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How to Teach Physics Subject Using ICT

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Research Paper - Physics

ABSTRACT

The use of information and communication technology in learning is a powerful way to prepare students to face a challenging global world. ICT supported education can promote the acquisition of the knowledge and skills that will empower students for lifelong learning. In twenty first century, personal success lies in being able to communicate, share, and use information to solve complex problems, in being able to adapt and innovate in response to new demands and changing circumstances, in being able to marshal and expand the power of technology to create new knowledge, and in expanding human capacity and productivity.

Key words: Information technology, teaching physics course

Introduction:

Information technologies in education refer to teaching and learning the subject matter that enables understanding the functions and effective use of Information and Communication Technologies (ICTs). A review and the literature on teaching ICT as a subject implied that there was limited, systematically-derived, quality information. In order to use technology effectively, educators need to be trained in using technology and they

need to develop a good understanding of it. Information Technology is used to enhance learning; therefore it is important for educators to be comfortable using it to ensure that students get the full advantages of educational technology. Teaching with technology is different from teaching in a typical classroom. Teachers must be trained in how to plan, create, and deliver instruction within a technological setting. It requires a different pedagogical approach. Teachers must find a way to assess students on what they take away from a class and meaningful, known knowledge, especially within an eLearning setting. Education will only change when our design methods, perspectives, and values change. Teachers have many roles when instruction is designed. They can be artists, architects, craftspeople, and engineers. Technology does not mean that using interactive electronic boards and LCD Power Point presentation is the most effective. So many more applications are available for students to be hands-on with their learning and gain deeper knowledge than they could before. Technology training appears to focus mainly on technology knowledge and skills while overlooking the relationships between technology, pedagogy, and content.

Teachers should be creative to create a pleasant class room atmosphere so that students do not afraid to physics lessons. It's not an easy thing for teacher's to make the physics class atmosphere into a fun class, mainly to make abstract physics concepts can be displayed in real terms so that students get new experiences in learning that are inherent in their minds. Sometimes teaching and learning activities are often faced with material that is abstract and outside the experience of students everyday so that this material becomes difficult to be taught by teachers and difficult to understand by students. Visualization is one way that can be done to concretize something abstract. Information and communication technology will easily visualize in the form of moving images (animation) which can also be added to the sound.

Information Technology in physics teaching

Schools' access to Information and communication Technologies (ICT) poses tremendous challenges to physics teaching and learning. Physics is one of the first areas where the possibilities that computers may offer for the employment of new teaching methods have been and are still explored. A variety of computer applications have been

developed and used in teaching Physics, such as computer-based laboratories, multimedia, simulations and intelligent tutors. Furthermore, research has often been employed to direct educational software design and development. Today numerous IT applications are available, aiming to stimulate students' active and offering the opportunity to work under conditions that are extremely difficult, costly or time-consuming to be created in the classroom or even the physics lab. The use of such IT applications has developed a new research field in physics education. Among the various IT applications, Information Technologies are of special importance in Physics teaching and learning. Information Technologies offer new educational environments, which aim to enhance teachers' instructional potentialities and to facilitate students' active engagement. IT offers a great variety of opportunities for modeling concepts and processes. IT provides a bridge between students' prior knowledge and the learning of new physical concepts, helping students develop scientific understanding through an active reformulation of their misconceptions. Specifically, they are developing their understanding about physical laws through a process of hypothesis-making, and ideas testing and isolate and manipulate parameters and therefore helping them to develop an understanding of the relationships between physical concepts, variables and employ a variety of representations (pictures, animation, graphs, vectors and numerical data displays) which are helpful in understanding the underlying concepts, relations and processes and express their representations and mental models about the physical world investigate phenomena's which are difficult to experience in a classroom or lab setting because it is extremely complex, technically difficult or dangerous, money-consuming or time-consuming, or happen too fast. Today a wide variety of educational software is available for teachers and students helping them to present and model physical phenomena and processes, or solve physics problems. Computer simulations have been successfully applied from high school to university physics teaching. They have been used to diagnose and remedy alternative conceptions of velocity, and confront alternative students' conceptions in mechanics. A recent study showed that simulations were equally effective to micro-computer based labs in facilitating the comprehension of concepts involving the free fall of objects. Other studies focus on the effects of the use of computer simulations on students' conceptual understanding.

Information technology (IT) is concerned with the use of technology in large organizations .In particular, IT deals with the use of electronic computers and computer software to convert, store, protect process, transmit and retrieved information.

Objectives of Physics Teaching:

In Physics Teaching, usually, concentrates on giving information / knowledge which is not the main objective of Teaching. Along with giving information/ knowledge, the other objectives are:

1. To develop understanding of the concepts / knowledge
2. To develop reasoning and thinking power for application of knowledge
3. To develop ability of judgment and precise decision making
4. To improve speed, comprehension and vocabulary
5. To develop scientific skill to perform experiments
6. To develop scientific temper, proper study habits
7. To develop innovative mind, etc.

Teaching Methods: Problem

Mostly for teaching Physics, teachers are used 'chalk and talk method' for theory and 'demonstration method' for practical. To improve the quality of teaching, some teachers use teaching aids like charts, models, specimen, etc. Only these efforts could not improve the quality of teaching to the level of satisfaction of teachers, students, parents and other stakeholders. So, new most effective tools to be used by teachers for quality education.

What is ICT?

The hardware, software, the methods and know how required or used in acquiring, storing, processing, displaying data and information is collectively known as Information Technology (IT). Hardware, know how, programs and the methods used in ensuring that message is transmitted correctly, efficiently and cost effectively are collectively known as Communication Technology (CT). Both of these technologies became complementary to each. Hence IT and CT started moving together and a new term was coined named as ICT (Purnima Hooda et.al, 2012).

ICT means Information and Communication Technology. It has three parts Information, Communication and Technology. ICT is defined by UNESCO as forms of

technology used for creating, displaying, storing, manipulating, and exchanging information. It has opened new avenues, like online learning, e-learning, virtual class room, virtual lab, virtual university, e-coaching, e-education, e-journal, e-books etc. Third Generation mobiles are also part of ICT. Mobile is being used in imparting information fast and cost effective. Mobiles are user friendly. One can access it anywhere. It will be cost effective. The ICT brings more rich material in the classrooms and libraries for the teachers and students. It has provided opportunity for the learner to use maximum senses to get the information. The ICT being latest, it can be used in education levels in the areas: Teaching, Learning, Evaluation, Instructional Material Development etc.

ICT Tools:

There are various ICT tools available which can be utilized for the knowledge creation and dissemination. Hardware tools like Radio, TV, Internet, Mobile phone, Computer, Laptop, Tablets, Smart board, LCD projector, CCTV, Pen drives, CDs, DVDsetc. Software tools like Computer Aided Instruction (CAI), Computer Assisted Learning (CAL), PowerPoint Presentation (PPT),E-mail, Discussion forum, Wikis, Blogs, Social Media, YouTube, Video Conferencing, Teleconferencing, Google Earth, Google Maps, School Tube, Teacher Tube, Flicker, Web2.0, Simulation Software's etc. These devices can be used in imparting education and training for teachers and students. Some tools discussed as follows;

LCD Projector: A Liquid Crystal Display (LCD) projector is a type of video projector for displaying video, images or computer data on a screen or other flat surface. It is a modified version of OHP (Over Head Projector). It is used as teaching aid in classroom transaction for displaying image, chart, PPT, videos, etc.

Interactive Smart Board: The smart board is an interactive white board that uses touch detection for user input in the same way as normal PC input devices. The white board accepts touch input from a finger, pen or other solid object. Smart board can be used in classroom instead of blackboard or whiteboard. It can be used as teaching aids. Teacher can use smart board by sharing lesson plan and ideas with each other, through Internet.

Power Point Presentation: Power Point Presentation (PPT) is slide presentation

software. Using MS Power Point, teacher can create interactive slide containing, text, art, animation, audio-video element related to classroom lesson. PPT will make the classroom interaction more interactive and effective. It can be a highly effective tool for teaching and learning. Benefits of using PPT are increasing Visual Impact, increasing Spontaneity &Interactivity, enriching Curriculum with inter-disciplinarily, improving Audience focus, engaging Multiple Learning Styles.

Social Networks: Social Networks like Whatsapp, Facebook, Twitter etc. are an interactive media, which is based on Web2.0 technology. People can share information, upload photos/videos, post comments etc. on social media. People can instantly communicate and share any form of information with each other.

Mobile Learning: Mobile Learning (M- Learning) means learning with the help of hand held technology such as Mobile Phones, Laptops, Tablets and other portable devices. It is accessible virtually from anywhere. It is user friendly technology, so any one can use effectively. It is low cost technology.

Use of ICT: The use of ICT in teaching can be a relevant and functional way of providing education to learners that will equip them with skills and knowledge required to function in modern world. The use of ICT tools for teaching falls into four major categories: 1. Constructing knowledge and problem solving through the Internet, e-mail, databases and video conferencing 2. Using process skills 3. Aiding explanation of concepts

Communicating ideas.

The systematic use of ICT tools in classroom instruction makes the teaching-learning process more effective and highly interactive. It has shifted the teaching-learning process from teacher centred learning to student centred learning. Research has shown that high level of student and instructor satisfaction can be produced in ICT enabled learning process. But the effective and efficient use of ICT depends on technically competent teachers.

The effective and efficient use of ICT in classroom instruction depends on:

1. Best quality ICT tools
2. Online support, networking and management
3. ICT literacy of Teachers

4. Effective use of ICT hardware and software
5. Innovation in the use of ICT

Role of teacher is very much important in teaching learning process. ICT cannot replace the teacher; it can aid the teacher in the process of teaching more interactive. The effective use of ICTs in teaching learning process also depends on teacher's ICT competency and skill. So the teachers have to realize that if the students are to achieve a high level of competency and competitiveness, they have no other choice but to adopt technology as an integrated tool in the field of education (Purnima Hooda et.al, 2012).

Advantages of ICT in Teaching:

1. ICT can make the teaching-learning process more interesting, interactive and effective.
2. It can helpful teacher to demonstrate practical with videos, simulations, models-static and live.
3. It helps the learner to study their lesson / practical.
4. Learners can learn and work at their own just with little guidance from the teachers.
5. Learners can get various information, study material, e-Books, e-Journals, videos etc very easily and quickly.
6. It helps teacher and learner to support their conclusions with evidence and logical arguments.
7. The learners can interact with the teachers and experts on various issues outside the classroom or laboratory.
8. It also helps the teachers to evaluate the learner's progress and proficiency in certain skills.

Conclusion:

If our schools throughout the country are to maintain maximum educational standards, they should be provided with adequate funds, infrastructural facilities in terms of modern classrooms equipped with electronic computer system which are connected to internet, well equipped laboratories, workshops, Libraries, instructional materials and highly qualified personnel that can effectively utilize these resources. With the introduction of information and communication Technology, a new challenge for science and physics

education has emerged. ICTs are making dynamic changes in education. They are influencing every aspects of education. Application of ICT tools in Teaching-Learning Process has changed the total scenario of teaching-learning process.Use of ICT in Teaching Physics play important role in science education. ICT can make the teaching-learning process more interesting, interactive and effective.It create interest in teacher and make them empowered for teaching Physics. It is helpful the students to learn Physics easily. Use of ICT must be compulsory part of Physics curriculum.

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Recent Techniques in Removing Phosphorus from Wastewater

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5 Research Paper - Physics

ABSTRACT

Phosphorus is one of the major nutrients contributing in the increased eutrophication of lakes and natural waters, human excreta, food additives, detergents, corrosion inhibitors and industrial discharges are the main sources of phosphorus compoundsin sewage today the main commercial processes for removing phosphorus from wastewater effluents are chemical precipitation and biological treatment. Phosphate removal is currently achieved largely by chemical precipitation, which is expensive and causes an increase of sludge volume by up to 40% an alternative is the biological phosphate removal (BPR) the aim of this study was to investigate the feasibility of phosphate removal from synthetic wastewater by calcium chloride addition in order to determine optimal operating conditions (PH &Ca/P molar ratios) and to study the influence of the ionic composition of a synthetic solution on calcium phosphate precipitation it is Ca/P ratio 1.5 PH more than Alum or polyaluminiumchloride. In systems where PH controls is an important factor.

Introduction :-

Nutrient salts are most important components of wastewater these consist mainly of Phosphorus and nitrogen which are responsible for one major international problem known as eutrophication of lakes & water ways. It has been generally understood that

Phosphorus is the limiting nutrient in lakes & waterways seeders is one of the countries in the EU that imposes lower limits for the discharge of Phosphorus in recipient water bodies. The maximum limit of Phosphorus in most waste water treatment plants is between 0.3 & 0.5 ingle total phosphorus as monthly or quarterly mean value in the water leaving the treatment plant, depending on the sensitively of the recipient water body. This calls for better waste water treatment technologies and more research is still being undertaking in this area. It is however clear that with conventional wastewater treatment only about 20% to 30% of Phosphorus is removed (Henze 1995) presently, there has been a trend towards combining biological and chemical phosphorusremoval method to achieve better results.

Result and Discussion:-

New technology is used for the removal of Phosphorus in waste water. When treating the waste water with magnesium onside. When the waste water is treated with magnesium onside, struvite (magnesium ammonium phosphate) (MAP) is formed which can be applied as a fertiliser in agriculture, resulting in a closed Phosphorus cycle. The ANPHOS technology has been implemented on a full scale at the waste water treatment plant at the kruiningen site Nitrogen and Phosphorus supply to fresh water negatively affects water quality and ecosystem balance this process known as eutrophication this can lead to increased wastewater treatment costs a reduction in the biological diversity & recreational value of natural water bodies in waste water containing relatively high concentrators of nitrogen& Phosphorus these elements are difficult to remove economically to reach the appropriate compliance limits by biological methods.

Phosphorus must be removed from wastewater as too high concentration may lead to an eutrophication effect & rapidly deteriorating water quality. Main sources of Phosphorus compounds in sewage come from human excreta and detergents. Average amount of Phosphorus from urine & faeces are about 1.0 & 0.59 P/cap day. Chemical precipitation with the use of aluminium and iron salts and lime was the chosen technology. Chemical precipitation in full scale sewage treatment the addition of chemical precipitation agents and removal of produced floss by sedimentation flotation or filtration is the main process technology. many combinations with chemical & biological methods

are possible for phosphorus removal the system choice depends on many factors and better evaluation methods are needed life cycle analysis (LCA) may be an interesting tool to evaluate the systems is still a need for optimization of different methods and more important to evaluate the Phosphorus cycle in rural areas.

Experimental:-

There are two types of processes to remove Phosphorus.

1) Biological Phosphorus removal:-

In biological Phosphorus removal there is an anaerobic state sufficient to create volatile fatly acids (VFAs) such as acetic &propionic in advance of a aerobic (Mixed liquor) zone during anaerobic treatment phosphorus is removed into waste streams. But in case of aerobic treatment the released phosphorus & much more is taken by phosphate accumulating organisms (bacteria)

Bundgaard & Hollander (1978) tested biological nitrification and deification with chemical phosphorus removed by simultaneous recitation with ferrous salts they operated a Bio-Cerrito ordination ditch at the condition F/M ratio 0.19 BOD19 MLVSSd, MLSS = 4100glm^3, SDT = 12 days. They achieved an effluents concentration of 0.89 plm3 in the effluent but did not observe parallel biological & chemical phosphorus removal.

2) Chemical Phosphorus Removal:-

Iron is used for the chemical phosphorus removal processes in the form of ferric chloride (Fecl3), ferrous chloride (Fecl2) and ferrous sulphate (Feso4) Phosphorus that is dissolved in wastewater like sugar in water, is hard to remove we found that a Nano media made with waste Iron can easily absorb & removed Phosphorus. In case of iron 816.47gm of iron is required to remove 453 gm. of phosphorus (as P) Iron works over a wide PH range Iron salt solutions contain some trace metals up to 75-100 mg/L depending on the product.

Ferric chloride (Fecl3)

$FeCl_3 + PO_4$ - $Fe_3(PO_4)_2$

$Fe^{+3} + HCO_3$ - $FeOH_2$

34.5% of ferric chloride solution = 589.67gm of Iron per 3.785 lit.

Aluminium Salts:-

Aluminium Salt (Alum) is also used in Phosphorus removed processes it having Aluminium sulphate (alum) Al2(SO4)3 poly-aluminium chloride (PAC), aluminium chloride (AlCl3), aluminiumchlorohydrate, & sodium aluminates ($Na_2Al_2O_4$)

$Al^{+3} + PO_{4-3}$ - $Al(PO_4)$

$Al^{+3} + 3HCO_3$ - $AlOH_3$

28% $AlCl_3$SOln = 267.629 of aluminium per 3.785 Lit.

70% PAC solution = 254.01 of aluminium per 3.785 Lit.

Lime:-

Chemical equations for lime removal of Phosphorus are given. Lime dosage is more influenced by alkalinity than Phosphorus concentration the PH must be raised to 10.5 for Phosphorus removal to occur.

$Ca(OH)_2 + HCO_3$ - $CaCO_3 + 2H_2O$

$5Ca_2 + 4OH + 3HPO_4$ - Ca5(OH) $(PO4)_3$ + 3H2O

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