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A Review of Teaching Methods that Sustain Interest in Science and Technology

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ABSTRACT

Students show a high general interest in Science & Technology. Preference should be given to student centered teaching methods rather than teacher centered one. however, few of them perceive the utility of school Science & Technology (S&T) for everyday life, want to spend more time doing S&T in school or intend to pursue S&T related studies or careers. Grade level differences appear to be important while gender differences are weak. In terms of school subjects, perceived importance and preference order, S&T seem to occupy an intermediate position. The preference order is not, however, similar to the perceived importance order. The latter, and therefore the role of S&T in school, appear to be strongly influenced by its status or its social value given in the curriculum. The importance for school to intervene on certain factors that promotes the development of students' interest in S&T. For instance, to affirm the importance of S&T right from the beginning of elementary school, to use teaching methods that allow students to establish links between what they learn in school and their lives, as well as methods centered on students' development of inquiry processes, to promote cultural activities related to S&T, and to promote a positive development of self-concept through quality schooling. It is better to move experiments with textiles up to 6th and 7th grade of primary school. Students, in the 8th and 9th grade, they already have an idea of their direction in further secondary education. By implementing various modes of teaching techniques proper interest can be developed among the students of science for proper education of science and technology. The modes include

1. Hands on Learning
2. Story Telling
3. Role Play
4. Sports Based Learning
5. Visual clues
6. Instructional Conversations
7. Science Text Cards
8. Word Games
9. Graphic Organizers
10. Word Parts
11. Virtual science labs
12. Word walls
13. Thinking Maps
14. Mini anchor charts
15. Crossover Learning
16. Argue with Science

17. Context-Based Learning
18. Computational thinking
19. Remote labs
20. Embodied Learning
21. Science museums
22. Projects
23. Multimedia Approach
24. ICT Enabled Learning
25. Video clips
26. Power Points
27. Mini-labs
28. Science Fair
29. Research books
30. Documented Problem Solving
31. Science kit
32. Science stations
33. Observation stations
34. Peer-to-Peer Teaching
35. Science movies
36. Science games for kids
37. Science songs
38. Science Exhibition
39. Mobile apps for Science
40. Field trips
41. Science clubs
42. Reward discovery
43. Interactive science journals
44. Science at home
45. Flipped Classroom
46. Guided Discovery Problems
47. Fishbone
48. Science Quiz
49. Build your model etc.

KEYWORDS: Critical thinking, Science & Technology (S&T), interest, value, teaching methods

INTRODUCTION

Student-centered approaches promoted critical thinking and collaboration but demanded alternative assessment methods (Laid, Shella & Adlaon, Mauricio, 2025). Important issues are associated to science and technology (S&T) education in modern societies. First among these is the development of a scientific and technological culture for all citizens, whether they are destined to pursue careers in S&T or not. In societies strongly marked by scientific knowledge and technological advances, the paucity of such a culture in the population hinders the exercise of informed citizenship. These issues are also

related to social progress. The shortage of people with training in this field may deprive societies of critical human resources needed for the industrial and economic development on which they are based. Furthermore, over the past decades a growing gap has been observed between the scientific and technical expertise offered by schools, on one hand, and the social demand in this regard, on the other societies are showing a growing need for individuals trained in this field, while the number of students attracted to it is stagnating and in some cases declining (Organisation for Economic Cooperation and Development [OECD], 2006; 2008). This gap, which may describe as students' loss of interest in S&T, has been observed in many parts of the world, for example in England (Convert, 2005; Cotgreave & Davies, 2005; Hannover & Kessels, 2004; in Germany (Haas, 2005), in the United States (Foster, 2010), in Canada (Dobson & Burke, 2013) and also in France (Convert, 2005; Ourisson, 2002 ; Porchet, 2002). In this context, developing students' interest in S&T and its related studies and careers, over and beyond the quality of learning, must be a preoccupation for schools, educational policies and academic research in education. The hypothesis behind this position is that strong interest in S&T might influence students' involvement in scientific tasks (Ainley, Corrigan, & Richardson, 2005; Ainley, Hidi, & Berndorff, 2002; Schiefele, Krapp, & Winteler, 1992) and studies, and consequently their engagement in developing a scientific and technological culture as well as pursuing career choices associated with these disciplines (Baram-Tsabari & Yarden, 2009; Hidi & Harackiewicz, 2000; Khoo & Ainley, 2005). Many studies related to this issue have been conducted over the past decades, addressing various aspects of interest in S&T and progressively building knowledge in this field. Analysis of these studies and related syntheses (Krapp & Prenzel, 2011; Potvin & Hasni, 2014; Renninger & Hidi, 2011; Schraw & Lehman, 2001) shows that while a lot has been learned about interest, further research is still needed, particularly in different cultural and educational contexts. Since interest seems to depend on these contexts (Ainley & Ainley, 2011; Wang & Berlin, 2010) with a focus on classroom teaching methods (House, 2009; Palmer, 2009). Osborne, Simon, & Collins (2003), in a review on attitude toward S&T, note that there is a greater need for research to identify those aspects of science teaching that make school science engaging for pupils.

The literature review of Potvin & Hasni (2014) based upon 228 research articles indicates that in addition to other variables (gender, grade level, country of origin, etc.), the studies highlight the important role of school related variables (including teaching methods), self-efficacy, and sociological variables (including the socioeconomic level of parents as well as family background). The literature review of Krapp & Prenzel (2011) stresses the need to pay special attention to specific domains or scientific disciplines (biology, physics, chemistry, etc.) and to consider a comparison of S&T with the other subjects that make up the curriculum. On the other hand, the selection of variables and dimensions also follows the priorities jointly established by the researchers. Among all the variables and the dimensions reported in the literature, primarily those on which the school can act (teaching methods, self efficacy, family involvement in cultural activities, support for students, etc.). This rational also explains why some variables and dimensions, such as the role of the socio-economic status of parents, were not retained.

Teaching methods is primarily through school exposes students to S&T and can consequently influence their interest. The family context, considering the following two types of family activities: frequency of family participation in cultural practices involving S&T (magazines, television programs, visits to museums, etc.) and frequency of conversations with children about what they are doing in school. Self-

efficacy at school (perception of ability to understand S&T contents or to carry out specific tasks in this school subject)

Characterization of the concept of interest

Following on Gardner (1996, in Krapp, 2007), many authors (Hidi, Renninger & Krapp, 2004; Krapp, 2007, Krapp & Prenzel, 2011; Renninger & Hidi, 2011) consider that "the decisive criterion of the interest construct which enables it to be clearly distinguished from several neighboring motivational concepts such as attitude and motivation is its content specificity" (Krapp & Prenzel, 2011, p. 30). "One cannot simply have an interest: one must be interested in something" (Gardner, 1996, p. 6, in Krapp, 2007). The interest construct is conceptualized as a relational concept: an interest represents or describes a more or less enduring specific relationship between a person and an object in his or her life-space (Krapp, 2007, p. 8).The object of interest in the field of S&T can be a specific subject (biology, physics, chemistry, etc.), a specific area or field of knowledge (the study of animals), a concrete operation or object (lab manipulations), an abstract scientific activity (formulating a scientific problem or question, or analyzing data), etc. (Häussler, 1987; Häussler & Hofmann, 2000; Krapp, 2007; Krapp & Prenzel, 2011).

Dimensions of the concept of interest

Some researchers have characterized interest as an affective variable or stressed this particular aspect in their studies (Rennie & Punch, 1991; Steinkamp & Maehr, 1983), others believe in the importance of not simply equating it with enjoyment while learning (Krapp & Prenzel, 2011). Interest is a multidimensional construct whose operational definition requires emotional, cognitive (knowledge) and related value. Models such as the four-phase model of interest development by Hidi & Renninger (2006) propose interdependency between these dimensions as interest grows and is maintained. Although the very earliest phases of interest might be considered to be an emotion and to involve minimal knowledge requirements (Hidi, 2006; Reeve, Jang, Hardre & Omura, 2002), Hidi and Renninger suggested that for interest to develop, knowledge and value, in addition to affect, need to be present (Ainley et Ainley, 2011, p. 69).

Emotional (affective) characteristics

According to the authors cited above, this feeling related dimension refers to emotion and the sense of enjoyment provided by the actual or evoked presence of a given object, as well as the involvement in an interaction with it. For example, this can mean enjoying science, having fun with science or with its specific objects (contents, teaching methods, etc.). As Krapp (2007) recalls, it has been proposed that emotional experiences are considered as related to the basic needs of competence, autonomy and social relatedness in order to characterise interest specific emotional experiences.

Cognitive aspects

This dimension bears on object related knowledge. What students know or think they know about it. Indeed, without knowledge, there is no interest. Students cannot be hoped to express interest in the inquiry process or in biology knowledge (such as photosynthesis), for example, without having some minimal knowledge of these objects. Moreover, interest in an object prompts a desire to find out more about it. Krapp (2007) noted that a person who is interested in a certain subject area is not content with his or her current level of knowledge or abilities in that interest domain. Rather, there is a high readiness to acquire new information, to assume new knowledge and to enlarge the competencies related to this domain. But there is also a high readiness for activating interest-related competencies in situations that do not require new learning.

Levels for studying interest

Situational interest

It is characterized by its association with an external factor (a situation, a task, a context, etc.) to which an individual is exposed and in which the individual is involved in an interaction (Ainley et al., 2002; Hidi & Renninger, 2006). The situation may produce a positive feeling (for example, the joy of engaging in a scientific experiment) or a negative one (for example, disgust in observing and describing the parts of a scorpion) (Swarat, Ortony, & Revelle, 2012). In the school context, this situation may involve, for example, specific knowledge to which students are exposed or the tasks in which they are involved (conducting experiments, listening to the teacher, reading textbooks, etc.). According to Hidi (2001, 2006) this psychological state involves focused attention, increased cognitive functioning, persistence, and affective involvement.

Situational interest

When situational interest is maintained over time, or when it occurs repeatedly in response to the same stimuli, does it possibly lead to long-term interest, increased knowledge, changes in values, and consistent positive feelings (Swarat et al., 2012, p. 4). In an extensive review, Hidi & Harackiewicz (2000) conclude that situational interest can contribute to the development of long lasting personal interest. In other words, certain conditions in the learning environment can do more than momentarily catch one's interest; they can also hold it (Hidi & Harackiewicz, 2000). When situational interest is sustained by conditions in the learning environment, it may lead to intrinsic motivation and individual interest (Hidi & Harackiewicz, 2000).

Personal (individual) interest

Individual interest is a cognitive and affective quality that individuals carry with them from place to place. The basis of personal interest appears to be pre-existing knowledge, personal experiences and emotions, high value (Schraw & Lehman, 2001, p. 28). It develops slowly over time and tends to be long lasting (Schraw & Lehman, 2001). Over time, individual interest may be integrated into the person's value system and become one of its basic components. Therefore, it is suggested that people carry with them a set of individual interests, which influence how they interact with various objects. When people with certain individual interest encounter a situation that matches the particular interest, their individual interest is actualized referred to as actualized individual interest by some researchers (Swarat et al., 2012, p. 4). Individual interest is based on existing knowledge about and values concerning tasks, objects, or ideas and is the desire to be involved in activities related to these concepts (Swarat et al., 2012). This type of interest is personal, broad, and often long lasting. Hidi & Harackiewicz (2000) describe individual interest in more detail, stating that it is a relatively stable motivational orientation or personal disposition that develops over time in relation to a particular topic or domain and is associated with increased knowledge, value and positive feelings (p. 152).

Predisposition or intention to act

Another important characteristic of individual interest is that it leads to a relatively enduring preference for certain topics, subject areas, or activities (Schiefele et al., 1992, p.152) or to an enduring predisposition to attend to certain objects and events and to engage in certain activities, contents or objects (Hidi & Renninger, 2006, p.113). This behaviour or predisposition is associated with a psychological state of positive affect and persistence and tends to result in increased learning (Ainley et al., 2002, p. 545). The predisposition to act is understood here as a favorable response to a given object on a consistent basis. As regards the research on interest (Ainley & Ainley, 2011), one can predict that

having a coherent body of science knowledge and understanding (knowledge), enjoying science (affect), and valuing science (value) will be predictive of the level of general interest in learning science (individual interest), which in turn will predict being currently engaged in science activities and having the intention to engage with science activities in the future (current and future engagements) (p. 55). Predisposition to act can be examined at different levels, including the engagement in S&T classes and the intention to pursue S&T related studies or careers.

Preferences for the Most Common Teaching Methods

Students prefer teaching methods in which they are active and collect scientific facts (observation, experimentation, etc.) or debate with others. They show less interest in methods based on explanations and textbooks, and even less in exercises and oral presentations. If some teaching methods are better predictors of general interest in S&T than others, the same is true when it comes to the role of the family. Environment they grow up in, does not present a reality from the perspective of natural sciences. The problems posed by today's lifestyle do not require the skills of individuals that are the subject of natural sciences. The self-indulgence and the reluctance of people to deal with real things goes hand in hand with the decline of the ability of critical thinking, with the imagination weakening, with the lack of coherence, which are needed to ensure that a person has completed all concrete work. In addition children are exposed to knowledge and adventure in a completely finished form in the multimedia for the excogitation of consumers. At the time when pupils decide on its further study and career guidance (corresponding eighth and ninth grade of primary school), it is necessary to offer them a possibility of application in the fields of scientific and technological interests. Didactical procedure used in primary and secondary schools is formed from a greater degree in order to make and bring their own curriculum. However the link to practical applications is rather in the background and is very general, even if materials promoting the specific technical topic are available.

In physics or chemistry, students are first exposed to number of unusual terms they do not have their own motivation or life experience with. The rapidity and the scope of the presented matter often do not give them the possibility to absorb the idea of the theory at all. In addition, the course often serves things as done. But science is working with the examination of assumptions, with questions and corrections. There is obviously not need for each generation to discover the world feature patterns from the beginning, but each generation has the right to at least look into the process by which the contemporary natural knowledge of mankind took place (Arons, 1981).

If, instead the whole ready conceptions and terms, the teachers could afford students possibility to discover nature by means of concrete, though less noble, problems and confront it with their incident experience, students would acquire required scientific skills and their own insight. Good science curriculum preferring phenomena of everyday life prior to mysterious dictionary of modern physics and chemistry, would soon reveals that teachers knowledge are in this respect nearly identical as their scholars' ones (Svobodová and Sládek, 2008). Understanding is creating an opinion in the dialog with others by means of activities based on the previous own experience. It is starting point to the constructive approach of an educational course. This conception synthesizes information from observation experience. If experiment is impossible, it uses analog method, observation and investigative correlation.

Video clip as a motivational tool

The task of motivation is to intentionally induce curiosity and strained expectations in order to influence attitudes towards further activities. Video clip is a very useful tool, since it wakes up pupils' attention by

means of their positive emotional feeling and encourages their interest in the curriculum. Video clip can illustrate the practical application of acquired knowledge and its importance in the further life of the student. This is an appropriate motivation for further interpretation of the exposure phase of education. Orientation in e-learning is intuitive, E-learning graphics is attractive and instructive, Video clips are engaging, Experiments are interesting.

Different methods of science teaching

The different methods of teaching of science have been proved very much helpful in building interests among pupil.

1. Hands on Learning

This is the best teaching method invented so far that involves the active participation of students to experience scientific concepts than to just have an audience view. Schools are promoting the use of low cost apparatus in classrooms to helps students to have hands on learning experience.

2. Story Telling

Students love to hear stories and therefore, storytelling is one of the best ways to get their attention in class. Teacher can explain the facts of biology or the laws of physics in the form of stories. This is a mental organizer as human brains can remember stories than just plain facts. Some teachers present the whole concept as a story while some others use a story to open and end the session.

3. Role Play

This innovative method is becoming an integral part of science education as students can intellectually and physically involve through activities while learning a new concept.

4. Sports Based Learning

This is an interesting approach to learn problem solving in physics or a step wise method to study complex chemical reactions. A game of football or cricket helps them to learn about percentage, average or probability which can find its use in physics problems. Sports are mostly played in teams which also promote the importance of team work that helps them to synchronize better in group projects.

5. Visual clues

Using visual clues easily supplements auditory information and students can easily connect better with ideas. The multi-sensory experiences improve their understanding and memorization. This includes drawings, diagrams, and pictures to assist theory and setting up examples to show its application side. The sequence of lab procedures can be better taught using pictures with words approach.

6. Instructional Conversations

Building instructional conversations is a key method to teach science vocabulary. Let them talk in between the lectures about the experience they had with an application related to the topic of discussion. This promotes their dialogue construction in science as they communicate using scientific and technical terms. Make this a classroom strategy to help students to easily learn science vocabulary.

7. Science Text Cards

This is an innovative teaching method to convey the science facts in an easy and organized way. In this activity, statements related to science concepts are written on index cards. Students can work individually, pairs or in groups to sort the cards based on the given format. The formats include true/false, agree/disagree, matching pairs, classification, sequencing and more.

8. Word Games

This is a creative strategy to help elementary students to experience the language of science. Hangman, Pictionary, Dingbats, Bingo, Scrabble, Odd One Out, Charades, Trivial Pursuit etc. are the common

games. Playing these games using scientific terms helps the students to work closely with different hard to understand words and use them fluently in their subject.

9. Graphic Organizers

This teaching approach is helpful for students to interact with science in a more organized and structured way. Teachers can use different types of templates to represent the data according to the topic that is being handled. A typical format for graphic organizer contains a central point from which different branches are formed and there may be sub-branches in certain cases. Arrows are used to point the direction or sequence of a process.

10. Word Parts

This teaching strategy is followed by teachers to educate the basics of science to elementary students. While introducing new scientific terms, they can reinforce the structure of words. Students are asked to identify and understand prefix, suffix, and base word, and to relate their meanings. For example, metamorphosis- meta (large), morph (change), osis (process); photosynthesis photo (light), synth (make), isis (process).

11. Social media

The different social media platforms can be used wisely to teach science to make the science classrooms more interesting and engaging. For instance, students can be asked to follow scientists in Twitter and share his/her new thoughts and findings in class or to use feedly for improving the content of their research projects. Students can also use Vine to document and to share science videos, Pinterest account for sharing images for research projects or writing prompts or Word Press class account for peer-to-peer learning.

12. Virtual science labs

There are many virtual science labs available online for free and therefore, this approach almost gives hands on experience of learning the subject without much expense. Detailed diagrams, illustrations or close up pictures allow students to virtually get inside a plant or animal part without actually doing it. Dissections in biology can be studied thoughtfully with a virtual hands-on sensation without the problem of odour and similarly, experiment a chemical reaction without burns.

13. Word walls

Science word walls in classrooms can stimulate the interest of students in the subject and an opportunity for them to illustrate different concepts. In an advanced technique, a more in depth understanding of different scientific terms can be made possible with pictures that accompany the words. This is also an option to help them better understand words with multiple meanings. Teachers can design creative word walls or ask students to contribute to the idea weekly or monthly.

14. Thinking Maps

This is an ideal way to visually represent different thought processes which help to organize the science education with a better flow. There are different types of thinking maps available which can be chosen wisely to represent the particular topic. This includes bridge maps to teach relation between ideas, brace maps to break larger objects into smaller parts, flow maps to show sequence of events, multi flow maps to show effects or causes of an event, tree maps to classify objects or ideas and more.

15. Mini anchor charts

These interesting charts are a great idea to give a detailed overview or explanation of a science topic. Teachers use it to interactively teach areas such as scientific methods, types of energy, plant life cycle, states of matter, mixtures and solutions, force & motion and more. To make the whole idea interesting,

teacher brings variations such as black and white charts, coloured ones; fill in the blank models, and full page anchor charts for large classrooms.

16. Crossover Learning

In this teaching method, students are given opportunity to learn in multiple settings such as inside the classroom, museums, field trips or clubs. Teachers can use this method effectively by proposing a question in class, taking students to informal settings to find answers and then, going back to classrooms to discuss and share the findings. This way, learners can record, link, recall and share their diverse learning events to explore the topic and get a deeper level understanding.

17. Argue with Science

Learning through argumentation gives students a widened thinking to contrasting ideas which in turn deepen their understanding. They can refine ideas with others and engage with open-ended questions, and re-state observations or remarks in a more scientific language. Teachers can also guide them in their approach and share the intellectual expertise with them.

18. Context-Based Learning

In this method, students are given the opportunity to create context and explore ideas from them. They interact with surroundings, hold conversations with subject experts, make relevant notes and attempt to modify the nearby objects. The context can be understood in detail by exploring the world around. This gradually helps them to interpret new information from the context and relate to what they already know.

19. Computational thinking

This is an advanced technique to improve thinking and problem solving skills. The method comprises decomposition i.e. breaking large problems into small units and pattern recognition-related problems to the ones which were already solved successfully in the past. Computational thinking skills also cover algorithms step by step approach to reach a solution; abstraction neglecting unimportant details and debugging-refining these steps.

20. Remote labs

Learning by doing is an unparalleled approach to teach science and this is made a reality with remote labs. Students are given access to authentic scientific tools and opportunities to control remote lab experiments. This would enhance their inquiry skills and conceptual understanding and also, the students can learn and explore with motivation.

21. Embodied Learning

In this approaches, mind and body of the students work together to explore science. The physical feedback as well as the resultant actions will reinforce their learning process. This idea is well supported by today's technology such as visual systems that track movement or wearable sensors to collect physical and biological data.

22. Science museums

Give opportunity to students to visit a science museum as part of the learning process. This gives them access to innovative resources and they can visualize data they learnt in class. They can have a look at the real work of scientists which improves their urge to learn about it further. Regular visits to museums make learning science more engaging and interesting.

23. Projects

This can be an individual activity or group activity which helps students to showcase the application side of what they learnt through theory. This method involves choosing the idea, building a plan, executing

the plan and finally evaluating it. When students pass through these stages, they can improve their skills to express ideas, problem solving, overcoming the challenges, team work and self-assessment.

24. Multimedia Approach

This method is a blend of text, audio, animation, video, still images 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 experience.

25. ICT Enabled Learning

ICT refers to the use of Information and Communications Technology to teach the scientific ideas that promotes open source learning. In order to make the accessing, storing, transmitting, and manipulation of information more easy, this approach integrates telecommunications, computers and relevant enterprise software, storage, middleware, and audio visual systems required to handle the topic.

26. Video clips

This teaching technique makes use of instructional video clips available online or in libraries to show and teach a new concept. The evolution of a process can be conveyed better with animation videos. It can also be videos of demonstration of an idea or an application side of a theory or an interview with a scientist, tutorial by a subject expert and more.

27. Power Points

Instead of the conventional talk and chalk methods, teachers now include power point presentations in their classroom sessions to make it more interesting. They connect the computers to projectors to address a larger classroom and include interesting slides with diagrams and flow charts to make the teaching more interactive.

28. Mini labs

Mini labs allow students to take part in hands on activities inside the classrooms to illustrate a concept. This makes classroom sessions more fun, engaging and memorable. Students can attempt to mock up day/night with a globe and flashlight, build circuits, test for conductivity and magnetism, produce mixtures and solutions or model the formation of sedimentary rock and more.

29. Science Fair

Schools should conduct science fairs as part of their teaching strategy to promote students interest in the subject as well as to evaluate their level of understanding. In this competition, students are given a time frame to answer a question or perform a task through a range of experiments and research. They showcase the output in the form of reports, display board, or as models.

30. Research books

Teacher can promote the use of research books in classrooms rather than just text books and lecture notes. Students are asked to do a research on whatever topic is covered in class by means of libraries, websites or by talking with experts. This can include the extended information of their syllabus and their findings with diagrams and charts to emphasize it. They can share their research books with classmates too.

31. Documented Problem Solving

In this method, the teacher insists students to record their thought process when solving a problem. They are asked to explain their reasoning for reaching the particular solution rather than simply presenting a solution. This kind of documented problem solving helps them to have a deeper understanding of their process and gives an option for self-analysis.

32. Science kit

This is one of the innovative methods of teaching science to kids and adults alike. Let it be physical science, life science, or earth science, teachers are now making use of science kits to help students have an engaging educational experience. They can conduct small experiments with guided instructions to identify rock specimens, to watch out for insect metamorphosis or demonstrate chemistry reactions.

33. Science stations

This is a fun, quick and engaging way to teach science that promotes student led learning. Science stations support differentiated learning that lets students to immerse themselves in topics, experience science to the fullest and then reflect back on their learning. There will be multiple stations built with different learning styles and students can research, explore, watch, read, write, assess and illustrate the science concepts.

34. Observation stations

More than just the text book assignments that have limitations in exploring the topic, these advanced observation stations help students to build up their research, observation and creativity. This includes activities that help them to have an understanding of a specific concept using 5 to 6 stations with varied options. The activities include determining mass using a triple beam balance or testing objects to find out their electrical conductivity and magnetism and a lot more.

35. Peer to Peer Teaching

Students take the role of teaching each other that promotes excitement learning science. In Peer to Peer Teaching approach, they are really engaged in the content by discussing scientific topics, generating questions and working in teams to explore new information. Some of the activities involved in this approach include buzz groups, solution groups and critic groups.

36. Science movies

Teachers take initiatives to take them for science movies in theatres or in school halls that clearly showcase the application side of scientific concepts. More than just entertaining them, many science movies captivate their attention and illustrate diverse science concepts in the real world. Science and nature focused documentaries is one of the best ways to introduce science to kids than spoon feeding them with text book content.

37. Science games for kids

Kids always love to play and that is why smart teachers introduce science to them with interesting games. They can learn more about science and technology with fun. A wide range of games are available online that showcase the concepts of animals, plants, space, forces, light, sounds, magnets, electricity, weather and gases. There are games with multiple levels and passing each level teaches a new concept and illustrates scientific experiments.

38. Science songs

This is another creative teaching method to help kids to learn about the science world with fun. Teachers can make use of the interesting science songs available online or create one to introduce the basics of astronomy, biology, botany, physical science and earth science with fun. Science Is Real, Meet the Elements, The Star Song and Motion Song are a few among the popular science songs available online.

39. Science Exhibition

Encourage your students to take part in science exhibitions as part of school level or inter-school level competitions. This is a great opportunity to bring out their creativity in science and design an application

based on a scientific concept. Develop this inquisitiveness and creative mindset in students right from the elementary classes to help them to grow up as science enthusiasts.

40. Mobile apps for Science

A number of mobile apps are available online for elementary, middle school and high school students as well as for those undergoing advanced studies. Today's kids are tech savvies and they love to learn science using their gadgets. The advanced mobile apps built with innovative features in fact turn students into scientists. This lets them hold science in their hands and explore it with just a few taps. The popular apps in the category include Human Body, Cozmic Zoom, Earth Primer, Video Science, Science360, NASA GLOBE Observer and a lot more.

41. Field trips

In the middle of boring classroom sessions, take your students out for field trips to experience science while learning. Go to an aquarium, a nature center, a scientist's home or visit a pet store. You can also spend some time with the students in the bird park or simply go on a nature walk to experience the science around while learning new concepts.

42. Science clubs

This is the right place for science enthusiasts to share and discuss new happenings in science world and to connect innovative ideas to what they actually learnt.

43. Reward discovery

Right from the elementary classes, teachers should support, guide and inspire students to discover the wonders of science. With an inquisitive mindset, there are a lot to discover from the science world we are living in. Also, reward them for the small discoveries they make and let them share and present it in class.

44. Interactive science journals

This is an advanced version of lecture notes in which students express the information they learnt into different templates and elicit their own responses. Students can use this technique effectively to have a deeper connection to their learning and this activity promotes their higher level thinking. They can be creative with their notebooks using pictures, charts and comments, thus, building an encompassing resource for future reference.

45. Science at home

Like scientists say, science starts from home. Encourage your students to discover science at home from elementary classes itself. Ask them to find out a specific science concept application at home as assignments and let them discover science on the go. There are fun science activities at home that involve parents and kids such as measuring Earth's circumference with a shadow, creating under water fireworks with chemistry, building a balloon powered toy car and a lot more.

46. Flipped Classroom

In this innovative teaching technique, students are asked to go through video instructions or tutorials in the initial stage, i.e. digital learning. The second stage will be in classrooms where they involve in challenging tasks and assignments based on the information gathered through video assets. This flipped learning frees up class time for activities such as hands on labs, guided practice or online simulations.

47. Guided Discovery Problems

Understanding science is more than just knowing some facts and the guided discovery problems method makes it possible. This technique can be integrated into lecture, lab and field courses. It refers to understanding science step by step through the discovery process and involves collection and processing

of data, debugging and explaining it through intriguing puzzles, structured hands on activities and right presentation of information. The conceptually difficult or counter intuitive topics are better handled with this approach.

48. Fishbone

This is a visual tool for organizing critical thinking which is a good approach for problem solving in science. The fishbone diagram helps to teach students about the root causes leading to a problem and quantifying the relationship between the effect and cause. This is more effective when teaching a group. In this diagram approach, the head of the fish represents the change, the ribs show the reason and riblets have the supportive evidence.

49. Science Quiz

Include quiz as a part of your classroom sessions when teaching science. This can be done as a whole class activity by splitting the group into 4 or more sets. The questions can include the application of the theory taught in class. Students can discuss and share ideas to find the solution within the stipulated time frame. This teaching approach helps students to think from different angles and sometimes, to think out of the box.

50. Build your model

This can be a challenging task given to students as part of science education. Models are the building blocks of science which are used to explain the diverse aspects of real world.

CONCLUSION

By implementing various modes of teaching techniques proper interest can be developed among the students of science for proper education of science and technology. The modes include 1.Hands on Learning 2.Story Telling 3.Role Play 4.Sports Based Learning 5.Visual clues 6.Instructional Conversations 7.Science Text Cards 8.Word Games 9.Graphic Organizers 10.Word Parts 12.Virtual science labs 13.Word walls 14.Thinking Maps 15.Mini anchor charts 16.Crossover Learning 17.Argue with Science 18.Context-Based Learning 19.Computational thinking 20.Remote labs 21.Embodied Learning 22.Science museums 23.Projects 24.Multimedia Approach 25.ICT Enabled Learning 26.Video clips 27.Power Points 28.Mini-labs 29.Science Fair 30.Research books 31.Documented Problem Solving 32.Science kit 33. Science stations 34. Observation stations 35. Peer-to-Peer Teaching 36.Science movies 37.Science games for kids 38.Science songs 39.Science Exhibition 40.Mobile apps for Science 41.Field trips 42.Science clubs 43.Reward discovery 44.Interactive science journals 45.Science at home 46.Flipped Classroom 47.Guided Discovery Problems 48.Fishbone 49.Science Quiz 50.Build your model etc.

It is better to move experiments with textiles up to 6th and 7th grade of primary school. Students, in the 8th and 9th grade, they already have an idea of their direction in further secondary education. However, according to the attention they dedicated to video clips, they could acquire a positive attitude towards technology and science. To wake up pupils' attention by means of their positive emotional feeling and to encourage their interest in the science curriculum, accompanying video clip illustrating practical applications of acquired knowledge and their importance in the students' further life can be prepare. This general plan is processed on a specific example, the promotion of the textile sector. Selected experiments are presented in the form of videos and e learning. Motivating clips accompanying experiments should be demonstrated.

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