ICT TOOLS IN TEACHING LEARNING OF CHEMISTRY: A STUDY OF THE IMPACT ON THE STUDENTS AT SENIOR SECONDARY LEVEL

Dr. Zeba Tabassum

Assistant Professor, Centre for Early Childhood Development and Research
Jamia Millia Islamia, New Delhi, India
E-Mail: tabassum.zeba@gmail.com

ABSTRACT

The present study focuses on the impact of teachers using traditional method and ICT tools on the academic achievement of the students, attitude of the students towards the subject chemistry, attitude of the students towards the use of ICT tools in teaching learning of Chemistry and the impact of the ICT tools on the written communication skills of the students. ICT tools in the present study may be understood as the application of digital equipment to all aspects of teaching and learning. Thus, the components of ICT would be video tapes, audio tapes, CDs, DVDs, television broadcast, video cassettes; computer-based learning materials, teleconferencing, video conferencing, internet, web conferencing etc. Sample for the present study comprised of students of 4 sections of class XII Science enrolled in Jamia Senior Secondary School and Syed Abid Hussain Senior Secondary School. As random assignment of subjects to control and Experimental Groups has not been applied, the present study is Quasi Experimental in nature. Of the many quasi experimental designs, Pretest-Posttest non-equivalent Groups Design was employed for the present study. The following tools were used for attaining the objectives of the study: Attitude Scales: a) Five point Likert scale for measuring Impact of ICT tools on the attitude of students towards chemistry (ATCS) b) Five point Likert scale for measuring Impact of ICT tools on the attitude of student towards the use of ICT tools in teaching learning of chemistry (ATIS). In accordance with the objectives of the study, the obtained data was analyzed using specific statistical techniques, which include computation of mean, S.D, t-test, ANCOVA (analysis of covariance). It was found from the study that traditional method must be used along with suitable ICT tool which may help in improving the teaching learning process and increasing the comprehensibility of the subject Chemistry. Thus, it was inferred that the use of ICT tools in the teaching learning of Chemistry has a positive impact on academic achievement, attitude and communication skills of the students.

Keywords: ICT Tool, Academic Achievement, Attitude, Communication Skill, Teaching Learning Process

INTRODUCTION

The rapid advances recently made in ICT, particularly in the Internet, have very important implications for us. As we begin the 21st century, it is almost impossible to imagine what ICT will be like by the end of the century. We can already start to see how these advances are changing our ideas about traditional education, distance education, just in time learning and the importance of life- long learning. Advances in ICT will mean an enormous increase in the amount of information available to our students as they study their courses and as they move into the workplace, but this must not be the limit of our expectations. If we wish to provide our students with a quality education, we must consider more than mere transmission of information and facts. We must take account of what the educational research tells us about learning, namely students learn best by building on pre–existing knowledge; active learning with understanding and adopting a meta-cognitive approach.

Concept of ICT

For the purpose of this study, Information and Communication Technologies are defined as all digital devices, tools, content and resources, which can be deployed for realizing the goals of teaching- learning as well as management of the educational system.

ICT tools in the present study may be understood as the application of digital equipments to all aspects of teaching and learning. Thus the components of ICT would be video tapes, audio tapes, CDs, DVDs, television broadcast, video cassettes; computer based learning materials, teleconferencing, video conferencing, internet, web conferencing etc.

ICT tools used in the present study are:-

- Internet
- Power point Presentations
- MS word
- MS Paint
- CD ROM

The potential role of ICT in science education is multifaceted and evolutionary. This can be realized from the opportunities provided by various ICT tools to provide a huge range of resources that are of high quality and relevant to science learning. There is a considerable research audience that learners are more highly motivated when their learning is supported by ICT and ICT also provides opportunities for teachers to be creative in their teaching. It is

established through various researches that ICT increase the efficiency of the subject to be taught.

In the present study, the impact of ICT tools on academic achievement, attitude towards Chemistry, attitude towards the use of IC T tools in teaching learning process and written communication skills of the students is studied.

Academic Achievement

It refers to the scores obtained by the students in posttest (based on content taught during treatment). The taxonomy of objectives given by bloom is used in the present study for preparing the blue print of the pretest & posttest. The steps given by Norman E. Gronlund (1990) are considered for preparing the achievement test for studying the impact of teaching with ICT tools on the academic achievement of the students.

ATTITUDE

In the present study, the Central attribute of the attitude concept is evaluative quality. The attitude towards anything is expressed as like or dislike of the thing. The Central attribute of the attitude is very broadly used in discussing issues in science education and is more often used in various contexts. There is a great agreement among science theorists and practitioners on the importance of student's attitudes toward chemistry lessons in school (Geban, O., et al, 2011; Collins, et al., 2003; Coll, R.K., 2002). Student's attitude toward the learning of chemistry is seen as one of the factors influencing their academic achievement. The development of student's positive attitudes toward chemistry as a school subject is an important issue.

It is worth mentioning that student's positive attitude to chemistry is necessary because researches on the relationship between attitudes and academic achievement discovered that these variables were closely related to each other.

The development of students and teacher's positive attitude towards the use of ICT in teaching learning process is important and researches indicated that these variables (attitude towards ICT tools and their use in teaching learning process) were closely related to each other (Sani Bala Shehu, April 2012, "Teacher's and student's attitudes towards the use of Modern Information and Communication Technology").

In the present study impact of teaching with ICT tools on the attitude towards Chemistry and attitude towards the use of ICT tools in teaching learning of Chemistry is

studied.

Attitude towards Chemistry: Attitude towards subject chemistry is the evaluative beliefs of the students regarding chemistry theory, structures of molecules, laboratory work, assignments, projects etc. Attitude towards chemistry is expressed as students likes and dislikes to the above aspects.

Attitude towards the use of ICT tools in teaching learning of Chemistry: The attitude towards the use of ICT tools in teaching learning of chemistry is defined as ICT tools related student's disposition based upon their liking, thinking and feeling about the use of ICT tools in teaching learning process.

Written Communication Skills

In the present study, written communication skills may be defined as expressing your ideas to others in writing other than oral. This requires a good presentation skill which can be improved of the students when they are exposed to appropriate learning activities utilizing ICT tools to develop the skills required for effective written communication.

Students through the interactive sessions were properly guided to develop information literacy and internet searching studying. They were also taught the use of MS-Word, Paint, and Power Point Presentation. These interactive sessions were meant to help students to improve their written communication skills and thus to study the impact of teaching with ICT tools on written communication skills of the students.

OBJECTIVES OF THE STUDY

The study was planned with the following major objectives:

1) To study the impact of teaching with traditional method on the academic achievement of the students

2) To study the impact of teaching with ICT tools on the academic achievement of the students.

3) To compare the impact of teaching with traditional method and teaching with ICT tools on the academic achievement of the students.

4) To study the impact of teaching with traditional method on the attitude of t he students towards the subject chemistry.

5) To study the impact of teaching with ICT tools on the attitude of the students towards the subject chemistry.

6) To compare the impact of teaching with traditional method and teaching with ICT tools on the attitude of the students towards the subject chemistry.

7) To study the impact of the ICT tools on the written communication skills of the students.

8) To study the impact of teaching with ICT tools on the attitude of the students towards the use of ICT tools in teaching learning of Chemistry.

METHODOLOGY

As random assignment of subjects to control and Experimental Groups has not been applied, the present study is **Quasi Experimental** in nature. Of the many quasi experimental designs, **Pretest- Posttest non-equivalent Groups Design** was employed for the present study.

SAMPLE

Sample for the present study comprised of 4 sections of class XII Science enrolled in Jamia Senior Secondary School and Syed Abid Hussain Senior Secondary School. The two Senior Secondary Schools are different in terms of financial aspects. Jamia Senior Secondary School is UGC funded and students pay very nominal fees in accordance with the central government norms. The salary of the teachers is met from the university budget account. Syed Abid Hussain Senior Secondary School is self-financing school.

The expenditure (teachers' salaries, other expenses like exams, sports day, functions etc.) are met from the fees deposited by the students. Therefore, the fee paid by the students of SAH Senior Secondary School is higher than those paid by the students of Jamia Senior Secondary School. The medium of instruction is English. Class XII science was taken for the present study because the topics which the investigator prepared using ICT tools were from XII science and involved more structures, figures, etc.

CONTROL GROUPS

XII Sc. B of Syed Abid Hussain Senior Secondary School and XII Sc.C of Jamia Senior Secondary School were labeled as Control group I and Control group II respectively and were taught by traditional talk and chalk method.

Experimental groups

XII Sc. D of Syed Abid Hussain Senior Secondary School and XII Sc.B of Jamia

Senior Secondary School were labeled as Experimental group I and Experimental group II respectively and were taught with the use of ICT tools (Power Point slides, internet, CD-ROM, MS word, MS paint). Role of teacher was that of an organizer of the activity only.

TOOLS USED FOR THE STUDY

Factual information or data is essential in every study, so that the research problem can be analyzed judiciously. Relevant data, adequate in quantity and quality should be collected. It is necessary to adopt or evolve systematic procedure to collect essential data. For collecting new unknown data required for the study, one may use various devices. Such instruments are called tools which are vital for successful research as they help in collecting and interpreting the data. The present study attempts to study the impact of ICT tools in teaching learning of Chemistry. The following tools were used for attaining the objectives of the present study.

I) Achievement tests

a) Pre-test

It was designed to provide useful information regarding the existing knowledge or previous knowledge possessed by the students of class XIIth in Chemistry. The content of the pretest was from the Chemistry NCERT textbook of class XI.

b) Post-test

Test meant to evaluate pupil's gain of instructional objectives after completion of topic. This may be also used as a measure for the effectiveness of teaching method employed to teach students. The content of the posttest was from the Chemistry NCERT textbook of class XII Blue Print for the pretest and posttest was prepared as it helps in assuring that test will measure instructional objectives and course content in a balanced manner.

II) Attitude Scales

a) Five point Likert scale for measuring Impact of teaching with ICT tools on the attitude of students towards chemistry (ATCS)

An attitude scale was constructed by the investigator to measure the impact of ICT tools on the attitude of the students towards chemistry. For the selection of items for the attitude scale many researches were reviewed by the investigator.

There were 37 Likert type (5: strongly agree – 1: strongly disagree) items designed to measure the impact of ICT tools on the attitude of students toward chemistry . The scale comprises of the following components:

1. Interest in Chemistry as a subject.
2. Importance of Chemistry in life.
3. Liking for Chemistry activities/assignments/projects in the class or laboratory.
4. Like to develop or update knowledge in the field of Chemistry.
5. Concepts and molecular structures.

The score of any student on ATCS would fall between 37 and 185.

b) Five point Likert scale for measuring impact of teaching with ICT tools on the attitude of student towards the use of ICT tools in teaching learning of chemistry (ATIS)

This attitude scale was constructed by the investigator to measure the attitude of students towards the use of ICT tools in teaching learning of chemistry before and after the intervention and hence to look into the impact of ICT tools on the attitude of students towards the use of ICT tools in teaching learning of chemistry. For the selection of items for the attitude scale many researches were reviewed b y the researcher.

The scale comprises of the following components:

1. Accessibility
2. Use of ICT tools in teaching learning process
3. Benefits of using ICT tools for the students

There were 36 Likert type (5: strongly agree – 1: strongly disagree) items designed to measure the attitude of the students towards ICT tools in teaching learning of chemistry. The respondents were asked to rate each item on a 1- to 5 response scale where 5 – strongly agree, 4 = agree, 3= undecided, 2 = disagree and 1 – strongly disagree. The final score of respondents on the scale was sum of their rating for all of the items. The score of any student on ATIS would fall between 36 and 180.

FINDINGS AND CONCLUSIONS

1. Comparison of the impact of teaching with traditional method and teaching with ICT tools on academic achievement of the students

It may be inferred that there is a significant difference in the academic achievement of students taught through traditional method and use of ICT tools. When initial differences are allowed for, significant differences in mean scores (Control Group-I and Experimental Group- I, Control Group-II and Experimental Group-II) were observed between students

taught through traditional method and those taught with the use of ICT tools. t-values were found to be significant at 0.01 level.

Thus it may be concluded that use of ICT tools is relatively more effective than traditional method for teaching learning of Chemistry in terms of academic achievement.
It may be interpreted that use of ICT tools in teaching not only offers an alternative way of teaching and learning; but also has learning benefits in terms of multi- sensory approach which serves different "Preferred Styles of Learning" of pupils. ICT tools also allows better presentation of content enriched with colour and sound effects thereby enhancing understanding of complex ideas by pupils, through engagement of senses.

It may therefore be inferred that there is a significant difference in the academic achievement of students taught through traditional method and use of ICT tools. It may be interpreted that there is an improvement in student achievement when they are taught with the use of ICT tools.

2. Comparison of the impact of teaching with traditional method and teaching with ICT tools on the attitude of the students towards the subject Chemistry

Use of Traditional Method in teaching learning of Chemistry has not resulted in improvingthe attitude of the students towards subject Chemistry. When mean attitude scores obtained on ATCS in the pretest phase and posttest phase compared using t-test. Therefore, Traditional Method must be used along with suitable teaching aid which may help in improving the teaching learning process and increasing the comprehensibility of the subject Chemistry.

Use of ICT tools in teaching learning of Chemistry has resulted in improving the attitude of the students towards subject Chemistry as the difference in mean attitude values obtained on ATCS in the pretest and posttest phases was significant. Therefore, ICT tools must be incorporated in the teaching learning of Chemistry when and where required so as to make the subject more interesting and comprehensive which is today's need.

Comparison of the impact of teaching with traditional method and teaching with ICT tools on the attitude of the students towards the subject Chemistry showed that there is no significant difference in the attitude of students towards subject chemistry taught through traditional method and use of ICT tools. This may be because to bring about a significant change in the variable attitude requires time and continuous working with the control and experimental groups for a much longer duration which is one of the constraints of the study.

3. Impact of teaching with ICT tools on written communication skills of the Students

It could be inferred that use of ICT tools is effective in improving written communication skills of students. Both the Experimental Groups have shown the same result i.e. the impact of ICT tools on the written communication skills of students is positive.

It may be concluded that use of ICT tools is effective in improving written communication skills of students. It may be concluded that writing competence in terms of presentation of content, figures, structures of molecules, incorporation of latest information was enhanced using ICT tools.

4. Impact of teaching with ICT tools on the attitude of the students towards the use of ICT tools in teaching learning of Chemistry

It was found that use of ICT tools in teaching learning of chemistry in the treatment phase has resulted in changing the attitude of the students from neutral to moderately positive towards the use of ICT tools in the teaching learning of chemistry. Students are less attracted by structural and monotonous nature of traditional method as compared to use of ICT tools. Use of ICT tools in teaching learning of chemistry allures the students through its text based effect and multisensory approach. It may thus be concluded that use of ICT tools had a moderately positive impact on the student's attitude toward the use of ICT tools in teaching learning of chemistry.

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