Appendix- I

Introductory Manual

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Introductory Manual

ICT AIDED CONSTRUCTIVIST LEARNING APPROACH FOR THE PROFESSIONAL DEVELOPMENT OF PRE-SERVICE TEACHERS

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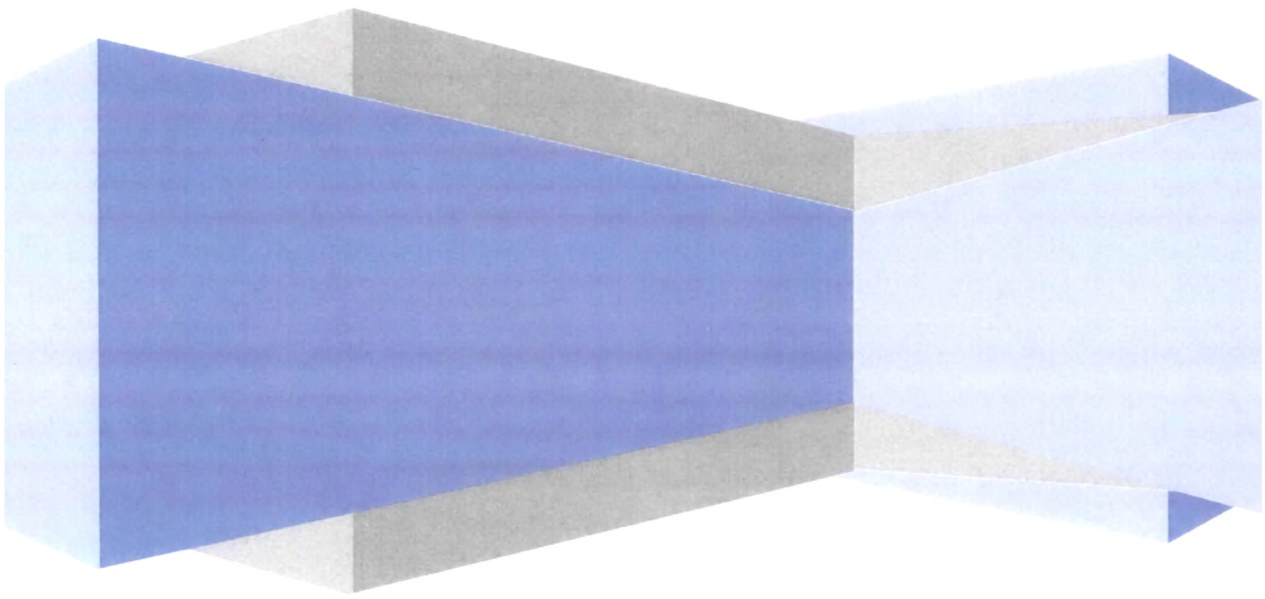


Introduction

Society of the today has been recognized as information societies due to impact of the Information and Communication Technology in various aspects of human life. In the last two decades Technology has entered into every aspect of social and cultural lives. But at the same time Teaching and other Educational Endeavors have not taken full advantage of Technology. We have largely failed to utilize the potential of new technology, particularly, digital technology as a teaching learning tool. We have allowed our schools to remain in the past, while our children are much ahead. In classrooms we present our knowledge to children in a linear, didactic manner that differs dramatically from the children's previous experience outside the school. For the children the school is rigid, uninteresting and ultimately alienating. The result is the mismatch between the learner and the educator. But it is not the children who are mismatch to the schools; rather the schools are mismatch to the children. This divergence between our children and our educational practices needs a drastic educational reform that will bring the classroom in line with society. Only by renewing educational practices we can fill this gap and reunite our schools with our children and rest of the society. So teacher must know the most current research practice which can be used effectively to match particular teaching procedures. Such goals are not easy to achieve. It requires reorganization of the pre-service and in-service teacher education programs as well as the school system keeping in view the new techno-pedagogy and challenges of globalization.

Information and Communication Technology (ICT) has the potential to transform the nature of education, the role of teacher, student, learning processes and the curriculum. Education systems around the world are under pressure to use the digital technology to teach students the knowledge and skills they need in the 21st century. The UNESCO World Education Report (1998) describes the radical implications the ICT has for conventional teaching and learning. It predicts the transformation of teaching learning process and the way teachers and learners gain access to information. With the emerging digital technologies the teaching profession is evolving from teacher-centered to learner-centered learning environment. In order to take the full advantage of digital technology in teaching learning, it is essential that pre-service and in-service teachers effectively use these new tools of learning. Teacher education institutions and programs must provide the leadership skills to the pre-service and in-service teachers in this direction.

To accomplish this goal requires both a change in the traditional views of learning process and understanding of how the digital technology can create new learning environment in which students are engaged learners, able to take greater responsibility for their own learning and construct their own knowledge through the constructivist learning approach.

Constructivism suggests that the learners understand the ways that the production is the result of one's own active construction rather than someone else's presentation. Constructivist believes that knowledge is the result of individual constructions of reality (Brooks, 1990). Constructivism is meaning making activity and produces active learners and creative thinkers. But now there is a widespread concern that the educational experiences provided in many schools are not preparing students well for the future. It is believed that creating a paradigm shift in view of learning process, coupled with the application of digital technology may play an important role in bringing educational systems into alignment with the emerging knowledge based information rich and technologically advanced society. ICT offers wide array for building new schooling systems that allows long distance exchange and interaction between geographically spread groups of teachers and their students meeting this challenge, in turn requires collaboration across national, cultural, and institutional boundaries. And among groups and individuals who have been isolated. Electronic mail, bulletin board systems, teleconferences and virtual communities of World Wide Web allow reciprocal communication among individuals and groups with common interests.

Our aim of educators must go beyond specialized training of craftsmen and factory workers. The only true education is one where all arts, crafts, sciences, technologies are linked and facilitate mutual cognitive development, productive creativity and personal growth. So, we need teachers who are masters not only in technology but also in content, pedagogy and above all they should be humane. Only technology and content cannot replace a teacher, the teachers must be well versed in child psychology, should have a capability to understand the children's mental, physical, psychological situations and then apply technologies with the content and pedagogy.

Module I

Information and Communication Technology (ICT)

Globalization and Technological change processes that have accelerated over the past ten years have created a global economy powered by technology, fueled by information and driven by knowledge. The emergence of this new global economy has serious implications for the nature and purpose of educational institutions.

Educational Technology is the application of the research, learning theory, emergent technologies for solving the instructional problems. Information and Communication Technology is a "Diverse set of technological tools and resources used to communicate, create, disseminate, store and manage information". These technologies include computers, the Internet, broadcasting technology and telephony etc.

ICT and Education

Technology has revolutionized our society, now the children are in a world of instant access to information. They are used to an environment where they control information flow and access with the press of a button. However, the experience of introducing ICT in classroom and other educational settings all over the world over the past several decades suggests that the full realization of the potential educational benefits of ICT is not automatic. ICT has become one of the basic building blocks of modern society. Educational institutes now regard understanding ICT and mastering the Basic skills and concepts of ICT as a part of the core of education, along with reading writing and numeracy. The effective integration of ICT into the educational system is a complex, multifaceted process that involves not just technology – indeed enough initial capital, getting the technology is the easy part!- but also curriculum and pedagogy, institutional readiness, teacher competencies and long term financing among others are required.

The benefits of ICT inclusion are more, like easy to access course materials; both teachers and learners can post the developed and learned materials in social networking blogs, other blogs, and can share through e-mail. Learner can get access to them at any time very quickly, it increases the learner motivation, wider participation, development of discussion, easy to learn the abstract concepts similarly there are more and wide opportunities for teachers and learners.

Technology has permeated almost every aspect of many people's daily lives. Generally, its benefits have outweighed its challenges. In some areas, such as cell phone use, people's integration into their ongoing activities has been relatively natural and seamless, with people large-scale overcoming obstacles to seek its benefits. In other areas, such as educational technology use, integration into regular practice has required concerted work, with its benefits largely dependent on its appropriate use and deliberate efforts to situate its use within the many constraints of educational settings. ICT as a tool should be used with care so that it serves to bridge the social divide and equalize opportunity; inappropriate and insensitive use may as easily widen the divide. Given the growing reach of the technology, it is imperative that efforts are initiated to utilize ICT at the school level to prepare children to face the challenges of a society that is fast transforming into information driven society.

This module focuses on introducing the ICT's that can be effectively used in the teaching learning process at the school level, particularly at secondary school level and how to integrate these ICT's in various subjects of study particularly science.

Learning Objectives

After completion of this module the participant will be able to:

1. Conceptualize the ICT.
2. Provide various examples of ICT.
3. Integrate ICT's into different aspects of teaching and learning.
4. Interpret the various models of ICT
5. State the role of teacher in the context of ICT.
6. Step into the virtual world of ICT.
7. Narrate how to integrate ICT in various aspects of Education.
8. Appreciate advantages of ICT in their regular teaching and learning process.
9. Narrate issues/problems for integrating ICT in Education
10. Communicate virtually through web.2 technologies.

The following technologies are the examples of ICTs which can be used in the teaching learning process.

1. Windows Operating system (Word, Excel, PowerPoint, Paint, Word pad etc.)
2. Print
3. Audio and Audio-visual Communication (Telephone, Television, Mobiles)
4. Graphics, photography
5. Satellite communication
6. Internet
7. Web.2 technologies (Social Networking, Face book, Orkut, Skype, Twitters, weblogs, podcasts, MySpace, Wikis, E-mail and many more).
8. Mobile learning

Activity:

The participants will be divided into small groups. The groups will be advised to discuss on the emerging ICTs; types of communication (one way, two ways) they envisage; their specific use; and educational implications in the format given below,

Sr. No.	Name of ICT	Types of Communication (one, two way, Network based)	Specific use	Educational Implications

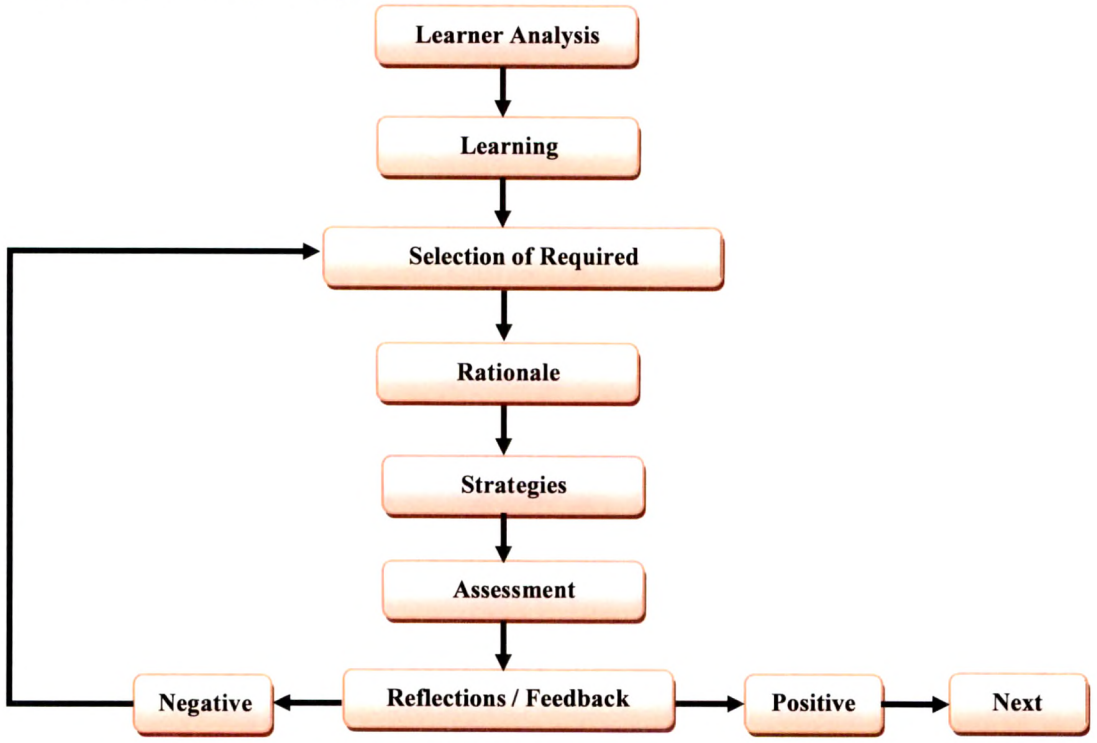
Integration of ICT in to Education

Integration of ICT into teaching and learning is not a new concept. It may be as old as other technologies such as radios or television. However with the rapid development of emerging technology, such as web technology, ICT integration has increasingly attracted the attention of educators. Mainly ICT in education is a tool or an Artifact. ICT is socially constructed. ICT used for continuous action and meaning making in the learning process, ICT in classroom go the view of constructivism, to make sense of one (ICT) other (Constructivist view) is required. Both are supplementary and complementary to each other.

In education only by handing out to students a collection of websites or CDs is certainly not ICT integration. In a properly crafted ICT integrated lesson, ICT and other crucial educational components such as content and pedagogy are molded into one entity. ICT integration can be broadly defined as the process of using any ICT (including information resources on the web, multimedia programs in CD-ROMs, learning objects or other tools) to enhance student learning. It is more of a process than a product. A simple placement of hardware and software will not make integration naturally follow. Numerous traditional classroom-based instructions with technology-enhanced instruction have found significant differences in student satisfaction, attitudes and learning outcomes. The computer should be fitted into the curriculum, not the curriculum in to the computer. Effective ICT integration into the learning process has the potential to engage learners. ICT can support various types of interactions: learner content, learner-learner, learner-teacher, and learner-interface. These types of interaction make the learning process more interactive and learners more active and engaged.

Model for the ICT Integration

There are many instructional design models available to integrate ICT in Education. The model of ICT integration requires teacher-designers to justify why the technology is used and how to effectively incorporate the technology.



Learner analysis

Learner analysis is the main point in any of the ICT integration model. Here the teacher has to analyze the learner in terms of requirements of the learner, requirement of the ICT, learner's level of learning. Learners' capacity of utilizing the given ICT and many more. Then the problem has to be found and should state authentically. It should describe the major issues in the topic. After knowing the needs of the learner the teacher has to discuss about the Learning objectives to be achieved.

Learning Objectives

Learning objectives specify the intended outcomes at the end of the topic. It is worth mentioning that the behavior in a learning- objective statement should be observable and measurable.

Selection of the required Technology

In order to address the problem and achieve the learning objectives, teacher's needs to carefully compare all possible technologies that can be used for learning the particular topic. The possible ICT tools like, multimedia courseware, web based resources, communication resources (chat, video conferencing, online forums, e-mail, mobile etc.), Web. 2 technologies and mind tools such as concept mapping tools, multimedia authoring tools, computer applications like word, power point presentation, Excel and many more applications can be used.

Need for using the Technology

Technology should be used not because it is available, but it should be used to enable the process and enhance the learning. The teachers who are integrating technology in their subject should know why it is needed there, what added advantages of integration, how the technology can support the instructional process. Improper use of technology may lead to negative effects so one needs to know the proper use of the Technology.

Strategies for the Implementation

After deciding purpose and the type of technology needed the teachers must have to decide that how to incorporate it effectively and meaningfully into the topic. Further, when designing an integration plan. The teachers also need to consider that, whether: The activities can promote students' critical thinking or other higher order thinking. The Students understand what they are supposed to learn.

Student Assessment

Usually at the end of the topic, the students will be assessed on how well that they have mastered the topic. The assessment should reflect both process and product. The assessment on the process examines how the student completes the learning activity, how they work together, how they construct knowledge collaboratively by using ICT. The assessment on the product aims at investigating the quality of the final outcomes, such as solutions to the problems, programs developed Power point presentation. Communicating and posting through weblog.

Reflections / Feedback

After conducting the ICT integrated lessons, the teachers need to reflect upon their learning experiences. The reflections can focus on the appropriateness of the technology used. Strengths and weaknesses of the technology and possible improvement. Additionally, the teachers can also provide further suggestions on how other teachers can use the lessons for different targets in the different contexts. These suggestions may include alternative technology, instructional methods and activities, assessment approaches and ways to improve the integration of ICT.

Once the feedback is positive, can go for the further objectives. If the reflections are negative, that finding some errors, then can go the selection of proper required technology,

Activity:

The learners will be divided into small groups, and will be asked to select the topic of their choice and prepare an ICT integration based on any model.

Instructional role of Information and Communication Technology

ICT alone of course, doesn't produce learning. Technology is a tool that can be used in many ways to enhance the learning. The literature generally describes three major categories of Instructional uses namely, learning from the Technology, Learning about the Technology and Learning with the Technology.

Learning from the Technology: The use of technology in this case reflects the traditional classroom practices; users are relatively passive, the content and interaction between user and the software are predetermined and there is a limited repertoire of acceptable responses. The acquisition of facts through repeated practice and rote memory or learning from the technology is the goal of instruction. It was in 1970's and 80's, but now CAI students usually learn more in less time with computer based instruction (Kulik, 1994).

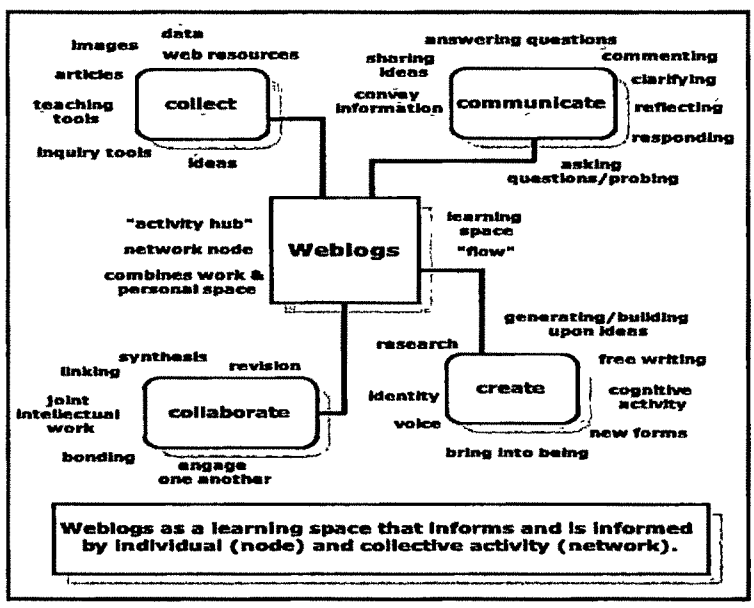
Learning about the Technology: Here classes in computer programming and computer literacy are designed to teach students how computer works. Students learn specific skills related to using the computer works. Jonassen (1996) observes that this use of technology is now less emphasized in schools. He attributed the changes to the increasing availability of computers in society that gives students more experiences on computers outside the school. The understanding that one doesn't have to know a computer work to take advantage of it as a tool.

Learning with the Technology: This drives much of the current thinking about use of technology to support learning (Jonassen, 1996). According to Bonk, Hay and Fischer (1996) "Currently popular ideas about students using electronic tools to be designers of knowledge are akin to Dewey's arguments that children can actively construct and interrelate knowledge by learning in more authentic ways". Technology used as a tool can serve as a means to seek and process information and to reflect on one's understandings, beliefs and thinking processes. It can use software such as, word processing, graphics, presentations, and database software, problem solving software, simulations, e-mail, and Internet. These encourage the accomplishments of creative, higher order tasks (Maddux & et.al., 1997). It acts as a mind tool that is computer based tool and learning environment that has been developed to act as intellectual partners with the learners in order to engage and facilitate critical thinking and higher order learning. (Jonassen, 1996).

Web.2 Technologies

Web 2. has been a hot topic since 2005. It was originally presented by O' Reilly Media, a well known media company publishing books and websites. And its phrase that refers to a new generation of web-based communities and hosted services such as social networking sites, wiki, communication tools and many more. These websites give web users an extensive space to reveal themselves such as sharing their experiences, views, opinions and interests as well as web users take advantage of web application technologies while they surf the web.

Web 2.0 is the network as platform, spanning all connected devices. Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an " architecture of participation," and going beyond the page metaphor of Web 1.0 to deliver rich user experiences (O' Reilly, 2005). Web 2.0 helps to read and to write, can be used as a platform, it provides rich experience, increases the participation, user-friendly interface, can interact with anyone through different platforms, one can upload, download the related information.



Source: http://www.weblogbrainst

Popular Examples of Web 2.0 Based Websites

Web 2.0 websites are built on participatory web based applications focusing basically on user experience and collaboration. Here are some websites utilizing the web 2.0 technologies:

1. **YouTube:** The concept of YouTube is very simple. It allows the users to share their videos with entire world and upload others.
2. **Wikipedia:** The most famous online encyclopedia where in the users contributes by writing the articles and definitions. It is completely edited and maintained by the users.
3. **MySpace:** This website allows users to create their own profile, blog, friend list and personal homepage adding whatever you want on it (text, images, videos, links, etc)
4. **Flicker:** This website allows users to upload their photographs and share it with anyone and everyone.
5. **Face book:** Face book is a social utility that connects people with friends and others who wok, study and live around them. People use Facebook to keep up with friends, upload an unlimited number of photos, share links and videos, and learn more about the people they meet.
6. **Wikispace:** It is free web hosting service; it is social writing platform for individuals. There are wikis for educators, teachers, students, administrators and many more. There is space for blogs called as wikispace blogs. learners and teachers can make use of this by collaborating with the people of similar interest.
7. **Twitter:** It is also online social networking service and micro blogging service that enables the users to share the information.

Types of web 2.0 tools

Forums

Early internet forums could be described as a web version of a newsgroup or electronic mailing list, allowing people to post messages and comment on other messages. Later developments resulted the newsgroups or individual lists, providing more than one forum dedicated to a particular topic. Forums perform a function similar to that of dial-up bulletin board systems.

Blogs

A blog can thought of as an online journal. The term blog is simply shortform of web log. Someone who communicates via a blog is known as a blogger and the network of blogs is known as the blogosphere. Blogs started as online diaries and have rapidly become highly interactive forum of communication. The bloggers can connect to reach readers and participate in various conversations. The typical blog combines text, images and links to other blogs, web pages and other media related to its topic. The ability of readers to leave comments in an interactive format is important part of many blogs. Blogs generally focus on one specific area of interest from academic investigations, spirituality, recipes, photography to personal experiences, diaries and hobbies. The user can delete one or more articles or even comments posted by another person.

Integrating with Teaching Learning Process

There are numerous unique ways that blogs can be implemented into the curriculum to promote student learning. You only need to use your creativity to determine how it might help meet student learning needs and how blogs could fit into your curriculum. The use of blogs for the purpose of education is by consulting http://edublogs.org/10-ways-to-your-edublog-to-teach/. (http://edublogs.org) This edublog provides different uses for the teacher and the tools to create their own blogs for teaching. edublogs provides the access to create and manage the student and teacher blogs, can be used as a tool for organizing the school events, experiments results, publications of teachers and students, discussions, allow everyone including parents to provide feedback and comment and can customize designs and can include videos, photos, slideshte, multimedia presentations.

Activity:

Create a blog of your own students and post some discussions on it.

Wikis

Wikipedia is important milestone in the history of ICT in education. A wiki is a Web page or site that can be modified by anyone who visits the site. Wikis are like traditional websites because they have a URL and they can contain text, images, hyperlinks and multimedia. They are unlike traditional Websites in that they are dynamic, meaning they

are easily manipulated by others and not just the owner of the website. A well known wiki is Wikipedia (http://www.wikipedia.com/), an online encyclopedia where contributors continually update and add to the entries. A wiki invites all the users to edit any page or to create new pages within the wiki web site. A wiki enables documents to be written collaboratively, in a simple markup language using the web browser. A single page in a wiki website is referred to as a wiki page; whiles the entire collection of pages, which are usually well interconnected by hyperlinks, is 'the wiki. A wiki essentially a database for creating, browsing and searching through information. Since anyone can contribute to wiki, the question arises of the accuracy of the information. So the relevant links have been provided on the site to enable the persons to edit or correct the errors, inaccuracies, misconceptions in order to maintain the reliability.

Integrating with Teaching Learning Process:

Wikis are being used as collaborative spaces where people share their work, as online journals, as discussion sites and even as a means to archive an individual's work. You can see a comparison of wiki software by going to the Wikipedia at http://en.wikipedia.org/wiki/comparison_of_wiki_software. Like blogs, wikis have the ability to provide students with a collaborative forum where they can write and share information. A wiki could be integrated as a learning tool into various curriculum areas where the goal is for students to share their knowledge in a collaborative manner. For example, students in science course could use a wiki to write their project report. This wiki could be accessed by each member of the group. The final report can make by taking the comments, suggestions and can be shared with the teacher. Students can get the details of it at http://en.wikipedia.org.

Activity:
Create a user page in any wiki site and upload the content and explain how you use wiki for learning.

E-mail

E-mail is an electronic mail. This e-mail technology can provide you to share your views, ideas and letters. Here you can upload pictures, graphics, hyperlinks, notes etc. it is the way of instant messaging and communication. This conversation takes place through various search engines or instant message Software's. Namely, Gmail, Yahoo, msn, Rediffmail, hotmail etc.

Activity:

Create an E-mail account of your own and explain the use of e-mail in the teaching learning process of science.

Social Networking

A number of social websites exists for the purpose of allowing people to learn more about and communicate with other people. These are known as Social networks or social spaces. A social network is a social structure made of individuals or organizations called nodes, which are connected by one or more specific types of interdependency such as friendship, kinship, financial exchange, likes and dislikes and many more. There are various social network sites through which one can keep contact, chat, exchange profile, ideas, and views about a particular topic of interest. Myspace, Facebook, Orkut, Zorphia, Twitter, Skype, Style, Hi Five and many such social networks are becoming famous. Here you can open your individual account and then post information. Members of the social space may search for other members who share similar interests and are located near them.

Activity:

Create an Account of your own in any one of the social networking service and share how you can interrelate with the Teaching learning process of science.

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Module II

Constructivist Learning Approach:

Introduction

The 20th century pedagogy was based on learning theories dominated by objectivism. Which consists of structured educational system, instructional objectives, teacher-centered education, drill and practice, reinforcement, remedial teaching with feedback, rote learning and memorization of facts objective assessment were the salient features. The goal of the education was acquisition of knowledge and skills. Teacher was more active and dominant, whereas, the students were passive recipients of information. And the teaching-learning strategy was mechanical and stereotypic. In the late 1970s and 1980s, many educationists began to criticize the teaching learning practice based on behaviorist school of thought. This was not able to develop the ability to work collaboratively, construct knowledge independently, and develop divergent thinking for discovering new knowledge among the both learners and teachers. As a result, constructivist pedagogy emerged in the world of educational scenario which believes that learning is knowledge construction by learners either independently or cooperatively when they are actively engaged in social experiences and activities. Realizing the importance of constructivism in education, the National Curriculum framework (2005) has emphasized the constructivist perspective, learning as a process of construction of knowledge. Learners actively construct their own knowledge by connecting new ideas to existing ideas on the basis of experiences provided to them.

History

In past centuries, constructivist ideas were not widely valued due to the perception that children's play was seen as aimless and of little importance. Jean Piaget did not agree with these traditional views, however. He saw play as an important and necessary part of the student's cognitive development and provided scientific evidence for his views. Today, constructivist theories are influential throughout much of the informal learning sector.

Some historical figures.\history of constructivism.docx that influenced constructivism: Giambattista Vico (1668–1744), Immanuel Kant (1724–1804), **John Dewey** (1859–1952), Maria Montessori (1870–1952), Władysław Strzemiński (1893–1952). **Jean Piaget**

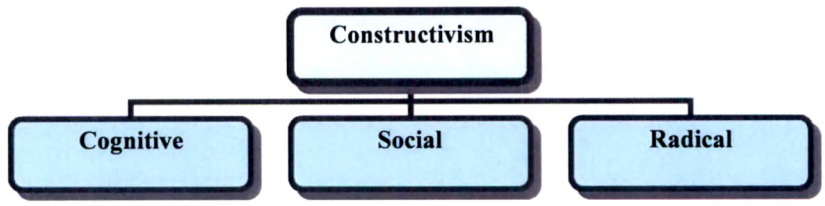
(1896–1980), Lev **Vygotsky** (1896–1934), Heinz von Foerster (1911–2002), **Jerome Bruner** (1915-), Herbert Simon (1916–2001), Paul Watzlawick (1921–2007), Ernst von Glasersfeld (1917–2010), Edgar Morin (1921-).

Concept

Constructivism has roots in Philosophy, Education and Psychology. Constructivism criticizes objectivism which embraces the belief that a human can come to know external reality, but constructivism holds the opposite view, that the only reality we can know is that which is represented by human thought. The term Constructivism refers to the idea that individuals through their own interaction with the environment construct their own knowledge and meaning. (Gale and Steff, 1995; Fosnot, 1996). This metaphor of construction comes from the idea that humans are Builders, Shapers and Designers. Constructivists believe that knowledge is the result of individual construction reality (Brooks, 1990). Thus constructivism emphasizes understanding active learners already possess and the application of understanding to authentic situations. (Brophy and Good, 1994). The student centered learning has emerged based on cognitive learning resources and influence of several theories that have developed our understanding of nature and context of learning. In student-centered environment the learner interacts with the other students, the teacher, information resources and Technology. The environment provides the learner with coaching and scaffolding in developing knowledge and skills. It provides a rich collaborative environment enabling the learner to consider the diverse and multiple perspectives to address issues and solve problems. It also provides opportunities for the student to reflect on his or her learning. This learning process is based on research that has emerged from theoretical frameworks related to human learning. Here learners are active agents who engage in own knowledge construction by integrating new information into their Schema or mental structures. The learning process is seen as a process of meaning making in socially, culturally, historically and politically situated contexts. In a constructivist learning environment students construct their own knowledge by testing ideas approaches based on their prior knowledge and experience, applying these to new tasks, contexts and situations and integrating the new knowledge gained with the pre-existing intellectual constructs.

Types

There are three deferent views on constructivism:



Cognitive constructivism is based on Piaget's work. It focuses on internal, individual constructions of knowledge. Cognitive constructivism is based on Piaget's work. It focuses on internal, individual constructions of knowledge. It emphasizes learning activities that are child determined and discovery oriented. Intellect is product of evolutionary adaptation

Social constructivism assumes that knowledge is socially constructed reality that emerges from social interaction and language. It is a shared meaning rather than an individual experience. *Lev Vygotsky* says 'through others we become ourselves'.

Radical constructivism postulates that knowledge is explored from individual experience without information given. It calls for students to generate new solutions to the problem by going beyond the information through formulating and verifying hypotheses. Radical constructivism is radical, because it breaks with convention and develops a theory of knowledge in which knowledge does not reflect an objective ontological reality, but exclusively an ordering and organization of a world constituted by our experience. The radical constructivist has relinquished metaphysical realism once and for all (Von Glasesfeld, 1987, p. 199).

Objectives

- Provide experience with the knowledge construction process.
- Embed learning experience in and appreciation for multiple perspectives.
- Encourage ownership and voice in the learning process.
- Embed learning in social experience.
- Encourage use of multiple modes of representations.
- Encourage self awareness in the knowledge construction (Honobein, 1996)
- Explain the various constructivist instructional strategies.
- Realize the role of teachers in constructivist environment.

Principles / Characteristics of Constructivism

- Learning is a search for meaning. Therefore, learning must start with the issues around which students are actively trying to construct meaning.
- Meaning requires understanding wholes as well as parts. And parts must be understood in the context of wholes. Therefore, the learning process focuses on primary concepts, not isolated facts.
- In order to teach well, we must understand the mental models that students use to perceive the world and the assumptions they make to support those models.
- The purpose of learning is for an individual to construct his or her own meaning, not just memorize the "right" answers and regurgitate someone else's meaning. Since education is inherently interdisciplinary, the only valuable way to measure learning is to make the assessment part of the learning process, ensuring it provides students with information on the quality of their learning.
- Learning involves reflective activity. According to John Dewey these are activities that engage both the motor and logical skills.
- Learning involves language. According to Lev Vygotsky , language and learning are inextricably intertwined as the language we use affects our learning.
- Learning is a social activity. Learning is intimately associated with connection to other human beings: teachers, classmates, family, etc.
- Learning is contextual: we learn in relationship to what else we know, what we believe, our prejudices and our fears.
- Learning is a process. For learning to happen students need time to digest new information, ponder on them and try them out.
- Learning requires self-motivation. Motivation is a key component to learning.

Brooks and Brooks (1993) has given principles of constructivist learning environments like,

1. Acceptation of students' prior knowledge.
2. Curriculum is presented from whole to part with emphasis on broader concept.
3. Pursuit of student questions are highly valued
4. Curricular activities rely heavily on primary sources of data and manipulative materials.

5. Students are viewed as thinkers with emerging theories about the world.
6. Teachers generally behave in an interactive manner, mediating the environment for students.
7. Teachers seek the students' prior view in order to understand students' present conceptions for use in subsequent lessons.
8. Principle of un-structured or ill- structured knowledge domain which bears significance for designing curriculum for constructivist classroom.
9. Principle of problem oriented activities.
10. Principle of assimilation when it is held that learners construct knowledge by relating new information to the existing knowledge which they already possess.
11. Learning is meaningful to children when it scaffolds on experiences they have already with them.
12. Principle of Active learning, i.e. learning by doing.
13. Principle of collaborative, cooperative learning.
14. Principle of social interactions.
15. Assessment of student learning is interwoven with teaching and occurs through teacher observations of students at work (Murphy 1997).

Activity:
The learners will be divided into small groups and each group will have reflective dialogue on the basic principles of constructivism.

Constructivist Learning Intervention

The Nature of the Learner

The Learner as a Unique Individual

Social constructivism views each learner as a unique individual with unique needs and backgrounds. The learner is also seen as complex and multidimensional. Social constructivism not only acknowledges the uniqueness and complexity of the learner, but actually encourages, utilizes and rewards it as an integral part of the learning process (Wertsch 1997). Each and every learner comes to class with certain inheritance characteristics based on their culture and background. NCF (2005) views learner as a discoverer or scientist. Kelly (1995) also views that every person is a scientist. So in the constructivist classrooms the learners are unique in their characteristics.

The Responsibility for Learning

Furthermore, it is argued that the responsibility of learning should reside increasingly with the learner (Glasersfeld, 1989). Social constructivism thus emphasizes the importance of the learner being actively involved in the learning process, unlike previous educational viewpoints where the responsibility rested with the instructor to teach and where the learner played a passive, receptive role. But the teacher are not completely passing the responsibility of learning on learners, they are also equally responsible. The learner's construct their own understanding and those they do not simply mirror and reflect what they read. Learners look for meaning and will try to find regularity and order in the events of the world even in the absence of full or complete information.

The Motivation for Learning

Another crucial assumption regarding the nature of the learner concerns the level and source of motivation for learning. According to Von Glasersfeld (1989) sustaining motivation to learn is strongly dependent on the learner's confidence in his or her potential for learning. This links up with Vygotsky's "zone of proximal development" (Vygotsky 1978) where learners are challenged within close proximity to, yet slightly above, their current level of development. By experiencing the successful completion of challenging tasks, learners gain confidence and motivation to embark on more complex challenges. The success of earlier simple task also motivates them for the undertaking of some more complex tasks.

The Role of the Instructor

Constructivist teachers are as facilitators

1. Encourage and accept student autonomy and initiative.
2. Use raw data and primary sources, along with manipulative, interactive, and physical materials.
3. Use cognitive terminology such "classify," "analyze," "predict," and "create" when framing Tasks.
4. Allow student responses to drive lessons, shift instructional strategies, and alter content.
5. Inquire about students' understandings of concepts before sharing their own. Understanding of those concepts.

6. Encourage students to engage in dialogue, both with the teacher and with one another.
7. Encourage student inquiry by asking thoughtful, open-ended questions and Encouraging students to ask questions of each other.
8. Seek elaboration of students' initial responses.
9. Engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion.
10. Allow significant wait time after posing questions.
11. Provide time for students to construct relationships and create metaphors.
12. Nurture students' natural curiosity through frequent use of the learning cycle model.

The Nature of the Learning Process

Learning is an active and social process, Vygotsky says that knowledge is first constructed in a social context and is then appropriated by individuals. Students are no more students they are learners, teachers are facilitators. There is always dynamic interaction between the learner, facilitator, and the learning process. It is a shared enterprise. Learning occurs with the interaction of the pupil in the classroom, with the adults and with the physical world outside the class. Learners learn new things by connecting it to prior knowledge about the idea. Learners are not empty vessels to be filled in, they actively learn, and metacognise their capability. There will be collaboration among the learners with different skills and backgrounds to arrive at a shared understanding of the truth in a specific field The knowledge constructed in the process of learning should be discovered as an integrated whole, it should never be divided into compartments. Constructivist learning environment emphasizes knowledge construction in a wholistic way. In constructivist learning the learners express their current thinking, interact with objects, organisms, substances, and equipment to develop a range of experiences on which to base their thinking. Reflect on their thinking by writing and expressing themselves and comparing what they think with what others think, and make connections between their learning experiences and the real world.

Constructivist View of Assessment:

In the constructivist practices the assessment is the dynamic one, which is the opportunity for the learner to get understanding the concept. It is a way of assessing the true potential of learners. The assessment is also a interactive process between teacher and learner. The continuous and comprehensive assessment is done in the classes. The observation as tool of assessment plays a significant role. Varity of assessment practices are used in the constructivist classes for the diverse learners. It is the continuous dialogue for the improvement of the learning process. Here the assessment is not only of the learners, but also of the teacher, classroom environment, strategies used and the learning content. The assessment is to learn and to learn is to assessment. It is the combined process. The feedback and results may help for the further development not for the punishment. The ways of finding out what the children understand and how do they understand is really a good form of assessment. Formal testing at the end of the class often gives limited information about the development of the pupils' understanding; it is possible through formative assessment that the real understanding can be assessed in order to improve the students learning. Vygotsky (1978) further claimed that instruction is good only when it proceeds ahead of development. Then it awakens and rouses to life an entire set of functions in the stage of maturing, which lie in the zone of proximal development. It is in this way that instruction plays an extremely important role in development.

Essential features of Constructivist Classes in terms of Learner and Teacher instruction Relationship

Essential Learners Features	**Variations**			
Learner engages in scientifically oriented questions	Learner poses a question	Learner selects among questions, poses new questions	Learner sharpens or clarifies a question provided by the teacher, materials, or other source	Learner engages in a question provided by the teacher, materials, or other source
Learner gives priority to evidence in responding to questions	Learner determines what constitutes evidence and collects it	Learner is directed to collect certain data	Learner is given data and asked to analyze	Learner is given data and told how to analyze
Learner formulates explanations from evidence	Learner formulates explanations after summarizing evidence	Learner is guided in process of formulating explanations from evidence	Learner is given possible ways to use evidence to formulate explanation	Learner is provided with evidence
Learner connects explanations to scientific knowledge	Learner independently examines other resources and forms the links to explanations	Learner is directed toward areas and sources of scientific knowledge	Learner is given possible connections	
Learner communicates and justifies explanations	Learner forms reasonable and logical argument to communicate explanation	Learner is coached in development of communication	Learner is provided broad guidelines to use to sharpen communication	Learner is given steps and procedures for communication

More <---------- Amount of Learner Self-Direction----------> Less

Less <---------- Amount of Direction from Teacher or Material ----------> More

(Source: National Research Council. 2002.)*Inquiry and the National Science Education Standards: A Guide for Teaching and Learning*. Washington, D.C.: National Academy Press.)

Activity

After understanding the role of teachers, students and environment, learners will be grouped into small groups and asked to create constructivist environment on selected topics of their choice and discuss the role of teachers and students on

Specific Approaches to Education that are based on Constructivism include:

- **Reciprocal Learning:** To teach each other.
- **Procedural Facilitations:** For Writing
- **Critical Exploration:** (Duckworth, 2006) the two components of critical exploration are curriculum development and pedagogy. In this method teachers find ways to encourage their students to explore the subject matter and express their thoughts on the material.
- **Cognitively Guided Instruction:** A research and teacher professional development program in elementary mathematics created by Thomas P. Carpenter, Elizabeth Fennema, and their colleagues at the University of Wisconsin-Madison. Its major premise is that teachers can use students' informal strategies (i.e., strategies students construct based on their understanding of everyday situations, such as losing marbles or picking flowers) as a primary basis for teaching mathematics in the elementary grades.
- **Inquiry-based Learning**
- **Problem-based Learning**
- **Experiential Learning**
- **Cognitive Apprenticeships**
- **Various methods involving Collaboration or Group Work**
- **Cooperative learning Anchored Instruction** (Bransford et al.)
- **Cognitive Apprenticeship:** (Collins et al.)
  - ✓ Learning is achieved by integration into a specific implicit and explicit culture of knowledge.
  - ✓ Six features of cognitive apprenticeships: modeling of the performance, support through coaching/tutoring, scaffolding, students articulate knowledge, reflection on progress, exploration of new applications. (Woolfolk, 2010).

Various Constructivist learning Designs

There are many constructivist design models developed by different educationists and many of these are being used and researched up on.

1. Constructivist learning design

A constructivist learning design was developed by George W. Gagnon.Jr. Michelle Collay. It includes six steps namely,

- **Situation:** developing goals, tasks and curriculum standards.
- **Grouping:** group students and materials and use of cooperative learning.
- **Bridge:** recall prior knowledge, skills, values, motivation and expressions.
- **Task:** use of higher level thinking skills and problem based learning.
- **Exhibit:** arrange student's portfolios and work samples.
- **Reflections:** synthesize critical thinking and knowledge.

2. The Information Construction Model:

This model is developed by John B. Black and Robert McClinton of Columbia University. This ICON Model includes seven steps namely,

- **Observation:** Learners make observations of authentic artifacts anchored in authentic situations.
- **Interpretation Construction:** students construct interpretations of observations and construct arguments for the validity of their interpretations.
- **Contextualization:** students access background and contextual materials of various sorts to aid interpretation and argumentation
- **Cognitive Apprenticeship:** Students serve as apprentices to teachers to master observation, interpretation and contextualization.
- **Multiple interpretations:** students gain cognitive flexibility by being explosed to multiple interpretations.
- **Multiple Manifestations:** Students gain transferability by seeing multiple manifestations of the same interpretations.

3.

Stages	Description	Participants	Work
Context & Metaphor	Creating rich and real contexts for learning, and creating metaphors to make the content concrete.	Teacher – Learners	Activities
Posing Problems & Questions	Posing real problems on which students work and asking directive, thoughtful, open-ended questions, and encouraging students to create/ask questions to each other. Use of technology.	Teacher -Learners Learner - Content - Technology	Individual, Collaboration
Discussion	Peer or group work, interaction to reveal previous knowledge, "classify," "analyze," "predict," and "create." Content Analysis, social interaction, think and act like experts.	Learners Learner - Content	Collaboration
Consolidation	Combination of what the peers/groups created through collaboration and cooperation on the board or any hyper environment. Exemplifying the multiple perspective and reality.	Learners	Collaboration
Concept Introduction & Contradiction	Introducing a new concept, bringing a new solution and a new perspective to the problem, scaffolding, activating the formal and abstract *schemata,* creating clash between old and new knowledge.	Teacher -Learners - Technology	Individual
Links	Creating links between prior knowledge and new knowledge, creating links beyond school context (construction of knowledge) Process of enculturation, anchored instruction.	Learners Learner - Content	Individual, Collaboration
Utilizing	Thoughtful process in which students must use their minds as sculpting tools to chisel and refine concepts and ideas so that they are useful and relevant, projects, real outcomes.	Learners Learner –Content Learner – Technology	Individual, Collaboration
Reflection	Reflection on learning process, self-reflexive process.	Learners	Individual
Evaluation & Extension	Evaluating the learning process by teacher and students, context dependent, process-oriented.	Teacher -Learners Learner – New Content Learner –Teacher Technology	Individual Collaboration

The 5E Approach

The Biological Science Curriculum Study (BSCS), Roger Bybee in developed an instructional model for constructivism, called Five Es. These 5 Es represent five stages of a sequence for teaching learning. Namely,

1. Engage

Activities which will focus student's attention, stimulate their thinking, generate interest, access prior knowledge and frame the setting for learning. This stage stimulates curiosity and activates prior knowledge of student. The activity should be a problem or an event that raises questions and motivates students to discover more about the concept. This stage helps in make connections between past and present learning experiences. Anticipate activities and focus students' thinking on the learning outcomes of current activities. Students should become mentally engaged in the concept, process or skill to be learned. It gives opportunities for teachers to understand misconception of students.

Suggested Activities

- Demonstration/Question
- Brainstorming
- Using Manipulative
- Graphic organizers
- Manipulative activity
- Interactive Reading

2. Explore

It Provides students with a common base of experiences. They identify and develop concepts, processes, and skills. During this phase, students actively explore their environment or manipulate materials. Activity which give students time to experience, think and investigate, probe, inquire, collect information, question, test, make decisions establishing relationships and understandings, and problem solve.

Suggested Activities

- Perform an Investigation
- Construct a Model
- Learn and practice a skill
- Read collaboratively

3. Explain

Activity which allows students to analyze their exploration and communicate new understandings. Student's understanding is clarified and modified through a reflective activity.

Helps students explain the concepts they have been exploring. They have opportunities to verbalize their conceptual understanding or to demonstrate new skills or behaviors. This phase also provides opportunities for teachers to introduce formal terms, definitions, and explanations for concepts, processes, skills, or behaviors.

Suggested Activities

- Student Analysis & Explanation
- Supporting Ideas with Evidence
- Thinking Skill Activities: compare, classify, error analysis, and interpret

4. Elaborate

Activity which expands and solidifies student thinking and/or applies it to a real-world situation. Student communicates new understanding with formal academic language. Extends students' conceptual understanding and allows them to practice skills and behaviors. Through new experiences, the learners develop deeper and broader understanding of major concepts; obtain more information about areas of interest and refine their skills. Students are encouraged to apply, extend and enhance the new concept and related terms during interaction with the teacher and other students.

Suggested Activities

- Problem Solving within a new context
- Decision Making
- Experimental Inquiry
- Thinking Skill Activities: compare, classify, apply, judge, conclude, synthesize and extend
- Extended Reading

5. Evaluate

Activity which allows the teacher to assess student performance and/or understandings of concepts, skills, processes, and applications. Student is demonstrating evidence of understanding.

This encourages learners to access their understanding and abilities and lets teacher evaluate students' understanding of the topic. The students must also be able to reflect on their own understanding and process.

Suggested Activities

- Develop a Scoring Tool or Rubric
- Performance Assessment
- Produce a Product
- Journal Entry
- Portfolio
- Pose new questions

The 7E Approach

A proposed 7E model emphasizes "transfer of learning" and the importance of eliciting prior understanding. This is the extension of the 5E model, and 7E model was proposed by Arthur Eisenkraft. Here Elicit and Extend have been added initially and al last respectively. Their stages of the 7 E model are as follows,

- **Elicit:** Here teacher has to uncover the prior understanding and knowledge and experiences of the learner.
- **Engage**
- **Explore**
- **Explain**
- **Elaborate**
- **Evaluate**
- **Extend:** Here the students will extend the idea to other related areas and relate the ideas to other concepts.

Resources for further exploration

http://www.edutopia.org/project_based_learning_research

http://faculty.plattsburgh.edu/william.gaeddert/images/M13-1c2.jpg

http://www.studentretentioncenter.ucla.edu/sfiles/articletemplate7_clip_image001.jpg

http://www.schoolshistory.org.uk/hitler1.jpg

http://www.historyonthenet.com/WW1/images/wpvd724u.jpg

http://encyclopedia.laborlawtalk.com/wiki/images/4/48/Inflation-1923-small.jpg

http://iisme.5ecommunity.org/

http://www.coe.missouri.edu:80tiger.coe.missouri.edu/

http://www.gwu.edu/~tip/bruner.html

Activity:

Learners are divided into small groups and asked to select a topic of their choice and prepare lesson plans based on any constructivist model and group leader has to present it in the classroom.

Module III

ICT Aided Constructivist Learning Approach:

The technology can support constructivist learning environment. When technology is used as a tool for learning rather than the object of instruction or as the instructor, it can assist the teacher to uncover students' prior knowledge, understanding and beliefs. Take on the role of the facilitator; increase the ability of the students to test multiple scenarios and thus challenge the preconceived notions, misconceptions and broaden the circle of social interaction to include students, peers and experts beyond the classroom, the school, the community and even their country. Constructivism transforms the student from a passive recipient of information to active participant of in the learning process. Students construct their own knowledge from the teacher or the text book. Its primary goal is helping the students to learn how to learn. Internet technology has made a substantial contribution to education. The emphasis has shifted from Computer Based Learning (CBL) and Computer Assisted Learning (CAI) to internet based learning. The students should be engaged in learning science as a composite discipline, in working with hands and tools to design more advanced technological modules than at the Upper primary stage, and in activities and analysis on issues surrounding environment and health. Systematic experimentation as a tool to discover/verify theoretical principles, and working on locally significant projects involving science and technology are to be important parts of the Curriculum at this stage. So this module is also working with the same.

Here in this program the idea of constructivism will be supported by Information and Communication Technologies (ICT) wherever feels its need. Students will construct the knowledge better when they work themselves with the support of teacher or any resource. And students develop interest when their learning is also supported with the modern technologies. When they work in small groups, not only they understand and construct the concept but also they can communicate among the group members, they develop various skills like leadership, communication, risk taking, trust building, decision making, conflict management, sympathy, empathy and values like honesty, self-respect, respect to others, cooperation, collaboration and many other values.

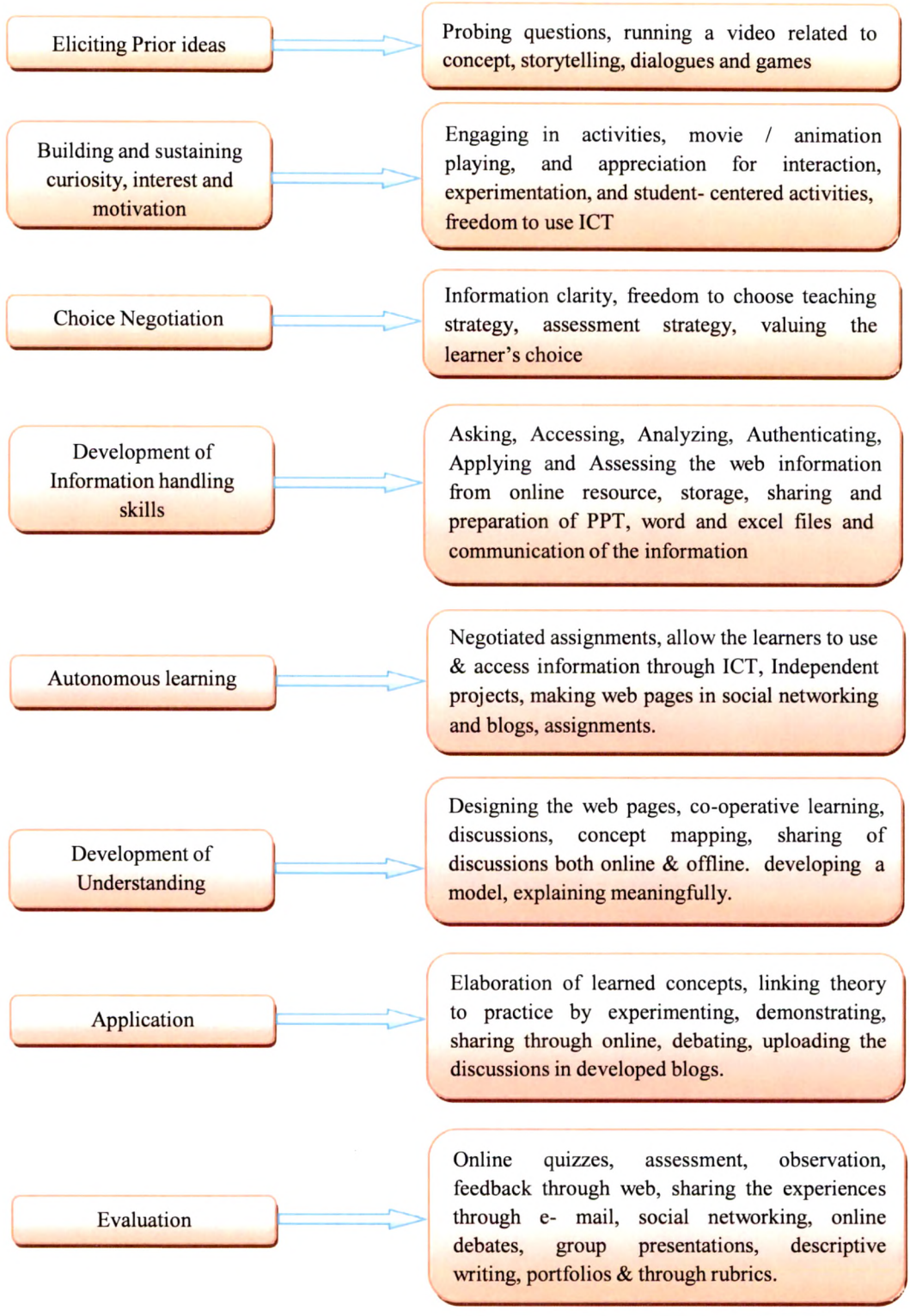
ICT has the potential to transform the nature of education, the role of the teacher, student, learning processes and the curriculum. The UNESCO, 1998 World Education Report, Teacher and Teaching in the Changing World describes the radical transformation of teaching learning process and the way teachers and learners gain access to information. With the emerging digital technologies the teaching profession is evolving from teacher-centered to learner-centered learning environment. In order to take the full advantage of technology in teaching learning it is essential that pre-service and in-service teachers effectively use these new tools of learning. Teacher education institutes and programs must provide the leadership to the pre-service and in-service teachers in this direction. To accomplish or to achieve all these goals it requires both a change in the traditional views of learning process and an understanding of how the technology can create new learning environment in which students are engaged learners, able to take greater responsibility for their own learning and construct their own knowledge through the constructivist learning environment. The aim of the educators should go beyond specialized training of craftsmen and factory workers. The only true education is one where all crafts, science; technologies are linked and facilitate mutual cognitive development, productive creativity and personal growth. So, we need teachers who are maters not only in technology but also in the content, pedagogy and above all they should be humane.

Objectives

After this module the learners will be able to,

- Explain what are the different web technologies
- Integrate the science concepts with ICT's.
- Apply virtual learning applications of Web technologies with the classroom teaching of science.
- Participate in the webinars, professional forums and edublogs
- Discuss the science issues on social networking sites.
- Assess the students in terms of various different tools, concept maps, rubrics and many more.

Strategies of Using ICT in Constructivist Classroom



Activity:
Share your experiences of ICT's and Constructivist principles and possible ways of integrating them in science concepts in the classroom as well as through e-mail, social networks and through blogs.

Group Discussion: Based on the above activity the all the learners discuss and present their views.

Activity:
All the learners are asked to prepare ICT Aided constructivist lesson plans after going through the examples given below.

Model Lesson Plans for the ICT Aided Constructivist Leaning Approach

1. Food Chain

Objectives

Students will be able to

- identify food chains of different environment
- construct a simple food chain
- differentiate between producers and consumers
- build relationship between producers-primary consumers-secondary-tertiary consumers
- site different examples of food chain
- access the internet to get resources and pictures of organisms in particular food chain,
- post the examples and discussions in their blogs

The steps followed,

Engagement

The teacher will start engaging the students by showing pictures and videos of a forest environment and the students to watch the happening events in the picture/video carefully. And watching the video the teacher asks the students to list out the events happened in the movie.

Immediately after watching the video all the students gets engaged themselves working on all characteristics found in the video on http://www.yourdiscovery.com/ and http://www.bbc.co.uk/schools/ks2bitesize/science/revision_bites/food_chains.shtml and its description.

Exploration

Teacher will provide the pictures and study materials related to the picture/video shown to the students. Teacher asks the students to tell the each list prepared, each students gives their list of all the events found namely, Nature, Forests, animals moving and grazing in the forest, animal's food habits, their habitats, their interdependency with the other animals and with the environment.

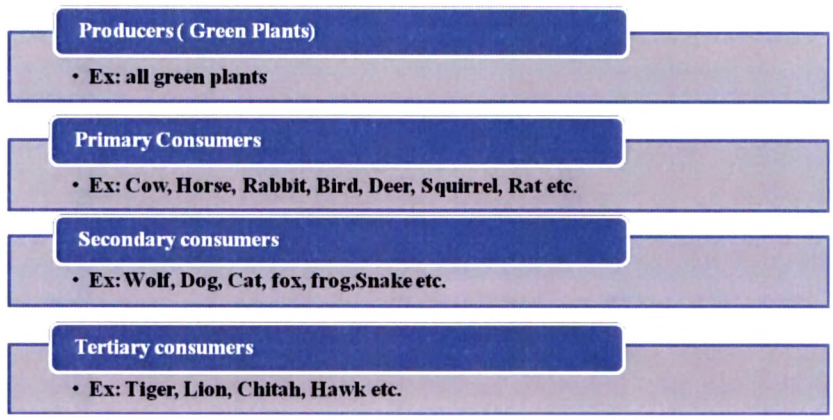
The teacher asks the students to compare the video watched and the material or literature and various names of the websites given and they relate them. The students will discuss among themselves about various interrelations between themselves and with the nature, food resources for all the animals and accordingly they told to draw the flow chart based on their food habit and the same will be done on the black board by the students. Thus the students finally understand that how various organisms are depending upon the each other and how nature balances them.

Explanation

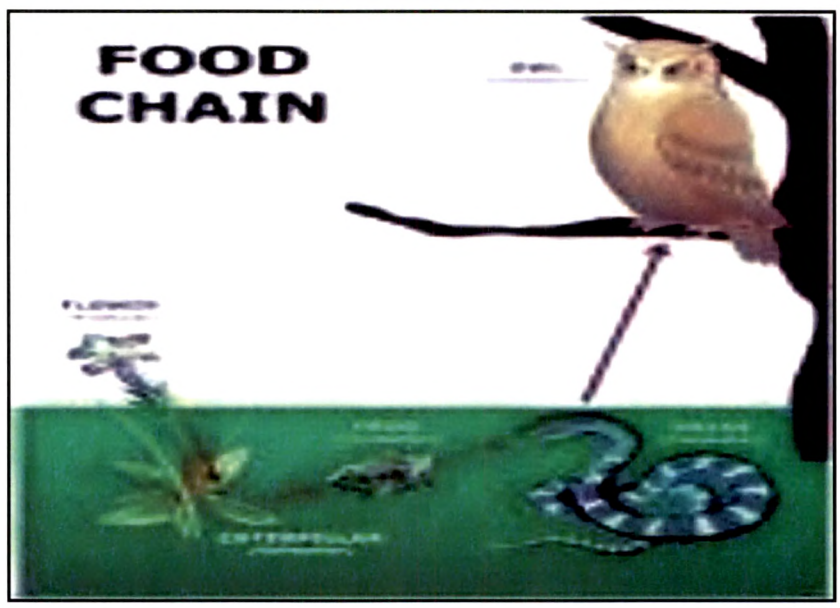
After all, the rough ideas are generated; the teacher will make them clear by explaining the food habits of all organisms, interdependency of all organisms among themselves and with the nature, the food chain phenomenon, transfer of energy in the food chain. Then by drawing the examples of food chain by the students, the teacher will explain the phenomenon.

Example: the Lion in the forest depends on deer, wolf and other animals for its food. The wolf depends on rabbits, birds, deers and other small animals, and these rabbits, deer's are depending on the green plants for their food. In turn all the animals are depending on the green plants as food resource. Here the green plants are producers, rabbits, deer's are primary consumers, wolf as a secondary consumer, and Lions, Tigers are tertiary consumers and accordingly the energy will transfer from producers to primary, secondary, and tertiary consumers. The teacher will draw the flow chart of the food chain with the help of student's ideas and examples as;

i. Food chain found in the Forest Environment



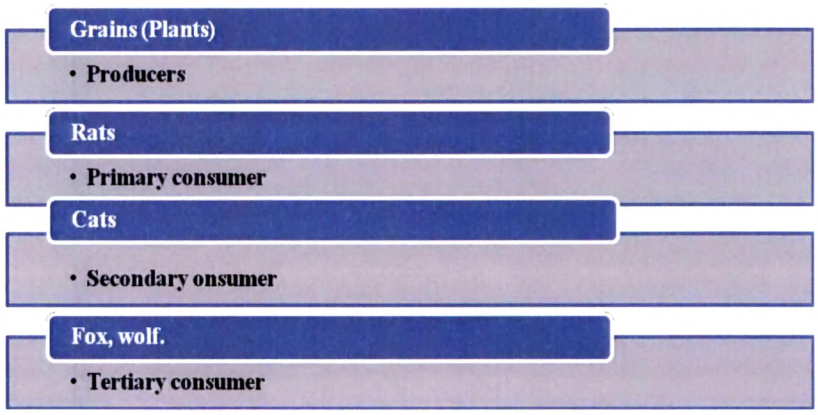
ii. Food chain found in the Forest Environment



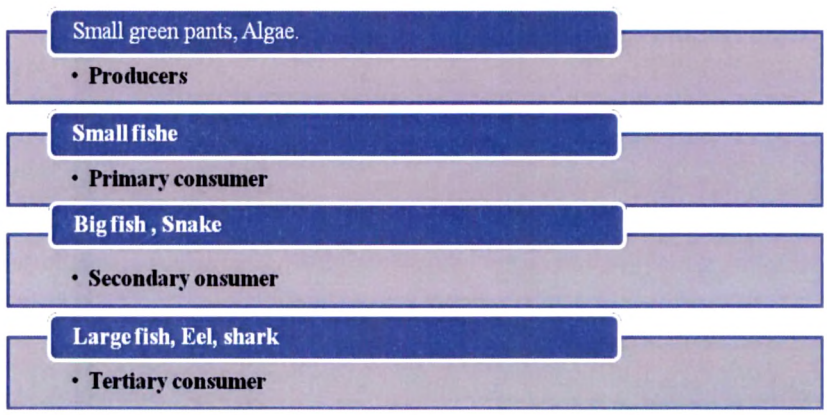
Extension

After discussing with the students about the phenomenon of the food chain and its examples, the teacher will asks some questions to the students like, to give various other examples found in various surrounding environmental situations found in day to day life, and to draw the food chain flow chart of each of them.

One of the students gave the example of the rat and cat explaining, the food grains will be eaten by the rat, the rat will be food for the cat, the cat become food for dog, fox etc. it is diagrammatically presented as,



Another student gave the example of water environment food chain i.e., in water environment the water surface is having the algae and other small plants are growing and these are the producers. These will become food for the some of the small fishes called primary consumers, and these small fishes will be food for the other snakes and big fishes, crabs etc. these are secondary consumers. And there are many large fishes, eels, sharks will prey these other secondary consumers and acts as tertiary consumers. And it drawn as,



After the discussion the teacher will take the students to virtual field trip (w4.nkcsd.k12.mo.us/~mkurbin/VirtualFieldTrips.htm) to show more food chain examples. The teacher will also provide various links of websites to go through the related concept and examples of food chain and discuss among themselves, collect information, pictures and note down the important points. Students will share the same information, experience, knowledge and pictures with their own peer group by making the presentations and through posting in their blogs and through their e-mail.

The teacher asks the students that in modern days how the natural balance, natural food chain system is breaking? What are the reasons for this imbalance? What are side effects we are facing due to this natural imbalance? And what measures to be taken to make it balanced? How to educate the man to not to disturb the natural balance? For all such kind of questions the students in group discusses and narrates various possible solutions to save the nature and natural balance.

Evaluation

Here in the evaluation process, the teacher will go for both the formative and summative evaluation. The teacher will formulate certain questions like multiple choice items, wherein students have to select the relevant answer. Teacher gives the online activity on food chain through the website BBC-KS2Bite size science-food chains-activity http://www.bbc.co.uk/schools/ks2bitesize/science/living_things/food_chains?play.shtml.

Students will be asked to collect the pictures, photographs of food chain. Students will be asked to draw the flow chart of the various different examples of food chain. Students will be evaluated when they are presenting the information about the food chain in the group discussions through evaluative rubrics. Students will be asked to prepare the models for showing the examples of food chain. Teacher will check the blogs where in students will post their experiences, information and comments.

2. Energy Resources

Objectives

The teacher will engage the students in the class by giving some experiences that Everyday students observe the food cooked at home, electricity used for the various purposes and so on. When asked to share these experiences to attempt another similar task. They are engaged in the activity of recollecting the different sources of energy that they have already experienced. All the students get engaged in work in the class, and also go through the certain pictures of sources of energy resources.

Teacher: List down the different types of energy resources you have observed in the home and outside.

Students (S1, S2, S3 & S4): Individually students will prepare the list.

Teacher: Teacher forms different groups and directs them to discuss and come out with the list, given below is one of the list, for example,

- Natural gas
- Coal
- Petrol
- Diesel
- Kerosene
- Lubricants
- Firewood
- Biogas
- Hydropower
- Geothermal power

When one group of students have not listed a few (Geothermal, Nuclear power), then the teacher has to provide the clues,

Tr: Do you know the water springs?

St 1: Yes.

Tr: What the reason they are found in nature?

Sts: No response.

Tr: As we go deep into the earths' surface, the temperature rises, sometimes this energy may itself in the form of hot spring, could it be a source of energy?

St 3: May be!

St 2: Yes, it is a source of energy.

Tr: What form of energy it could be?

St 2: Heat energy.

Tr: Reforms the answer, this form of energy is known as geothermal energy.

Like this the teacher elicits the other energy resources (nuclear) which is listed. The teacher shows a video of different energy resources and information about them, and asks the student to observe carefully using the link www.energyquest.ca.gov/story/chapter08.html

Tr: List down the different uses of energy resources and provide supportive evidence in the form of pictures, diagrams and cartoons etc.

Students are involved in the assigned task in different small groups .

Tr: Have all students completed the task?

St: Yes... No.....

Tr: Inspects them and asks the students to write them on the board.

Teacher will discuss in groups that, at various places the energy resources are situated worldwide. Teacher continues the process by assigning students to refer different resource materials and asks them to search in different websites and share the information among themselves virtually through wiki spaces, blogs, social networks and e-mail and also in the classrooms.

All the students work on internet, collect information regarding energy resources and share among themselves.

Student groups will give various list of energy resources like,

- Petrol, Diesel, Kerosene, Lubricants.
- Natural gas, Biogas, Firewood, coal.
- Hydropower, Tidal Power.
- Solar energy, Wind energy.

- Nuclear power, Geo thermal power.

  (There could be many other such classifications).

Tr: On the basis of these classifications of energy resources and directs them to write the advantages and disadvantages.

All the students involved in the process and listed them, while the students engaged in individual and group activity, the teacher evaluates them during the process, at the end of teacher prepares a test to evaluate the student learning.

3. Oil and Environment

Topic: What are the Environmental impacts of petroleum products and consumption?

Objective

Student will discover the changes in the petroleum industry practice during the past 50 years. Students will learn of the control and technological innovations that have been impacted to take better care of the natural environment, future concerns and alternatives.

Materials

- Books on Oil and Natural Gas.
- ICT with Internet facility

Engagement

Teacher will engage there class by citing with the present situation of oil and its demand, by showing a video (http://energyquest.ca.gov/movieroom/index.html) of daily life activities, uses of oil and petroleum and how it is necessary for the life. Teacher will glance over that with the world's current demand on oil and gas running about 86 million barrels a day. Which is equivalent to approximately 40,000 gallons in a second, then how do we meet the challenge of future demands? Let's look at the facts we have.

Exploration

Teacher will assign groups of students to work together as a team; the teams have to make presentations after collection of information on certain subtopics under the main title.

Students can use the useful websites given and students have to tell the results of their work.

Websites: http://energyquest.ca.gov/index.html
http://www.fwee.org/
http://www.need.org/

Explanation

Teacher will explain certain important facts of oil and environment by using the video results, text books and by referring the other materials and teacher selects one member to be the leader of the group and his job will be to manage his group and keep everyone on track of work assigned. Each group has to prepare the PowerPoint, posters, diagrams related to,

- The present demand and consumption of oil.
- Oil and the environment.
- How the oil can be drilled from the oceans.
- What are the some of the initiative oil and gas companies have used to protect our future generations, and many more concepts.

Extension

In the extension part the teacher will extend the knowledge of oil and environment to other situations and provide more information regarding the energy resource. Teacher will also explain about the uses of these resources with the help of student's reaction to the above questions. Teacher will provide useful websites like, www.energy4me.org, 42explore.com/recycle.htm, niehs.nih.gov/kids/recycle.htm, www.energyzone.net/, and many more to students to refer and discuss the measures should be taken care for fuel such as oil and petroleum, how to reduce the use of them. What are the alternatives to be adopted instead of using oil, other eco friendly energy resources and many more such activities can be suggested.

Evaluation

In the process of evaluation students can be given questions like,

- Based on the answers presented by your friends in the class, which is the strongest concern? And why?

- What are the useful measures to protect environment from the oil pollution?
- How one can adopt the eco friendly energy resources for their daily uses in Life?

Students will also be evaluated in terms of active participation in the engagement work like, presentations, collection of different resources materials, using of useful websites. Teacher will give a mini project work that each group has to prepare themselves about the environmental concerns and to make awareness in the public about the same. From this also the teacher can evaluates them.

4. Food Web

Objectives

- Students will be able to understand food relationships between each and every organism.
- Students will be able to locate the organisms in the food web.
- Students will be able to interconnect the organisms based on their interdependence and interrelationships and their organizations in the ecosystem.

Engagement

The teacher will introduce the topic food web, by engaging them to watch a video on http://www.yourdiscovery.com/ and picture clips on various organisms feeding on the other organisms in the natural environment wherein all organisms are depending on other organisms and how nature is getting balanced.

Teacher will ask the students,

Tr: All students have to watch the movie carefully and try to point out the various organisms and their habit, habitat and about their activities.

Sts: All the students engaged themselves and started working on writing points related to video material.

Tr: Have you finished?

Sts: Yes, No,

St1: I have written that, in the video there are various animals, birds, plants.

St2: Yes.

St3: Rabbits are eating grass and they are moving here and there.

St4: I saw that the snake is eating frog.

St5: Some birds are eating insects.

Tr: Very good. In the natural environment all organisms are living in their own habitats and food styles. So let me provide you certain reading material on these concepts.

Exploration

Teacher will provide the reading material related to the food habit relationship among organisms. Teacher will provide the certain websites to go through the materials and examples and teacher will ask the students to compare the activities and different activities and all student will be very busy in writing and comparing.

Explanation

Here students will again give their writings what they have observed and compared in the materials.

Tr. What do you come to know about the video and other resources?

St. Some organisms like rabbits, cows are eating grass, and some others like lizards, snails are depending on insects which eat plants.

Tr. Snake is eating lizard.

St. Tiger is eating deer, deer eats plants.

Tr. Very good, what we can call it as?

St. Food chain?

Tr. It is already discussed that inter-dependency is more than food chain.

St. Not getting clearly.

The teacher will explain that,

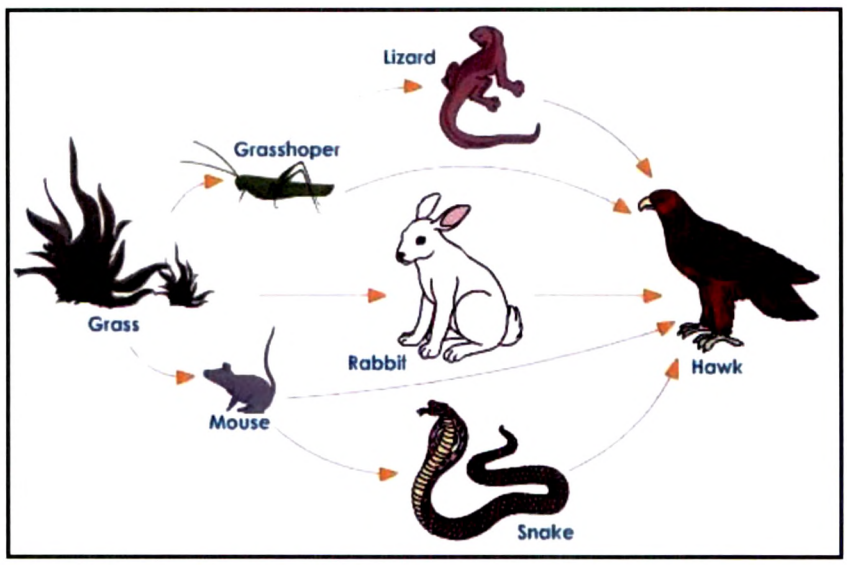
Tr. Rabbits, Deer's and some organisms are depends upon green plants, they become prey for other big animals like fowl, fox and they become prey for tiger and lion etc. The green plants eaten by insects also become prey for lizards and lizards are prey for snake, snake will be eaten by other vultures, fox and tigers etc.

That means, large number and variety of food chain occurs in any given ecosystem. One organism found in one food chain cannot limit themselves to any one particular ecosystem; they will also be a part of many other food chains operating in the same ecosystem. All herbivores are depends upon herbs or plants, herbivores becomes food to any carnivorous organisms.

There is an interdependence and interrelationship between the different food chains of an ecosystem. Such an interrelationship is known as **food web.**

Teacher will ask the students to interact with her to write the examples.

Ex. 1.



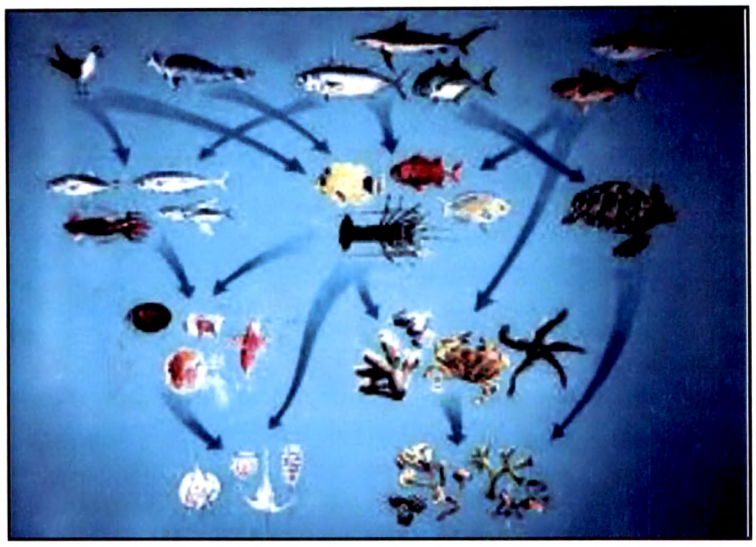
The Teacher will draw the food web diagram with the help of student's interactions.

Extension

After discussing with the students and explaining about concept and examples of food web and asks all the students to give different examples in different environments by searching in the internet, and tell them to draw on the black board and discuss among the mechanism in each food web.

All students start working with the materials and search in the internet to get examples of food web.

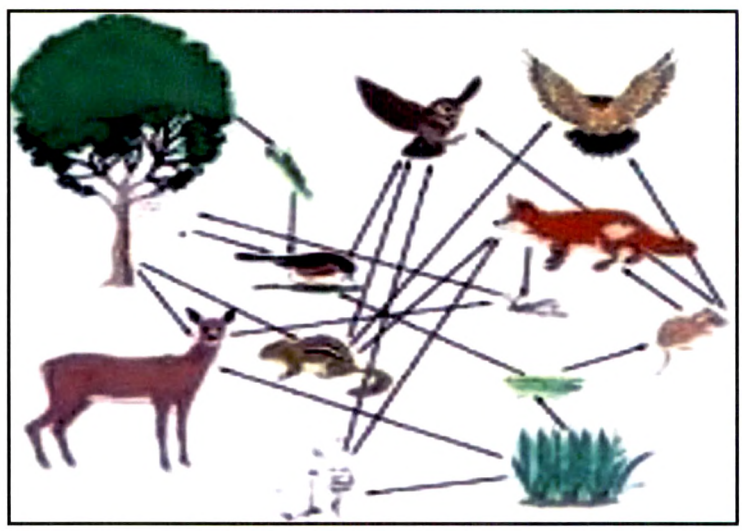
St1. Yes, I can draw one food web that exists in of water ecosystem, Ex. 2.



The student explained as, in the water ecosystem the plants like phytoplanktons are eaten by the zoo planktons, and these are eaten by the fish larvae and then they become food for small fishes and these are eaten by the predators like big fishes and finally after these fishes death these will become food for decomposers.

Tr. Very good.

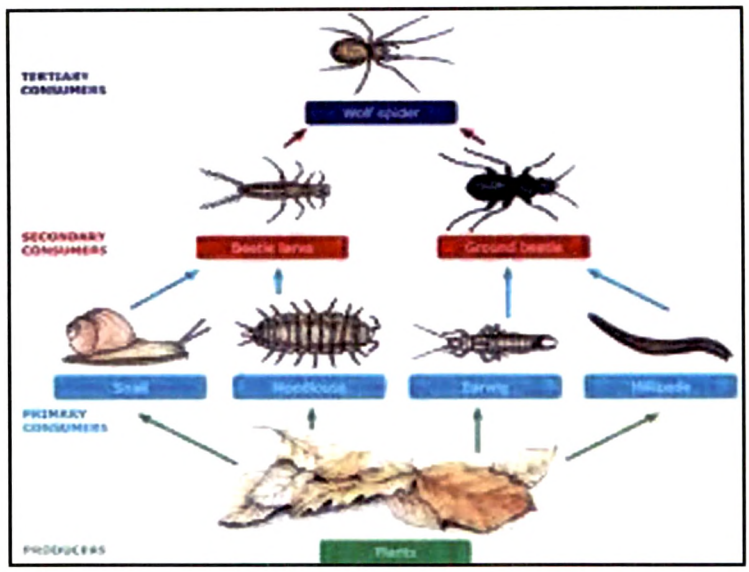
St3. I too have drawn one food web,



Here in my example of food chain, rabbit, deer, insects, squirrels, birds and many other herbivores are eating plants directly, and other carnivores like fox, wolf, eagle, hawk are depending on all these herbivores in different food chains.

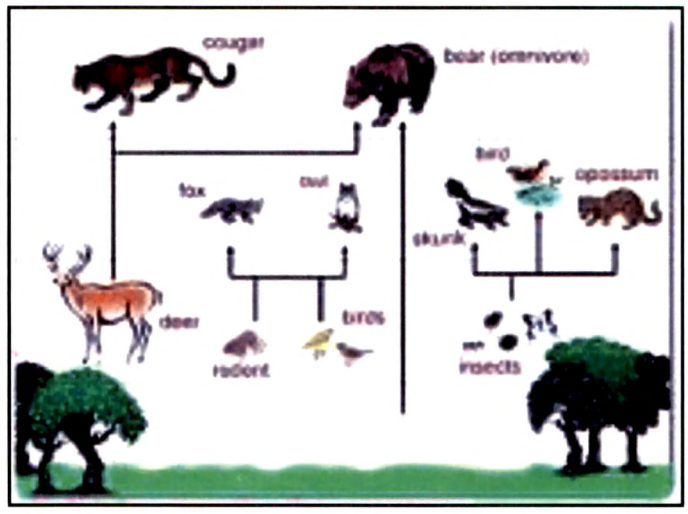
Tr. Very good, what about other students (encourages all other students).

St 2. Teacher I will give ex of food web in soil.



Here plants leaves after falling and drying various organisms will eat them like earth worm snail, ants' millipedes, and after death and for the decay of these done by other organisms and intern they get food like nematodes, spiders and many other organisms. They form different food chains with different organisms.

St 4. Teacher I can also give one example of food web,



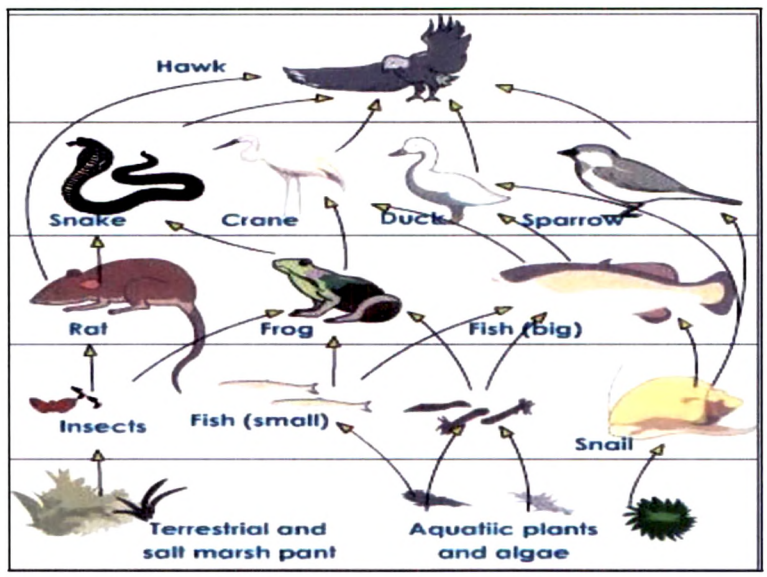
This is an example of forest environment, where in plants trees are there at the forest area, various herbivores like deer, birds, rabbits, insects and many more are depending upon the tree for its food. Some of these animals like deers, rabbits are directly eaten by bear, tiger,

and other small animals form different food chains and finally eaten by tertiary carnivores like, lion, tiger, chitah and man.

Tr. Very good,

St 5. Teacher I will also try for designing food web of two ecosystems

(Teacher encourages the student)



Teacher will appreciate all students' efforts in the discussion of different food webs and also discuss that this is the way how nature is maintaining balance in all organisms, and if it gets imbalanced what will happen? And what we have to do as a precaution to that? And how to protect certain forests, species and protect the ecosystem.

All students will forms different groups and discuss the questions raised by the teacher and give various solutions group wise.

Evaluation

In this stage the teacher will ask the student to write their suggestions regarding protection of ecosystem, each student has to write and collect more examples of food web.

Teacher will observe the students activity in the class room and in browsing the internet. Students have to collect various pictures of food web, answers to the objective type of questions in the class room. Teacher will tell the students to collect information about habit and habitat of various animals in India.

5. Water Pollution

Objectives

- Conceptualize the pollution and water pollution
- The causes of water pollution will; be identified.
- Student will build the relationship between water pollution and health hazardous?
- Students will forecast effect of water pollution on human life?
- Narrate, what is the present scenario of drinking water in polluted world.

Engage

Teacher asks some questions about the water pollution to create interest among the learner. Students will view the video clippings and pictures on water pollution to generate the curiosity. (http://www.youtube.com/watch?v=m5zVASaOu9g) Students will observe the video and starts the reflections, questions in the classroom and through online web quest of the ill effects of the water pollution on human life (www.webquest/wq15a.htm).

Explore

Exploration activities for the topic,

Teacher allows the learners to explore the knowledge of water pollution through different possible actual and virtual ways.

1. Learner will visit two or three nearby water polluted areas along with digital recording equipments.
2. They also take the virtual trip to explore and investigate, to satisfy the curiosity about their chosen topic.(www.indiastar.com, www.exploratorium.com)
3. They will understand about the causes of water pollution in different countries through online collaboration: such as (www.googleimagesearch.com, www.youtube.com)
4. All learners think and discuss among themselves, discuss in groups about how the water get polluted.
5. Observation and recording of new ideas and they share among themselves.
6. Expertise opinion and information will be provided to them through chat or e-mail on water pollution (www.allexperts.com/waterpollution) .

Explain

Explain activities for the topic:

Teacher allows one of the members of each group to explain about the water pollution based on above discussions. Teacher encourages the students to explain the concepts and definition among the peer group. During the process of explanation teacher accepts and appreciates each group member ideas.

1. Plan and design a project for growing awareness among students regarding water pollution.
2. Students will use various informational sources, group discussions and teacher interactions to derive definitions and explanations of the chosen concept and various causes of water pollution in different countries.
3. They will show and explain the local water polluted areas.
4. They will explain the possible solutions to inhibit the water pollutions. Students will listen critically to others explanations.

Teacher collects all learners ideas related to water pollution and explain for deeper understanding.

Elaborate

The teacher reminds the students from the existing evidence and data and asks:

What do you already know about water pollution? What do you think about water pollution? So from the observations found through all these activities, write a review on water pollution and the same you share among yourself in classroom and also post on your home page in social networking site.

Students apply or extend the concepts and skills in new situations through presentations. They explore the causes of soil pollution, scarcity of ground water, drinking water, water conservation programs conducting in India (Karnataka), various effects due to water pollution and what measures to be taken to control water pollution. Students will search the internet and make a database of rate of water pollution.

Evaluate

The teacher evaluates the students' in different formative and summative patterns. Teacher asks the students to create a digital portfolio on water pollution to evaluate on the following, project reports, blog posts, presentations, discussions in the group. Conduct a traditional multiple choice test. Assess through rubrics for various classroom activities.

6. Animal Husbandry- Poultry Farming

Engage

Engaging activities for the topic:

- View the online streaming video on poultry farming from http://www.youtube.com/watch?v=aJ7rrHYmFiQ
- Collaborative digital concept map on egg/poultry farming- mind map-use free mind (offline), bubbl (online), http://www.bubbl.us/index
- Questions that you want to ask about egg and poultry farm –online forum (questions like the following will emerge) http://www.allexperts.com.
- Take a online webquest on bird flu from http://mofb.org/webquest/wq15a.htm

Explore

Exploration activities for the topic:

- Take the following virtual fieldtrips
  1. Online visit to an organic egg farm/virtual trip. http://www.exploratorium.com/cookong/eggs/farm/index.html
  2. Poultry virtual farm http://sites.ext.vt.edu/virtualfarm/poultry/poultrey.html
- Visit a poultry farm: Visit a nearby poultry farm. Take along all types of digital recording equipment. Audiotape farm sounds. Videotape farm activities. Photograph farm people, equipment, crops and animals. Show the world a unique farm area by adding your own farm website to the internet.
- Different poultry birds and stages/processes of poultry framing- creating a digital album-flicker / picasa.
- Understanding poultry farming and poultry birds in different country through:

1. Online collaboration through e-pal
2. Viewing and discussion of various streaming videos from youtube. http://www.youtube.com/watch?v=k0k8lcn_TQ
3. Through Google image search

- Ask an expert. Have your class e-mail (or live chat if available) an expert about a question. They have about a poultry farm http://allexperts.com/ , specifically http://www.allexperts.com/el/poultry-farming/, http://en.allexperts.com/q/poultry-farming-3481_11.htm .
- Ask questions on the following forum sites http://apps.exploratorium.edu/egi-bin/yabb2-cooking/YaBB.pl http://www.the-coop.org/cgi-bin/UBB.ultimatebb.cgi
- View the webcast on egg http://www.exploatorium.edu/cooking/webcasts/index.html

Explain

- Explain activities for the topic.
- Student collaborates and develops a wiki on poultry using wiki space.
- E-news letter on poultry farming- publisher or equivalent open source software.
- Plan and design a digital poultry farm of your own in groups and share the design
- Discuss the difference in poultry farming in different countries using discussion board/forums/groups.
- After the visit to the local poultry farm show the world a unique farm in your area by adding your own farm website to the internet.
- Compare traditional poultry farming with modern poultry farming using discussion board/forums/groups.
- Collaborative digital concept map on poultry farming-mind map-use free mind (offline). Bubb (online) http://www.bubbl.us.index

Elaborate

Elaborate activities for the Topic:

- Making art work using egg shell.

- They analyze and develop a social bookmarking of websites related poultry farming/animal husbandry.
- Take a webquest on the following.
    1. Bird flu http://www.mofb.org/webquest/wq15a.htm
    2. From egg to chick http://mofb.org/webquest/wq23a.htm
    3. Adventures on aviculture http://www.besd61.k12.il.us/webquest/8th%20Grade/sharp/birds2/studentspage.htm
- Write a review of a poultry farming website in your blog.
- Develop a collaborative podcasts on importance of poultry farms.
- Conduct a survey of poultry industry in India- internet search and online survey.
- Explore the poultry (duck) farming in Kerala through internet and e-mail.
- Searching the net and making a database of poultry related websites
- The coop is dedicated to all the folks around the world that rises, breed or show poultry, waterfowl, game birds and related species. http://www.the-coop.org/index.htmal

Evaluate

Evaluation activities for the topic:

- Create a digital portfolio on poultry farming
- Portfolio artefacts
    1. News letter
    2. Project report
    3. Blog post
- Online reflective journal
- Peer assessment
- Create digital rubrics along with students for assessing the portfolio and other activities.
- Develop digital checklist for all other activities and products they are involved in.
- Conduct a traditional multiple choice online test.

Activity:

The participants, in small groups, will prepare Web 2.0 integrated constructivist lesson plans in different school subjects.

7. Soil Erosion

Observe and describe the process of erosion, transportation, and deposition of the earth's land surface using natural phenomena and models.

Objective: Students will observe and describe the processes of erosion, transportation, and deposition by creating a physical model.

Materials

Paint tray (the kind used for a paint roller) ,Pieces of sod (enough for each group) potting soil, heavy clay like soil, Rainmaker (paper cup with about ten tiny holes poked in the bottom), Water, video on soil erosion.

Engagement

Take students on a walk outside the school building and ask them to note where the soil is worn away or seems to have collected. Before going on the walk you may want the children to explain what they will look for or what are the signs that soil has worn away or built up? (Suggested answers may include: erosion - puddles, hollowed out areas, areas that dip or are lower that the surrounding area; deposition - mounds of dirt, collection of soil or other materials in a certain spot, etc.) Upon returning to the classroom make a list of the sites where soil was worn away or collected.

Examples:

- Bottom of slide under swing
- End of splash guard by rain spout at entrance to door
- Path leading to the playground at the bottom of hill/slope

Do you notice anything different about these areas? (They are just dirt; no grass is growing here).

What do you think caused these changes? (Students walk over them; water running through it).

Exploration

Construct a model to investigate how these changes may have occurred. Provide materials so the students can construct their own model of a landscape. It should include a piece of sod, fine potting soil, and heavy clay like soil. Have them use a paint roller tray as the base of the landscape. Do not put any landscape materials in the bottom well; it should remain empty. Once students have constructed their models have them diagram and label their models and make a prediction as to what will happen if it "rains" on their landscape.

One student pours a cup of water all at once into the rainmaker. Hold the rainmaker about 4 inches above the upper end of the landscape and slowly move it back and forth so the water "rains" down on the model landscape. Observe what happens to the landscape. When it is finished raining have the students observe the final effects of the rain on their landscape. Have students go back to their predictions and record what actually happened.

Explanation

Tell me some of your prediction, before it rained on your landscape. (Record on board).

What actually happened to your landscape when it rained on it? (Record so you can make comparisons).

How is your landscape different after the rain than before it rained on it?

What happened to the soil? Where did it go? Why did this happen?

As students share their ideas and understandings, record key phrases on the board. Some phases that may be valuable to your later discussion may include:

- Dirt and soil washed away
- The soil collected at the bottom of the slope
- The water hollowed out the soil
- The rain carried the soil down the hill
- When the water washed away the soil it formed a hole

Relate their observations to the processes scientists observe over an extended period of time. Use student models to identify and label erosion and deposition. Have students work to create definitions for these terms. When you are sure students have a real understanding of the terms, formulate a final definition and post on board or chart in the classroom for future reference. Demonstrate the process of transportation and lead students to understand that it is the movement of soil particles from one place to another. Refer to the list generated during the engagement and have students make connections; they should use the new terms to discuss and explain what they saw. Help them to understand that they just used water to simulate erosion, transportation, and deposition, but it can also be caused by wind, people, animals, etc.

Elaboration

- Using the same paint roller tray as the base for their landscape, have the groups of students plan a method to decrease or eliminate erosion. Students should draw a diagram of the model planned and label the materials used in their landscape. They should write a short explanation explaining why they think this will work to curb erosion. (Tell students that you will provide the same materials that they used today and they are responsible for supplying the rest of the materials to build their new landscape tomorrow.)
- Have students use a variety of resources and references to research various landmarks that are the result of these processes (e.g. Grand Canyon, Mississippi River Banks, etc.). You can then lead a class discussion on the topic: Erosion and Deposition - Help or Hindrance?

Evaluation

- Have photographs representing each process and have students identify and explain why they identified it as such.
- Have students take a walk in their own neighborhood tonight to find examples of each process. They should draw and write one sentence telling what they observed.
- Have students write their own definition and list an example for each process in their science journals.

8. The Universe

The planets of the solar system

Objectives: students will be able to

- Identify and name all the planets
- Observe and deduce the motion of all planets
- Differentiate all planets in terms of their features
- Prepare the power point presentations of planets
- Construct models of planets to show the motion of planets

Engagement

Teacher starts the discussion on planets of solar system by asking students previous experiences related to universe, sun and moon and other planets known to them, and teacher provide certain slides regarding the planets and ask the students to watch and reflect on those namely on http://video.nationalgeographic.com/video/player/kids/science-space-kids/solar-system-101-kids.html and http://dd.dynamicdiagrams.com-wp-content-uploads-2011-01orrey_2006.swf.url And pictures of all planets and their features.

Explore

After engaging all the students in a work that discussing their prior knowledge and compare with the information got from the video clips and picture, and now teacher asks them to about how many planets and descriptions of each planet according to their own knowledge.

All students will present their views on the clips and slides one by one.

Now teacher will explore their knowledge by giving more ideas of all planets, specialties of each planet and structure through power point presentation. And give them certain reading materials by giving suitable websites like http://dd.dynamicdiagrams.com, http://www.virtualfieldtrips.com and many more.

Explain

Teacher will now based upon students ideas about planets and their characteristics proceed to clear those ideas with further understanding and meaning. Teacher explains each planets starts from Mercury, Venus, Earth, Mars, Jupiter, Saturn Uranus and Pluto and to Neptune by showing pictures and presentations. Their features, distance from sun and their direction of rotation. And the teacher now asks the student to discuss among themselves about all these. And to give reasons why earth is so important and special and the life existence on the earth.

Elaborate

Teacher asks all the students to discuss all these reasons among themselves in the classroom and to post and share these discussions in social networking and e-mail and through blogs. Now all students have to elaborate their knowledge on solar system through referring various resource materials, by visiting library, virtual library, virtual trips, real and virtual laboratories, educational sites and planetariums. Teacher asks the students to do seminar on each planets using application of ICT.

All students will prepare study materials on their own by following their own experiences in the class; students will compare the solar system with structure of atom that the nucleus is at the centre remaining surrounds it like that sun is the centre as that of nucleus. Students will prepare models on solar system using simple available resource materials.

Evaluate

Here in this topic of solar system, all students self evaluate them and evaluates their peers work of seminar and assignment through rubrics and observations. And teacher assess through the session and at the end also by giving tests. And teacher assesses their involvement in the group work and their visiting to websites and through their e-mail and blogs. And observe their presentations during the seminar session.

9. Water

Objectives: students will be able to,

- Explain the structure of water molecule
- Understand the polar nature of water
- Reason out why the water is universal solvent
- Describe the formation of hydrogen bond in water with a diagram
- Design slides to explain the sources and properties of water

Engagement

In the class the teacher will start the discussion on water and some of its subunits, by relating to students prior understanding of properties of water. All students get engaged in telling their own view on water. Now the teacher provides them certain slides showing availability of water, main sources of water, and properties of water, and asks the students to watch and give their opinions about the features high lightening in the slides.

All the students after watching it, one by one starts reflecting on slide that,

St1. water is available only on the planet earth,

St2. 70% of the earth is covered by water

St3. Water is having no color and odor

St4. Water is there in ocean, river, Lake Etc

St5. All water available is not drinkable

Now the teacher asks them to discuss these among them and make a note ready on that.

Explore

After engaged in the activity of recollecting and comparing the properties of water, teacher now allows the students to describe their notes done in the prior activity, all students present their understanding of water through PowerPoint. Now teacher provides resource materials to go through and site the name of websites related to water, and asks the students find out the characteristics apart from their understanding and compare and relate those.

Explain

The teacher collects the students given information on prior activities and now teacher will explain them clearly about the availability of water, properties of water, sources of water, structure of water using the resource material given to the students through the power point presentation, http://www.slideshare.net/nkuhn/water-intro. Now teacher makes the groups of about 4-5 peer and ask present their ideas in groups according to the explanation o the teacher, ask other to observe their positive and negative points.

Elaborate

The teacher elaborates each and every idea of water including their molecular structure. Already students have presented these ideas. Now teacher elaborates the ideas, like, the quantity of water all organisms should have, Polar nature of water, Water as a universal solvent hence used to the large extent, why water is getting polluted?, why water scarcity is arising now?, also discusses the reasons and water conservation methods. All these have been elaborated through interactions. Now teacher asks the groups to discuss all these and to find the possible solutions to water problems by discussing in class as well as virtually, and to share these with groups through e-mail, blogs, social networks and find the feedback.

Evaluate

Here evaluation is continuous from beginning to the end, both formative and summative, teacher gives the students observation sheets and rubrics for their own group assessment in the seminar, presentation, and assignments. Teacher visits to social networking sites to see their postings and visits and feedback. At last teacher gives a test to write down the importance, properties, conservation of water. Gives home assignment that their daily consumption of water, to give a note on conservation of water.

10. Magnetism

Objectives

Students will be able to

- Identify different properties of magnetism
- Compare various magnets with respect to their properties

Teacher

Good morning students, today we shall have a discussion session. Listen I have kept many things in front of you on the demonstration table, name them and state their properties.(all the students sitting round the table start observing the displayed things).

St 1. What is this.....? (Holding a magnet in his hand).

Tr. Can you guess what it is?

St2. Don't you know? It's a magnet.

St3. Yes, magnet draws the things towards it.

St1. Yes.....

St2. How does it draw?

St3. Look here; bring this magnet near this key.

(All students are observing, now the key stucks to the magnet bar)

St1. You mean magnets draw all the things.

St2. No,,,,,, only the iron substances.

Tr. Yes....yes.....you are correct.

It is one of the magnetic properties, can anybody say?

St 3. Magnet and iron substances come closer.

Tr. i.e., Magnet attracts the iron.

St 4. Teacher ... why it is named as 'magnet'?

Tr. It is a beautiful story, I shall narrate the History

A shepherd Magnees who lived at MAGNESIA in Asia Minor, noted that the nails fixed to his shoes were attracted by a piece of stone. The stone has the magic property of attracting iron. This stone was called as Magnet.

(www.howmagnetswork.com/history.html)

St 5. Very interesting……. (Observing towards the iron fillings).

Tr. (Showing the iron fillings teacher asks), What is this?

St 6. It looks like iron powder.

Tr. Yes, you are right.

St 7. Does it attract to magnet?

Tr. Take the magnet near the iron fillings and observe.

(**St.8** rotates a magnet bar in iron fillings)

St 9. Hey….! See here, how this powder stuck to magnet.

St 10. How nice…..

St 11. Teacher… Iron powder is stuck only to the edges, but not in the middle of the bar.

Tr. Why is it so?

St 12. I think it has more power towards the edges.

St 13. It might be another property of magnet.

Tr. Yes……

Attraction will be maximum at the ends of the magnet.

St 5. What should we do with this iron stand? Teacher…….

Tr. Suspend the magnet to the stand with the help of a thread and make it to rotate and observe what happens.

St 6. Teacher, see here, magnet comes to rest in North-South direction.

Tr. Yes, you are right.

It is another property of magnet, can anybody say it.

St 7. Magnet comes to rest in a particular direction.

Tr. Yes…Yes…. Very Good…

Freely suspended magnet always comes to rest in North-South direction.

Now bring another magnet facing its south near the south pole of the suspended magnet.

St 5. Teacher, now I have bought South Pole to South Pole. It is moving far away, why?

St 1. Hey! It is repelling, they are like poles.

St 2. Yes…. …. he is right, madam

Tr. Yes. You are right; it's another property of magnet.

Like poles of magnet repel each other.

Do you know what happens if you bring South Pole of magnet to the North Pole of another suspended magnet?

(**St3.** brings a magnet facing South Pole to the North Pole of the suspended magnet.)

St. Hey...! See here it is attracting

St 2. Then, it means, it attract only when the different pole comes closer. Is it a property of magnet, Madam?

Tr. Yes..., you are right.

Unlike poles attract each other.

St 3. What is this Madam? The iron blade is cut into pieces.

St 4. See, each end is marked with N and S at the edges.

St 5. It shows that all the smaller pieces of magnet have both N and S ends.

St 2. Every piece of a magnet has 2 poles- i.e., North Pole and South Pole.

Tr. The poles of the magnets can never be isolated.

Every magnet has two and only two poles- a north pole and south pole.

Yes you all are very good students: today in this discussion you have learned about the properties of magnet. Then now any one of you come and summarizes all the properties of magnet, which you have experimented and conformed so far.

St2. Yes teacher.....

- Magnets attract iron.
- Attraction will be maximum at the ends of the magnets.
- Freely suspended magnet always comes to rest in N-S direction
- Like poles of the magnets repel each other.
- Unlike poles of the magnets attracts each other.
- Every magnet has two poles- a north pole and a south pole.

Now the teacher will describe all the properties using power point presentation 1 and 2 and explain by searching different websites like,

- www-istp.gsfc.nasa.gov/Education/Imagnet.html
- www.sciencetech.technomuses.ca/.../Information_Magnetic.cfm
- www.mcwdn.org/Physics/Magnetism.html
- http://en.wikipedia.org/wiki/Magnet

Tr. Excellent, my dear student.....

Now all students will make list of all properties of magnets, use of magnets. Discuss among yourself and discuss virtually through social networking sites, e-mail etc. and all of you prepare power point presentations and present them in the next class and will discuss them.

11. Micro Organisms

Objectives

Students will be able to

- Learn more about salient features of micro organisms
- Identify diseases caused by micro organisms
- Appreciate the pioneers in the field of Microbiology

Engagement

Here in this class of Micro organisms, the teacher will engage the class by asking questions related to the various kinds of micro organisms found in all types of habitats particularly learners' home and school surroundings. Learners will respond to teacher that about that they know about the bacteria and viruses are their surroundings but, they have not seen them through the naked eyes.

Now, the teacher will provide some pictures of pioneers (http://www.fems-microbiology.org/website/nl/page151.asp, http://www. microbiologyguide.com/1149-history of Microbiology,) worked in microbiology, and asked the students to recall the names shown in the pictures if they know. Students started buzzing among themselves, and some started imagining that who might be they and what might have done, teacher gives their names finally viz, Edward Jenner, Joseph Lister and Alexander Fleming: and asked them to share their contributions by referring the material both textual and virtual. Here in this phase all the learners will work actively to write and share the contributions.

Exploration

In this phase of Exploration teacher divide students in to small groups and asked the leader of the group to share those in front of all learners, again inter and intra group discussion continues.

Teacher provides the links to Biology4kids.com:Microorganisms:Man&Microbes, http://www.biology4kids.com/file/micro.modern.htm, http://microbilogytext.com/index.php?module=book&func=displayparticle&art_id=647

Go through the links to explore the pioneer's work on microbes. Now the teacher explores the knowledge of micro organism from the shapes and structure of different microbes. The microbes are present both inside and outside the body and materials which we use daily, they are present everywhere but they cannot be seen with the naked eyes. Students go through the websites and materials provided and prepare short notes.

Explanation

Here in this phase of explanation, teacher asks the learners to explain about microbes after referring to the materials, learners will try to explain accordingly. Finally teacher explains that the micro organisms are classified into five major groups,

1. Viruses, 2. Bacteria 3. Protozoans 4. Algae 5. Fungi

Teacher will explain the viruses in detail by discussing with the learners.

Asks the name of certain viruses and diseases those caused by the viruses that the learners knows and heard about.

Learners started answering one by one that they have heard about small pox, AIDS, common cold, polio, influenza, viral hepatitis, mumps, foot and mouth diseases of cattle etc.

Teacher appreciates the learners and knowledge regarding the viral diseases. Further explains that the viruses cannot see by the compound microscope, they can be seen only through the electronic microscope, because their size ranges from 0.015 to 02 micron.

They are very simple in structure. The nucleic acid is present in the centre surrounded by protein coat. They grow and reproduce only in the living cells.

Extension

Teacher asks the learners to refer the material and draw the diagram of various viruses, and explain their simple structure, and write the viral diseases and name of viruses which cause those diseases. And discuss about these among the groups and post on your blogs, share through e-mail and collect the feedback.

In the extension activity the teacher asks the students go through the further information regarding the viruses and viral disease and symptoms, preventive measures and treatments of those diseases through internet and collect the information and discuss in the class as well as virtually. And teacher asks the learners to arrange a symposia and discussions outside the classroom with local doctors.

Evaluation

Here in the evaluation stage, the whole class is assessed formatively throughout the class activities, learners are self evaluated through performance criteria in their group activities, discussions, and teacher also evaluates them in the interactions. Teacher checks their e-mail, blogs, feedback, and give certain assignments like collect the photographs of prominent medical scientists and read their biographies and make a file to submit. Teacher asks them to present power point presentations on both scientists and micro organisms and present in the class. And gives some paper pencil test on micro organisms and viruses.

12. Bacteria

Objectives

Students will be able to,

- Identify the different disease caused by different bacteria
- Differentiate between different bacteria
- Classify the bacteria

Engagement

Here in this class the teacher will engage the learners by discussing the continued part of micro organisms, ask the learners to characterize the micro organisms, learners will recall and discuss the characteristics one by one. Teacher asks the learners to discuss on

bacteria, that taking examples of certain bacterial diseases like cholera and typhoid. Al learners will add some line that they know about these diseases as some of them have experienced and shared the symptoms of those. And Teacher provides the study materials to them and asks them to compare their ideas with the materials. Teacher put a dialogue that some bacteria are useful, some are harmful and all learners will reflect on this and discuss among themselves.

Exploration

In this phase of Exploration, teacher asks the learners to know more about bacteria, presents the power point on the size and structure of the bacteria, and asks them to go through internet and collect the pictures of bacteria to know about the bacteria. Now the learners will have to the activities like,

- Heat the milk till it boils. Then pour it in three beakers in equal quantities. Label the beakers as A, B, C.
- Take curd in equal quantities in three test tubes and label them as 1, 2, 3.
- Add curd from test tube 1 to the beaker A which contains very hot milk.
- Add curd from the test tube 2 and 3 to the beaker B and C which contains the milk with the room temperature.
- Keep the beaker B in a warm room and beaker C in the ice water. Observe the milk in all the three beakers after about 5 hours and note the findings.

After finding out the results, all the leaners will discuss what the findings are and why they are so? They make a hypothesis about the reasons and discuss with the teacher.

Now teacher deviates learner's concentration to advantages and disadvantages of bacteria, how they are helpful and harmful to us, ask them to list out various uses and disuses of bacteria in day today life. Learners will search in the internet and list out them. Learners will be engaged in the activity.

Explanation

Here in the explanation phase, the teacher asks the learners to explain the structure and classification of bacteria. Learners have already gone through the internet, so they could explain them to some extent. Now the teacher will explain them clearly that the size of the

bacteria varies from 0.2 to .01 micron. They move either by cilia or flagella. Picture of Bacteria. (Gallery of Bacteria, http://bacteriainphotos.com)

Multiplication of bacteria generally occurs by the process of the binary fission, bacteria are of different shapes, some are spherical (cocci), some are rod shaped (bacilli) others are spring like (spirilli). Teacher presents them with the power point presentations and internet. The commonly found bacterial diseases like, cholera, Typhoid, Leprocy, Tuberculosis and Tetanus, their symptoms, preventive measures and treatments have been discussed in the groups and presented.

Extension

In this phase of extension, the teacher extends the knowledge regarding bacteria, by the discussing various diseases and causing bacteria. Asks the students to picturise the different bacteria, causing diseases, uses to mankind and make it a project file and share to all the friends in the class as well as through e-mail and social networking sites. And teacher asks the learners to arrange a symposia and discussions outside the classroom with local doctors about the bacterial diseases, how to prevent them, how to keep the surrounding clean and hygienic, taking healthy and balanced food and how to take care of patients suffering from the bacterial diseases.

Evaluation

Here in the evaluation stage, the whole class is assessed formatively throughout the class activities, learners are self evaluated through performance criteria in their group activities, discussions, and teacher also evaluates them in the interactions. Teacher checks their e-mail, blogs, feedback, and give certain assignments like collect the photographs of different types of bacteria and make a file to submit. Teacher asks them to present power point presentations on both scientists and micro organisms, present in the class. Teacher also evaluates them through some paper pencil test on bacteria.

13. Protozoans

Objectives

Students will be able to

- Identify the different protozoans
- Differentiate between different protozoans
- Identify diseases caused by protozoans

Engagement

Here in the class, the teacher starts discussing on protozoans by engaging the learners into discussion that about unicellular organisms and examples, now teacher assign a small activity to the students that to collect the stagnant water from the area where grass grows. Put a drop of water on the glass slide and observe the movement of microbes. So now all students bring stagnant water and engage in the activity, teacher provides the microscopes also to observe the movement and structure of protozoans. All students have to observe carefully and should write down.

Exploration

In the stage of exploration each one has to discuss about the results of observation through the group discussion, the group leader has to present their group views. Now teacher will provide the pictures of certain protozoans and ask them to compare, and suggests virtual resources go through and find more information and explore them and discuss with each other. Teacher now provide certain study material for protozoans, their structure, example and diseases caused by the protozoans. All students will go through them.

Explanation

Now students will explain the protozoans after reading the information through internet and also through materials provided by teacher.

The protozoans of the size of about 2- 200 microns, they are primitive animals made up of a single cells, which are able to perform all the activities to sustain life, their habitat as, soil, water and some are in free living in other parasites. They move with the help of pseudopodia, cilia or flagellum.

Students draw the pictures of Amoeba, Paramecium, and trypanosome on the black board also refers to the other Pictures of Protozoans.

Now the teacher explains in details about the protozoans an about the diseases caused by the them, namely amoebic dysentery, Trypanosoma causes sleeping sleekness and plasmodium causes malaria. These diseases' symptoms, treatments and preventive measure that clean and hygienic life, controlling the mosquitoes in the stagnant water.

Extension

Teacher asks all the students to draw the pictures of all protozoans with their characteristics, diseases and all other preventive measures by referring the internet and materials and ask them to discuss in the class as well as to post the discussions on blogs and refer the feedback. Now all the students with teacher will arrange a symposia and discussions outside the classroom with local doctors and other people about the awareness regarding diseases caused by protozoans specially malaria, symptoms and how to prevent them, how to keep the surrounding clean and hygienic, taking healthy and balanced food and how to take care of patients suffering from these diseases.

Evaluation

Here, all the activities in the class room have been evaluated by the students by rubrics, self evaluative performance criteria; teacher assigns a project that all students have to submit a file contains all information regarding the protozoans including name of websites where the data is authentically available. Teacher goes through the social network site to see the student's postings of their discussions and asks the students to prepare power point presentation on the topic. Students are also evaluated on the basis of some paper pencil test on the topic.

14. Algae

Objectives

Students will be able to

- Identify the different Algae
- Differentiate between different Algae
- Appreciate the economic use of Algae

Engagement

Here in this class the starts the class by discussing about algae, ask the students to recall that where they have seen green colored patches of algae, all students recalled and answered that they found these kinds of algae in the surrounding places, that in stagnant water, near water tanks, on the bark of the trees, in the damp soil, rivers and in the sea also. Teacher appreciates the students' knowledge regarding algae's habitat. Now the teacher will show some pictures of algae through power point presentations and asks the students to observe carefully. All students will be busy in observing the structure of different algae.

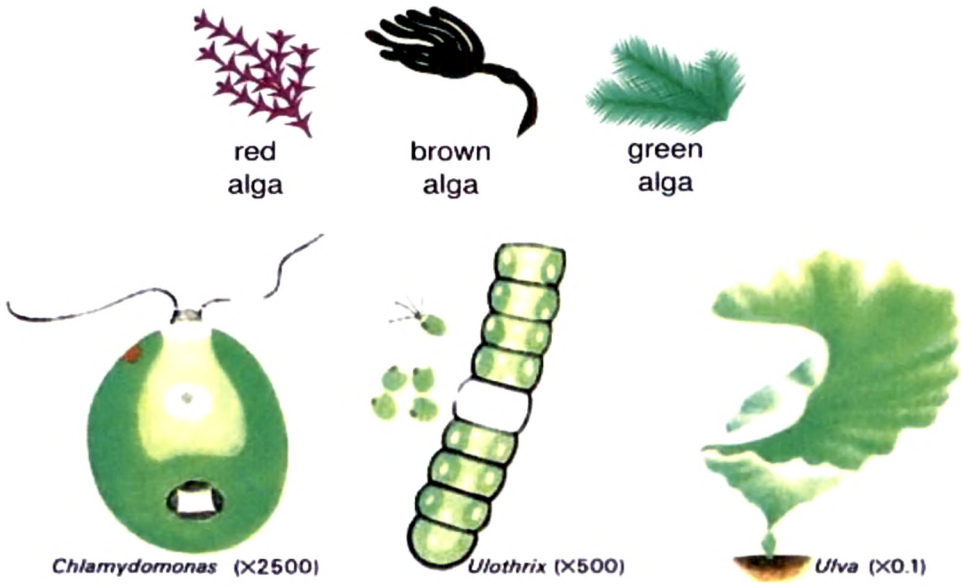
Exploration

In the phase of exploration the teacher makes the groups to discuss on algae's structure and habitat and uses, teacher will provide some study materials and also asks them to go through the internet and collect the information regarding the habitat, structure and uses and some specialties of algae, and write and share them in classroom by intergroup discussions and share through the e-mail.

Explanation

In the phase of explanation, asks the students to explain whatever they have discussed on the algae after referring to the teacher given materials and through internet, students explained that algae will grow in stagnant water, near water tanks, on trees, in damp soil, rivers and sea. Algae also small in size 1.0 micron to few meters in length, they float on water, they are green in color.

Teacher appreciates the students, and explains in detail by power point with diagrams, Algae are green in color because of green pigment chlorophyll; similarly red algae have rhodophyll and yellow green algae have xantophyll. Examples for algae are Nostoc, Oscilillatoria, Volvox, Chlamydomonos, Spirogyra and Diatoms.



Teacher site some important feature of algae that, the red algae grow for many kilometers on the surface of the sea and appear red in color, hence the name red sea. 'Sargassum' is a brown alga grows on the Atlantic ocean nearly for about 64, 000 sq. kms. Hence this part of the sea is called 'Sargasso-Sea'. Japanese make thin paper like material from red algae and sell them in the market and they prepare a food 'noori' from this.

In the group discussions teacher and students also explain the uses of the algae, that they help in nitrogen fixation ex, Azolla, nostoc, and they help in increasing the amount of oxygen in water, they provide chemicals like agar and alginic acid, they help in preparation of medicines, they are used as food in China and Japan.

Extension

Here, teacher assigns the students to collect stagnant water in the school campus near water tanks where algae has grown. Then take a drop of stagnant water on glass slide and observe them through the microscope and identify the names of algae and draw their picture and explain. The same observations with their explanation all students have to prepare a project file and discuss about what they have observed, post the same

discussions on their blogs and share through social networking sites. Again the teacher extends the activity that in their surrounding environment if they find the algae growth, they have to bring them to the school and then discuss all the features they would find.

Evaluation

The evaluation process started from the beginning when the class started itself. Here all students have to submit their project files, and with the help of performance criteria students only evaluates their performance in the group discussion. Teacher also checks out their posting about the classroom discussions on the blogs and social networks. And some paper pencil tests on algal characteristics.

15. Mammals

Stages	Description of Activities	Participants
Observation	Learners read a text on mammals & view a video on life of mammals in different locales. Such activities consists of mammals moving in groups or in water, grazing, attacking prey, giving birth, flocking together at the time of danger and related events.	Teacher, Learners
Contextualization	Learners make a note of key activities of mammals; They relate their analysis to the text.	Learners
Cognitive apprenticeship	Teacher Illustrates how he would analyze and interpret such information using the examples of mammals.	Teacher
Collaboration	Learners form the group to work on the task while the teacher suggests them as they proceed. and they form hypothesis	Teacher and Learners
Interpretation construction	Learners analyze and generate evidence to verify their hypothesis related to mammals living on land and water.	Learners
Multiple Interpretations	Learners provide explanations and defend their ideas using their analysis and text both within and between the groups. Evidence and arguments along with the text expose them to various ways of finding answers or Interpreting data.	Learners
Multiple Manifestations	By going back and forth through the process and relating each contextual background on various events and the behavior of mammals, the learners notice that the general principles embedded in what they are doing become manifested.	Teacher and Learners

(Constructivist Learning situation, NCF, 2005)