.77		45.90
9	23	6.77		45.90
10	20	3.77		14.25
11	20	3.77		14.25
12	15	-1.23		1.50
13	15	-1.23		1.50
14	18	1.77		3.15
15	20	3.77		14.25
16	12	-4.23		17.85
17	20	3.77		14.25
18	18	1.77		3.15
19	18	1.77		3.15
20	18	1.77		3.15
21	15	-1.23		1.50
22	20	3.77		14.25
23	12	-4.23		17.85
24	23	6.77		45.90
25	15	-1.23		1.50
26	12	-4.23		17.85
27	12	-4.23		17.85
28	15	-1.23		1.50
29	12	-4.23		17.85
30	15	-1.23		1.50
31	12	-4.23		17.85
32	12	-4.23		17.85
33	15	-1.23		1.50
34	20	3.77		14.25
35	15	-1.23		1.50
36	20	3.77		14.25
37	15	-1.23		1.50
38	18	1.77		3.15

39	15	-1.23		1.50
40	18	1.77		3.15
Total=40	650			486.98

Post-test data analysis

N_2: 40

$df_2 = N - 1 = 40 - 1 = 39$

M_2: 16.23

SS_2: 486.98

$s^2_2 = SS_2/(N - 1) = 486.98/(40-1) = 12.49$

Steps to calculate standard deviation

Count, N: 40

Sum, Σx: 650

Mean, $\bar{x}$: 16.25

Variance, s^2: 13.576923076923

$$s = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(x_i - \overline{x})^2},$$

$$s^2 = \frac{\Sigma(x_i - \bar{x})^2}{N - 1}$$

$$= \frac{(12 - 16.25)^2 + \ldots + (18 - 16.25)^2}{40 - 1}$$

= 529/39

= 13.576923076923

s = $\sqrt{13.576923076923}$

= 3.68

T-value Calculation

$s^2_p = ((df_1/(df_1 + df_2)) * s^2_1) + ((df_2/(df_2 + df_2)) * s^2_2) = ((39/78) * 13.32) + ((39/78) * 12.49) = 12.9$

$s^2_{M1} = s^2_p/N_1 = 12.9/40 = 0.32$
$s^2_{M2} = s^2_p/N_2 = 12.9/40 = 0.32$

$t = (M_1 - M_2)/\sqrt{(s^2_{M1} + s^2_{M2})} = -2.98/\sqrt{0.65} = -3.7$

The *t*-value is -3.7038[1]. The *p*-value is .0001.

The result is significant at $p < .05$ and also significant at $p<0.01$.

Measurement of magnitude of the relationship between ICT as a pedagogical tool and achievement scores of the students by Effect size:

For the independent samples T-test, Cohen's *d* is determined by calculating the mean difference between your two groups, and then dividing the result by the *pooled* standard deviation.

[1] The t-values are shown as negative but it should always be reported as positive because it represents the difference between means of two groups. Difference is a scalar quantity which has only magnitude but no direction.

Cohen's $d = (M_2 - M_1)/SD_{pooled}$

where:

$SD_{pooled} = \sqrt{((SD_1^2 + SD_2^2)/2)}$

Group 1	***Group 2***
Mean (M): 13.25	*Mean (M): 16.23*
Standard deviation (s):3.64	*Standard deviation (s): 3.68*
Sample size (n): 40	*Sample size (n): 40*

Cohen's $d^2 = (16.23 - 13.75)/3.66 = 0.6$.

Data analysis to measure interest :

It is measured with the help of the questionnaire presented to the students after the intervention/treatment. The participants were the same students to whom treatment was given. The survey was conducted with the help of google form. It was filled and submitted by the students and analysed by the reasearcher for the interpretation of the data.The following table illustrates the data representing responses

[2] **Cohen's D** is one of the most common ways to measure effect size. An effect size is how large an effect of something is.

Small effect = 0.2
Medium Effect = 0.5
Large Effect = 0

Table 3 showing Student's interest in the subject biology taught through ICT Pedagogical tools.

Questions	Total Students	Response - Yes	Response- Yes %	Response- No	Response- No %	Response- Can't Say	Response Can't Say %
1. Learning biology through ICT has been fun for me	40	39	98%	0	0%	1	3%
2. I always look forward to my biology lessons when it is ICT integrated because I enjoy them a lot.	40	39	98%	0	0%	1	3%
3. I am interested in Biology since I was young, but it is difficult to understand some abstract concepts which has become easier through simulations and 3D Video representations	40	35	88%	0	0%	5	13%
4. Learning Biology through ICT also aids in enhancing knowledge and skills in computer technology and how to use them in instructional process in a classroom.	40	34	85%	0	0%	6	15%
5. Using ICT in biology class can positively contribute to the learning	40	33	83%	1	3%	6	15%
6. Using ICT in Biology makes the classroom learning environment effective?	40	35	88%	0	0%	5	13%
7. I find it easier to learn by using ICT	40	37	93%	1	3%	2	5%
8. I think the quality of teaching-learning has improved by integrating ICT in the classroom	40	35	88%	1	3%	4	10%
9. The use of ICT enable us to be more active and engaging in a lesson	40	38	95%	0	0%	2	5%
10. I am looking forward to computer-aided learning in my classroom in future for better understanding of the subject biology	40	39	98%	0	0%	1	3%
Mean		36.4		0.3		3.3	
SD		2.27		0.48		2.11	

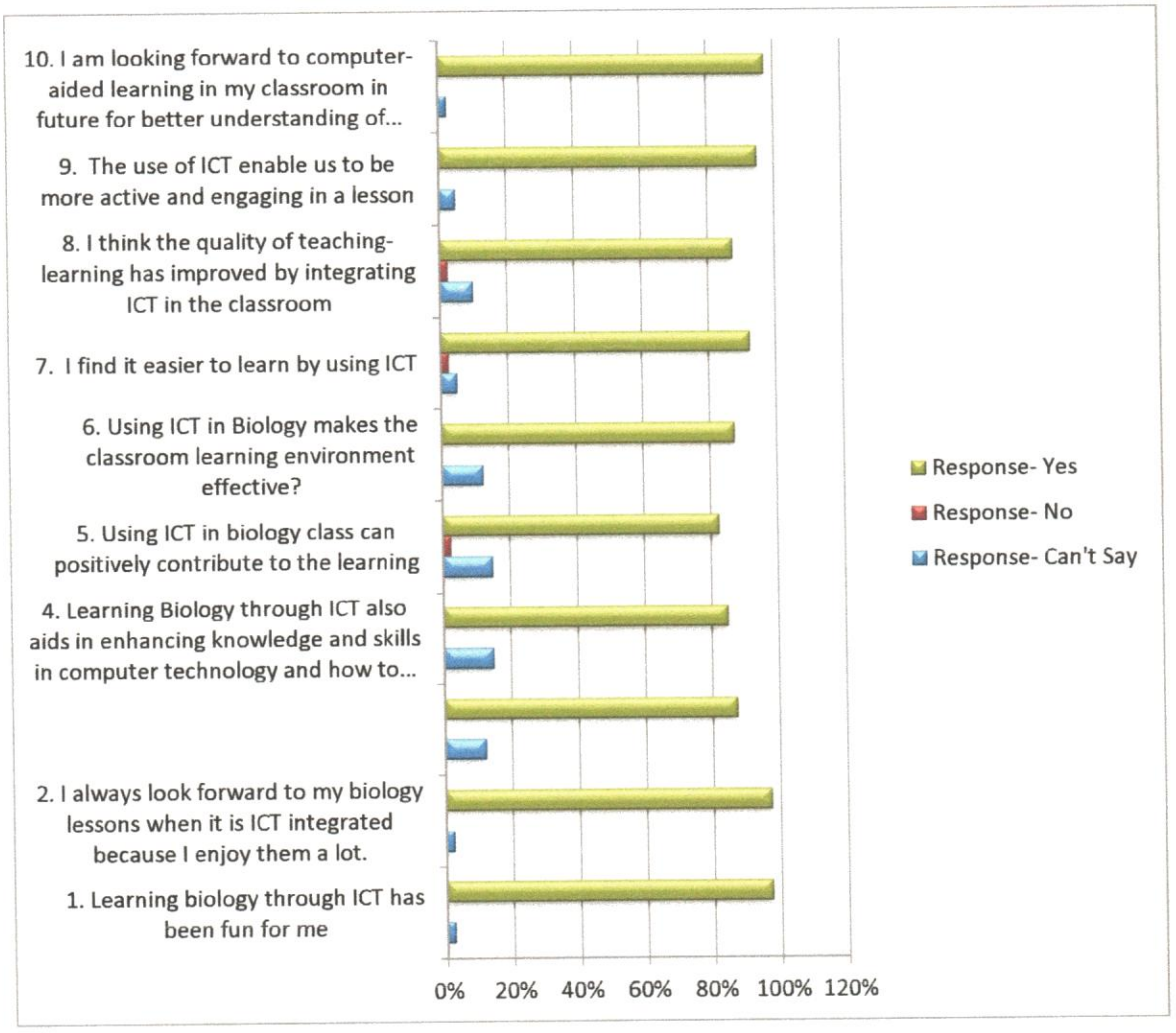

Figure 1 Graphical Representation of the responses given by the students in bar graph.

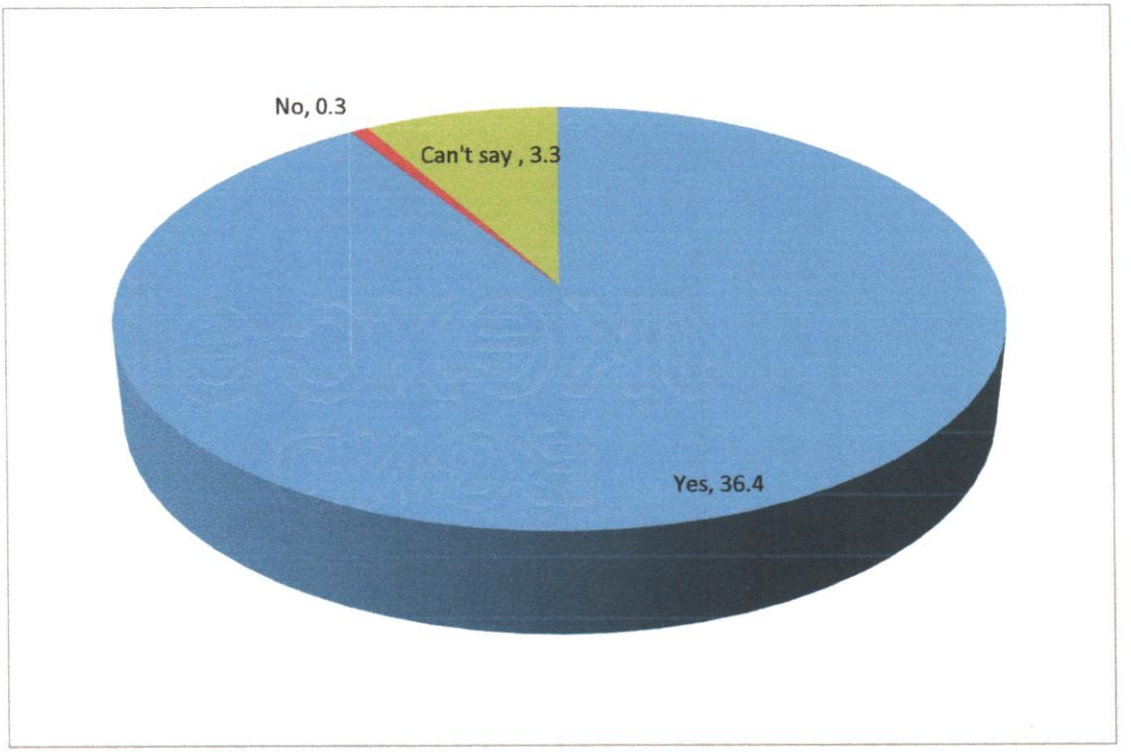

Figure 2 Pie chart showing mean of responses given by the students.