

TEACHING SCIENCE WITH TECHNOLOGY: FOSTERING LEARNER'S PARTICIPATION

Anu Rawat
Research Scholar

Dr. Kiran Lata Dangwal
Department of Education, University of Lucknow
Uttar Pradesh,

Abstract

Today's science can't be separated from technology, they are complementary to each other. Technology advances the tools to facilitate and upgrade the way of imparting education. We live in a world of science and technology and there are so many innovative teaching strategies helping students to discover and explore science every day. The integration of technology depends upon the level of the class or standard, what works for a primary class might not work for secondary or higher classes or vice-versa. Digital technologies help in empowering the students. Interactive techniques like internet, smart phones providing the way to exchange ideas, thoughts and information. Technology facilitates the learners to engage in interaction in many innovative ways. Technology creates an environment where every student felt comfortable to share their ideas. Technology education laboratories can perhaps be the most conducive environments in the school for positively influencing a child's brain to grow and learn in all subject areas. Teachers must prepare themselves for techno-rich future and incorporate the effective and appropriate strategies for preparing the lessons. This paper explores the technological tools that may contribute in fostering the learners' participation in teaching-learning process.

Keywords: Science Teaching, Technology, Innovative Teaching Techniques

Introduction

“The most important and urgent reform needed in education is to transform it, to endeavour to relate it to the life, needs and aspirations of the people and thereby make it the powerful instrument of social, economic and cultural transformation necessary for the realization of the national goals. For this purpose, education should be developed so as to increase productivity, achieve social and national integration, accelerate the process of modernization and cultivate social, moral and spiritual values.”

Report of the University Education Commission

(Dr. S. Radhakrishnan Commission), 1948-49

Science is not only limited to the classroom or laboratory but it is amalgamated in our daily life. It is directly related to the people, so it is essential for the common people to get the knowledge of science. Science is a subject which needs sequencing, systematization and higher order thinking skills. There has been a radical change in science education through technology. Technology has transformed the way of conducting science education. Today's science can't be separated from technology, they are complementary to each other. Technology advances science education. Technology not only transforms education but it also transforms the society. It continuously trans-figure the living of society and the way of utilization of leisure time. Technology is not the end rather it provides the means for improving the process of education. Technology advances the tools to facilitate and upgrade the way of imparting education. The tools of educational technology as laptops, tablets, projectors, search engines, apps, multimedia, software, smart classrooms, interactive boards etc. help learners to actively interact in the classroom. By using these tools impressively and properly in the classrooms, learners attentively engage in construction of knowledge and this helps them to improve their thinking. Teachers must prepare themselves for techno-rich future and incorporate the effective and appropriate strategies for preparing the lessons. The Scientific Policy Resolution (1958) stated that "the key to national prosperity, apart from the spirit of the people, lies in the modern age, in the effective combination of three factors - technology, raw materials and capital of which the first is perhaps the most important, since the creation and adoption of new scientific techniques can, in fact make up for a deficiency in natural resources and reduce the demands on capital".

The subject of students' participation in class is not new. As the child reaches school, keeping in tone with a new environment, begins to take part in all activities. Traditional method of teaching hinders the route of learner centred education or personalized learning, which is highly engaging. If only a few class students participate in questioning, answers, discussion, then the purpose of education will not be fulfilled. To increase the participation of the students in class, it is essential that teacher makes teaching interesting, so that the students get excited to be a part of the process. Not all students are alike, each student is different from each other, so it is not necessary that all students participate in class with the same eagerness. Therefore, the teacher needs to prepare an environment in which more and more students can raise their voice and express their point of view without any hesitation.

Science Teaching

Teaching is an art, it is the most prestigious profession. Teacher shapes the future of any nation. They make the students engaged in creation of knowledge, it is their responsibility to inspire and help the students for their overall development, make them connect with the environment around them and to prepare them a better citizen. Students active participation and engagement is necessary for the successful learning therefore using the tradition method of teaching is not adequate to teach subject like science or other related subject. Science is a subject which needs logical reasoning it can be develop when the students themselves explore the world of science. Science is directly related to our daily life. Science is not about understanding the things but it is about developing understanding about the things. "Science teaching is such a complex, dynamic profession that it is difficult for a teacher to stay up-to-date. For a teacher to grow professionally and become better as a teacher of science, a special continuous effort is required (Showalter, 1984)."

Science teaching with Technology

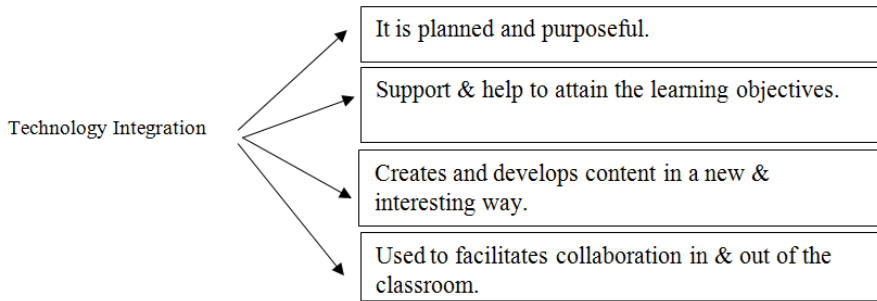
Integrating technology into classroom instruction means more than teaching basic computer skills and software program in a separate computer class. Effective tech integration must happen across the curriculum in ways that research shows deepen and enhance the learning process. In particular, it must support four key components of learning: active engagement, participation in groups, frequent interaction and feedback and connection to real-world experts. Technology is the powerful tool nowadays. It makes the process of teaching and learning easier for both teacher and student. It emphasizes active participation, engagement of the students and makes the learning joyful. The integration of technology depends upon the level of the class or standard, what works for a primary class might not work for secondary or higher classes or vice-versa. Technology educators can create climates that make children feel positive about themselves in many ways. Positive emotional learning could include a student feeling comfortable, accepted, appreciated, desirable, happy, satisfied, supported, optimistic, respected, safe, relaxed, motivated, focused, independent, confident, competent, proud, worthy, excited, energetic, or connected. Technology education laboratories can perhaps be the most conducive environments in the school for positively influencing a child's brain to grow and learn in all subject areas. National Educational Technology Standard for Students, International Society for Technology in Education defines, "Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyse and synthesize the information and present it professionally. The technology should become an integral part of how the classroom functions—as accessible as all other classroom tools."

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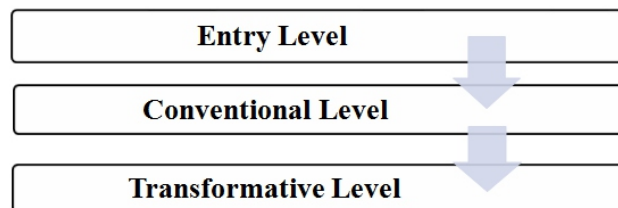


Technology has brought great advancement in the field of education. Technology has changed the style of educating students. TPACK and SAMR are the two methods that conjoin technology and education together in a finest manner. The SAMR Model created by Dr. Ruben Puentudura, SAMR stands for Substitution, Augmentation, Modification and Redefinition. This model guides the technology integration into teaching. The goal of the model is to transform the learning experiences for the high achievement of students. The TPACK (Technological Pedagogical Content Knowledge) Model was described by Mishra and Koehler. In TPACK model technology could be use of interactive boards, cell phones, laptops, e-books and more. Pedagogy is the way of teaching. Every teacher has their own pedagogical style. Content is the subject matter that a teacher teaches. All of those combined create TPACK.

Levels of Integration of Technology

Entry Level: Entry level is the first or primary level. At this level the teacher integrates the technological tools for presenting the information to students. For example, a teacher may use smart boards, transparencies, slides or videos for present the knowledge/information to students.

Conventional Level: It is the second stage or level, as the name suggest students offers to use the conventional technologies for any given task. At this level students allow to access the online libraries or mail their assignments in typed format.



Transformative Level: Transformative level is the highest level. It requires creativity to change or design the learning materials.

Students are also becoming content creators-creating and sharing media such as original artwork, digital photographs and videos, blogs and web pages. Many of these students have grown up with the interest and can be characterized as digital natives.

Ediger's (1994) studies on technology in elementary classroom have revealed, applying technology in the classroom does several things to students learning:

- It increases interest even in rote tasks.
- It provides purpose for learning.
- It can attach meaning to an ongoing lesson.
- It provides opportunities to perceive knowledge as being related, not isolated bits.
- It allows for individual student differences.
- It can affect students' attitudes towards learning.

Innovative Teaching-Learning Techniques

Innovative teaching-learning techniques makes the process exciting rather than burden or boring. Here are some innovative techniques that help teachers to reinvent the teaching material.

Interactive Whiteboards: Interactive whiteboards are very popular from last few years. It is an instructional tool that encourages collaborative learning, interactivity and innovation. It displayed the images onto the board by using a digital projector. The teacher or the instructor can manage the displaying items by using the mouse or directly touch the screen by finger. Interactive whiteboards promote group discussion, participation, collaboration among students at more focused and engaged manner.

Social Media: Social media is very popular among the new generation, it can be used as an educational tool. It can be used wisely to teach the concepts of science and this will make the teaching-learning process more lively and interesting. On twitter the students can follow the eminent scientists, share their view, communicate on innovative ideas. On facebook the students make their educational page and share their thoughts with lots of people. Similarly, on Instagram and pinterest the students share images, videos, thoughts on any particular topic.

Visual Clues: It is better than the auditory information, audio and visual experiences improve the ability to understand and retain the content. It includes images, diagrams, pictures to enhance the learning experience and quality and assist the material in more interesting way.

Multimedia Approach: This method is a blend of text, audio, video, still images, animation or interactivity content forms to teach diverse difficult to understand concepts in science. The educator can convey vast information using advanced media, devices and techniques and involve a wide range of activities to provide a meaningful learning experiences.

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Power Point Presentations: Power point presentations or slides, is the method which makes the students attentive towards the content. It includes images, graphs, charts to make the learning material more interesting. Slides make the content crisp & short and pointed. Computer/laptop connect with the projector for showing the slides. The presenter presents the slides and address the class and after the presentation gets over the students asked for their thoughts, confusions, questions or suggestion, this makes the whole process very interactive.

Mobile Apps: Mobile apps offers the content in very interesting way. These apps are available on smart devices. Apps like BYJU's learning app, video science, earth primer, cosmic zoom, human body, are the popular apps. Today's learners are tech-savvy and they use gadgets to learn. These apps created with innovative features which help students learn new things.

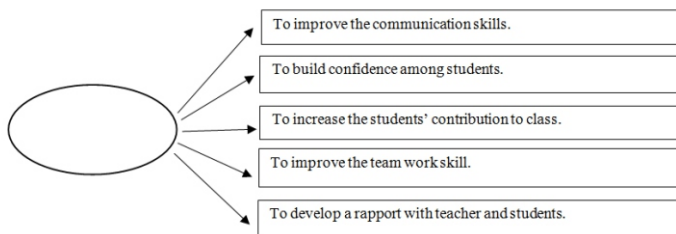
Flipped Learning: This innovative technique is divided into 2 stages, at initial stage the students are introduced to the learning material before the class and at second stage, the teacher and students discuss over the learning material in classroom. So, this technique makes the classroom environment more interactive.

Virtual Science Lab: Many online virtual science labs are available for free and this provides the hands-on experience of learning. 3D diagrams, illustration, detailed description allows students to virtually get inside the plant, animal or human body part without actually doing it. These labs are more effective in science subject.

ICT Enabled Learning: ICT stands for information and communication technology, it is that mode of education which enhance, support and optimize the dissemination of information. ICT improved the method of teaching & learning and it emphasize the positive impact on students' achievement. ICT promotes enjoyment. Online interactions would facilitate learning without time constraints and it will be much easier to conduct assessments and generate reports, since the

necessary information doesn't have to be manually handled. ICT in teaching-learning is not only beneficial in assimilating and accommodating concepts but it also enhances the skills that are required in digital age. ICT tools make the learning easy to understand, for example Smart Learning for All is a series of you tube videos which present the basic science concepts in more interesting and easy manner. ICT tools can be helpful in collection of scientific data, in presentation, in demonstration, in interactive education, like it is better to demonstrate the planetary system instead of teaching them through chalk and talk.

Importance of Participation



Increasing Learners' Participation with Technology

Classroom is a place of interaction, in a class there are individual differences among students. It is not necessary for everyone to feel confident and comfortable in expressing their views. It has been observed that outspoken students do dominate the class and there are some students in every class who feel shy or embarrass and can't present their views in front of everyone. This lack of interaction or participation brings difficulty for teachers to identify the understanding level of students, but technology makes it possible for the students to participate. Digital technologies help in empowering the students. Interactive techniques like internet, smart phones provide the way to exchange ideas, thoughts and information. Technology facilitates the learners to engage in interaction in many innovative ways. Technology creates an environment where every student felt comfortable to share their ideas.

- The development of science and technology is rapidly happening, through technology like internet we can keep ourselves updated with new information about the innovative tools and methods used in teaching around the world.
- The traditional passive learning mode is broken by technology. Technology encourages self-learning, students analyse & verify the information which is collected from internet sources and decide about the relevancy of information on their own. So, technology helps in the development of higher order thinking.

- Students can share their views online by using app like whatsapp. One can form a group and communicate by posting their thoughts. Students who feel hesitant about having their views in class, they can share their views with their teacher and peer group by using these apps.
- Blogs, forums, e-pals, online lectures tools, message boards are some of the web tools that motivates the less vocal students to come forward and take active participation in learning process.
- Technological tools like projector, smart classes making the class much more interesting. Showing how a digestion system works rather describing with words only, brings a huge difference.
- Technology can help to increase the interest of students towards the classroom teaching. Technologies tools modifies the content in a better and effective way which is an important factor to improve knowledge retention.
- Students can use various websites to search for the data. The data could be scientific, historic or educational etc. there are quite a number of official websites on the internet that students can get information they need.

Conclusion

In the words of John Dewey, “If we teach today as we taught yesterday, we rob our children of tomorrow” this quote describes the need of technology in current education system. We live in a world of science and technology and there are so many innovative teaching strategies helping students to discover and explore science every day. Apart from the listed methods teachers can also incorporate the techniques which encourages the active participation of students such as group discussion, seminars, outdoor teaching, quizzes, exhibitions, scientific games, science museums, etc. that help students to experience the beauty of science. It is the today's necessity for educators and learners to understand the role of digital system in future world. Students must have the skills like problem solving, higher order thinking, effective communication and collaboration. Participation in the classroom is essential for the development of students. Classroom should be a place where every student feels comfortable and free to express their thoughts & ideas.

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