SCIENCE TEACHERNG

PARADIGM SHIFT- CLASSIC TO NEXT GENERATION

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PREFACE

SCIENCE TEACHER^{NG} : PARADIGM SHIFT - CLASSIC TO NEXT GENERATION is a collection of important research papers written by Dr. Prasanth Mathew, Assistant Professor in Physical Science, P. K. M. College of Education, Madampam. It's all about how teaching science is changing for the better. The Researcher looks at new ways of teaching science that are different from the old-fashioned methods. Each paper in this book shows a new idea that can help teachers inspire students. Right now, education is changing a lot, and science teaching needs to keep up. Dr. Mathew helps us understand these changes by looking at real examples and facts.

This book is not just for teachers. It's for anyone interested in how we can make science education more exciting and useful. It's a call to everyone involved in education to keep learning and improving how we teach science to make the world a better place.

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Science Teacher ^{NG} : Paradigm Shift - Classic to Next Generation.

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Introduction

"We can't solve problems by using the same kind of thinking we used when we created them"

Albert Einstein.

The stiffest challenge science teacher's face is coping and adapting to change. All teachers must understand that the profession is never static and a permanent state of change is normal. Sometimes change is trivial and transient, at other times it is more fundamental. The changes in the science curriculum at the moment are more fundamental. With far greater attention being placed on how science, technology, society and environment interact rather than pure science for science's sake, the science teacher needs new skills. There are many science lessons these days that could be taught well, (perhaps better), by English or Humanities teachers because the classroom skills necessary include group work, discussion, opinion, critical analysis etc. Certainly science teachers will need to have a greater repertoire of classroom techniques than they have had before.

The changing nature of the society and the expectations that society has for education, increasing ethnic diversity of the school population, rapid advances in science and technology, changes in our understanding of how students acquire and develop complex scientific understanding, increased awareness of the significance of the affective and social dimensions of learning, the impact of new technologies on classroom practice, shifts in the relative influence afforded to different stakeholders in education etc. have brought *conceptual shifts* in the ways that children are perceived, in the approaches to teaching learning process, in the nature of classroom enquiry, in the virtues of the teacher, in the nature of educational atmospheres, in the nature of supportive conditions for the learners, in the context for learning, in the patterns of classroom discourse, in the school- home relationship and so on.

Conceptual Shifts

1. Scientific Literacy Vs Scientific Capability

Little of the world's poverty, injustice, terrorism and war will be eliminated, and few of current environmental crises (ozone depletion; global warming; land, air and water pollution; increased deforestation and desertification, loss of biodiversity) will be solved, without a major shift in the practices of Western industrialized society and the values that currently sustain them. Interestingly, one of the keys to ameliorating the current situation may lie in increased levels of scientific literacy among the world's citizens- but a different kind of scientific literacy.

The authors of Science For All Americans (AAAS,1989) direct attention towards scientific literacy for a more socially compassionate and environmentally responsible democracy when they state that science can provide knowledge 'to develop effective solutions to its global and local problems' and can foster ' the kind of intelligent respect for nature that should inform decisions on the uses of technology' and without which , they say,' we are in danger of recklessly destroying our life support system'. Regrettably, they don't go on to suggest that scientific literacy also includes the capability and willingness to act in environmentally responsible and socially just ways.

The Scottish Consultative Council on the Curriculum (SCCC, 1996) adopted the term *Scientific Capability* instead of scientific literacy as it conveys more clearly a flavor of science education for action as well as for personal enlightenment and satisfaction.

Scientific capability is described in terms of five distinct, but clearly interrelated, aspects:
Scientific curiosity- an enquiring habit of mind;

Scientific competence-ability to investigate scientifically;

Scientific understanding -understanding of scientific ideas and the way science works;

Scientific creativity- ability to think and act creatively; and

Scientific sensitivity- critical awareness of the role of science in society, combined with a caring and responsible disposition.

Hence, becoming 'scientifically capable' involves considerably more than the acquisition of scientific skills, knowledge and understanding. It also involves the development of personal qualities and attitudes, the formulation of one's own views on a wide range of issues that have scientific and/or technological dimension, and the establishment of an underlying value position.

2. Changing Values, Changing life style and Changing Pedagogy

Science and technology education has the responsibility of showing students the complex but intimate relationships among the technological products we consume , the processes that produce them, the values that underpin them and the biosphere that sustains us.

The planet can no longer sustain our present (Western style) way of life unless we change the way we live. Changing our way of life entails changing our values. Acid rain, global climate change, toxic waste, the threat of nuclear holocaust, ozone depletion, loss of biodiversity, increased deforestation and desertification are all located in our impoverished values. We have to reject our current values of bigger, faster and more powerful, our current preoccupation with higher production and wealth generation, in favor of an orientation towards 'the organic, the gentle, the non violent, the elegant and beautiful' (Schumacher, 1973).

The most fundamental element in this value shift is the rejection of anthropocentrism, identified by Smolicz and Nunan (1975) which is the root of the global environmental crisis. Through Anthropocentric thinking, people absolve themselves of the responsibility for the care and preservation of the natural resources. Hence there is the need to replace this anthropocentrism with a biocentric ethic which advocates respect for the intrinsic value of all living things, a sense of compassion and caring towards both human and nonhuman species. Laszlo(2001) describes the inculcation of this clutch of values as developing a 'planetary ethic' which ' respects the conditions in which all people in the world can live in dignity and freedom, without destroying each other's chances of livelihood, culture, society and environment

Changes in pedagogy are necessary to affect such a radical shift in student values. It is well documented that to inculcate such values in children, informal learning experiences can be more effective than formal schooling in bringing about the awareness of issues, attitudinal shifts and willingness to engage in sociopolitical action (Ramey-Gassert & Walberg,1994; Rennie & Mc Clafferty,1996; Jeffrey-Clay,1999; Pedretti,2002). Informal learning experiences are particularly well positioned to facilitate the affective and social components of learning (Alsop &Watts, 1997).

3. Changing Philosophy: Children as Philosophers

Philosophy with children acknowledges children as capable thinkers and persons and accords them an active role in the construction of knowledge. In many ways, both in the wider world and in the spheres of childhood studies, the past thirty years have been all about the realization that children are far more competent than usually given credit for and that they are easily able to contribute actively to everyday life, when encouraged and included in ways that are sensitive to their growing capacities (Nutbrown, 1996). With the changes in educational, legal, ethical, economic and social directions the orientation to children and young people have come conceptual shifts in the ways that children are perceived. As James and Prout (1997) have pointed out, children are no longer seen as *'becomings'* but as *'beings'* whose thoughts, choices, relationships and concerns are of interest in their own right. When children are thoughtfully vocal, their thinking and talking can help to change the classroom from *the place of instruction into a place where education is possible*.

It is possible for teachers to transform their own classrooms, *simply by making room for children to participate.* The first step is to create a teaching and learning space for enquiry and dialogue. In a collaborative community of enquiry (Haynes, 2008), children are not mere spectators but participants in knowledge making. Here, *the teacher does not know the precise content of the lesson in advance.* Rather it is determined by the children's questions. Answers are provisional, and this is somewhat odds with the curricula of schools, where the emphasis is often on very precise learning objectives and outcomes. This way of working opens up the debate about the purpose of teachers' planning, preparation for effective teaching and what styles of teaching are appropriate. In a community of enquiry teachers are facilitators, holding back on their own views, tactfully supporting children's thought and talk and encouraging the dialogue to flow between the participants.

Teachers have to be willing to treat pupils' questions without prejudice and to genuinely commit themselves to the enquiry. They need to resist a natural desire to lead the discussion in a planned direction and must avoid the temptation to show children that 'teacher knows what's best'. The teacher's skills are crucial to the success of the enquiry–based methods of teaching. The teacher's presence, attention and responsiveness during the enquiry are of the utmost importance in supporting the children's experience of thinking for themselves. Bonnet (1995) argues that teaching in *this way requires certain virtues in the teacher*: *patience and ability to hold back, faith in the usefulness of thinking that is difficult and challenging, and charity in maintaining an open disposition towards the thoughts of others.*

4. Changing context for learning

A context for learning refers to the setting in which the learning occurs, or the audience or recipient of the fruit of the learning or the situation- any of which create a reason, purpose, or focus for the learning.

Traditionally, the context for learning for students has been alone in a chair at a desk in a classroom. However, the context can be river or stream that runs through the community. Students working in groups with engineers from a local plant can be engaged in collecting specimens and conducting experiments from the water to determine effects of manufacturing on the water's purity, so they can submit a report to the company or the Environmental Protection Agencies.

Science, Technology, Society and Environment (STSE) education, originated from the science technology and society (STS) movement in science education emphasizes the teaching of scientific and technological developments in their cultural, economic, social and political contexts. In this view of science education, students are encouraged to engage in issues pertaining to the impact of science on everyday life and make responsible decisions about how to address such issues. (Solomon & Aikenhead, 1994; Bingle & Gaskell, 1994; Pedretti 1997 & 2005) Teachers need to provide a balanced view of the issues being explored. This enables students to formulate their own thoughts, independently explore other opinions and have the confidence to voice their personal viewpoints. Teachers also need to cultivate safe, non-judgmental classroom environments, and must also be careful not to impose their own values and beliefs on students.

5. Changing Methodology of Teaching

No one method works in all contexts for all students and no two students are exactly alike. What seems most valuable, from the postmodern perspective, is that the teachers develop a contagious *sense of inspiration* that infuses the classroom. This sense of inspiration is easiest to achieve when the teacher is seen and valued for being an innovator, when the teachers place great value on their own practitioner-based knowledge, and also on that of their colleagues. Post modern teachers work to tailor their ideas to particular students or particular classrooms or situations. And, when it all comes together, postmodern teaching becomes, quite simply, an effective quest for planning and developing ***situational based teaching masterpieces, masterpieces that might not work for others, or in other contexts.***

6. World Wide Web: ***Shift from*** **Web 1.0 - Web 2.0 - Web 3.0**

Many argue that the World Wide Web challenge the traditional authority of the teacher and of schools. It offers the possibility of greater individual autonomy and the creation of new knowledge networks and communities outside the authority of the state. Some people of course believe that, as the technology advances, schools in the present form will disappear.

"Web 2.0" refers to the second generation of Internet-based services - including social networking sites, Wikis, blogs, communication tools, and collaborative documents. 'Web 2.0' websites allow users to do more than just retrieve information as already possible in 'Web 1.0'. Bart Decrem (2006) calls Web 2.0 the "participatory Web" and regards the Web-as-information-source as Web 1.0.

Web 2.0 tools assist students in communicating within and beyond the classroom- with the teacher, other students, and the community and science experts. Web 2.0 technologies provide teachers with new ways to engage students in a meaningful way. "Traditional classrooms have students do assignments and when they are completed, they are just that, finished. However, Web 2.0 shows students that education is a constantly evolving entity. The lack of participation in a traditional classroom stems more from the fact that students receive better feedback online. Whether it is participating in a class discussion, or participating in a forum discussion, the technologies available to students in a Web 2.0 classroom does increase the amount they participate.

By allowing students to use the technology tools of Web 2.0, teachers are actually giving students the opportunity to learn for themselves and share that learning with their peers. By making the shift to a Web 2.0 classroom, teachers are creating a more open atmosphere where students are expected to stay engaged and participate in the discussions and learning that is taking place around them.

Conrad Wolfram (2010) has argued that Web 3.0 is where "the computer is generating new information", rather than humans. Web 3.0's early geosocial webs are an extension of Web 2.0's participatory technologies and social networks into 3D space. According to some Internet experts Web 3.0 will allow the user to sit back and let the Internet do all of the work for them. Rather than having search engines gear towards your keywords, the search engines will gear towards the user. Keywords will be searched based on your culture, region, and jargon.

7. Shift in the Pattern of Classroom Discourse –Authoritative to Dialogic Discourse

In authoritative discourse the teacher's interventions are intended to convey information, the emphasis is on the transmissive function of teacher talk**,** while the dialogic function of teacher talks realized as the teacher encourages students to put forward their ideas, to explore and to debate points of view. The authoritative discourse is invested with authority which tends to discourage interventions and it involves formal reviews or factual statements which offer few invitations to dialogue. It is univocal in function and it "conveys meanings adequately." In authoritative discourse the students' contributions are usually in response to the teachers instructional questions. The dialogic discourse is open to challenge and debate and is intended to act "as generators of meaning". The 'dialogic' or 'internally persuasive' discourse maps directly onto what Van Zee and Minstrell (1997) refer to as 'reflective discourse' in which three conditions are frequently met. The three conditions are that a) students express their own thoughts, comments and questions, b) the teacher and individual students engage in an extended series of questioning exchanges that help students better articulate their beliefs and conceptions, c) student/student exchanges involve one student trying to understand the thinking of another.

A shift from the authoritative discourse to dialogic discourse provides room for a wide range of creative expressions. The various written forms of discourse which involves fiction, letter, autobiography, brochure, play, news paper article, cartoons, editorial, blog, investigative report, journal entry, etc also find favour in science learning and teaching. An experimental procedure can be described through different types of science writing exercises as above which were traditionally thought to be explained only in one way (diagram, method, results and conclusion).

8. Shift from Content Learning to Performance Based Learning

"How is this going to help me later in life?" is a usual question of a school kid to the science teacher. Mere content learning without gaining practical applications of this knowledge to their real-life experiences leave children in such a dilemma.

Authentic performance- based education (Burz & Marshall, 1997) asks students to take their learning far beyond the knowledge and basic skills. A performance orientation teaches students to be accountable for knowing what they are learning and why it is important and asks them to apply their knowledge in an observable and measurable learning performance. This shift "from knowing to showing" means that everything we do – instruction, curriculum, assessment evaluation, and reporting - will ultimately be focused on and organized around these learning performances.

Educators, parents, business and industry leaders and community members through out world are coming to agree that students should be demonstrating what they are learning in observable and meaningful ways. If we are to succeed in difficult shift from content coverage to performance –based education, we will need to have new strategies for defining and organizing what we do around *significant learning performances.*

9. Changes in School Home Relationship

The Parent Learning Support System (PLSS), an innovative programme established in Phillipines (Carino & Valisno, 1992) recognizes parents as teachers of children and facilitates their collaboration with professional teachers. The programme is monitored at every school by a teacher parent group. Teachers and headmasters are trained in managerial skills as effective collaborative mechanisms and shared decision –making techniques as well as skills in teacher-parent and teacher-pupil dialogue. At parent –education seminars, parents are counseled as to ways in which they can contribute to the education of their children. Parents are drawn into the teaching –learning processes. With the guidance from the teachers, they assist their children in their assigned learning tasks at home or in school. They also help teachers in conducting classes. Parents are asked to observe their children's behavior in the classroom, as well as the teaching methods. In view of the considerable gains in the pupil's achievement levels and greatly reduced drop-out PLSS has been extended to other parts. The conceptual shift in the collaboration of the Teachers, parents and the community for educational change challenges the next generation science teaching.

Conclusion

The moral and pedagogical demands challenge the science teacher to cope and adapt to change for the next generation science teaching. The conceptual shifts in the ways that children are perceived, in the approaches to teaching learning process, in the nature of classroom enquiry, in the virtues of the teacher, in the nature of educational atmospheres, in the nature of supportive conditions for the learners, in the context for learning, in the patterns of classroom discourse, in the school- home relationship make greater demands on the science teacher for effective teaching.

Hence, science teachers need to have a greater repertoire of classroom techniques than they have had before. Teachers need to equip themselves to adopt innovative techniques of teaching for meeting the demands of the time. A paradigm shift from the traditional science teacher –"Science Teacher$^{\text{Classic}}$" to next generation science teacher – "Science Teacher$^{\text{NG}}$" is the need of the scenario.

Reference

- Alsop,S. and Watts,M.(1997) Sources from Somerest Village: A Model for Informal Learning about Radiation and Radioactivity. *Science Education*, 81,633-650.
- American Association for the Advancement of Science.(1989). *Science for All Americans*. A Project 2061 Report on Literacy Goals in Science, Mathematics and Technology. Washington DC
- Bart Decrem (2006-06-13). "Introducing Flock Beta 1". Flock official blog. http://www.flock.com/node/4500. Retrieved 2007-01-13.

- Bingle, W. & Gaskell, P. (1994) Science literacy for decision making and the social construction of scientific knowledge. *Science Education*, 78(2): pp. 185–201.
- Bonnet, M.(1995).'Teaching Thinking and Sanctity of Content', *Journal of Philosophy of Education.* 29(3):295-309.
- Burz,L.H. andMarshall,K. (1997). Performance Based Curriculum for Science. Corwin Press:California.
- Carino,I.D.,& Valisno,M.D. (1992)The Parent Learning Support System.: School and community collaboration for raising pupil achievement in the Philipines, in Shaeffer,S. (ed.), *Collaborating for Educational Change : The role of Teachers,Parents and the Community in School Improvement,* Paris,UNESCO-IIEP.
- Conrad Wolfram on Communicating with apps in web 3.0 IT PRO, 17 Mar 2010
- Costa,V.B. and Kottler,E.(2009). Secrets to Success for Science Teachers. Corwin Press:California
- Gilbert, J.(eds)(2004) *The Routledge Falmer Reader in Science Education*. Routledge Falmer: London and New York.
- Haynes, J. (2008). *Children as Philosophers.* Routledge Falmer: London.
- James, A. and Prout, A.(eds.). (1997) *Constructing and Reconstructing Childhood: Contempory Issues in the Sociological Study of Childhood. Second edition.* London and Washington DC; Falmer Press.
- Jeffrey-Clay,K.R. (1999). Constructivism in Museums: How Museums create Meaningful Learning Environments, *Journal of Museum Education*,23,3-7.
- Laszlo,E. (2001).*Macroshift: Navigating the Transformation to a Sustainable World*. San Fracisco,GA: Berret-Koehler.
- Nutbrown,C.(ed.)(1996).*Respectful Educators, Capable Learners: Children's rights and Early Education*. London: Paul Chapman.
- Pedretti, E. (1997) Septic tank crisis: a case study of science, technology and society education in an elementary school. *International Journal of Science Education*, 19 (10): pp. 1211–30.
- Pedretti, E. (2005) STSE education: principles and practices in Aslop S., Bencze L., Pedretti E. (eds.), *Analysing Exemplary Science Teaching: theoretical lenses and a spectrum of possibilities for practice*, Open University Press, Mc Graw-Hill Education
- Pedretti, E.(2002). T. Kuhn meets T. Rex: Critical Conversations and new Directions in Science Centres and Science Museums. *Studies in Science Education,* 37,1-42.
- Ramey-Gassert,L. and Walberg,H.J.I.(1994) Re-examining Connections: Museums as Science Learning Environments. *Science Education*, 78, 345-363.
- Rennie, L.J. and McClafferty, T. (1996) Science Centers and Science Learning. *Studies on Science Education*.27, 53-98.
- Schumacher,E.F. (1973). *Small is Beautiful: A Study of Economics as if People Mattered.* London: Bond& Briggs.
- Scottish Consultative Council on the Curriculum (SCCC). (1996). Science Education in Scottish Schools: *Looking to the future*. Broughty Ferry: SCCC.
- Smolicz,J.J. and Nunan,E.E. (1975). The Philosophical and Sociological Foundations of Science Education: The Demythologizing of School Science. *Studies in Science Education*,2,101-143.
- Solomon, J. & Aikenhead, G. (eds.) (1994) *STS Education: International Perspectives in Reform*. New York: Teacher's College Press.

Conserving Natural Life-Support Systems for the Well-Being of Adolescents

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Introduction

The present day education has adopted *fragmented approaches to reasoning* which have been at the root of much sickness and alienation in our culture. Because we have either refused or been unable to see the ***interdependence*** of things, social alienation and environmental decay have occurred. (Miller, 1999). One of the purposes of fragmented education which 'took away the parts from the whole' was to make *understanding better*, but in doing so the connections were destroyed which changed our perspectives of the whole. In modern schools, the separation of *being* and *thinking* has been at the root of learning and has taken the form of 'processing information.' This way of knowing has brought us many good things in technology, but it has also alienated and fragmented our humanity. The experience of 'being' has been replaced by our preoccupation with reason. In doing so, we have failed to understand the wholeness of our being, to understand ourselves holistically in all profundity. This has also resulted in the lack of resilience in children and adolescents in the face of stress. The technologically- driven existence of man has placed him at the heights of luxuries with all amenities at his finger tips. Unprecedented scientific developments at a galloping pace have influenced the physical, social, cultural and economic facets of human life. Modern advancements have well catered to physical human survival. However, man's invincible desire for an inner peace has not been gratified with these developments. Physical survival, on its own, is not sufficient to provide for the satisfaction and fulfillment that individual humans yearn for in their lives. This has been known for thousands of years. The biblical wisdom that "Human beings cannot live on bread alone..." strongly suggests that human fulfillment is not synonymous with mere physiological subsistence. Beyond this, people have subtler and less tangible needs that contribute to what can be thought of as emotional and psychological sustainability. Deep in our soul we yearn for beauty, for balance, for rhythm and harmony. Lacking this type of development, human beings can feel demoralized and worthless. Life can seem emotionally empty or unsustainable.

Conserving Natural Life -Support Systems for a sustainable future

A Natural life support system is any natural system that furthers the life of the biosphere in a sustainable fashion. The fundamental attribute of life support systems is that together they provide all of the sustainable needs required for continuance of life.

We live today in a globally interconnected world in which physical, biological, psychological, social and environmental phenomena are all interdependent. An indiscriminate use of natural resources can disrupt the "complex webs of relationships and multiple interdependencies" among various systems of the universe.

In 1992, United Nations Earth Summit defined 'Biological diversity' as "the variability among living organs from all sources including, *inter-alia,* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems". Human encroachment and exploitation of natural resources has disrupted the biodiversity which has led to the environmental crisis of climate change and global warming. This has posed a serious threat to the healthy existence of human and non-human species on earth.

However, it is inappropriate to regard environmental problems as matters of mere careless industrialization and inexpert management of natural resources to be solved by experts and officials. Environment is not just a 'given' but a social construct. Environmental Problems are not "problems 'out there' in our surroundings, but problems 'in here', in the way we choose to make sense of the world. They are pre-eminently social problems-problems of people, their life styles and their relations with the natural world". I, being a part of the society, have a personal responsibility towards these problems. "Environmental problems will not 'go away' nor will they be solved by a quick 'technical fix' while we blithely maintain our profligate life style". I must change the way I live. Changing my way of life entails changing my values in favor of an orientation towards "the organic, the gentle, the nonviolent, the elegant and beautiful" (Shumacher, 1973). The significance of this change for conservation of natural resources should spring not merely from the prospect of a comfortable material life in future but for our emotional, psychological and spiritual well being.

Nature: A Potential Source for Gratifying Deeper Human Yearnings

Abijan (2008), after conducting some naturalistic studies on culture, enumerates his experiences with the natives of some small villages in the southern African Countries. He writes:

> "I marvelled at how these people, who are rooted in their culture in a spirit of dwelling, can find inner peace and peace with others. Nestled in a natural environment they are able to care and nurture, following their indigenous ways and make peace with the Earth, with other people and most importantly with themselves… I discerned the villagers 'deep connections with the Earth, the vegetation and the animals. I conjured that their deep understanding of the science of the earth and of the spirituality of the Earth is enshrined in their stories, songs and dances". (p.64)

From this, he drew a fragment of his understanding of humanity- *making connections with Earth and with others,* with deep reverence.

Positive Emotions which broaden our attention and prepare us to be open to new ideas and practices and to be more creative than usual (Isen, 2000) are associated with being in natural rather than artificial environments. People report positive feelings in geographical locations where there is vegetation, water and panoramic views (Ulrich *et al*., 1991). Such environments are both safe and fertile.

Positive emotions broaden momentary thought–action repertoire. This broadening of momentary thought–action repertoires offers opportunities for building enduring personal resources, which in turn offers the potential for personal growth and transformation by creating positive or adaptive spirals of emotion, cognition and action. Educational studies of children show that children in positive mood states learn faster. Evidence from developmental and laboratory studies show that positive emotions can facilitate creativity and problem solving which in turn increases work productivity. (Fredrickson,2002)

Paul Shepard (1982) says, maturity of thought (*wisdom* rather than mere knowledge) arises from connecting with the Earth in the *early years of childhood.* Without close contact with the natural environment, he argues, we become ***infantile adults****:* wanting everything now and new; careless of resources and waste; unable to empathize with 'others'; prone to violence when frustrated; despising age and denying human natural history.

The warmth and silence of nature, the gentle whisper of the breeze, the chirping sounds of birds, the majesty of the awe –inspiring animals, the rippling sounds of the rivulet have the potential to ignite the psychic/vital energy in man and can stir human beings into creative endowments. They have the power even to revitalize the drooping spirit in man to move through life with courage and vitality.

The philosophical aspect of nature lies in its unraveling of healthier conception about life- the need of benevolence portrayed by plants, the unending flow of water which inspires man to go on amidst all formidable challenges posed by life and so on.

Why should I Conserve Natural Life -Support Systems?

The starting point for considering the central significance of human psychological and emotional dynamics in the sustainability of physical life-support systems is the observation that human beings yearn to experience well-being and fulfillment in their lives.

Emotions once associated with the mother do not disappear as a person grows up. Furthermore, the emotions are no longer expressed purely and simply as immediate needs for physical nourishment, security, and so on. Even if the latter are satisfied, the *experience* of yearning continues and is often felt as lack, emptiness, or desire for fulfillment, completeness, and satisfaction. As adults, these feelings are displaced onto other objects—other people, beliefs and ideologies, and material things—which come to be seen as the means of resolving these yearnings and are therefore desired and sought after.

Significance of the Educational Scenario in conserving Natural Life support system

Children, being the citizens of tomorrow, are the future makers. Hence, nurturing a caring disposition, compassion and sense of responsibility in them is inevitable for a balanced ecology in future. The impressions made on the absorbent mind of a child are almost indelible. Children must be made 'to experience and sense the world in its natural state' through innumerable experiences of being 'one' with nature. Providing learning experiences 'against the backdrop of nature by going out into the fields, meeting nature at its best, the sun, the wind, the rain, the flowers, the grass and the animals in their actual habitat' can help them grow in a natural way. They must be taken beyond the 'level of awareness' of the interconnectedness of man with his environment to a 'level of being sensitized', whereby they experience and feel their interrelationship with the other systems in the universe. Such upbringing of children can generate in them a 'biocentric ethic' of *respecting* the intrinsic value of all living things; of *showing a sense of compassion and caring* towards both human and non species; of *having a concern* for maintaining the existence of biological and cultural diversity; of *challenging and rejecting all forms of discrimination*; of *appreciating interconnectedness* between all the natural and human made systems; of *recognizing* that all human actions have consequences that will affect a complex global system that includes human and nonhuman species, of *having an awareness of and acting* on choices to maintain an ecologically sound and humane life style. Laszlo (2001) describes the inculcation of this clutch of values as developing a '*planetary ethic'*- an ethic which respects the conditions under which all people in the world community can live in dignity and freedom, without destroying each other's chances of livelihood, culture, society and environment.

Educators have a crucial role to play in enabling pupils to recognize the 'wholeness of their being', which would make them 'sensitive' to their part in the complex web of relationships among human and non-human species and various other systems of the universe. A creative curriculum where children can experience and sense the world in its natural state can awaken pupils to 'responsible stewardship' (taking care of the earth), characterized by a strong sense of responsibility towards the dynamic web of relationships in this universe. Learning activities that provide a 'personal' experience of the benevolence of nature can instill in the pupils a feeling of 'oneness' with it which can lead to an 'inner urge' for the *conservation* of forests, ponds, the sacred groves, various plant and animal species and other natural resources that influence our lives in various ways. In forging a lasting relationship with planet earth, we need to teach a new set of three R's regarding this relationship: a) 'Respect' which means 'honouring the defined ways of acting towards the relationship b) 'Responsibility' which demands a responsive attitude and 'loyal fulfillment' of the responsibilities to each other and to the relationship itself c) 'Reverence' which means considering the relationship 'sacred'.

They can provide the fusion of the cognitive, affective and social that is too often absent in the classroom but is essential to the kind of radical shift in attitudes and values. It is also well established that **education *in* and *through* the environment** can play a substantial role in assisting the reordering of values and the development of new ones.

Woolnough and Allsop(1985) talked about the importance of students '**getting a feel for phenomena'** through hands-on-experience in the laboratory as a prerequisite for conceptual understanding. Similarly, Dereck Hodson(1999) advocates the idea of ***'getting a feel for the environment'-*** building a sense of ecological relationships through powerful emotional experience 'in the field'.

Conclusion

The need for conservation of Natural life-support system emerges not merely from the prospective material gains and comforts offered by nature but also from its potentiality to re-vitalise our psychic energy and contribute to our emotional, psychological and spiritual well-being. 'Personal 'experience of nature at a 'sensitising level' would lead to an 'inner urge' for conservation of natural resources which would rather be long-lasting than a mere ephemeral feeling. Education must enable the exploration of the *interrelationship, interdependence and the interconnectedness* of the various systems of the universe to enjoy the real *beauty, bliss and bounty* of nature. We must , thus, pursue Laura Rendon's (2000) ***academics of the heart,*** where we can " honor both our science and our heart" in our educational enterprises , and most importantly, honor our relationships with our fellow beings and other living and non-living species.

References

Abijan,R.N., (2008). Re-arranging the Fragments: Towards the Ecology of Education. In Sue &Clay (Ed), *Building a Culture of Peace for a Civil Society, Proceedings of the 12th World Conference on Education,* Manila, Philipines.

Alsop,S. and Watts,M.(1997) Sources from Somerest Village: A Model for Informal Learning about Radiation and Radioactivity. *Science Education*, 81,633-650.

Fredrickson, B. (2002). *Positive Emotions*. *Hand book of Positive Psychology*. New York: Oxford University Press.

Hodson,D.(1999) Going beyond Cultural pluralism: Science education for sociopolitical action, *Science Education*,83(6),775-796.

Isen, A. (2000). *Positive affect and decision making. Handbook of Emotions* (2nd edn.) New York: Guilford Press.

Laszlo,E. (2001).*Macroshift: Navigating the Transformation to a Sustainable World*. San Fracisco,GA: Berret-Koehler.

Miller,J.P. (1999). Education and the soul. In J. Kane (Ed), *Education, information and transformation essays on learning and thinking* (pp.201-221) New Jersey: Prentice Hall.

Rendon,L. (2000). Academic of the heart: reconnecting the scientific mind with the spirit's artistry. (Association for the study of Higher Education). In *The Review of Higher Education*,24,(1),pp.1-13.

Schumacher,E.F. (1973). *Small is Beautiful: A Study of Economics as if People Mattered.* London: Bond& Briggs.

Shepard,P.(1982) *Nature and madness.* Athens,GA: University of Georgia Press.

Ulrich,R.,Dimberg,u.and Driver,B.(1991). Psychophysiological indicators of leisure benefits. In B.Driver,P.Bromn and G. Peterson (eds), *Benefits of Leisure* (pp,73-890 State College, PA: Venture Publishing.

PERSONALISING SCIENCE BASED ON LEARNER'S PREFERENCES

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Introduction

When we ask a secondary school student for their favorite subject we rarely hear science as a response. The pupils will go on to say 'Science is too hard' or 'It is boring – all we do is copy from books.' 'Why should I study science when there are more interactive, interesting and less difficult ones to study? Is science education necessary for living in this world? Is it helpful to develop a better career for me? Why is it included as an essential requirement of basic education?' These are the questions that arise in every pupil's mind while going through science study.

Progress in science and scientific inventions are inevitable for a nation's development as a whole. A large number of scientists are required, but majority of people in the adolescent generation are disinterested in this area and are reluctant to take up a professional qualification and career in this field. In fact, the purpose of school science education is twofold. The first is to enable young people to achieve science qualifications at advanced levels to progress along certain career pathways in the scientific field. The second and the most important purpose is to provide young people with a sound preparation for understanding science related to their own lives. One of the answers that scientists offer when asked 'Why is science important?' is that 'Science gives you answers to things that go on all about you'. Hence, science curriculum should provide an understanding of science relevant to individual needs, for example, health, diet, drug awareness, fire hazard and electrical safety, in addition to providing opportunities for pupils to engage with social issues on a local, national or global scale.

However, decreasing interest in school science has been shown by students across the world which is an important challenge for the Science teachers. There are well-documented studies of declining interest in science and science careers in both primary (Jarvis & Pell, 2002) and secondary schools (Royal Society 2008; Sturman & Rudduck, 2009). It is vital that we increase the interest of students in science. International Council of Associations for Science Education (ICASE) and the Australian Science teacher Association (ASTA) with the support of UNESCO, reached a clear conclusion on why students lose interest in Science learning. So much of what is taught in science is uninteresting because it is not related to our everyday lives.

Personalization of Science

How can interest in science be awakened and maintained? This is a major problem which the science teachers face today. In many countries, research projects were initiated in order to examine the decline of interest and science-related attitudes more closely and to explore effective measures on how to work against this. Students reject a school science that is disconnected from their own lives, a depersonalized science, where there is no space for themselves and their ideas. A depersonalized science and a transmissive approach would create disinterestedness in students in learning science, whereby they would choose to leave science at a younger age. School science has to emphasize working with ideas rather than transmitting information, through scientific investigations of students' own ideas, on science topics related to ongoing, current scientific issues of the day (Márquez Bargalló y & Prat, 2010). Only when science gets personalized, the student considers it a part of his/her own daily life.

According to the National Educational Technology Plan, 2010 developed by the US Department of Education, personalized learning is defined as adjusting the pace (individualization), adjusting the approach (differentiation), and connecting to the learner's interests and experiences. Personalization is broader than just individualization or differentiation in that it affords the learner a degree of choice about what is learned, when it is learned and how it is learned. The personalized classroom does not entail having 30 separate teaching plans; it is about having one strong inclusive plan which allows as much room as possible for individual engagement, targeted support, a degree of choice and respect for the range of abilities and interests in the class (DCSF, 2007). Personalization does take into account the pace at which the learner is progressing, but also aims to valorize the entire potential of the learner, the biography, the intelligences, the sensibilities and competences (also emotional ones) that characterizes each person, in order to reach a form of cognitive excellence, by developing all aptitudes, capabilities and talents. Dialogue is a central element to personalization, as it is with all social constructivism in learning spaces. Whilst personalized learning may happen in traditional learning contexts such as schools and colleges, it embraces learning that happens anywhere, for example in the home, in the community - anywhere. Personalized learning can happen in partnership with other learners, for example learners working together in a group to study a particular topic. ICT and Communications technology can be a powerful tool for personalized learning as it allows learners access to research and information, and provides a mechanism for communication, debate, and recording learning achievements.

Traditional learning based on “one size fits all” approach, tends to support only one educational model, because in a typical classroom situation, a teacher often has to deal with several students at the same time. Such situation forces each student to receive the same course materials, disregarding their personal needs, characteristics or preferences. Moreover, it is extremely difficult for a teacher to determine the optimal learning strategy for every learner in a class. And even if a teacher is able to determine all the strategies, it is even more difficult to apply all multiple teaching strategies in a classroom. Therefore, implementing learning concept in the context of conventional learning is quite difficult due to diverse preferences, prior knowledge, and intelligence of the learners.

In response to individual needs, personalization in education not only facilitates students to learn better by using different ways to create various learning experiences, but also teachers’ needs in preparing and designing varied teaching or instructional packages. So to learn effectively and better, learner has to be aware of his preferences that make easy to manage his own way of learning. This information will enable the learner to improve the effectiveness of its approach to learning and to exploit its own resources. Jungian based psychologists add that people’s personality preferences influence the way they may or may not want to become more actively involved in their learning, as well as take responsibility for the self-direction and discipline. So we may have to identify a student's individual learning style and then adapt instruction toward that person's strengths and preferences. In fact, adjusting instruction to accommodate the learning styles of different types of students can increase both the students’ achievement and their enjoyment of learning.

How to personalize science

Science education today does not cater to the students' interests and preferences. Science teaching is carried out in the standard mode now. Personal relevance, which is the existence of a relation of the taught subjects with the daily experiences of students, is an important dimension in constructivist learning environment. For personalization of science, it needs to be changed to the customized mode, where students feel it as part of their daily life, rather than an entity cut off from their personal lives. Through science learning a student should develop not only in his knowledge or intellect. Students should attain certain process skills and he should have a scientific attitude. Student should be able to apply his scientific knowledge for the best of his life and society. Development in creative domain is important. Science education which fosters 'creative thinking' and 'scientific sensitivity' in students is inevitable to develop a "culture of science" in our society. This is possible only through re-designing science education in a way to personalize science so that children experience science as 'part of their daily life'. Personalization of the teaching strategies is needed.

Following are the six major themes of science learning which would enable personalization of science -

1. **Science Learning - as part of one's own daily life**
2. **Science Learning - in accordance with one's own exhibited interests**
3. **Science Learning - as part of one's everyday media**
4. **Science Learning - in partnership with others**
5. **Science Learning - in pace with one's ability**
6. **Science Learning - as issues that affect one's personal well being**

Certain strategies for redesigning science education based on each of the major themes of science learning and the corresponding personal preferences and personal practices of students are given in tables 1-6.

Table 1: **Science Learning – as part of one's own daily life**

Personal preferences/ interests	**Personal Practices**	**Strategies for redesigning science education**
My daily routines	Using Calendar	Designing and use of Science Calendar
	Celebrating Days	Commemorating Birthdays and inventions of Scientists Observance of days of scientific importance
	Writing Diary	Designing and use of Science Diary
	Noting down Reflections	Designing and use of Reflective Diary
Asking Questions related to my daily life situations	Related to my body	Collecting answers to questions related to application of science in daily life
	Related to Kitchen	
	Related to Agriculture	
	Related to Medicines	
	Related to Cosmetics	

Table 2: **Science Learning - in accordance with one's own exhibited interests**

Personal preferences/ interests	**Personal Practices**	**Strategies for redesigning science education**
My exhibited interests	Engaging in creative endeavours	Making science toys, models etc
	Reading fictions	Collecting Science fictions suited to the scientific concepts and writing new Science fictions.
	Reading anecdotes	Collecting Science Anecdotes
	Reading stories, comics etc	Gathering, writing and designing Science Picture stories
	Reading and watching	Collecting and drawing Science

	cartoons	concept cartoons
	Watching videos	Collecting Science video clips
	Playing games	Designing Science Games suited to various scientific concepts
	Travelling	Nature rambling Interacting with Biodiversities Conducting Field trips
	Solving puzzles	Developing Science Puzzles

Table 3: **Science Learning - as part of one's everyday media**

Personal preferences/ interests	**Personal Practices**	**Strategies for redesigning science education**
I engage in everyday medias	Digital medias Radio Television Internet Blog Social networking Video games Mobile phones Documentaries	Using digital medias in formal and informal educational contexts
	Non Digital Medias News Papers Magazines Journals Children's Literatures	Encouraging to Collect and read science related articles in newspapers, Magazines, Journals, Children's Literatures

Table 4: **Science Learning - in partnership with others**

Personal preferences/ interests	**Personal Practices**	**Strategies for redesigning science education**
I prefer to be in partnership with	Peer members	Familiarizing with different cooperative learning structures, choosing and implementing the right structures suited to the scientific concept in cooperative learning situations; Encouraging to form learning communities for collaborative learning outside formal educational settings.

Table 5: **Science Learning - in pace with one's ability**

Personal preferences/ interests	**Personal Practices**	**Strategies for redesigning science education**
I prefer to learn things that are in pace with my ability	Learning meaningful things that are simple and keeps in pace with my ability	Designing and using Graphical organizers that make the learning tasks meaningful and easy

Table 6: **Science Learning - as issues that affect one's personal well being**

Personal preferences/ interests	**Personal Practices**	**Strategies for redesigning science education**
I care, I am concerned, I am responsible about personal issues.	I care, I am concerned and responsible about things that affect my personal well being.	Developing conservation cards, conservation tips, albums/posters on themes of scientific sensitivity , using SMS facilities to propagate valuable messages on conservation, visiting and interacting with biodiversities, offering empathy training, encouraging to change lifestyle

Conclusion

Decreasing interest in school science shown by students is a major challenge to a science teacher. Solution to this problem is to personalize science so that students experience science as 'part of their daily life'. This is possible only through re-designing science education by adopting certain strategies based on the personal preferences of the learner. Strategies presented in this paper can be included in pre service and in service teacher training programmes.

References

Department for Children, School and Families (DCSF) (2007) *Making Good Progress Consultation Document http*://www.dcsf.gov.uk

Jarvis, T., & Pell, A. (2002). Changes in primary boys' and girls' attitudes to school and science during a two-year inservice programme. *The Curriculum Journal, Vol. 13. No. 1*,43-69.

Márquez Bargalló, C.; & Prat, A.(2010). Favorecer la argumentación a partir de la lectura de textos [Stimulating argumentation using Reading of texts] , *Alambique No. 63*,39-49.

Royal Society Science and Mathematics Education. (1996-2007). A 'state of the nation' report on the participation and attainment of 14-19 year olds in science and mathematics in the UK. 14 – 19

Sturman, L., & Rudduck, G. (2009).Messages from TIMSS 2007, *Association for Science Education Annual Conference Reading,* U.K.

A STUDY ON OBSERVANCE OF DAYS OF SCIENTIFIC IMPORTANCE IN SCHOOLS

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Introduction

Festivals are an important part of our lives. People from all over the world have festivals and celebrations - birth days, saint days, religious festivals, festivals to celebrate the seasons, national holidays and so on. World's important days are actually not holidays. The international community and United Nations treat World's important days as favourite days for they have something to commemorate, promote or mobilize. World's important days or international days are days to observe issues of world's concern and interest (Wikipedia, the free encyclopedia).

The school is a home away from home for children. It should stimulate all round development of a child. The activities in the school should help the children to understand the outside world through its activities and should also help them to know how to adjust with the society. Celebration of festivals in a school is one of the major activities which enable them to develop an awareness of the world around them. Festivals are celebrated in schools to understand and keep up our cultural heritage and values and also to develop a desire to understand the culture of others and respect them (Pankajam, G. (2005).

There are certain days related to science. Days with scientific importance must be celebrated in schools. By observing such science related days in schools, children acquire knowledge and get sensitized. This in turn helps to develop a culture of science among children.

We can classify science related days as:

a) **International days**
b) **National days**
c) **Commemoration days**
    i. Birthdays of scientists
    ii. Invention days

d) **Space related days**

Relevance of Observing Days of Scientific Importance

Observing days of scientific importance in schools help students in developing a scientific attitude. Most of the conservation days such as World Earth Day, World Environmental Day, World Ozone Day etc. come under the International days. By observing these days in schools, students get a chance to realize the world's present concern and interest. By celebrating these days in schools through various activities, students get a chance to interact with others and for doing creative things.

National days are days which are celebrated in the national level - for example, National Science Day, National Energy Conservation Day etc. By celebrating these days, students acquire knowledge and more information about the day.

Birthdays of scientists and Invention days come under the Commemoration days. By observing the birthdays of scientists, students get knowledge about the life history of scientists and their contributions, how these contributions make a revolutionary change in science etc. By observing Invention days, students learn about the great inventions of scientists.

Space research is an area of great scope in science. Today, it is very relevant to observe days related to space research. Students of today are keenly interested in such areas.

Considering the importance of the Days of Observance, a study was conducted in seven schools of Kannur district to explore the scientific days that are observed in these schools and those that are not observed. The reasons for not observing certain scientific days have also been studied.

Objectives

1. To analyse the scientific days observed in the secondary schools at the school level.
2. To analyse the scientific days those are observed in the secondary schools at the class level.
3. To investigate the reasons for not observing certain scientific days in the schools.

Methodology

Method

Survey method was employed for collecting data on the observation of days of scientific importance in schools. The data was collected with regard to the observations of each scientific day at the school level and also at the class level.

Variables

Observation of the Scientific days related to the conceptual themes in the secondary school science curriculum of Kerala State Board is the variable for the study. The scientific days are classified as International days, National days, Commemoration days and Space related days.

Instruments

A questionnaire to assess the scientific days of importance observed in schools was developed and administered. The questionnaire comprised of mainly two parts. The first part included 30 questions to analyse whether scientific days of importance were observed in the schools. It included six items on International days, three items on National days, Birthdays of twelve great scientists, five items on Invention days and four items on Space related days. The second part included options which helped to analyse the reasons for not observing certain scientific days of importance. The possible options/reasons provided in the questionnaire were lack of Awareness, Time, Fund, Interest, Facility and other significant reasons.

Sample

The sample consisted of seven secondary schools randomly selected from Kannur district.

Procedure

The data was collected from the selected secondary schools. The data was gathered from the Physical Science teachers of these schools. The data regarding the observation of each scientific day has been tabulated in the form of the percentage of schools observing the scientific day both at the school level and also at the class level. The data regarding the reasons for not observing certain scientific days has been analysed qualitatively.

Results and Discussion

I. Data regarding Observance of Scientific days

1. Observance of International days

Percentage analysis of the data regarding observance of International days is given in table 1.

Table1. Observance of International day.

International Days	Whether observing in			
	School level		Class level	
	Observing	Not Observing	Observing	Not Observing
1. World environmental day	100	0	14	86

2. World ozone day	86	14	29	71
3. World wetland day	14	86	0	100
4. World earth day	14	86	0	100
5. International energy day	14	86	14	86
6. World water day	0	100	14	86

World Environmental Day is celebrated in all these schools at school level and in 14% of schools at the class level too.

World Ozone Day is observed in 86% of schools at school level and in 29% of schools at the class level.

World Wetland Day, World Earth Day and International Energy Day are observed in 14% of schools at the school level. However, World Wetland Day and World Earth Day are celebrated in none of these schools at the class level.

World Water Day is celebrated in none of these schools at the school level. However, World Water Day and International Energy Day are observed in 14% of schools at the class level.

2. Observance of National days

Percentage analysis of the data regarding observance of National days is given in table 2.

Table1. Observance of National days

National Days	Whether observing in			
	School level		Class level	
	Observing	Not Observing	Observin g	Not Observing
1. National science day	71	29	14	86
2. National energy conservation day	43	57	14	86
3. National science fiction day	0	100	0	100

National Science Day is observed in 71% of schools at the school level and 14% of schools at the class level.

National Energy Conservation Day is observed in 43% of schools at school level and 14% of schools at the class level.

National Sciencefiction Day is observed in none of these schools at both the school level and also the class level.

3. Observance of Commemoration days

Percentage analysis of the data regarding observance of Commemoration days is given in table 3.

Table3. Observance of Commemoration days

Commemoration days	Whether observing in			
	School level		Class level	
	Observing	Not Observing	Observing	Not Observing
Birthdays of Scientists				
1. Birthday of C.V. Raman	43	57	43	57
2. Birthday of Dmitri Mendeleev	14	86	14	86
3. Birthday of Thomas Alva Edison	14	86	43	57
4. Birthday of Galileo Galilee	14	86	29	71
5. Birthday of Lavoisier	14	86	14	86
6. Birthday of Rutherford	14	86	14	86
7. Birthday of Neils bohr	14	86	14	86
8. Birthday of APJ Abdul Kalam	14	86	0	100
9. Birthday of Marie curie	14	86	43	57
10. Birthday of Albert Einstein	0	100	29	71
11. Birthday of J.J. Thomson	0	100	14	86
12. Birthday of Sir Isaac Newton	0	100	0	100
Invention days				
1. Discovered radio activity	14	86	0	100
2. X-Ray discovered	14	86	0	100
3. Discovered neutron	0	100	0	100
4. Isaac Newton published 3 laws of motion	0	100	0	100
5. First time scientist converted energy in to matter	0	100	14	86

Birthdays of Scientists:

The Birthday of C.V. Raman is celebrated in 43% of schools at both the school level and also at the class level.

The Birthdays of Dmitri Mendeleev, Thomas Edison, Galileo Galilee, Lavoisier, Rutherford, Niels Bohr, APJ Abdul Kalam and Marie Curie are celebrated in 14% of these schools at school level. The Birthdays of Dmitri Mendeleev, Lavoisier, Rutherford and Neils Bohr are celebrated in 14% of schools at class level too. The birthday of Galileo Galilee is celebrated in 29% of these schools at the class level. The Birthdays of Thomas Edison and Marie Curie are celebrated in 43% of schools at the class level.

The Birthdays of Albert Einstein, J.J. Thomson are observed in none of these schools at the school level. The Birthday of Isaac Newton is observed in none of these schools at either the school level or the class level. However, the birthdays of Albert Einstein and J.J. Thomson are celebrated in 29% of the schools and 14% of the schools respectively at the class level.

Invention Days:

The day of the discovery of radio activity and the day when X-Ray was discovered are celebrated in 14% of schools at the school level. However, the day of the discovery of radio activity and the day when X-Ray was discovered are not observed in any of these schools at the class level.

The day of Neutron discovery, the day of Isaac Newton's publication of the 3 laws of motion and the day when scientists converted energy into matter for the first time are observed in none of these schools at the school level. The day of Neutron discovery and the day of Isaac Newton's publication of the 3 laws of motion are not observed in any of these schools at the class level too. However, the day when scientists converted energy into matter for the first time is observed in 14% of these schools at the class level.

4. Observance of Space related days

Percentage analysis of the data regarding observance of Space related days is given in table 4.

Table 4. Observance of Space related days

Space related days	Whether observing in			
	School level		Class level	
	Observin g	Not Observing	Observin g	Not Observing
1. Moon day	100	0	29	71
2. International day of human space flight	0	100	0	100
3. Aryabatta launched	0	100	0	100
4. ISRO established	0	100	0	100

The Moon Day is observed in all these schools at the school level and in 29% of the schools at the class level.

However, the International day of human space flight, the day when Aryabatta was launched and the day when ISRO was established are observed in none of these schools at the school level and nor at the class level.

II. Reasons for not Observing Scientific Days

Based on the data gathered from the science teachers on the reasons for not observing certain scientific days of importance it was found that Lack of awareness of the scientific day and lack of time were the major reasons. However lack of fund, interest and facility did not matter much in this regard.

Conclusion

The findings of the study reveal that though certain International days like World Environmental Day, World Ozone Day etc are observed in almost all the schools, certain scientific days of importance like World Water Day and National Science fiction Day are observed in none of the schools. The Birthdays of many great scientists like Albert Einstein and Isaac Newton have also gone unobserved in almost all the schools. In the present Teacher Education Curriculum, only about a few scientists and their contributions are studied. Considering the importance of observing the scientific days in schools in cultivating a scientific attitude and scientific sensitivity in children, it is greatly inevitable to highlight the importance of observing days of scientific importance in the pre-service curriculum and also in the in-service training programmes for teachers.

References

Pankajam, G. (2005). Festivals in the Pre-Primary School. *Pre-Primary Education: Philosophy And Practice* (pp. 195-196). India: Concept Publishing Company

Wikipedia, the free encyclopedia. (n.d.). International observance. Retrieved September 01, 2014, from http://en.wikipedia.org/wiki/International_observance

Science Calendar: A Process Oriented Way to Enrich Scientific Knowledge

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Introduction

Science enjoys a rich history of discovery. Familiarizing students with the lives and accomplishments of the men and women who made contributions to science will help students understand that what they learn in science class is the product of the hard work of those who have come before them, and will encourage them to be future contributors to our understanding of how nature works. In addition, it helps the students to understand science as a human endeavor, the nature of science, and the history of science. Science calendars helps the learners serve this purpose. A science calendar is a physical device (often paper), which display the important scientific dates such as scientific contributions, scientific events, birthdays and death days of scientists, etc.

A calendar is a system of organizing days for social, religious, commercial, or administrative purposes. This is done by giving names to periods of time, typically days, weeks, months, and years. The name given to each day is known as a date. Periods in a calendar (such as years and months) are usually, though not necessarily, synchronized with the cycle of the sun or the moon. Many civilizations and societies have devised a calendar, usually derived from other calendars on which they model their systems, suited to their particular needs. Although some calendars replicate astronomical cycles according to fixed rules, others are based on abstract, perpetually repeating cycles of no astronomical significance. A diversity of methods has been used in creating calendars.

There are different types of calendars such as paper calendars, online based calendars, etc. Online calendars allow us to input and store information in a calendar format online. Paper calendars come in so many shapes and sizes and are designed to serve the needs of all kinds of people. Wall calendars, personal agendas, and desk calendars all accomplish the same purposes as digital calendars without needing to know as much about technology. A wall calendar is a large calendar usually located in a central place where everyone has access.

The primary practical use of a calendar is to identify days: to be informed about and/or to agree on a future event and to record an event that has happened. Calendars are also used to help people manage their personal schedules, time and activities.

Programme on Developing Science Calendar

For welcoming the New Year (2012), the Physical Science students of PKM College (2011-2012 batch) organized a programme on developing science calendar. For this, they organized a classroom based research team of five members with the guidance of the class teacher. The team initiated the programme during the month of December, 2011; with the aim of developing science calendars for the coming year.

Phases of the Programme

Phase: 1 - Orientation

At the initial phase the class room based team oriented the peer members on the importance of developing science calendar.

Phase: 2 - Planning and Organizing

In the second phase, the whole class was divided into twelve groups with 2 members each for collecting data regarding each month. Each group was assigned to collect the information regarding the scientific days of importance, scientific events, scientific inventions and discoveries, birthdates and death dates of scientists, mile stones in science etc. related to particular month.

Phase: 3 - Pre Test

For assessing the initial awareness regarding the scientific days of importance , scientific events , scientific inventions and discoveries, birthdates and death dates of scientists, mile stones in science etc. a pretest was conducted with two questions (one word/ objective type) each from 12 months with a total of 24 questions for the whole class. The correct answers were not disclosed.

Phase: 4 - Collection of data

The students were allowed to collect data related to their allotted month for a period of one week.

Phase: 5 - Discussion

In this phase all the students presented the collected information from various sources and had an open discussion.

Phase: 6 - Editing

Based on the discussion the students edited the collected data and finalized the data to be included in the calendar based on the themes.

Phase: 7 - Calendar making

The students were divided into small groups. Using low cost materials they developed two different types of calendars: a wall calendar and a table top calendar. It took two to three days to complete the process. This phase was interesting as it involved many creative expressions.

Phase: 8 - Post Test

For assessing the terminal awareness regarding the scientific days of importance, scientific events , scientific inventions and discoveries, birthdates and death dates of scientists, mile stones in science etc. the modified form of the pretest was used as the post test.The answers were disclosed and the scoring was done.

The mean scores of the pre test and post test were compared and the difference in the mean scores was tested for statistical significance and found to be significantly different. The results proved that the process of science calendar making enriched the student teachers scientific knowledge.

Table1. Test of significance of the difference in the mean score on the pretest and post test of student teachers.

Test	No. of Students	Mean	Standard Deviation	t-test of significance	Interpretation
Pre Test	21	53.369	17.211	7.04	Significant
Post Test	21	81.744	6.648		

Phase 9: Publishing the Science calendar.

On the first week of the New Year the science calendars were published in the college assembly.

Importance of Science Calendar Making Process

- The schools can organize science calendar making competitions at the local to state level.
- Through the process of science calendar making, the team spirit of the students and their creative talents can be developed.
- The knowledge regarding; the scientific days of importance, scientific contributions, scientific events, birthdates and death dates of scientists, mile stones in science etc. will be developed through the process.
- The science calendars will be useful for the students to celebrate the days of scientific importance, birthdays of scientists etc. This would help them to appreciate the beauty of science.

Scope of Science Calendar

Scientific calendars on different themes such as on scientific days of importance, on scientific contributions, on birth days and death days of scientists, on scientific events , on milestones in science or on specific themes such as calendar on developments in the periodic table , astronomical calendars etc can be developed by the students. If it could be printed and published in a massive form it could act as a means for direct communication of science with the public. For instance, the scientific calendar published by *Sastra Sahithya Parishith* in the year 2011 as part of the celebrations on Year of Chemistry was a means to communicate science with the public.

References

- Costa,V.B. and Kottler, E.(2009). *Secrets to Success for Science Teachers.* Corwin Press:California
- Gilbert, J. (eds) (2004) *The Routledge Falmer Reader in Science Education*. Routledge Falmer : London and New York.
- Burz, L. H. and Marshall, K. (1997). *Performance Based Curriculum for Science*. Corwin Press: California.

Capturing Scientific Concepts through Cartoons

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Introduction

Next generation students will preferably choose easy and interesting methods for learning science. To make science teaching effective we can use cartoons as one of the tool. Beginning a topic with cartoons or a humorous quotation will create a curiosity and interest for learning that subject. Students will never forget the idea if it is taught through an interesting picture.

Cartoons are often viewed as an entertainment media and the serious use of cartoons as a pedagogical tool to be frivolous. However it is the intention of this paper to correct this myth, and to demonstrate on the use of cartoons as an amazing media of instruction. A cartoon is a graphical media that can either be in the form of a single picture or a series of pictures as in the form of a comic strip, captioned or non-captioned, that are printed in magazines, newspapers and more currently in books.

Cartoons

A cartoon is a form of two dimensional illustrated visual arts. While the specific definition has changed over time, modern usage refers to a typically non-realistic or semi realistic drawing or painting intended for satire, caricature or humor or to the artistic style of such works.

Cartoons has a long, noble history, although really becoming popular in the 20th century along with the flourish of the film and news paper industries, this important art form has been around for many thousands of years. Our human ancestors all over the world drew on caves and rocks using paint and charcoal, cave artist drew what was important to them. They produced pictures of animals, hunting scenes, and people dancing, and performing rituals. The term cartoon is originated in the middle age and first described a preparatory drawing for a piece of art, such as painting, fresco or stained glass window. Through the 17^{th}, 18^{th}, 19^{th} centuries, this art form became an important part of the printed world, being used to illustrate stories in books, magazines, and news papers. In the 19^{th} century, it came to refer to humorous illustrations in magazines and newspapers, and in the early 20^{th} century and onward it referred to comic strips and animated films.

Today cartoons are everywhere. In addition to books and newspapers, cartoons can be found on bill boards, posters, television and movies. We will have a hard time spending a single day without seeing cartoon somewhere, whether it is on a TV commercial, a magazine or even an advertisement in our mailbox.

There are different types of cartoons such as:

Political cartoons- sets of humorous drawing that were about political subjects, such as poverty, elections, war and riots. A political cartoon does not always show people. Sometimes it may show a country as a person, an animal, a monster or a baby.

Portrait cartoons- cartoon often showed real politicians or other famous people.

Comic strips- are a type of cartoon published in the newspaper; such as superman and the phantom

Web comics - Comic strips posted on the internet are web comic.

Editorial cartoon- An editorial cartoon uses pictures and text to make a statement about something. Editorial cartoon are a way to express opinion about a wide range of topics, such as politics or culture.

Movie cartoons- moving drawings is known as movie cartoons. Modern movie cartoons are sometimes created using computer graphics, rather than hand drawn cartoons.

In this paper the authors discusses on how cartoons can be effectively used in learning science. Cartoons can be used at anytime during the teaching as long as they are relevant to the point or have been designed with a specific purpose. The specific purpose can be to start a lesson, to keep the learners occupied, alert, liven up the class and to wake them up after a lunch break. As part of the pedagogic analysis of secondary school science curriculum the authors have developed cartoons based on secondary school science concepts. The paper highlights the importance of engaging science students in the process of developing cartoons for making the science learning easy and interesting.

Cartoons in Teaching Learning Process

The impact of cartoons is immediate and people from all walks of life, irrespective of age or background, are able to respond the same way to the educational point being made with the potent combination of words and pictures, it can attract attention and interest. Other alleged benefits include the promotion of understanding, motivation towards learning, improved attitudes, productivity and creativity.

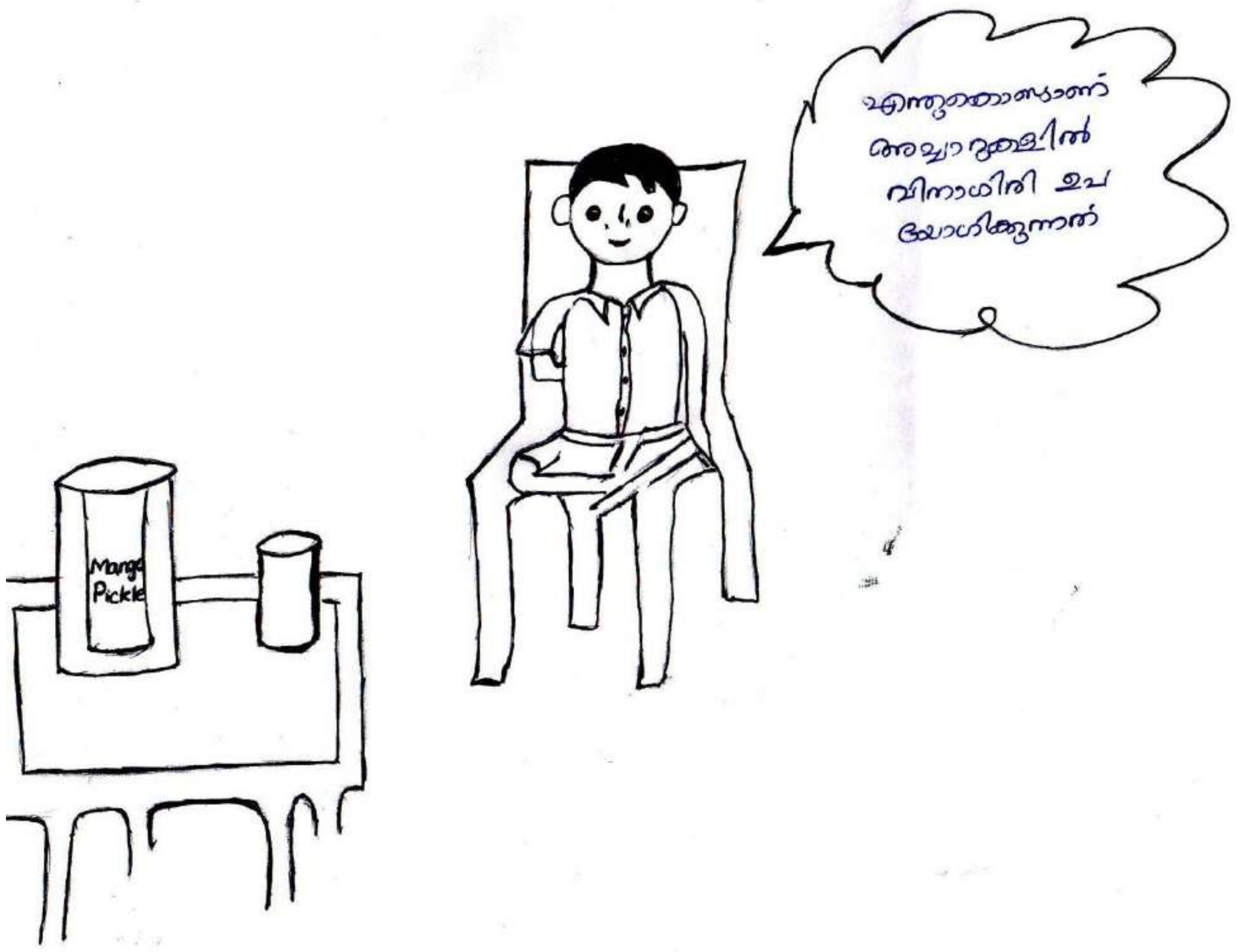
We find pictures and symbols everywhere in our daily life and our children are attracted to cartoons from an early age. Children are exposed to so many colors on television, movements and interactivity on the computer screens. Our society and the world in general are becoming more visual but many of our institutions, particularly our schools, have not kept up with its progress. we often here children complaining about boring school lessons and activities .Using cartoons would certainly break the monotony of reading text after text in the school books. Very often a picture speaks louder than words and has more impact than just reading the text. It also believed that the usage of cartoons can reduce boredom and decrease academic stress, anxiety and disruptive behavior. We might have to incorporate some of these interests within our school and training environments.

Cartoons can be used at any time during the teaching or learning process as long as they are relevant to the point or have been designed with a specific purpose. Cartoons should not be used simply to fill in time when the facilitator does not have anything else to present. We should apply cartoons to achieve some of the teaching and learning needs. These include:

1. In the Orientation Process

Almost any cartoon can be used as an icebreaker or an introduction to a lesson or a unit. The cartoons can be used by teachers as a lesson starter, to determine students prior knowledge (such as existing scientific vocabulary, preconceptions and misconceptions), to motivate students to ask questions, and to help gauge students understanding of science concepts by allowing them to produce their own comics and punch lines.

For instance, the following cartoon can be used as a lesson starter for the unit *acids and alkali* for teaching the concept *pH value*.



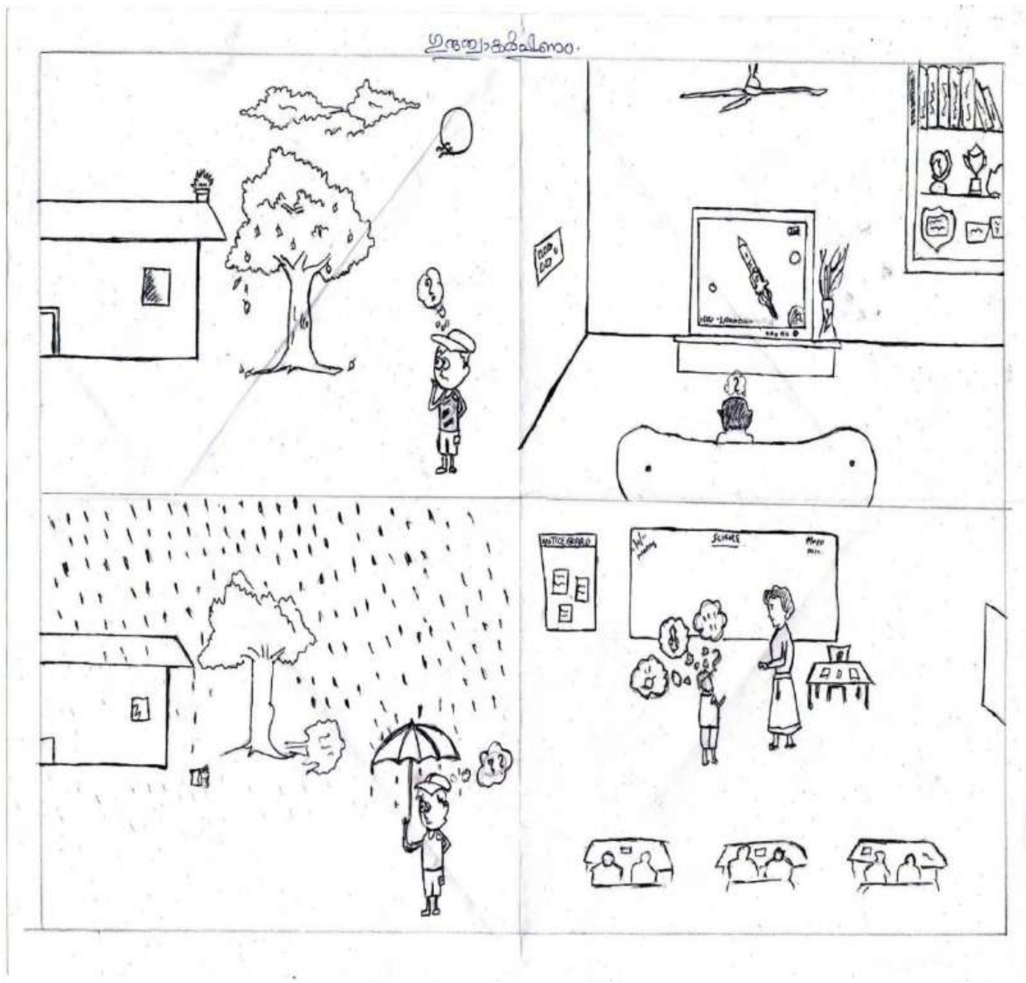
2. In the learning Process

Cartoons can act as a means to facilitate the learning process. It can be used for eliciting ideas, for comparing ideas, for generalizing ideas, for debriefing the ideas and also as a midcourse energizer.

2.1. For eliciting ideas

Cartoons lead to a number of learning developments such as a shift from negatively-worded to positively-worded statements, a shift from statements to questions and a shift from single alternative to multiple alternatives. Cartoons are intended as starting point to stimulate discussion and for eliciting ideas from the learners.

For example, the following cartoon can be used for stimulating a discussion and for eliciting ideas on the concept of *gravitational force*.



2.2. For comparing ideas

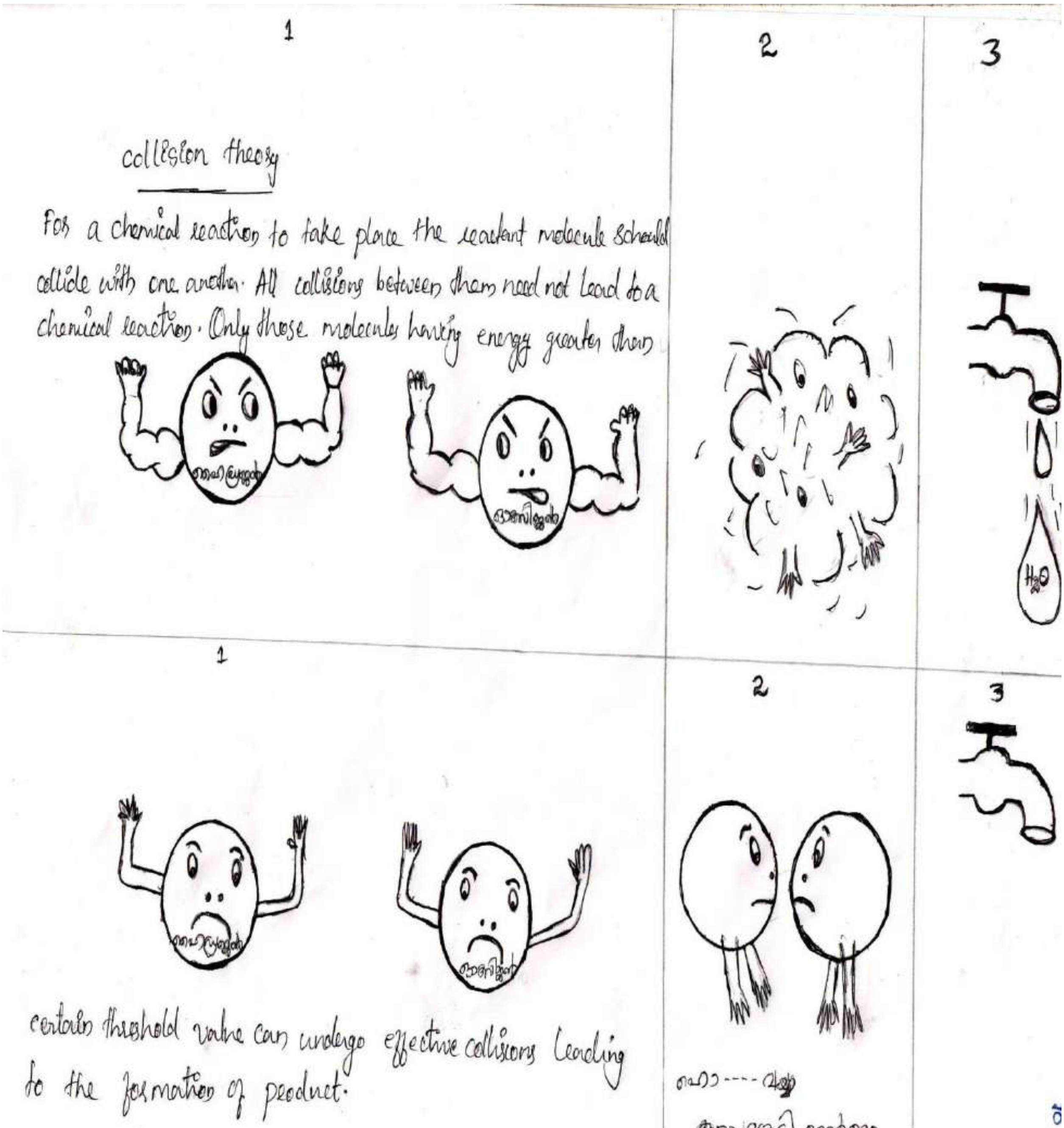
Cartoons can be used for differentiating, comparing and contrasting certain concepts which appear to be similar and create confusion among the learners.

For instance, the following cartoon would suit our purpose of differentiating the two different properties of light such as *reflection and refraction*.

2.3. For generalizing ideas

For generalizing some of the scientific principles, laws or theories cartoons can act as an effective medium.

For example, *the collision theory* can be easily generalized through the following cartoon.

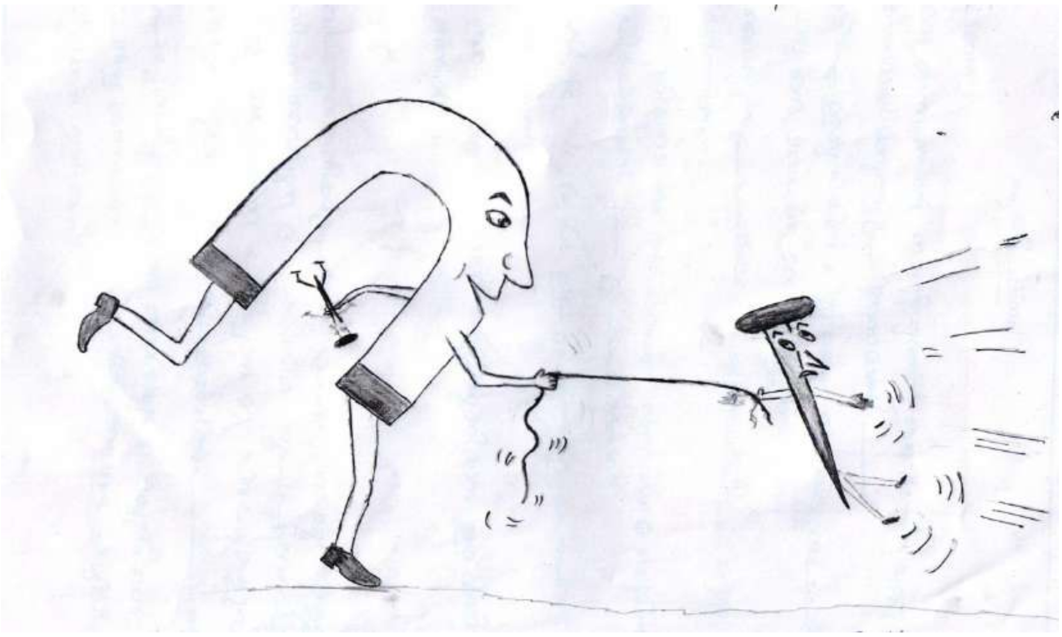


2.4. For debriefing the ideas

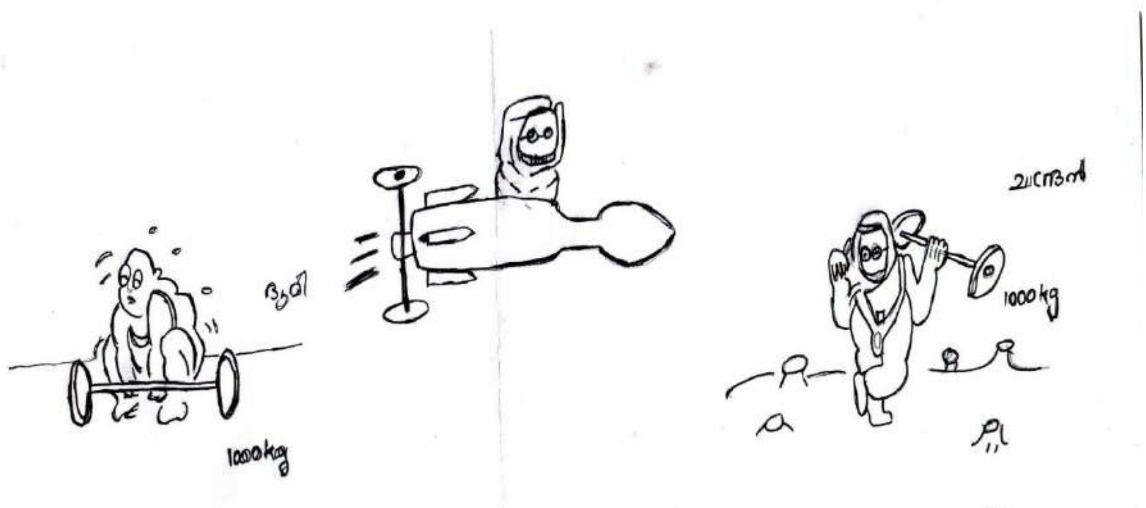
At the end of any learning experience, teachers usually debrief the lesson for the day or the session. By showing appropriate cartoons, the teacher would be able to encapsulate important teaching points without having to say or repeat too many words.

For instance, the following cartoon would enable the teacher to effectively debrief the lesson on

1. *Magnetism and*



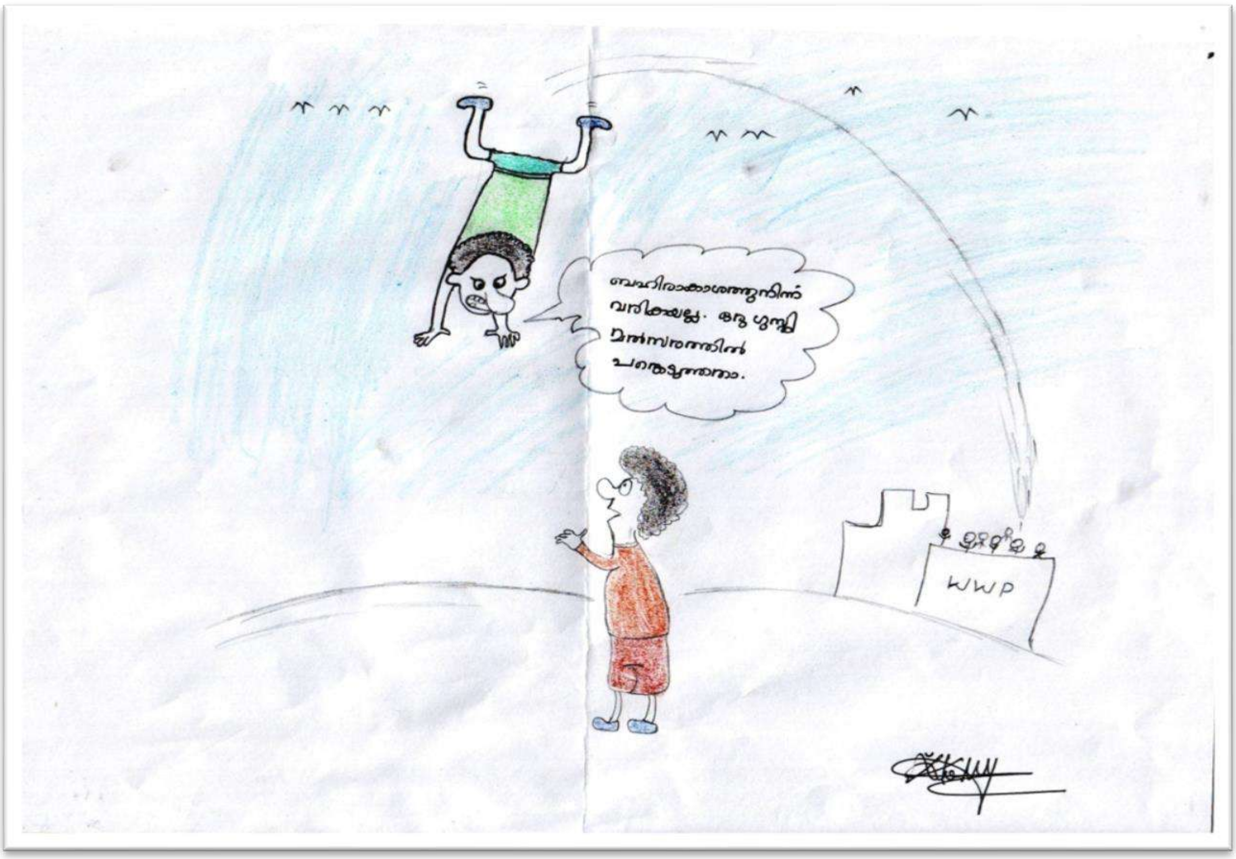
2. Gravitational force



3. As Mid Course Energizers

When at any time we observed that the learners are losing interest or falling asleep, we can use cartoons as one of the mid course energizers. Their purpose is to keep participants awake, to get their blood moving, to keep them from falling asleep often after a lunch break, to simply get people back on line or to think about a new approach to a problem. They can also be used at certain points of time to reduce tensions that may have build up with individuals or groups.

Example:



4. In the Assessment Process

Cartoons can also be used for evaluating the learners after the learning process. By raising questions based on the cartoons related to the concept assessment can be done. For instance, following cartoon on the concept *properties of light* can be used for assessment by raising questions related to the concepts.

Conclusion

As facilitators, we are constantly looking for new ways of teaching to enable learners to be actively involved in their own learning. In this respect, graphics such as cartoons can make a valuable contribution. This is because cartoons provide visual impact, which is immediate. Irrespective of age or background, every learner can respond instantly to what is being shown. Cartoons appear to offer a valuable strategy in a variety of teaching situations and with pupils covering a wide range of ages and capabilities. The effective use of cartoons in every phase of the teaching – learning process, can do much to produce the desired results among the learners.

References

1. Costa,V.B. and Kottler,E.(2009). Secrets to Success for Science Teachers. Corwin Press:California
2. Gilbert, J.(eds)(2004) *The Routledge Falmer Reader in Science Education*. Routledge Falmer: London and New York.
3. Burz,L.H. andMarshall,K. (1997). Performance Based Curriculum for Science. Corwin Press:California

Crossword Puzzle:
A Magical Approach towards Learning Science

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Introduction

"Anyone who has never made a mistake has never tried anything new": Albert Einstein.

In the coming generation there will be a tremendous change in science teaching learning process. Science education at school level has to be designed in such a way that instead of loading the child with content information, it should provide him with the joy of learning and develop in him scientific temper and attitude. In order to improve the quality of education, one has to link effectively the basic elements of quality education and organize activity in accordance with them. To make all the students who come to school participate in the learning process with interest is the first step in this direction. In that aspect crossword puzzles will be a best way to learn science more interestingly. Students of all ages and abilities enjoy word search puzzles. Crossword puzzles act as an excellent teaching tool.

A crossword puzzle is a popular type of word puzzle. A crossword is made up of black and white squares and a list of clues. The answer to each clue is a word or phrase. The aim is to write the words; letter by letter in the white squares. The white squares go "across" or "down" the page and each clue has a number.

There are many types of crosswords. Straight crosswords-usually made up of simple words to describe the answer. Some crosswords are riddles and wordplay and are usually more difficult than straight crossword. Another type is a word search puzzle. It is a word game that is letters of a word in a grid. The objective of these puzzles is to find and mark all the words hidden inside the box. The words may be horizontally, vertically or diagonally. Often a list of the hidden words is provided. Many word search puzzles have a theme to which all the hidden words are related. Another type is cryptic crossword. It is a crossword puzzle in which each clue is a word puzzle in and of itself.

Crossword Puzzles in Science Learning

Crossword Puzzles can act as an important tool for learning science. Students of all ages and abilities enjoy crossword puzzles. It helps the students to improve their language and reading skill. It also helps to develop process skill, creative thinking, team spirit, co operation and confidence. Crossword puzzles light the candle of thinking and imagination.

It is firmly believed that every lesson should begin with a starter activity and end with a plenary session. This could be as simple as some quick fired questions to access prior knowledge or summarize the information learned in the lesson or as complicated as the production of a summary of the whole unit of work. Crossword puzzles can be utilized for these purposes.

In this paper the authors are trying to discuss on the importance of cross word puzzles in different phases of science learning process i.e. learning as well as assessment. The cross word puzzles can be used in the learning process such as for assessing the previous knowledge, for orienting the learners to new topics, as a means of learning activity, in the reviewing process and in the follow up activity. As part of the pedagogic analysis of the secondary school curriculum the authors have designed different types of cross word puzzles on different science units.

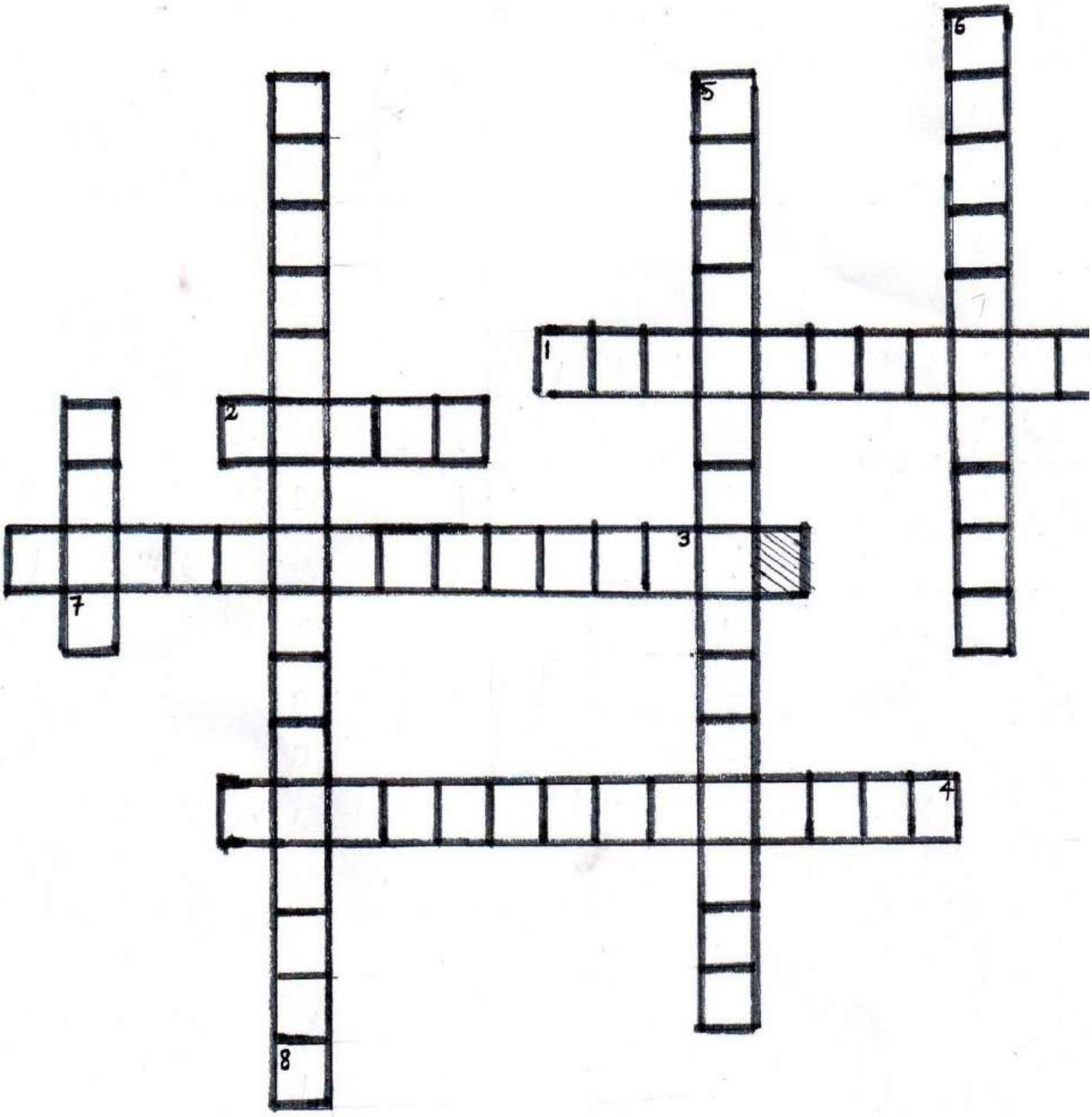
I. Cross Word Puzzles: As a Learning Tool

1. In the introductory phase of a lesson

Before introducing a science lesson, the science teachers can ***assess the previous knowledge of the students*** using crossword puzzles; instead of asking questions orally or conducting a written test. This can act as an interesting tool for assessing the previous knowledge related to a topic.

Box: 1.Example of crossword puzzle for assessing the previous knowledge on the unit *Effects of electric current.*
Right: 1) In………..electric current is caused by the motion of free ions. 2) Positive electrode is known as ………… Left: 3) ……….. = $\frac{\text{Work done by electric current}}{\text{Time}}$ 4) The process of coating a metal on the surface of a conductor by electrolysis is known as ……….. Down: 5) Conduction of electricity through the electrolyte is …………. 6) What is the device used to protect the circuit? Up: 7) Fuse wire is the alloy of tin and ……..

8) The filament lamp is called ……….



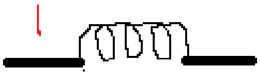
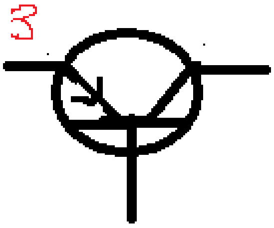
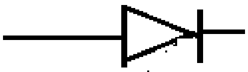
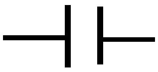
While introducing a lesson, the science teachers can use cross word puzzles as a means to ***arouse curiosity*** among students on what they have to learn. Puzzles provide hints for students on what they are expected to learn so that they can solve and answer problems easily without much strain during the learning process.

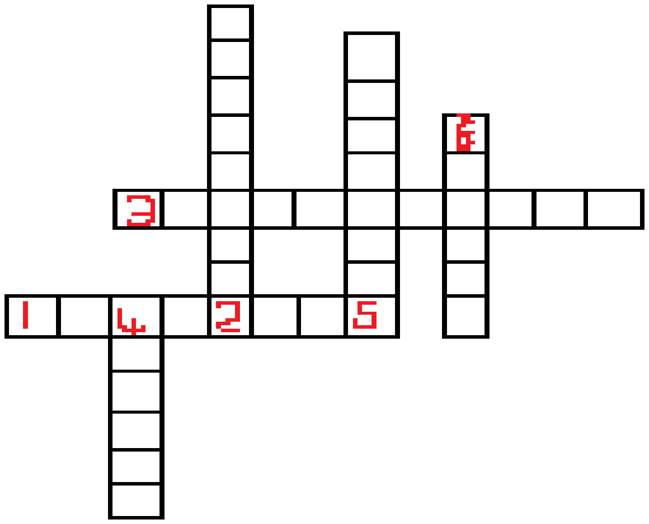
Box: 2. Example of crossword puzzle based on the topic *Atoms and molecules.*
1) The smallest particle of a substance which has all the properties of that substance is known as ……….   2) A substance which is made up of same types of atoms in their molecule is known as ……..   3) A substance which is made up of different types of atoms in their molecule is known as……….   4) The centre of an atom is known as……….   5) ……… are revolving around the nucleus.   6) Path of the electrons are known as ……..   7) Charge of proton is ……….   8) Total sum of protons and neutrons in a nucleus of an atom is known as …….   9) Total number of protons in a nucleus of an atom is known as ……..   10) Maximum number of electrons in a K shell is ……..   11) The smallest particle of a substance is …….

A	R	Q	A	T	O	M	S	Z	A	B	F	H	M	L
S	B	P	O	L	M	N	D	E	C	D	G	I	J	K
T	U	C	E	F	G	H	N	U	C	L	E	O	U	S
V	R	W	D	I	J	K	U	N	O	P	Q	S	R	S
X	E	Y	T	I	B	R	O	T	U	V	N	W	X	Y
Z	B	A	J	I	H	G	P	M	K	O	L	M	N	O
B	M	C	M	D	E	F	M		R	O	X	Y	Z	A
Q	U	P	R	O	S	T	O	T	U	T	Y	W	C	B
G	N	D	E	F	L	M	C	P	W	A	A	S	N	T
H	C	I	J	K	L	E	N	O	Q	O	R	E	V	T
O	I	W	X	Y	L	Z	C	A	R	S	M	T	X	Y
B	M	I	J	E	M	N	Q	U	U	E	V	W	Z	A
C	O	H	K	L	P	O	B	C	L	D	E	F	G	H
D	T	G	P	O	S	I	T	I	V	E	I	J	K	L
M	A	S	S	N	U	M	B	E	R	M	S	N	Z	O
E	F	M	N	A	C	D	F	N	O	R	S	Q	W	Y

2. In the Presentation Phase of a Lesson

Crossword puzzles can act as a means for learning activity. By constructing and solving crossword puzzles as part of their learning activities, students can learn the lessons more easily and interestingly.

Box 3. For example, to teach the symbolic representation of electronic components, the students are advised to construct and solve a cross word.
Right: 1  3 
Down: 4  6 
Up: 2  5 



3. In the Review/Recapitulation Phase of a Lesson

After completing the activities related to a lesson, a review of the lesson can be done by solving a crossword puzzle related to that lesson.

We can also give an overview of the lesson by a crossword puzzle. For example while doing an overview of the lesson on the properties of metals; a box type crossword puzzle can be used. Here we have developed a box type crossword puzzle. Different properties of metals and non metals are arranged randomly in this box. From that the students have to label only the properties of metals.

Box.4. Label the properties of metals.

A	M	Y	N	Q	L	L	E	E	V	U	T	Y	Y	Y	W	A	A
X	T	L	G	P	L	E	B	B	R	R	S	S	T	W	A	Z	Z
R	X	Y	Z	B	B	X	X	O	O	O	N	I	X	A	W	M	E
M	F	F	L	E	X	I	B	L	E	N	R	X	M	W	M	W	E
F	D	L	E	I	I	E	E	L	N	O	X	L	X	M	Z	Z	Z
F	D	X	X	X	I	E	E	L	N	X	L	L	M	X	X	Z	E
T	E	R	R	Q	L	N	L	O	X	M		M	L	X	M	X	X
E	R	D	S	T	E	S	S	M	L	X	M	L	A	L	W	W	L
E	N	O	P	Q	R	E	W	U	M	X	L	L	L	M	A	M	L
R	S	T	O	V	W	L	W	E	L	T	T	I	R	B	A	A	A
T	K	Y	Z	A	B	B	X	V	M	A	L	L	E	A	B	L	E
S	S	T	O	L	U	U	X	I	W	X	T	X	L	L	A	L	E
U	S	S	T	O	U	L	X	T	Z	M	X	O	X	M	A	M	X
L	M	M	O	O	R	O	D	I	L	L	L	X	R	X	X	X	W
C	L	M	L	D	D	S	D	S	M	M	L	X	X	M	X	M	E
I	L	L	R	P	S	R	P	O	Y	L	M	X	M	X	M	A	E
L	L	E	S	Q	S	E	Q	P	X	L	L	L	L	A	A	R	R
L	M	E	L	E	C	T	R	O	N	E	G	A	T	I	V	E	R
A	M	L	O	O	O	A	M	L	S	M	W	M	W	M	V	M	O
T	R	M	L	M	P	W	S	L	M	S	L	D	M	W	W	S	T
E	L	L	M	Q	L	L	S	S	S	M	D	L	W	M	R	L	R
M	R	Q	C	O	N	D	U	C	T	O	R	P	M	P	L	R	R
D	Q	O	O	P	L	L	M	M	N	N	Q	Q	L	P	Q	Q	Q

4. In the follow up phase of a lesson

Crosswords make very good plenary activities and can involve very little preparation. Provide the pupils with a crossword containing some of the key words that have been discussed as part of the lesson and ask them to complete it as quickly as possible. To make this activity more challenging for more gifted pupils we can ask them to produce their own crossword using the key words from the lesson. Puzzles provide a systematic collaborative approach to homework, assignment, project, and examination. For example, the crossword puzzle developed as a follow up activity.

Box: 5. Naming of Hydrocarbons

Right:

1.CH_3-CH_3

3.CH_3-$C\equiv CH$

Down:

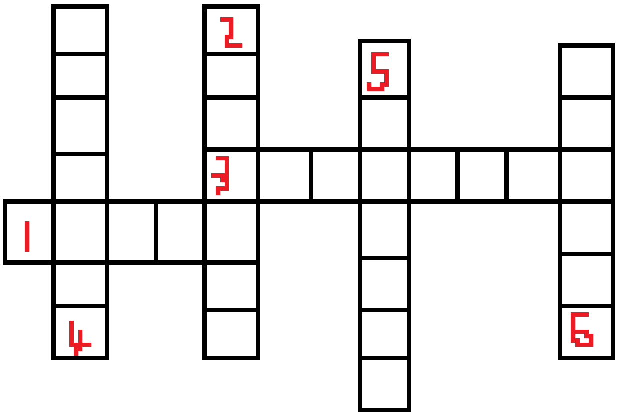
2.CH_3.CH=CH_2

5.CH_3.CH_2.CH_2-$CH_2CH_2CH_3$

Up:

4.CH_4

6.CH_3.CH_2-CH_2-CH_2.CH=CH_2



5. As an Overview of a Unit

After learning a unit, an overview of a unit can be done through a crossword puzzle. It will help the learners to remember all the concepts without any difficulty.

Box: 6. Example of crossword puzzle developed for the overview of the unit - *Gaseous State*

Right:

1) What is the common unit for expressing pressure?
2) …………. of the substance is the space it requires to occupy.

Left:

3) At constant pressure the volume of a fixed mass of gas is directly proportional to its temperature. This law is known as ………
4) An equal volume of all the gasses under the same conditions of temperature and pressure contains same number of ……….

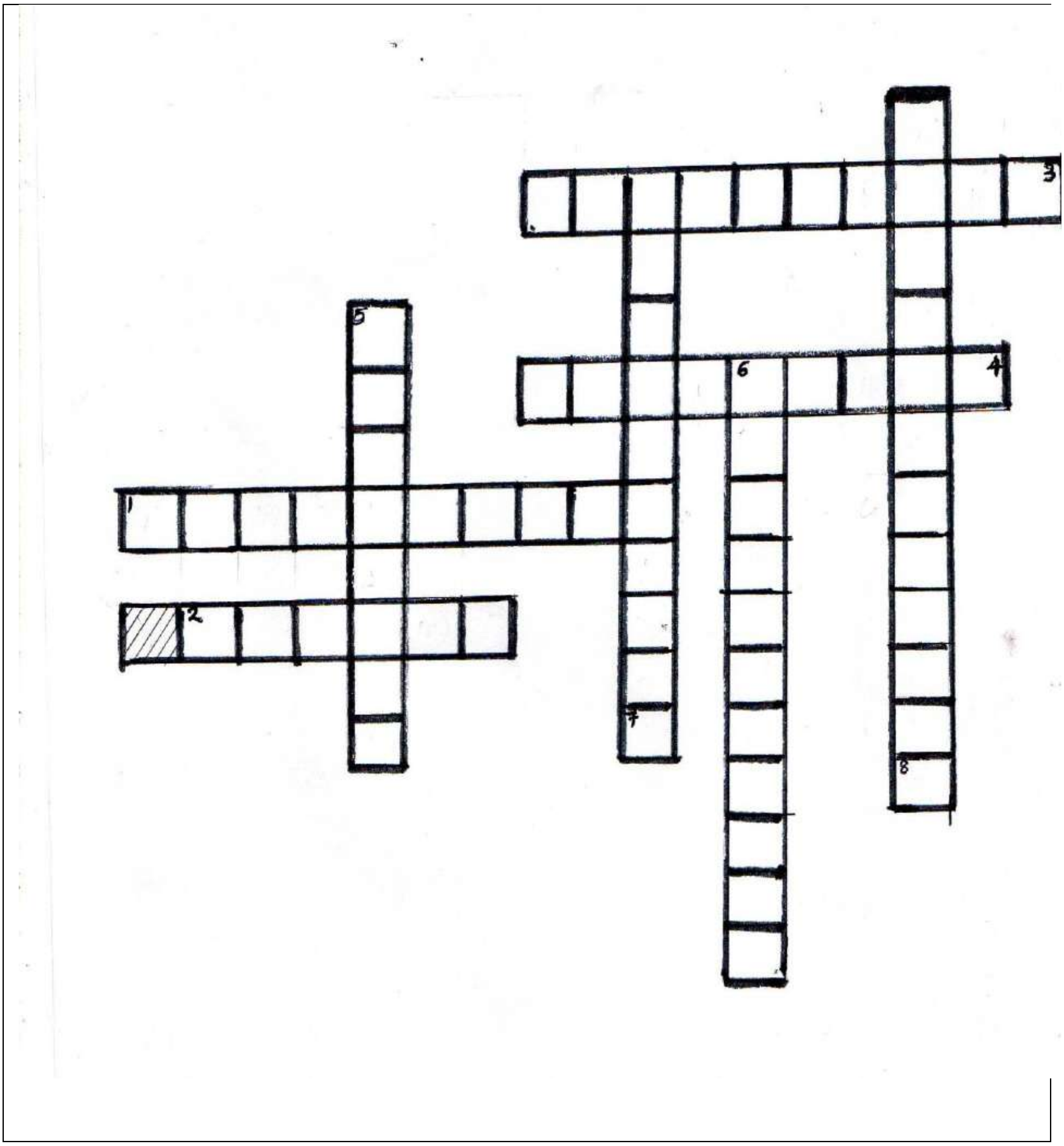
Down:

5) The force exerted on unit area of the plain in known as……..
6) $\frac{P1V1}{T1} = \frac{P2V2}{T2}$

   This equation is known as ……..

Up:

7) The volume of a fixed mass of gas is inversely proportional it pressure at constant temperature. Name the law.
8) At constant pressure and temperature the volume of a gas is directly proportional to the number of molecules. This law is called …….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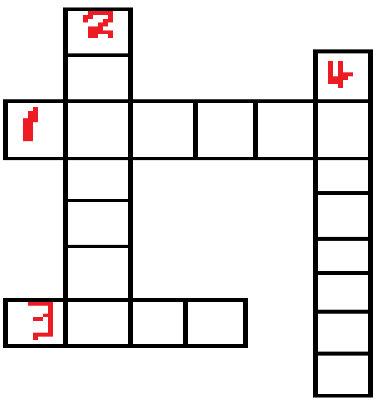
II. Cross Word Puzzles: As an Assessment Tool

1. Assessment of a Specific Modules/ Units

Modular / Unit wise assessment help to measure the progress of students and teacher effectiveness. Teachers can give a cross word puzzle instead of a question paper to assess the progress of students. Otherwise; the teachers can include cross word puzzles in the achievement tests.

Box:7. Example for unit wise assessment related with the chapter *Force.*
Right: 1..What is the unit of force? 3.The amount of matter in a substance is called ……….. Down: 2.The inability of an object to change its state or straightline motion is called……… 4.One person is sitting inside the vehicle ,which type of force he is applying?


2.Achievement Test Construction

Box: 8. Example of crossword puzzle developed based on the units *Motion and Properties of light.*

Right:

1) What happened when light passes through a prism?
2) In which direction we can see the rainbow in the morning?
3) Which is the lower wavelength ray in the electromagnetic spectrum?
4) …….of change of momentum depends up on time.

Down:

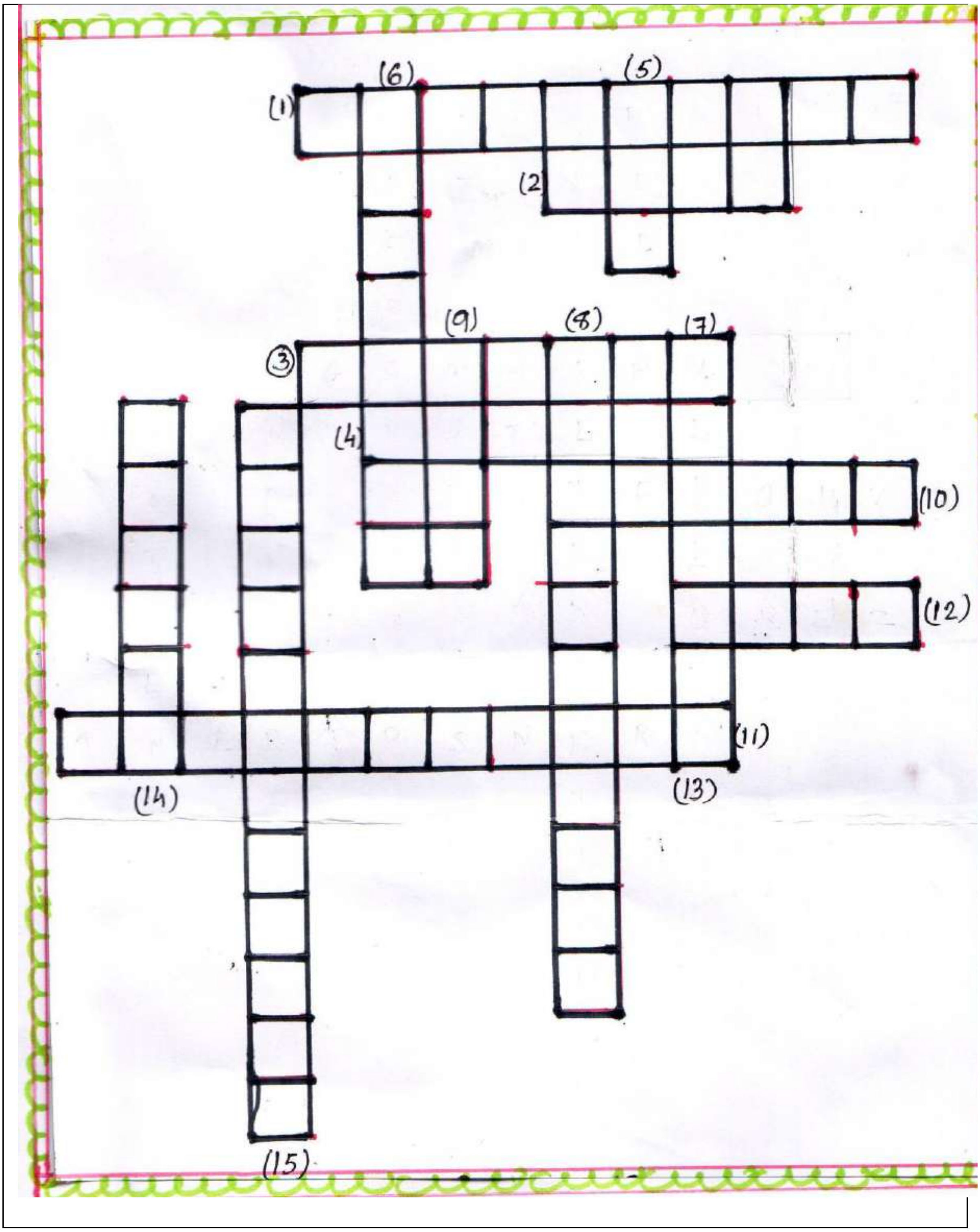
5) Which is the higher wavelength color in the light spectrum?
6) One of the rays which is coming from sun other than visible light.
7) Green + Red = …………….
8) What is rate of decease of velocity?
9) Momentum = ……….. x velocity

Left:

10) Which color is having lower wavelength in the light spectrum?
11) Name the object which allows the light to passes through it.
12) What is the velocity of an object in its stationary state?

Up:

13) How many times the visible light will undergo dispersion in water drops.
14) Who propose the law of motion?
15) The rate of increase or decrease of velocity of the moving body is known as ……..?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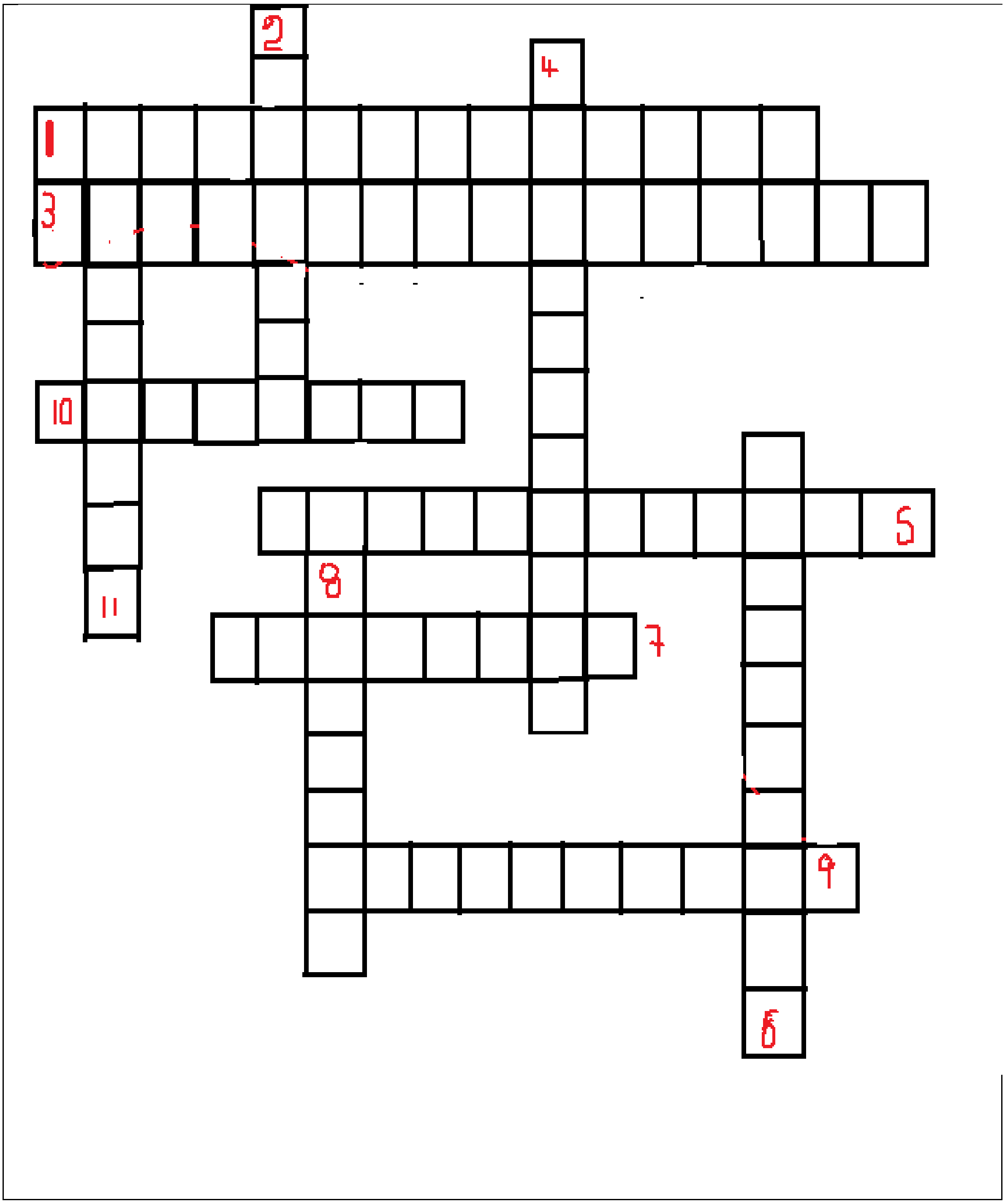
3. Assessment of General Scientific Knowledge

Box: 9. Example of crossword puzzle developed assessing the general scientific knowledge regarding scientists and their contributions



Conclusion

Teaching and evaluating science can be an entertainment rather than an engagement using the crossword puzzle method. Such teaching will also help to inculcate a scientific temper among the students. Teachers and students should develop and use new ideas like crossword puzzles, cartoons etc. to make learning and assessment process in science more effective, lively and enduring.

References

- Costa,V.B. and Kottler,E.(2009). Secrets to Success for Science Teachers. Corwin Press:California
- Gilbert, J.(eds)(2004) *The Routledge Falmer Reader in Science Education*. Routledge Falmer: London and New York.
- Burz,L.H. andMarshall,K. (1997). Performance Based Curriculum for Science. Corwin Press:California.

GraphicOrganizers for Simplifying Complex Learning Tasks in Science

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Introduction

Cognitive research reveals that even with what is taken to be good instruction, manystudents, includingacademically talented ones, understand less than we think they do. With determination, students taking an examination are commonly able to identify what they have been told or what they have read; careful probing, however often shows that their understanding is limited or distorted, if not altogether wrong. Educators should pick the most important concepts and skills that must be emphasized, so that they can concentrate on the *quality of understanding*rather than on the *quality of information presented*.

In planning instruction, effective teachers draw on a growing body of research knowledge about the nature of learning and on the craft knowledge about teaching that has stood the test of time. Typically, they consider the special characteristics of the material to be learned, the background of their students, and the conditions under which the teaching and learning are to take place.

Students have to construct their own meaning regardless of how clearly teachers or books tell them things. Mostly, a person does this by connecting new information and concepts to what he or she already believes. Concepts- the essential units of human thought – that do not have multiple links with how a student thinks about the world are not likely to be remembered or useful. Concepts are learned best when they are encountered in a variety of contexts and expressed in a variety of ways, for that ensures that there are more opportunities for them to become imbedded in a student's knowledge system.

Complex tasks are a part of everybody's daily life. We may not realize it until we get overwhelmed and stressed. Without proper organizing and structuring, we can get stuck wasting a lot of time doing things that are not productive or redoing the steps more than once due to improper planning.

In cognitive psychology, cognitive load is the load related to the executive control of working memory (WM). Theories contend that during complex learning activities the amount of information and interactions that must be processed simultaneously can either under load or overload the finite amount of working memory one possesses. All elements must be processed before meaningful learning can continue.

Among psychologists it is widely acknowledged that, compared to "cold" learning, people learn more effectively when they can build on what they already understood (known as existing schemas). But the more a person attempts to learn in a shorter amount of time, the more difficult it is to process that information in working memory.

Cognitive load theory provides guidelines intended to assist in the presentation of information in a manner that encourages learner activities that optimize intellectual performance. Cognitive load theorists' advocates on understanding how many discrete units of information can be retained in short-term memory before information loss occurs. Based on the theory an average person can retain only seven "chunks" of information in short-term memory. The theory provides a general framework and has broad implications for instructional design, by allowing instructional designers to control the conditions of learning within an environment or, more generally, within most instructional materials. Specifically, it provides empirically-based guidelines that help instructional designers decrease extraneous cognitive load during learning. *Extraneous cognitive load* is generated by the manner in which information is presented to learners and is under the control of instructional designers (Chandler &Sweller, 1991). This load can be attributed to the design of the instructional materials. Thus, especially when *intrinsic cognitive load* (the inherent level of difficulty associated with a specific instructional topic) is high (i.e., when a problem is difficult), materials should be designed so as to reduce the extraneous load (Ginns, 2006). In this instance, the efficiency of the visual medium is preferred. This is because it does not unduly load the learner with unnecessary information.

Graphic Organizers

Graphic organizers are instruments of representation, illustration and modeling of information in visual or graphic forms that are used to achieve a meaningful learning. They are a set of learning strategies which involve translating words expressed in linear form into visual structures. They are simply a graphical or spatial representation of text concepts. It helps students to organize, structure the information and relate concepts with other concepts.

In addition, the spatial arrangement of Graphic organizers allows the students to identify the missing information or absent connections in one's strategic thinking (Ellis, 2004).

The idea of Graphic Organizer is based on Ausebel's assimilation theory of cognitive learning (Ausebel et al., 1978).According to them, the information is organized by mind in a hierarchical top-down fashion. The cognitive approach to learning seeks to understand how incoming information is processed and structured into memory (Weinstein & Mayer, 1986). Learning is best achieved when the information is presented systematically and stored in the student's brain in an organized, meaningful and useable manner (McElroy & Coughlin, 2009).

Studies have shown that meaningful learning can be assisted through the use of Graphic Organizers. Students who used Graphic Organizers as a learning strategy performed better rather than the students who used underlining (Amer, 1994), note-taking (Reader &Hammond, 1994), discussing with co-students (Chularut & De Backer, 2004) or outlining (Robinson & Kiewra, 1995). According to Clark (2007),Graphic Organizers not only enable students to record and categorize information, but also help students to understand difficult concepts, generate thoughts, and identify connections between ideas. When used effectively, these visual tools can have a positive impact on student achievement. Students who work with Graphic Organizers often show improved writing and critical thinking skills. Study by Oliver (2009) about the effectiveness of concept mapping on students' comprehension of science text structure found that students understand the concept and would prefer to read and map rather than just read without mapping.

In general, the Graphic Organizers functions a means for *clarifying and organizing* knowledge and reasoning, *identifying the conceptual errors*, *strengthening the learning process* and *integrating the new knowledge in the prior knowledge system*, leading to a superior learning process.

Background of the Paper

The paper is an offshoot of the first conference on "Graphic Organizers for Processing Scientific Knowledge", held as part of the series of conferences on the Classroom Based Research Project on "Cultivate Culture of Science" at the Department of Physical Science, PKM College of Education,Madampam,Kannur in collaboration with *PhysicaScientia*: the Physical Science Teachers'Learning Community, on March 1st 2014.

The outcome of the Conference can be classified under three heads:

1. Tips for Designing Graphic Organizers were formulated
2. Graphic Organizerssuitable for processing ‘scientific knowledge’ were identified.
3. Graphic Organizers were classified based on-
    a. Nature of scientific knowledge
    b. Nature of the processes involved in learning science
    c. Nature of the complexity of the learning task.
4. Students teachers started generatingvarious Graphic Organizer designs suitable for science learning

The tips for designing Graphic organisers that were formulated are:

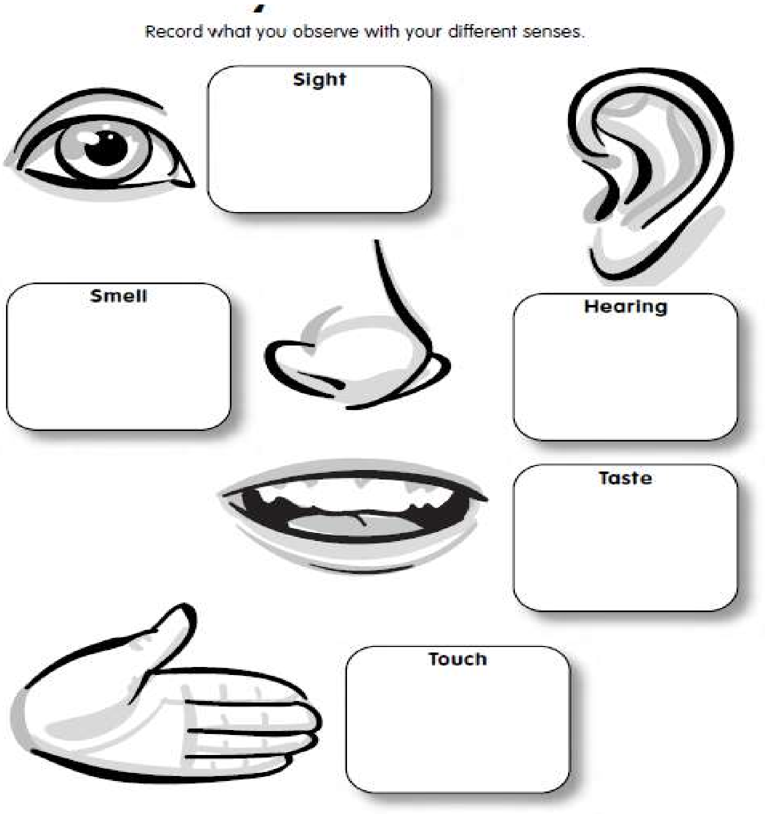
- *Write down the task and break it down*
- *Convert one big task into micro tasks*
- *Take out all unessential steps*
- *Group information into chunks to reduce potential overload*
- *Categorize information by putting information in meaningful groups*
- *Use semantic maps or networks to connect a main idea to related ideas*

The present paper illustrates graphic organisers suitable for complex learning tasks that can be grouped under various processes involved in learning science

1. In the Process of Gathering Scientific Knowledge

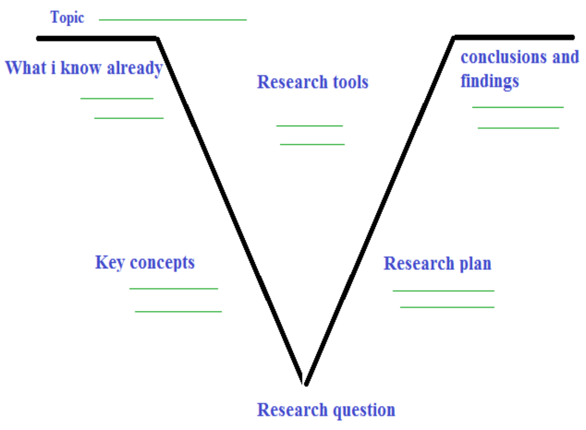
Observation is the fundamental process in science learning. While involved in the complex data gathering through observation science students can use the graphic organizer to write what they observe using their five sense organs.

1.1. Sensory Observation

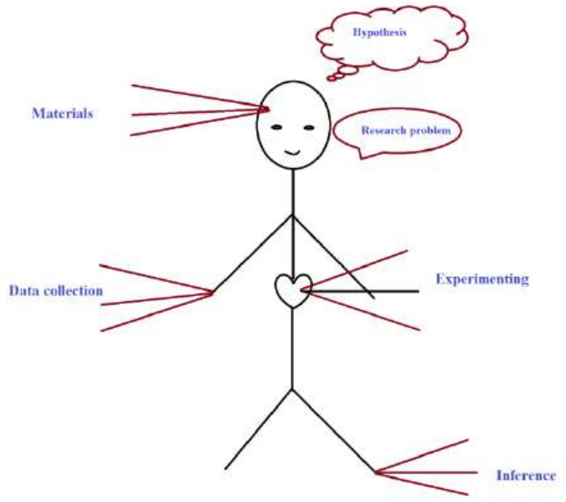


Experimentation involves integrated process skills in science. While involved in Experiments, Science Projects etc.**V-map and Stickman diagram** can be used to help students get familiar with the process of scientific thinking and investigation. With the aid of this organizer, students can be helped to focus on the various steps and the types of knowledge required for scientific investigations.

1.2. V- map

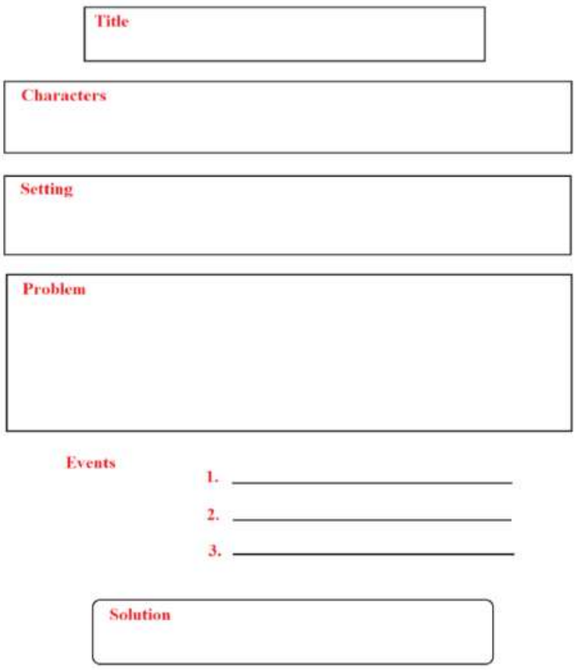


1.3. Stickman diagram



1.4.Story map

Descriptive type projects can be summarised in the form of a story map

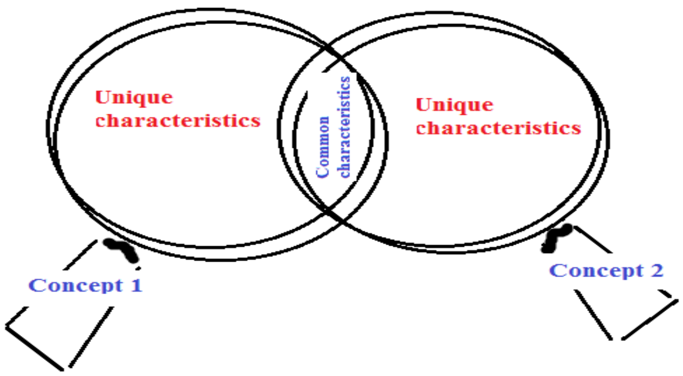


2. In the Process of Analysing Scientific Knowledge

Graphic organizers can be used to analyse scientific information based on similarities and differences; pros and cons etc.

2.1.Venn diagram

Using a Venn diagram, students can list characteristics or attributes of two (or more) things and notice how they are different and what they have in common.

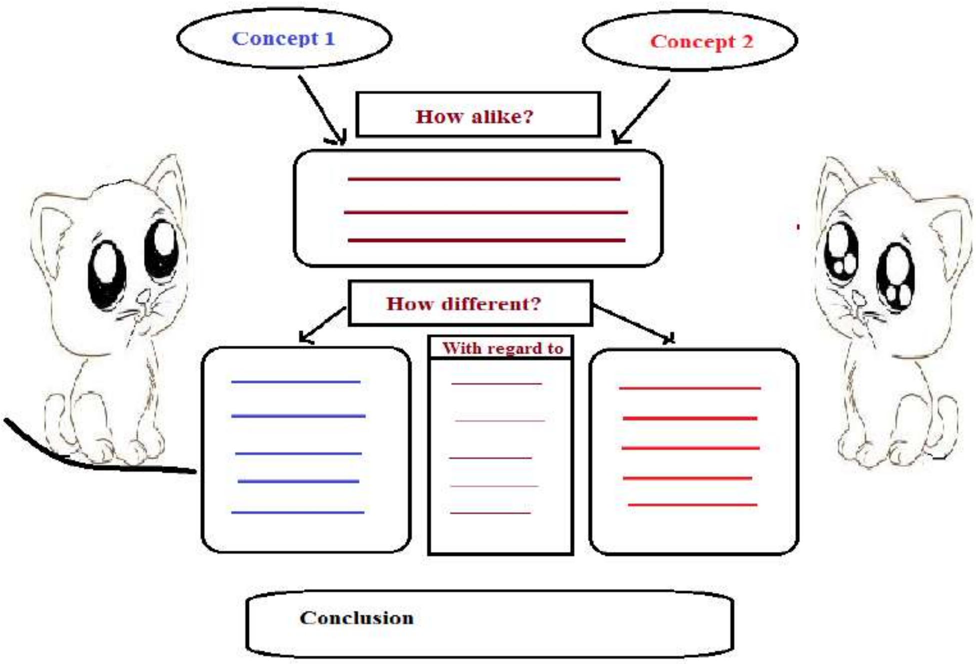


2.2.Compare contrast matrix

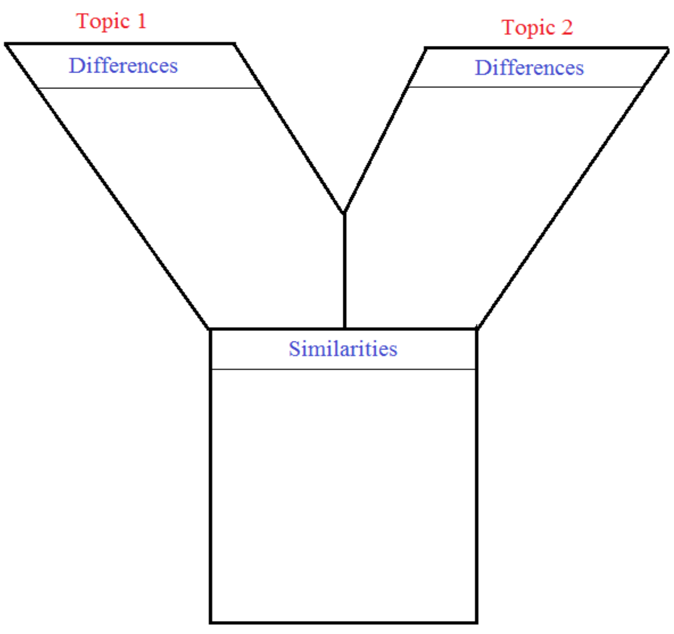
Another way to compare concepts attributes is to construct a compare contrast matrix.

Concepts / Attributes	Concept 1	Concept 2	Concept 3
1.			
2.			
3.			
4.			
5.			
6.			
7.			

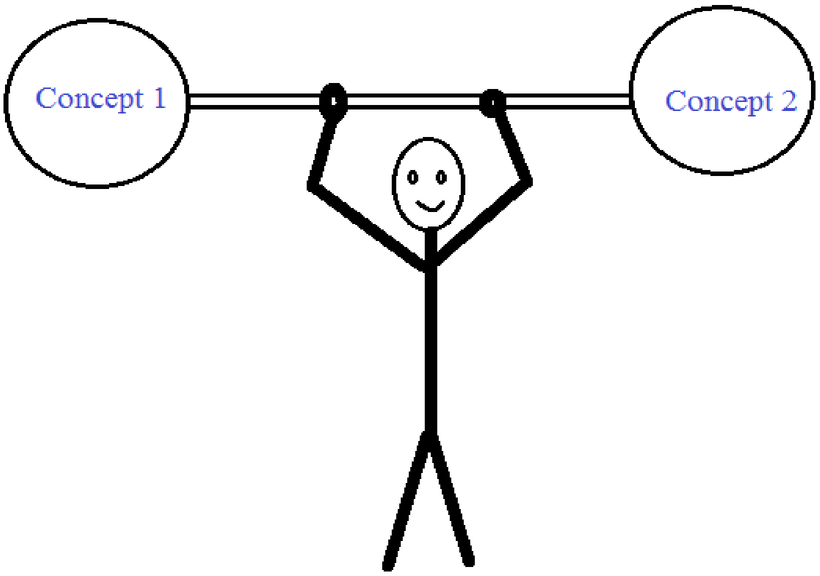
2.3. Compare / Contrast With Summary



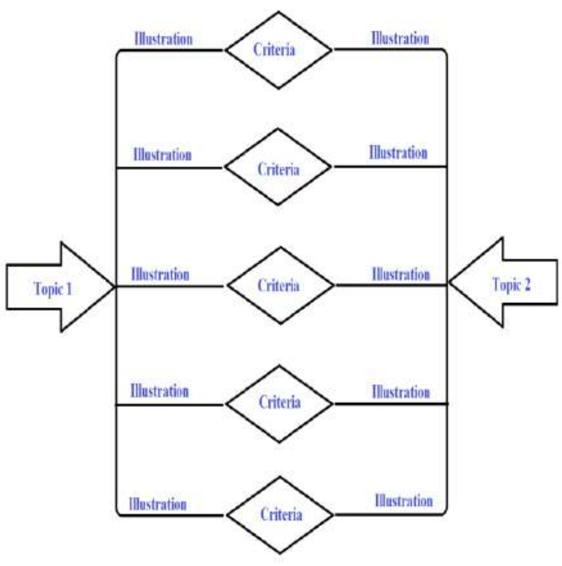
2.4. Y- Notes



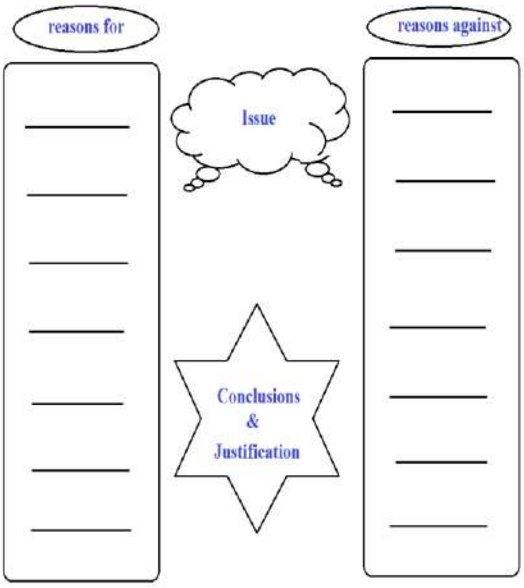
2.5. Weight lift model



2.6.Compare map



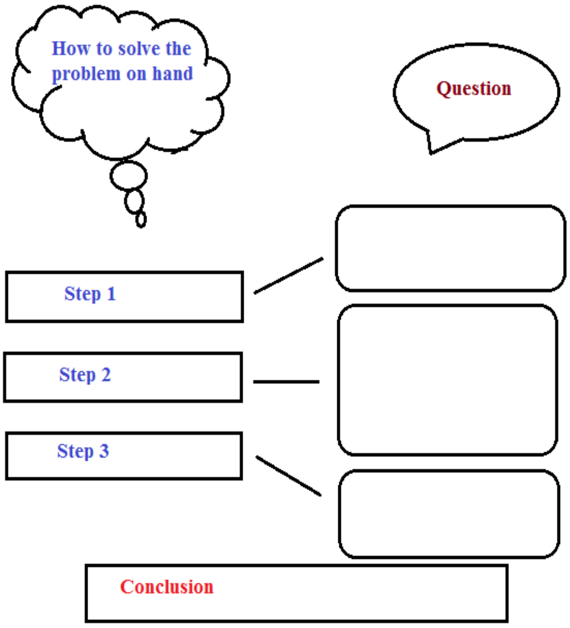
2.7. Discussion map



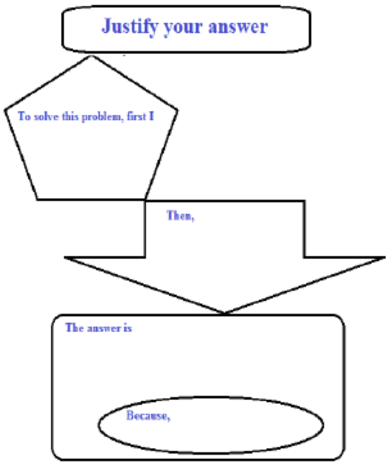
3. In the Process of structuring Scientific Knowledge

3.1.Step by step problem solving

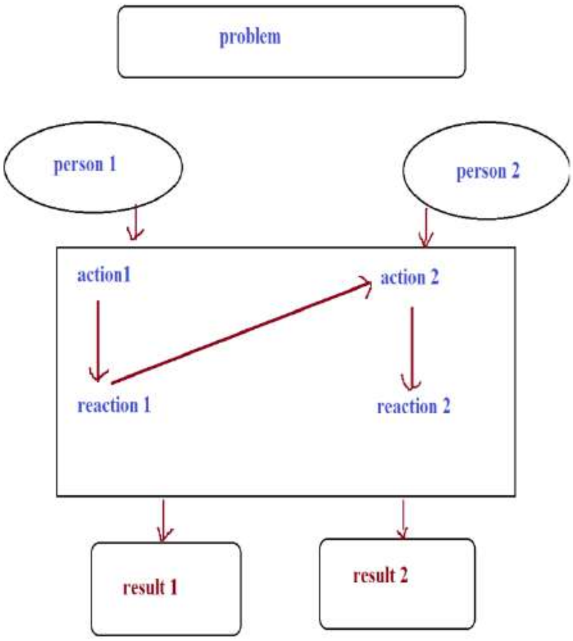
This can be used to solve derivation type questions, which require writing its steps along with derivation.



3.2. Justify your answer

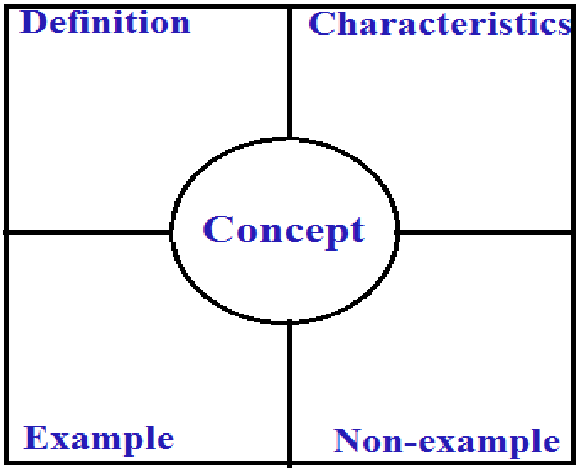


3.3.Problem solution organizer

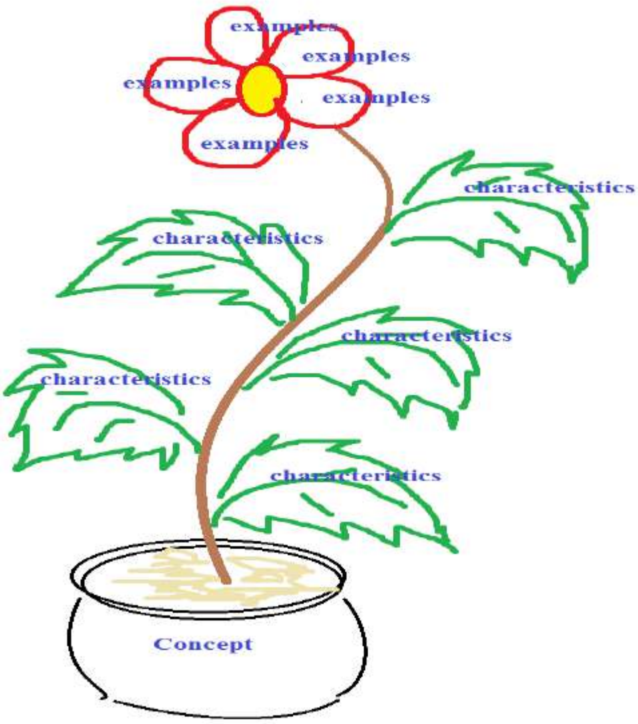


3.4.Frayer diagram

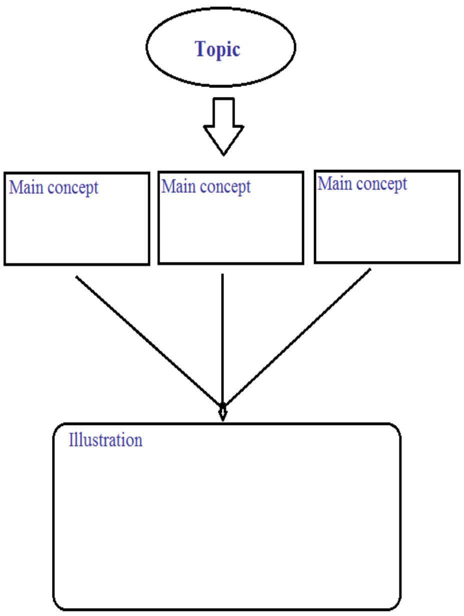
The Frayer diagram ids a vocabulary development tool. This model helps to develop a better understanding of the concepts by having students to identify what something is and what something is not



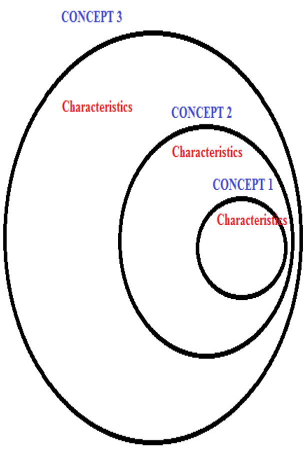
3.5. Elements of Concept



3.6. Main concept map

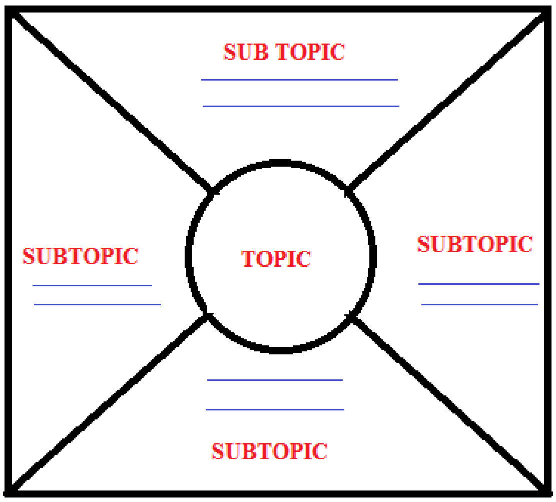


3.7. Overlapping circles map



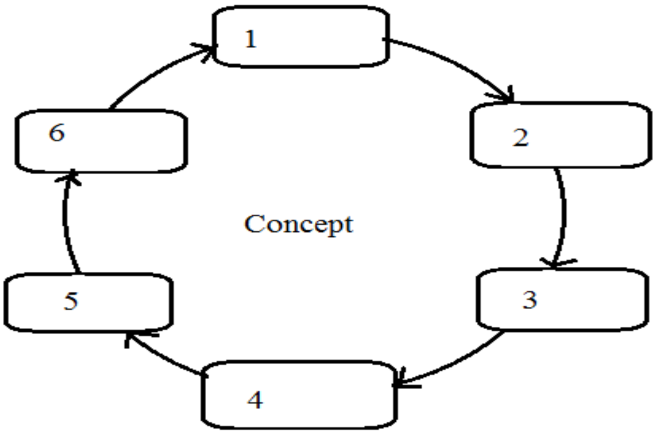
3.8. One and all organizer

This organiser can be used uncover similarities and differences among various subtopics of a main topic. It facilitates the development of student's comparing and contrasting skills helps to understand the topic.



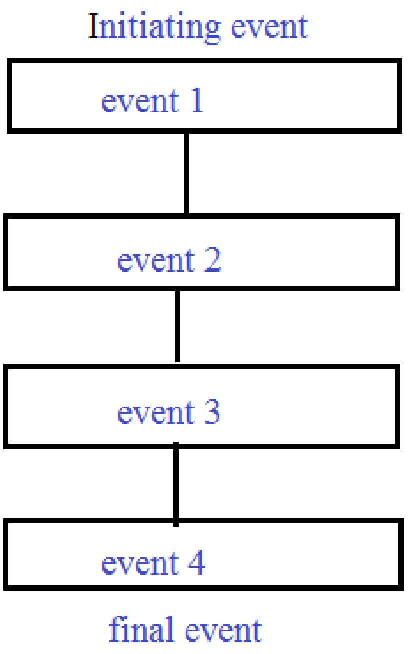
3.9. Circle Diagrams

Cycle diagram is a type of graphic organizer that shows how items are related to one another in a repeating cycle.by making a circle diagram student identifies the main events in the cycle, how they interact and how the cycle repeats.

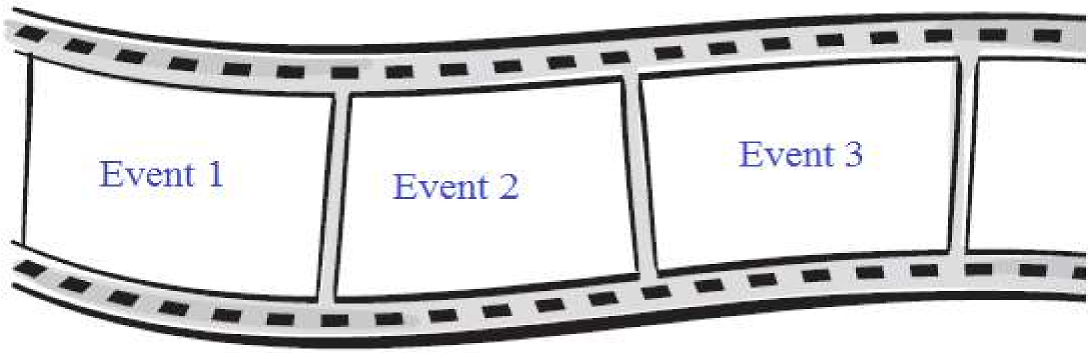


3.10. Series of events

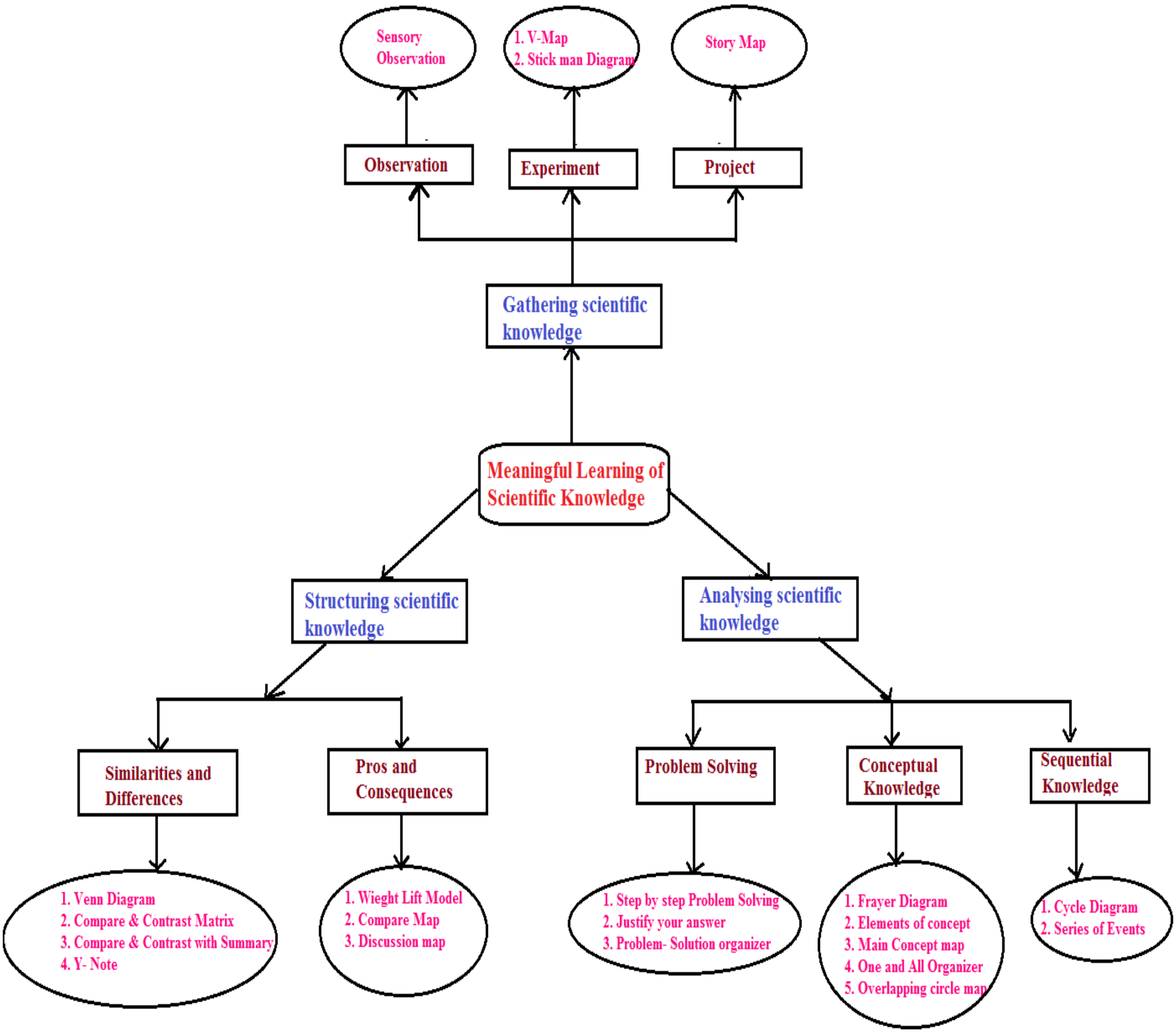
Some of scientific knowledge follows a linear sequence of events with an identifiable beginningand ending.



A series of events chain can help the student to track the particular science process and to follow its sequence.



Summary



Conclusion

The effective utilisation of the different graphic organizers by the teachers and by the learners can contribute to the meaningful learning of science. Creative teachers and learners can design Graphical organizers on their own. Appropriate use of suitable graphical organizers can make learning of even complex tasks easier and effective.

References

1. Chandler, P. &Sweller, J. (1991). "Cognitive Load Theory and the Format of Instruction". *Cognition and Instruction*8 (4): 293–332.
2. Ginns, P. (2006). "Integrating information: A meta-analysis of the spatial contiguity and temporal contiguity effects". *Learning and Instruction*16 (6): 511–525
3. Ellis, E. (2004). What's the big deal about GO? Retrieved on January 23rd, 2010, from http://graphicorganizer.com
4. Ausebel, D.P., Noval, J.D., &Hanesian, H. (1978). *Educational psychology: A cognitive view.* New York: Holt, Rinehart and Winston.
5. Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 315-327). New York: Macmillan.
6. McElroy, L. T., & Coughlin, C. N. (2009). The other side of the story: Using graphic organizer as cognitive learning tools to teach students to construct effective counter-analysis. Unpublished thesis University of Baltimore Law Review.
7. Amer, A.A. (1994). The effect of knowledge-map and underlining training on the reading comprehension of scientific texts. *English Specific Purposes*, *13*, pp. 35-45.
8. Reader, W., & Hammond, N. (1994). Computer-based tools to support learning fromhypertext: concept mappingtools and beyond. Computers and Education.
9. Chularut, P., &DeBacker, T.K. (2004). The influence of concept mapping on achievement, self-regulationand self-efficacy in students of English as a second language. *Contemporary EducationalPsychology, 29*, pp. 248-263.
10. Robinson, D.H., &Kiewra, K.A. (1995). Visual argument: GOs are superior to outlines in improving learning from text. *Journal of Educational Psychology*, *87*, 455-467.
11. Clark, A. (2007). *GOs and the school library program*. University of Alberta Department of Elementary Education.
12. Oliver, K. (2009). An investigation of concept mapping to improve the reading comprehension of science text. *Journal Science Educational Technology (18)*, pp. 402-414.

Exploring Science through Science Fictions

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Introduction

In this world, nobody knows just what the future will bring, but you can bet your last dollar that it will bring change. Change and the future-they are the certainties in our modern world. They are also the heart and soul of fictions. Although fiction may be viewed as a form of entertainment, it has other uses. Fiction has been used for instructional purposes, such as fictional examples used in school textbooks. Here we are trying to explore on how science fictions can be used in secondary school curriculum. The paper presents a collection of science fictions related to secondary school science learning and how we can use it for fostering the creative writing of science students.

Fictions

Fiction is the form of any narrative or informative work that deals, in part or in whole, with information or events that are not factual, but rather, imaginary—that is, invented by the author. Although fiction describes a major branch of literary work, it may also refer to theatrical, cinematic or musical work. In general fictions are classified into *realistic fictions and nonrealistic fictions.*

Realistic fiction although untrue, could actually happen. Some events, people, and places may even be real. This is termed 'Faction'. It can be possible that in the future imagined events could physically happen. Realist fiction strives to make the reader feel as if they're reading something that is actually happening—something that though not real, is described in a believable way that helps the reader make a picture as if it were an actual event.

Non-realistic fiction is that in which the story's events could not happen in real life, because they are supernatural, or involve an alternate form of history of mankind other than that recorded, or need impossible technology. A good deal of fiction books are like this, e.g. Alice In Wonderland and Harry Potter.

Fictions are in different forms. Traditionally, fiction includes novels(e.g.: The *Stuff and Style of the Universe* by C. Radhakrishnan, *From the Earth to Moon* by Verne, *The Time Machine* by H. G. Wells), short stories(*Noise Level* by Raymond. F. Jones), fables, fairy tales, plays(eg: *The War of The Worlds*), poetry, but it now also encompasses films(e.g.: *Frankenstein, Jurassic Park, Ra One* etc.), comic books, and video games.

Science Fictions

Science fiction is a genre of fiction dealing with imaginary but more or less plausible (or at least non-supernatural) content such as future settings, futuristic science and technology, space travel, aliens, and paranormal abilities. Exploring the consequences of scientific innovations is one purpose of science fiction, making it a "literature of ideas". Science fiction is largely based on writing rationally about alternative possible worlds or futures. It is similar to, but differs from fantasy in that, within the context of the story, its imaginary elements are largely possible within scientifically established or scientifically postulated laws of nature (though some elements in a story might still be pure imaginative speculation). The settings for science fiction are often contrary to known reality, but most science fiction relies on a considerable degree of suspension of disbelief, which is facilitated in the reader's mind by potential scientific explanations or solutions to various fictional elements.

Science fiction elements include:

- A time setting in the future, in alternative timelines, or in a historical past that contradicts known facts of history or the archaeological record.
- A spatial setting or scenes in outer space (e.g., spaceflight), on other worlds, or on subterranean earth.
- Characters that include aliens, mutants, androids, or humanoid robots.
- Technology that is futuristic (e.g., ray guns, teleportation machines, humanoid computers).
- Scientific principles that are new or that contradicts known laws of nature, for example time travel, wormholes, or faster-than-light travel.
- New and different political or social systems (e.g. dystopia, post-scarcity, or a post-apocalyptic situation where organized society has collapsed).
- Paranormal abilities such as mind control, telepathy, telekinesis, and teleportation.

Definition

Author and editor Damon Knight summed up the difficulty by stating that "science fiction is what we point to when we say it", a definition echoed by author Mark C. Glassy, who argues that the definition of science fiction is like the definition of pornography: you don't know what it is, but you know it when you see it. Vladimir Nabokov argued that if we were rigorous with our definitions, Shakespeare's play *The Tempest* would have to be termed science fiction.

According to science fiction writer Robert A. Heinlein, "a handy short definition of almost all science fiction might read: realistic speculation about possible future events, based solidly on adequate knowledge of the real world, past and present, and on a thorough understanding of the nature and significance of the scientific method." Rod Serling's definition is "fantasy is the impossible made probable. Science Fiction is the improbable made possible." Lester del Rey wrote, "Even the devoted aficionado—or fan—has a hard time trying to explain what science fiction is", and that the reason for there not being a "full satisfactory definition" is that "there are no easily delineated limits to science fiction."

The term "sci-fi"

Forrest J Ackerman used the term ***sci-fi*** (analogous to the then-trendy "hi-fi") at UCLA in 1954. As science fiction entered popular culture, writers and fans active in the field came to associate the term with low-budget, low-tech "B-movies" and with low-quality pulp science fiction. By the 1970s, critics within the field such as Terry Carr and Damon Knight were using *sci-fi* to distinguish hack-work from serious science fiction, and around 1978, Susan Wood and others introduced the pronunciation "skiffy". Peter Nicholls writes that "SF" (or "sf") is "the preferred abbreviation within the community of sf writers and readers". David Langford's monthly fanzine *Ansible* includes a regular section "As Others See Us" which offers numerous examples of "sci-fi" being used in a pejorative sense by people outside the genre. The abbreviation **SF** (or **sf**) is commonly used instead of "sci-fi".

Types of Science Fiction

1. **Hard SF**

Hard science fiction, or "hard SF", is characterized by rigorous attention to accurate detail in quantitative sciences, especially physics, astrophysics, and chemistry, or on accurately depicting worlds that more advanced technology may make possible. Many accurate predictions of the future come from the hard science fiction subgenre. Some hard SF authors have distinguished themselves as working scientists, including Gregory Benford, Geoffrey A. Landis and David Brin.

2. Soft SF

The description "soft" science fiction may describe works based on social sciences such as psychology, economics, political science, sociology, and anthropology. Noteworthy writers in this category include Ursula K. Le Guin and Philip K. Dick. The term can describe stories focused primarily on character and emotion.

3. Cyberpunk

Common themes in cyberpunk include advances in information technology and especially the Internet, visually abstracted as cyberspace, artificial intelligence and prosthetics and post-democratic societal control. Nihilism, post-modernism, and film noir techniques are common elements. James O'Ehley has called the 1982 film *Blade Runner* a definitive example of the *cyberpunk* visual style.

4. Time travel

The most famous is Wells' 1895 novel *The Time Machine*, which uses a vehicle that allows an operator to travel purposefully and selectively, while Twain's time traveler is struck in the head. The term "*time machine*", coined by Wells, is now universally used to refer to such a vehicle. Time travel continues to be a popular subject in modern science fiction, in print, movies, and television such as the BBC television series *Doctor Who*.

5. Military SF

Military science fiction is set in the context of conflict between national, interplanetary, or interstellar armed forces; the primary viewpoint characters are usually soldiers. Stories include detail about military technology, procedure, ritual, and history; military stories may use parallels with historical conflicts. Heinlein's *Starship Troopers* is an early example. Prominent military SF authors include John Ringo, David Drake, David Weber, and S. M. Stirling.

6. Superhuman

Superhuman stories deal with the emergence of humans who have abilities beyond the norm. This can stem either from natural causes such as in Olaf Stapledon's novel *Odd John*, and Theodore Sturgeon's *More Than Human*, or be the result of intentional augmentation such as in A. E. van Vogt's novel *Slan*. These stories usually focus on the alienation that these beings feel as well as society's reaction to them. These stories have played a role in the real life discussion of human enhancement.

7. Apocalyptic

Apocalyptic fiction is concerned with the end of civilization through war (*On the Beach*), pandemic (*The Last Man*), astronomic impact (*When Worlds Collide*), ecological disaster (*The Wind from Nowhere*), or some other general disaster or with a world or civilization after such a disaster.

8. Space opera

Space opera is adventure science fiction set in outer space or on distant planets, where the emphasis is on action rather than either science or characterization. Space opera is sometimes used pejoratively, to describe improbable plots, absurd science, and cardboard characters. But it is also used nostalgically, and modern space opera may be an attempt to recapture the sense of wonder of the golden age of science fiction. The pioneer of this subgenre is generally recognized to be Edward E. (Doc) Smith, with his *Skylark* and *Lensman* series.

9. Fantasy

In general, science fiction differs from fantasy in that the former concerns things that might someday be possible or that at least embody the pretense of realism. Supernaturalism, usually absent in science fiction, is the distinctive characteristic of fantasy literature. " Examples of fantasy supernaturalism include magic (spells, harm to opponents), magical places (Narnia, Oz, Middle Earth, Hogwarts), supernatural creatures (witches, vampires, orcs, trolls), supernatural transportation (flying broomsticks, ruby slippers, windows between worlds), and shape shifting (beast into man, man into wolf or bear, lion into sheep). Such things are basic themes in fantasy

10. Horror fiction

Horror fiction is the literature of the unnatural and supernatural, with the aim of unsettling or frightening the reader, sometimes with graphic violence. Historically it has also been known as weird fiction. One of the defining classical works of horror, Mary Shelley's novel *Frankenstein*, is the first fully realized work of science fiction, where the manufacture of the monster is given a rigorous science-fictional grounding.

11. Mystery fiction

Works in which science and technology are a dominant theme, but based on current reality, may be considered mainstream fiction. Much of the thriller genre would be included, such as the novels of Tom Clancy or Michael Crichton, or the James Bond films. Modernist works from writers like Kurt Vonnegut, Philip K. Dick, and Stanisław Lem have focused on speculative or existential perspectives on contemporary reality and are on the borderline between SF and the mainstream." Isaac Asimov, Walter Mosley, and other writers incorporate mystery elements in their science fiction, and vice versa.

12. Superhero fiction

Superhero fiction is a genre characterized by beings with much higher than usual capability and prowess, generally with a desire or need to help the citizens of their chosen country or world by using his or her powers to defeat natural or super powered threats. Many superhero fiction characters involve themselves (either intentionally or accidentally) with science fiction and fact, including advanced technologies, alien worlds, time travel, and inter dimensional travel. E.g.: Spider-Man, the Fantastic Four, the X-Men, and the Hulk by Stan Lee

Fiction Lead Discoveries

The science-fact articles serve as bridges between the fiction of the stories and the realities of our life. Some of the articles consider how even the most exotic ideas of science fiction may someday be transformed into science fact. Some of the fictions that lead to scientific discoveries are given below:

1. **Jules Verne Predicts the Moon Landing in Ridiculous Detail ... in 1865**

   Though it was written over 100 years before the Apollo 11 mission, Verne's novel '*From the Earth to the Moon*' actually serves as a pretty damn accurate novelization of that mission, down to the scariest details. He was slightly off on the cost and weight of the rocket (but only slightly -- the real stats were 26,275 pounds and $14.4 billion), and in the biggest departure from reality, Verne's astronauts were shot out of a huge gun. But get this: Verne's space cannon were called Columbiad, and the Apollo 11 command module was named *Columbia*.

2. **Mark Twain Predicts the Internet in 1898**

   It was in one of his science fiction stories, *from the 'London Times' of 1904*, that Mark Twain dreamed up an invention called the "telelectroscope," which used the phone system to create a worldwide network of information-sharing. Basically, Mark Twain invented the Internet. Keep in mind that he wrote this in 1898, when telephones were still fairly new and rare.

Purpose of Science Fictions

The general purposes of Science Fictions are:

1. To explore possibilities and dream up new ideas.

2. Exploring the consequences of scientific innovations.
3. To promote scientific thinking, scientific curiosity.
4. To foster Creative writing and artistic talents.
5. To develop reading habit in science related articles.
6. To warn us about dangerous tomorrows.
7. To develop scientific sensitivity.

Science Fictions and Related Topics in Secondary (8-12) Level

As part of the class room based research project we have collected details regarding the science fictions available for use. The team has organized the science fictions based on the scientific concepts related to secondary school science. The units, related topics, the fictions available and the summary of the fictions are presented in the form of a table. This can act as a resource material for the secondary school science teaching learning process.

Table1. Science Topics and Related Science Fictions

Class and Unit	Topic	Fiction	Author	Summary
IX States of Matter	Antimatter	Fireball (*Novel*)	Davis, Paul (1987)	Antimatter micrometeorites threaten earth
IX Gravitation	Antigravity	Bharathan (*Malayalam Film*)	Madhu Muttam (2007)	An inventor makes a small gadget which could fly without fuel using the concept of antigravity
VIII Celestial sights	Asteroids, Black holes	1. Pilot in vacuum Diagrams (*Film*)	Baxter , Stephen (1997)	Future Space travelers follow out Chiron and use it as a spaceship to escape invading aliens
		2. The Planets (*Film*)	Preios , Byron and Franknoi	A Fundamentalist and a scientist find fossils on an asteroids

		3. Earth (*Film*)	Brin, David (1990)	A mini black hole fall into the earth's core
		4. Stuff and Style of the Universe (*Novel*)	C. Radhakrishnan	It presents a new model of the universe so as to solve riddles haunting physics
VIII Static Electricity IX Electricity X Effect of Current Electricity, Electromagnetic induction	Electricity	Frankenstein (*Film)*	Mary Shelley (1994)	A man made monster comes to life with the help of electricity
VIII Structure of atom XII Nucleus, Atoms	Nuclear energy	1. Them(*film*)	Ted Sherdeman Russell Hughes George Worthing Yates (1954)	Early atomic tests in New Mexico cause common ants to mutate into giant monsters.
		2.Silkwood(*Film*)	Nora Ephron (1980)	The story of Karen silkwood, the Oklahoma nuclear-plant worker who blew the whistle on dangerous practices at the kerr-McGee corporation
X Our universe VIII Celestial sights	Meteors and comet	Meteor(*Film*)	Stanley Mann Edmund H. North (1979)	After a collision with a comet ,a piece of the asteroid heads towards Earth .
X Our Universe VIII Celestial sights X Electronics	Space	2001:A space Odyssey (Film)	Clarke and Kubrick (1968)	Mankind finds a mysterious artifact on the moon,and scientist work with an intelligent computer to understand its meaning .

X Chemistry in everyday life	Pollution, environment, natural resourses,	The Lorax(Film)	Dr. Seuss (1972)	A ruined industrialist tells his tale of his environmentally self-destructive greed despite the warnings of an old forest creature.
VIII Celestial Sights X Our Universe	Earth and Space Science	October Sky(Film)	Joe Johnston (1999)	The story of Homer Hickam,a coal Miner's son who studied rocketry against his father's wishes.

Table 2: Some science fictions related to general science issues;

Topic	Fiction Film	Summary
Earthquakes	*Earthquake (1974)*	An earthquake devastates Los Angeles
Volcanoes	*Dante's Peak (1997)*	Dante's Peak is threatened by a volcano
Global Warming	*The Day After Tomorrow (2004)*	A climatologist tries to save the world from global warming

How to Use Science Fictions in Teaching Learning Process

Science fictions are good means for fostering the creative ability, scientific thinking and reading habit of students. Dubeck, Moshier, and Boss (2003) have found that by teaching students through science fictions instead of traditional technique, students gain a better understanding of the scientific principles. Using science fiction for teaching scientific facts is one way to tap its popularity with young people, and use it as an educational tool to build interest and awareness of real science.

Science fictions can be used in teaching learning process in many ways such as for introducing a topic, ,as an additional reading, as a follow up process etc.

1. **For Introducing a Topic.**

Science fictions can be used in the teaching process for introducing a new topic to the learners. These introductions not only provide useful background information, but also pose questions for students to think about the topic.

For example, for introducing the unit *Electricity* in Standard IX, we can show the science fiction film *Frankenstein* by Marry Shelley.

2. As an Additional Reading.

Science fictions can also be used for additional reading. The teacher can ask the students to find out and read the fictions related to the discussed topic. This will enable the students to become interested in science learning and will help to improve their reading habit. It can emerge the student's taste of scientific enquiry and the interest in the study of scientific ideas.

For example, after teaching the unit- 'Our Universe' in standard X teachers can suggest the students to read the fiction novel *Stuff and Style of the Universe* by C. Radhakrishnan.

3. As a Follow up Process.

Science fictions can also be used as a follow up process or as an extra work, after teaching a topic. This can be done by assigning the students to develop science fictions related to the topic. The teacher will also get a feedback on how much knowledge the student gathered from that topic.

The teachers can organize science fiction competitions at the class room level to the state level. This can provide opportunities for young people to develop their creativity in the domain of science. Through this the students can apply the knowledge of scientific concepts to new situations. The scientific curiosity, scientific creativity, artistic talent etc will be fostered through this process.

As part of the pedagogical analysis of the secondary school curriculum the student teachers of the present batch conducted a competition on the science fiction. This has lead the student teachers to explore the alternative lines of scientific enquiry.

Conclusion

Science fictions have an essential role to play in cultivating and encouraging young people's innate sense of curiosity and eagerness to know and understand their world. Working in the area of science fiction gives the learner opportunity for unlimited creativity. It allows him or her to create new worlds, address moral dilemmas and mold the future. It gives the reader an opportunity to experience something completely new. Science fiction can provide motivational link between science concepts and everyday experiences. Teaching science with science fiction is a way to provide brain storming thoughts to your students. Use of science fiction to teach science facts is one way to tap into its popularity with young people, and to develop interest and awareness of real science.

References

1. Robert J. L. & Lila L. *Science Fiction, Science Fact and You.*
2. Dubeck, L.W. Moshier, S. E & Boss, J. F (2003) *Fantastic Voyages: Learning Science Through Science Fiction Films*
3. Costa,V.B. and Kottler,E.(2009). Secrets to Success for Science Teachers. Corwin Press:CaliforniaGilbert, J.(eds)(2004) *The Routledge Falmer Reader in Science Education*. Routledge Falmer: London and New York.
4. Burz,L.H. andMarshall,K. (1997). Performance Based Curriculum for Science. Corwin Press:California.
5. Balarama Digest,July2010.

Web 2.0: Socializing and Collaborating Science Learning

B.Ed. Physical Science 2011-2012Batch

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Introduction

With the increase in the use of school desktop and laptop computers, as well as handheld devices, teachers and students have additional venues for information and communication in the classroom. Technology is a wonderful way to facilitate student-centered learning. In addition, it may be used to promote twenty-first-century skills and enhance learning through research, exchanging ideas, collaboration and productivity strategies and tools (Salpeter, 2003). Technology can also encourage student self direction and higher-order thinking.

Web 2.0 is the term given to describe a second generation of the World Wide Web that focused on the ability for people to collaborate and share information online(Wikipedia.com,2006). Web2.0 basically refers to the transition from static HTML Web pages to more dynamic Web that is more organized and is based on serving web application to users. 'Web 2.0' websites allow users to do more than just retrieve information as already possible in 'Web 1.0'. Bart Decrem (2006) calls Web 2.0 the "participatory Web" and regards the Web-as-information-source as Web 1.0.

The concept of Web 2.0 began with a brainstorming session between Tim O'Reily and Media Live International at the conference held in 2004. Web 2.0 services-including social networking sites, wikis, Blogs, communication tools, and collaborative documents-LET PEOPLE work together and share information interactively. Other improved functionality of Web 2.0 includes open communication with an emphasis on Web based communities of users, and more open sharing of information. Thus Web2.0 exemplifies the increasing prominence of the individual as anyone can create and upload print, audio and video to the Internet. Through Web-based application and services such as Web logs, video blogs (vlogs), podcasts, and wikis, anyone with computer connected to the internet can be part of the Web2.0 experience.

Web 2.0 tools assist students in communicating within and beyond the classroom- with the teacher, other students, and the community and science experts. Web 2.0 technologies provide teachers with new ways to engage students in a meaningful way. “Traditional classrooms have students do assignments and when they are completed, they are just that, finished. However, Web 2.0 shows students that education is a constantly evolving entity. The lack of participation in a traditional classroom stems more from the fact that students receive better feedback online. Whether it is participating in a class discussion, or participating in a forum discussion, the technologies available to students in a Web 2.0 classroom does increase the amount they participate.

By allowing students to use the technology tools of Web 2.0, teachers are actually giving students the opportunity to learn for themselves and share that learning with their peers. By making the shift to a Web 2.0 classroom, teachers are creating a more open atmosphere where students are expected to stay engaged and participate in the discussions and learning that is taking place around them.

Tim O’Reilly describes web3.0 as a term used to describe the evolution of the web as an extension of web2.0. Conrad Wolfram (2010) has argued that Web 3.0 is where "the computer is generating new information", rather than humans. According to some Internet experts Web 3.0 will allow the user to sit back and let the Internet do all of the work for them. Rather than having search engines gear towards your keywords, the search engines will gear towards the user. Keywords will be searched based on your culture and region.

Web 2.0 Tools

Blog

A blog which is a blind form of web log, is a personal journal published on world wide web consisting of discrete entries typically displayed in reverse chronological order so the most recent post appear first. The term ‘blog’ was coined by Jorn Barger in 1997. Usually work of a single individual often is themed on single subject. The emergence and growth of blog in late 1990’s coincided with the advancement of web publishing tools that facilitated posting of content by non-technical users. Blog are interactive, allow visitors to leave comments and even message and it is its interactivity that distinguishes them from other static websites.

Wiki

A wiki is a web page or a set of web pages that can be easily edited by anyone who is allowed access. Wikipedia’s popular success has meant that the concept of the wiki as a collaborative tool that facilitates the production of a group work is widely understood. Unlike blogs, wikis has a history function which allows previous versions to be examined and a rollback function which restores previous versions.

Social Networking Sites

Social networking sites facilitates meeting people ,finding like minds ,sharing comments ,use ideas from harnessing the power of the crowd. It includes user generated contents. It can be used to create personal learning environment.

Other Web Services

There are also various other web services in web 2.0 like podcast ,photos/slide sharing, video sharing, instant messaging services, mind mapping, virtual worlds-virtual conference and seminars, team meetings etc

Web 2.0 in Education

Today's students are digital natives. But they still see faculty knowledge as the most important element in learning (Roberts2005). They will want faculty members to use IT to communicate that knowledge better (Kwawik Carso 2005). Due to the frequent use of web 2.0 technologies by students in daily life, the teachers should also be able to use web2.0 tools to share their knowledge.

Now let us discuss about the application of each web 2.0 tool in education.

Blogs:

Blog can be used to expand course activities beyond the four walls of the class rooms. Students are writing for a worldwide audience instead of only for classmates and the instructor. Blog can be used for real world writing experiences. Student can use Blogs to construct their own knowledge, update home work and assignments. Comments in Blogs will encourage students to help each other with their writing and get responses to a question. Examples of some useful blogging sites are

- Audio boo-An audio-blogging site where one can send updates through web and phone.
- Blogger-web 2.0 blog writing tool
- Edublogs-A hosted blogging platform designed for education.
- Word press-A blogging platform and content management system.

Wikis:

These are used for collaborating on ideas and organizing documents and resources from individuals and group of students. It can be used as a presentation tool and can be used for student project. Wiki is a place to aggregate web resources. Student created books and journals can be published in wikis. Examples are

- Wiki-oss-watch
- Wiki how
- Wikipedia

Social Networking:

Social networking sites like face books, you tube, twitter can be used to share knowledge. It can be used in creating content, generating knowledge and sharing information online. Social networking sites develop technologies that facilitate the spread of information through social networks(facebook.com2006). Social networking sites can be used in tentative yet innovative ways. A teacher can use a social networking site as a publicity vehicle for his study-abroad trips (Leumel2006), for advertising events and then give students an assignment asking them to analyze the site (Silver 2006). It can also be used as communication information gathering tool.

- 99chats-Allows teachers to create customizable chat rooms that can be added to a class websites/blog
- Twitter-Twitter is a real time blogging service that connects millions of people. It is a great way for educators to share information and ideas.
- Twiducate-It is a micro blogging services for schools. One can post resources for students, share readings, reflect and encourage discussions.
- Mahara-It is an open source software that allows one to create electronic portfolios, weblogs, resumes and social networking systems. It provides one with tools to setup and share an online personal learning environment.

Other Web Services:

- Other web services like **online collaborative documents** allow users to create and upload documents to the web where they can be edited and shared.
- **Online surveys** can be conducted that can be used to analyze and gather data.
- **Photo/Slide sharing** can be used to share comment and add notes to photos/images to be used in the class room which would inspire writing and creativity.
- **Video sharing** can be used to create subject specific videos with students; video sharing sites can be used to find and down load videos current issues and class room based topics.

- A **podcast** is an audio file similar to a radio broadcast that can be downloaded and listened to on computer or MP3 player.

Examples for video sharing sites and online surveys are given below

- Teacher Tube-YouTube but for educational purposes. This site is moderated so that content is suitable for students.
- TED-Includes talks by remarkable people.
- YouTube/edu-The world's most popular online video sharing websites sorted to show only videos from education institutions like universities and colleges.

Online surveys and polls:

- 99polls-Create customized surveys and polls for one's website, blog and social network profiles.
- Blog poll-Simple polling tool that can be embedded into any school website.
- Poll daddy-Create online surveys and polls.

Shift from Traditional Teaching-Learning to Web Based Teaching-Learning

Web based teaching strategies are often based on cognitive views of teaching and learning. Traditional teaching techniques are more teachers centered than learner centered and teachers are viewed as experts imparting knowledge. On the other hand in web based learning, teachers are just facilitators or collaborators with students as they learn. Students in web based learning take much more responsibility for their own learning. Moreover the type of class works that students do would be quite different and complicated. Student developed projects can be very complex with students seeking information from a variety of different web 2.0 resources and going into great detail. Such projects can take several months to complete and usually involve a lot of collaboration among students. There also tends to be a strong emphasis on the use of problem solving and research skills as students take more active roles in defining developing and presenting their projects.

Web based teaching strategies often require different kinds of assessments of students. Like the class activities, assessments tend to be more project/performance oriented. Attempts are often made to assess not only the portions learned but also the problem solving, thinking and research skills developed. Assessments also sometimes include changes in student's motivation for learning and the degree to which students take responsibilities for their own learning.

Currently web based instructions at the K-12 level is usually less integrated and less comprehensive. It often involves the use of web as an information resource for student projects, experiments and reports. But the web is also used at these levels to allow students to collaborate with experts and other students in different locations.

Applying Web 2.0 Tools in Science Education

Contemporary technologies provide Science educators with a range of ways of engaging students in their learning. The goal of using web 2.0 technologies in science is not to simply use the technology tools like scientists do, but to utilize these technology tools to deepen student participation and cognitive engagement. The web 2.0 tools support students to visit and revisit their science understanding as they author themselves into their products and publish their output enriched with sound, movements and images. Various science related videos and photos can be downloaded and used in instructions. Web 2.0 tools enable students to view a particular topic related experiments on line. This would make science learning more effective and interesting. Through the medium of blogs and social networking sites, students can connect with experts in various fields and communicate with them. Moreover web 2.0 tools enables sharing of ideas between students, students and teachers and teachers and teachers of various locations which helps in socializing and collaborating science learning.

Now let us discuss some websites which would make science teaching- learning interesting.

- Google earth-www.google.com: Google Earth is an excellent resource for science education. Students may study science topic, including images, links and descriptions from this site. There is even a free tool for windows users that enables one to create charts and graphs inside Google Earth using data sites. With Google Earth's new sky feature one can view incredible images of distant galaxies and nebulae from the Hubble space telescope. At www.google.com/educator one can find a teacher community and additional resources and tools, including printable posters.
- Inspiration- www.inspiration .com: With integrated diagram and outline views, students can create graphic organizers. This software program utilizes visual learning, in which ideas, concepts data and other information are associated with images and represented graphically. This tool is useful for both teachers and students to organize and analyze ideas. Teacher resources such as concept maps of Newton's laws, physical and chemical changes etc are available by grade level.
- Explore learning- www.explorelearning.com: explore learning offers modular, interactive simulations in maths and science for teachers in sixth through twelfth grades. This site allows students to practice skills and apply knowledge.
- Science interactive: www.learner.org/interactives: This site includes interactives for seventh through twelfth grades on physics, DNA, the periodic table etc.

Advantages of Web 2.0

Web2.0 has a lot of advantages. Some of them are listed below:

- It is flexible
- Easier and faster access to information when and where it is needed
- A variety of web 2.0 technologies can be integrated in teaching learning activities
- Extensive opportunities of information and collaboration using web 2.0 tools
- Sharing accumulated experiences and resources
- Independence from the classical way of assignments, seminars projects etc
- It is reliable over extended period of time
- Low level of complexity needed for use
- Less amount of energy and time expenditure
- Helps to improve technological knowledge of both learner and teacher
- It is economical to some extend
- Students can experience the information several times and in different ways, something that can improve memory and comprehension

Disadvantages

Though it has many advantages, there are some limitations which cannot be neglected

- Requires an internet connection.
- Most of the Web2.0 tools are even now insufficiently defined.
- It is a second hand web, a medium for people with low digital abilities.
- It has limited security.
- The speed of the programs is lower.
- There is a possibility of misuse.

Web 2.0 in Our Classroom

To utilize web2.0 as an enchanting learning tool, the authors -, the classroom based research team- created an online community via facebook. Now all the students in our class and our optional teacher are members of this community so that we can share scientific ideas and knowledge at any time. In the next phase, we are planning to add all the former students of physical science option in this community and thereby widen the range of scientific knowledge. Further, we have a plan to access creative ideas and current issues in science from science teachers of various cooperative schools and science experts by adding them as members of this community.

Conclusion

Web2.0 is an enormous store house of science information constantly being listed and updated. It has the potential to increase the accessibility of science learning. World class scientific experimentation is possible through web2.0 and improves the potential for increased interaction with students of different backgrounds. It allows collaboration across classes, districts even across nation. It can improve the quality of science learning by encouraging the development of problem solving, information evaluation and information search skills. Even the definition of web2.0 terms are highly debatable however, they don’t exclude each other because web2.0 refers to the social use of the web which allows people to collaborates, to get actively involved in creating content, to generate knowledge and to share information online. Beneath all the type, web2.0 can be used as an emerging tool to transform teaching and learning.

References

- Bart Decrem (2006-06-13). "Introducing Flock Beta 1". Flock official blog. http://www.flock.com/node/4500. Retrieved 2007-01-13.
- Burz,L.H. andMarshall,K. (1997). Performance Based Curriculum for Science. Corwin Press:California.
- Costa,V.B. and Kottler,E.(2009). Secrets to Success for Science Teachers. Corwin Press:California
- Facebook.com.2006.About Facebook. http://www.facebook.com/about.php (accessed March23,2007)
- Gilbert, J.(eds)(2004) *The Routledge Falmer Reader in Science Education*. Routledge Falmer: London and New York.
- http://www.educause.edu/ir/library/pdf/ers0506/rs/ERS0506w.pdf (accessed March23,2007)
- Kvavik,R.B.,and J.B.Caruso.2005.Ecar study of students and information technology,2005:convenience,connection,control and learning.Boulder,CO:EDUCAUSE

- Lemuel,J.2006.Why I registered on Facebook.The Chronicle of Higher Education,Chronicle Careers 53(2):C1. http://chronicle.com/weekly/v53/i02/02c00101.htm (accessed March 23,2007)
- Roberts,G.R.2005.Technology and learning expectations of the Net generation.In D.Oblinger and J.Oblinger,eds.Educating the Net generation http://www.educause.edu/TechnologyandLearningExpectationsoftheNetgeneration/6056 (accessed March23,2007)
- Salpeter,J. (2003).21st century skills:Will our students be prepared?*Technology and Learning,24(3).Retrieved November11,2008,from http://www.techlearning.com/showArticle.php? articleID=15202090*
- Wikipedia.com.2006.Web 2.0. http://en.wikipedia.org/wiki/web2 (accessed March23,2007)

SCIENCE TEACHER NG

PARADIGM SHIFT- CLASSIC TO NEXT GENERATION

P. K. M. COLLEGE OF EDUCATION, MADAMPAM