

Impact of Online Teaching in Science Education – Experience of Teachers using Technology for Teaching and Learning Science in Schools

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Abstract:

This study is an exploration on the effective use of 'Online Teaching Strategies' to teach science for the students at schools. The research was carried out for a period of 5 weeks at a secondary school for teaching science. This research is an attempt to understand the approaches and perceptions of science teachers to teach students online. A sample of 20 school teachers was considered as the overall population of the study. In order to quantify the data of this research, this study was done based on a survey questionnaire. The questionnaire was the only instrument used in this study. A survey was conducted through the questionnaire for 20 school teachers who taught science as their major subject. Results show that majority of the teachers found the online teaching process challenging and thought-provoking. On the other hand, students liked learning science through online mode of education. The findings of the study also highlight one of the major inferences that technology enhanced teaching can be incorporated as a part of the curriculum to address students independently and individually.

Key words: *Online teaching strategies, Science, Schools, Survey, Questionnaire, curriculum*

1. INTRODUCTION:

Today, during the pandemic of COVID-19, education has changed rapidly. This is a welcoming change as the process of teaching and learning is not restricted only to the four walls of the classroom. Learning as a concept always should be taken beyond the classroom. And this current scenario is only paving way for such a revolution to take place in India. Traditional approaches of learning are not going to be the sole medium through which teaching and learning is going to effectively happen. New approaches and strategies have cropped up overnight to throw light on various platforms such as online education, mobile education and internet Education. In future if traditional teaching strategies does not support teaching and learning, novel and innovative methodologies can be adopted such that technology comes into effective use (Caglar, 2007; Yemen, 2009). It is anticipated that technology will definitely aid in the process of teaching and learning.

It is found that the most significant factor influencing the education towards a course is attitude (Cheung, 2009; Erokten, 2017; Guden & Timur, 2016; Gurbuzoglu Yalmanci, 2016). Hence, administrators, teachers, parents and students should adopt a positive attitude towards the implementation of new methodologies in the field of education (Akçay, Aydogdu, Yildirim, & Sensoy, 2005). Technology enhanced learning can create a positive classroom climate for both the teachers and the students to explore new avenues in the learning. It can also trigger the interest and attention. While contemplating on the role of online education in teaching science the options are very many. Most of the science classes are conducted in the class, laboratory or outdoor activity. Very little opportunity is given for the students to tap individual learning and thinking. Assuming that the teacher concentrates only in imparting knowledge and getting the students ready for examinations, much of the learning is dependent on what the teachers delivers in the classroom. In order to meet the requirements of the sudden change in the field of education, teachers need to be trained first on online education. All

countries should focus on imparting training for the teachers about online education. (Milli Egitim Bakanligi [MEB], 2006). In the 21st century, learning is controlled by technology as the use of technology has become mandatory (Erdemir, Bakirci, & Eyduran, 2009). Consequently, there is rapid growth in technology-enhanced teaching. (Bull at al., 2007; Ekici, Taskin Ekici, & Kara, 2012; Tabach, 2011). At the same time, the primary objective of integrating technology in education is only to fine tune the process and not to demean traditional methodologies (Yildirim & Cakir, 2009).

Importance of Science Education

Science Education plays a major role in the development of students. Every student should positively develop this literacy to cope with the challenges of the changing world. Science education forms the basis for participation in an evolving technological world. The role of science education contributes to the continuous process of education and the holistic development of a student (Science Council of Canada, 1984). Knowledge in science is required to solve day to day problems along with the technological advancements. Hence, science education will tap creative quotient of the students. In the perspective of G. Ram Reddy (2007),

science has paved way for a more sustainable and an innovative world connected with new technologies of the modern world. In this time of an industrialized era, no wonder science along with technology and innovation has created a major impact in the world economy. Science literacy forms the nuclei of all other developments providing a basic platform for other technological developments. Online science education can certainly help students in providing an in depth understanding of scientific concepts through the application of recent technology.

Objectives of Science Education in Schools:

The broader objectives of teaching science in schools are given below:

- (i) To develop a relationship with the physical environment science imparts general education to students
- (ii) To familiarize students with scientific principles and applications in the service of mankind.
- (iii) To prepare students to live a self-sustained life.
- (iv) To help students wonder about things and trigger their curiosity.
- (v) To make them understand the system of observation and experimentation.
- (vi) To inculcate an attitude of thinking, feeling and acting by training their character. Hence, the objectives of science education are not restricted to the above points, though there are many things that emphasize on the need for promoting science.

Online Teaching and Learning

In online teaching the role of teachers keep constantly changing. Hence, to adapt to the changing trends of education, prior training is required for teachers to handle the challenges of technology. Such type of training programs can create a huge impact in the minds of the teachers as it helps them gain confidence to handle the latest technology. Especially in India, where teaching is primarily done on traditional mode that is classroom teaching, this technological shift has led to a drastic change in the paradigm of teaching and learning. Teachers have to shift their focus from teaching face-to-face and adapt to online teaching. Students' satisfaction plays a crucial role in the online teaching (Andreatta, 2003). Responsibility is on the shoulders of the teachers to draw the attention of the students to the course and help them complete the course successfully (Halstead & Coudret, 2000). A study conducted by Blackwell, Roack, and Baker (2002), Hong, Lai, and Holton (2003), Klinger (2003), Motiwalla and Tello (2000), and Young and Norgard (2006) states that majority of the students were satisfied with online teaching and learning. Though, another study done by Lauren, Jennifer, and Marguerite (2004)

proved that students achieved maximum satisfaction while attending classes face-to-face than on online. Factors such as gender, age and computer literacy could possibly create an impact in the satisfaction level of students attending classes online Gallo (2007) and Strachota (2003).

2. METHODOLOGY

Research Design

The type of research methodology adopted in this study is the survey method. A questionnaire was used as an instrument to collect data from the participants. The questionnaire comprised of 5 questions with options of 5 Likert scale ranging from strongly disagree, disagree, neutral, agree and strongly agree.

Participants

Around 20 school teachers who teach science as their major subject were identified as the participants for this study. Out of 20 teachers 12 teachers are female and 8 teachers are male. All teachers had smart phones and they had easy accessibility to internet at their homes. Overall, these 20 teachers were requested to participate in this study and fill in the questionnaire.

Data Collection

Teachers were requested to teach a particular concept for a period of 5 weeks. Their day-to-day activities such as planning, preparation and delivery of the lecture were closely monitored without disturbing the process. At the end of the 5th week, the 20 participants were handed over a questionnaire. The questionnaire comprised of 5 questions covering their experiences of online teaching of science. Demographic details about the participants namely, name, age, gender, experience were given in the questionnaire. After the participants filled in the questionnaire the data was collected and quantified.

Questionnaire:

1. Teaching science on online platforms is challenging.
a. Strongly disagree b. disagree c. neutral d. agree e. strongly agree
2. Online teaching will benefit me in a long term process.
a. Strongly disagree b. disagree c. neutral d. agree e. strongly agree
3. Online teaching is effective than face-to-face teaching.
a. Strongly disagree b. disagree c. neutral d. agree e. strongly agree
4. Students enjoy online teaching.
a. Strongly disagree b. disagree c. neutral d. agree e. strongly agree
5. I like to teach students online.
a. Strongly disagree b. disagree c. neutral d. agree e. strongly agree

Data Analysis

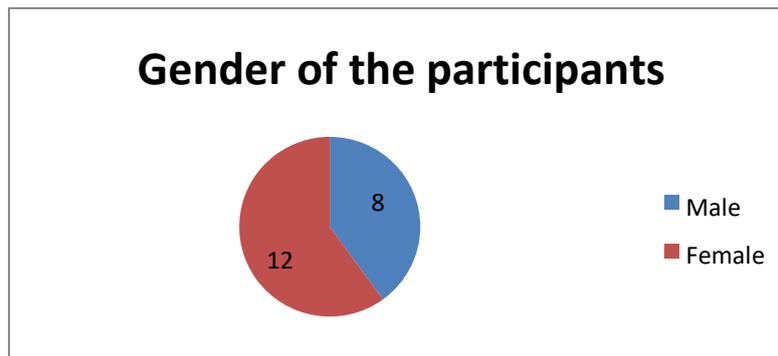
As mentioned in the research design, this study was conducted for 20 school teachers who teach science. A questionnaire survey was conducted and the analysis of the survey will be presented in this section.

Proportion of Gender of the respondents

Table - Gender of the Respondents

S.No.	Respondents	Frequency
1	Male respondents	8
2	Female respondents	12
	Total	20

Pie chart representing the gender of the participants



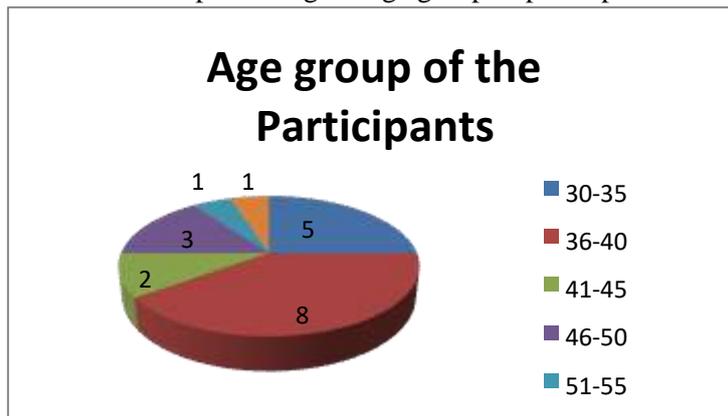
From the above chart it is understood that the majority of the participants are female as their overall population is 12. And the population of the male participants is 8.

Age group of the Respondents

Table - Age group of the Participants

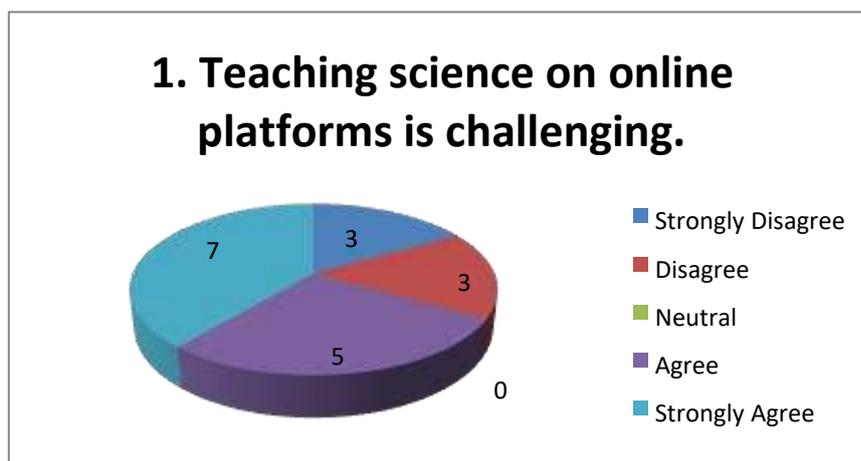
S.No.	Age group	Frequency
1	30-35	5
2	36-40	8
3	41-45	2
4	46-50	3
5	51-55	1
6	56 and above	1
	Total	20

Pie chart representing the age group of participants



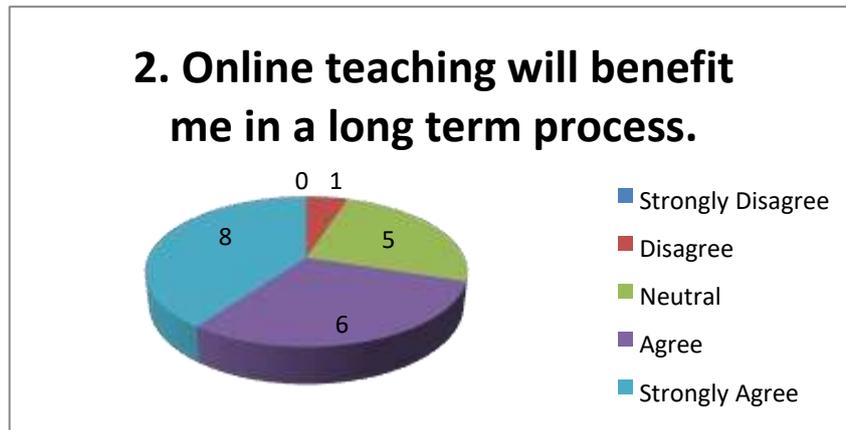
From the above table and pie chart it can be interpreted that the majority of the teachers belong to the age group of 30-40. And only two teachers belong to the 41-55 age groups.

Question No. 1 Teaching science on online platforms is challenging.



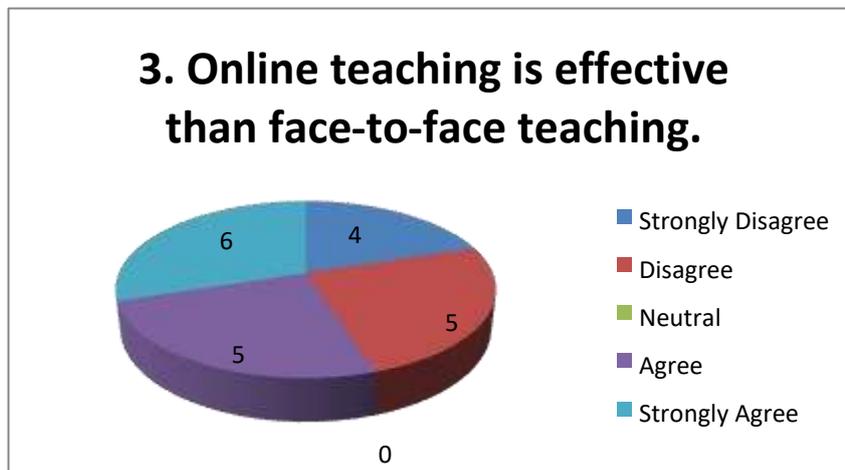
The above pie chart clearly indicates that majority of the teachers agree to the fact that teaching science on online mode is challenging. Though, equal number of teachers have disagreed that online teaching is not challenging.

Question No. 2 Online teaching will benefit me in a long term process.



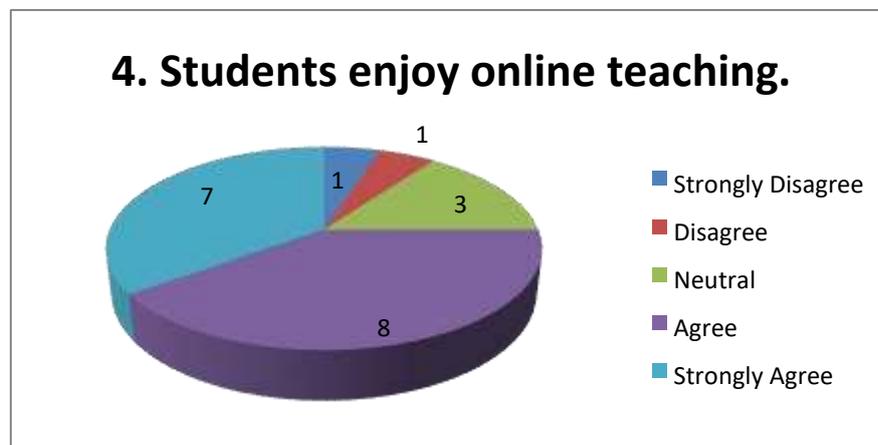
It can be inferred from the above pie chart that majority of the participants have agreed to the fact that online teaching will benefit them in the long term process. At the same time, it is also interesting to note that 5 participants have stayed neutral and only 1 participant has disagreed.

Question No. 3 Online teaching is effective than face-to-face teaching.

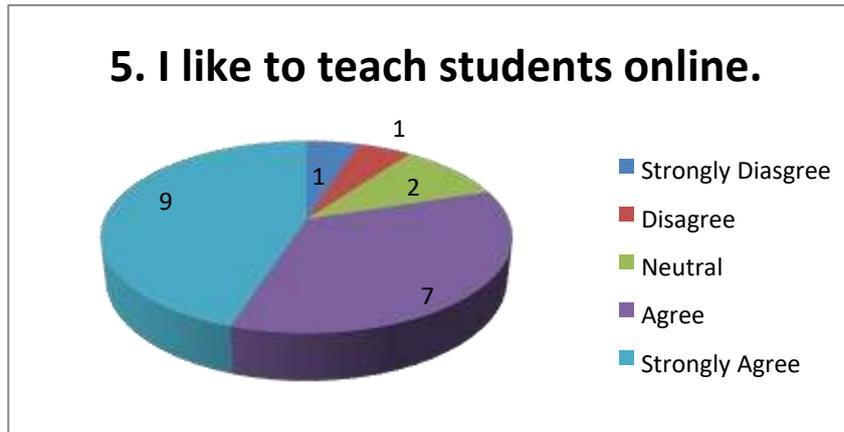


From the above pie chart it can be understood that participants feel online teaching is both effective and ineffective compared to face-to-face teaching.

Question No.4 Students enjoy online teaching.



The pie chart above clearly depicts that majority of the students enjoy attending classes online though 3 participants have expressed their neutrality. Only 2 participants have disagreed to this question. Question No.5 I like to teach students online.



The above chart shows that 16 participants agree that they would like to teach students online. And 2 participants have disagreed that they don't like to teach online in future.

Research Findings

Some of the major findings of this study are:

- Online teaching is considered to be a challenging task because lot of pre planning is required on the part of the teachers more than the conventional mode of teaching. This could be due to the fact that when teachers teach online the supportive materials provided should be in the form of suitable files to be given to students. Moreover, the teacher-preparedness is a major factor that could make the task even more challenging and complicated. Especially handling subjects like science require in depth explanation and description of diagrams. Hence, the teachers need to be adequately prepared for the class.
- In the long term process most of the teachers feel that online teaching will be beneficial for the students. In spite of the daily struggle to conduct classes and tests online, teachers agree that the future of education is greatly dependent on online education mode.
- Though online teaching has a number of advantages it cannot be concluded that it is more effective compared to face-to-face teaching. There have been mixed opinion for this question as teachers know that both medium of teachings have their own advantages and disadvantages. Hence, both medium of education is considered to be the best.
- Students enjoy online teaching and there is no doubt about it. As it gives them a feel of independency and privacy online medium of teaching has become very popular among the students. Students in fact can record the lectures and play back at their own pace and time. It promotes self-learning among the students as the whole process of teaching and learning becomes mutual sharing of knowledge in online medium.
- Teachers have to be quick in learning and this attribute of them is considered to be appreciable. Hence, most of the teachers have adapted to the new wave of online teaching while others might still struggle to achieve perfection. Age could be a barrier here as teachers who belong to the older generation might definitely feel a bit strange and uncomfortable acclimatizing to the new teaching strategies.

3. CONCLUSION

To conclude the results of the study, it is found that teaching science is enhanced by integrating technology in the process of teaching and learning. This methodology has created a positive impact in the minds of the teachers and students. Student-centered teaching is the right way one can look at the process of education. In the study conducted, it has been inferred that students have thoroughly enjoyed the process of learning online. It is to be noted that students learn more when the educational environment is enhanced with tools and technology (Renshaw & Taylor, 2000). It helps them learn concepts not by rote memory but by gaining deeper understanding of the subject. Therefore, integrating technology in learning environments in a rational and planned way with teaching methods will comfort and improve learning and training (Oktay & Cakir, 2013). In the study directed by Bacanak, Karamustafaoglu, & Kose (2003), it was highlighted that the usage of technology, which is applied in learning environments and has a promising influence on the success of the students.

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