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**TECHNO-PEDAGIGICAL INTERPHASE (TPI) AMONG TEACHER
TRAINEES OF LIFE SCIENCE USING VALUES, ATTITUDES, SKILLS,
AND KNOWLEDGE (VASK) APPROACH**

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Submitted to

The Deputy Secretary

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DECLARATION AND CERTIFICATE

I hereby declare and certify that, the complete project report on the Minor Research Project entitled ***“TECHNO-PEDAGIGICAL INTERPHASE (TPI) AMONG TEACHER TRAINEES OF LIFE SCIENCE USING VALUES, ATTITUDES,SKILLS, AND KNOWLEDGE (VASK) APPROACH”*** is a bonafide record of research work done by me during the year 26.04.2011 to 29.10.2012 . Further certified that the work presented in the report is original and carried out according to the plan in the proposal and guidelines of the University Grants Commission.

Principal Investigator

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CHAPTER 1

1.1 Introduction

Educational technology is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning. And it is the application of scientific knowledge and learning and the conditions of learning to improve the effectiveness and efficiency of teaching and training. And it is to modernize the learning methods and techniques after systematizing them so that these may be tuned effective according to the need of the changing era for the unknown future. Educational technology has been found to have positive effects on student attitudes toward learning and on student self-concept. Students felt more successful in school, were more motivated to learn and have increased self-confidence and self-esteem when using computer-based instruction.

The 21st century is knowledge based, technology driven and fast changing. Education must be harnessed with technology and the teachers and the learners who should be made familiar with the use of ICT tools in their teaching learning process. Information technology has touched all aspects of human life-communication, styles of shopping, modes of entertainment, education, research and services provided by different organizations. Familiarity with the technology is now a pre-requisite for not only academic purposes but also for career needs. IT makes desirable modifications in the behaviours of the teachers and pupils by improving the teaching learning and evaluation conditions.

Through the use of advanced computing and telecommunication technology, learning can also be qualitatively different. The introduction of information technology in recent years has provided the opportunity to integrate alternative learning techniques into traditional teaching. Learning or teaching systems have been developed in a bid to improve the teaching process. In this age of knowledge explosion, selecting apt techno- pedagogic competencies for teachers is one of the challenges that ICT integration brings in. New e- content and on- line programmes should be created in a wide range of formats to enable different types of learners to master need based learning objects. In a developing country like India, an empowered instructional force is a necessary condition for achieving quality education.

In this context, every teacher practicing or prospective- needs to know varieties of advanced instructional strategies that can not only bring drastic changes in pedagogy and curriculum content, but also equip him/ her to work in a technology enriched class room. Understandably many governments have embarked on programmes for equipping educational institutions with computers and the associated paraphernalia. The Kerala Government too has taken the necessary initiatives through the programmes IT @ school. Today many of schools consist of smart rooms or virtual classrooms.

Educators and policymakers believe that information and communication technologies are of supreme importance to the future of education and, in turn, for the country at large. As ICT is becoming an integral element for educational reforms and innovations at secondary schools, this situation calls for an enhancement of pre-service education on ICT for prospective teachers.

There is a growing importance for ICT within the school curriculum. Not only it is used to support teaching and learning within other curriculum subjects, but it is also a subject in its own right as a separate discipline. The major objective is that developing skills, knowledge, and understanding in the use of ICT prepares pupils to use such technologies in their everyday lives. ICT tools enable pupils to access, share, analyze, and present information gained from a variety of sources and in many different ways. The use of ICT provides opportunities for pupils to work both collaboratively and independently. As such, the role of ICT within the curriculum is not only to enhance the learning experiences of pupils but also to help them develop the skills essential to participate effectively in the world of affairs. It generates avenues for working in groups developing team spirit, cohesion, and social values. Here, a teacher plays a pivotal role in the process of teaching learning. Hence, knowledge of ICT and skills to use ICT in teaching/learning has gained enormous importance for today's teachers. Teachers are expected to know to successfully integrate ICT into his/her subject areas to make learning more meaningful. This knowledge development during pre-service training has gained much importance with the notion that exposure to

ICT during this time is helpful in increasing student teachers' willingness to integrate 86technology with classroom teaching.

1.2 ICT in Kerala

A few worth while attempt are made in Kerala for mass education and at school level education in the field of Information and Communication technology such as (1)Akshaya Project and (ii) IT @ school project.

1.2.1 Akshaya Project

The IT Policy of 1998 and 2001 of the State Government of Kerala paved the way for adopting ICT in all walks of life to improve the living standards of the people. The first step in this direction was an attempt to computerize the administrative system of the Government, the first attention was to improve computer literacy and Internet usage among people all over the state. Through the programme of SEVANA, Government planned to provide internet facilities in rural libraries throughout the 14 districts of Kerala. Due to management issues and technological problems, SEVANA turned out to be a failure. However, as a sign of the determination of the government to go ahead with its ICT visions, the Government has opened an official web portal, www.Kerala.gov.in. Information on various Government departments were made available through this site and the Government initiated seminars, discussions and surveys, the Government has decided to establish ICT, access points by the name 'Akshaya e- Kendra' for every 1000 families, one for every two or three Grama Panchayat wards and to provide five computers and other infra structure at a cost of Rs 4lakhs per centre.

The major aims of Akshaya e- kendras all over the state are:-

- 1) To develop over 5000 numbers of networked multipurpose community technology centres to provide ICT access to the entire population of the state.
- 2) To enhance the quality of available IT infrastructure in the state, and also to provide facilities for rural connectivity infra structure.
- 3) To accelerate the development of local content relevant to the population.
- 4) To enable e- transaction and e- governance services through the centers.
- 5) To generate 50,000 employment oppurtunities in 3 years.
- 6) To mobilize direct investment of over Rs.500 crores in 3 years.

Today Akshaya e- kendras are functioning as computer training centres, departmental information centres, e- transaction centres, e- governance cell, communication hub, multimedia animation and designatory centres and centres of computer based business services such as travel and tourism etc. Under the giant umbrella of Akshaya Kendras, the Government implemented various programe such as SHRADHA for children, MITHRA for unemployed, SAKTHI for women, BHOO MI for farmers etc. Through computer literacy programmes and activities, Akshaya e- kendras are using every opportunity to popularize e- payment, e- krishi, e- Governance, content development etc.

Through computer aided learning for students, Akshaya project envisages to promote on-line examinations, single window seat allotment process, publish results through Internet and certificate verification etc.

Akshaya e- kendras also promote various services to the public. It gives people access to District Collector every Wenesday to inform him of complaints and requests using the software, e- parathi. Together with this e- parathi system at district level., Akshaya Kendras provide e- mail IDs of Ministers and people can send their demands and complaints via e –mails. This programme is known as Public Grievance Re dressal programe. Health and Family welfare department has lot of initiatives to reachout to the grass root level, to create awareness and educate people on a variety of issues related to health and family welfare. Some projects are in the pipeline to offer tele- medicine services through Akshaya centres, with more focuss to deliver tele- health, tele- counselling programmes etc. There are a number of government schemes available to citizens and application forms are made available through online facilities.

1.2.2 IT @school project

The year 2001 marked a new era in the education sector with the opening of a special office of IT @ school project in SIET campus. In 2001 itself the Kerala Government by a Guzzette order, incorporated IT in school curriculum. This order paved the way for an IT revolution in the education sector in Kerala.

In 2002, then the Chief Minister Sri A.K Antony officially inaugurated IT @ school project and published a text book for IT for the V111th standard. In order to fruitfully implement IT Project in school, the education department organized intensive training for teachers in IT. The grant of one Lakh each, to Government schools for instituting IT labs accelerated the successful implementation of projects. In 2002, the education departments organized an IT exhibition as part of animal science exhibition. In 2003 the Government provided computers, CD's and 'ISM office 2000' software to selected schools and established resource centres at the district level to co-ordinate the activities of the computer labs in different schools. From 2003 onwards the SSLC examination results were made available through the Internet.

India now faces an International environment in which success in global competitiveness of higher education depends on the quality of tertiary level of teaching and research. Indian schools are gearing towards student centered teaching and learning with a constructivist vision in education. Therefore, it is a top educational priority to prepare a new generation of teachers who can use ICT innovatively to promote student centered learning. The development of technology based learning is an active, ongoing process situated in multiple contexts. It is therefore imperative for teacher education programme to adopt various strategies to guide, model and support pre-service teacher's development of technology

based pedagogy, until it becomes an integral part of their professional growth. The computer and telecommunication technologies are enabling the teachers to develop multimedia in which text, voice, pictures and simulation etc. can be integrated and delivered through computers, as an interactive learning package.

Despite the advances in Information and communication technology, the potential of teacher educators and student teachers remain untapped. So it high time for both of them to develop and utilize innovative teaching strategies supported by electronic media to improve the quality in pedagogy and content. The role of the teacher changes from a knowledge transmitter to that of a learning manager, learning facilitator, knowledge guide, knowledge navigator and co- learner. This would require an information base, models, of teaching and learning, organization of knowledge applicable to the design of experience and understanding of the needs.

Teachers, teacher educators and student teachers at the secondary level need to be trained for the successful implementation of technology enhanced learning. They should be made aware of the importance and possibilities of educational technology, learning theories and technology integration, basic hardware and software skills, the use of multimedia and internet, pedagogical application of technology tools in their respective curricular subjects, introduction to open source software, which can be downloaded free of cost from the internet and their applications in teacher education, social, legal, ethical and health issues in using technological devices, the professional productivity etc of the learner(smith,1995). The teacher education curriculum should be upgraded considering the changing roles of both student-teachers and teacher- educators. This necessitates a transformation the existing teaching learning strategies.

There is a growing importance for ICT within the school curriculum. Not only it is used to support teaching and learning within other curriculum subjects, but it is also a subject in its own right as a separate discipline. The major objective is that developing skills, knowledge, and understanding in the use of ICT prepares pupils to use such technologies in their everyday lives. ICT tools enable pupils to access, share, analyze, and present information gained from a variety of sources and in many different ways. The use of ICT provides opportunities for pupils to work both collaboratively and independently. As such, the role of ICT within the curriculum is not only to enhance the learning experiences of pupils but also to help them develop the skills essential to participate effectively in the world of affairs. It generates avenues for working in groups developing team spirit, cohesion, and social values.

Pre-service teachers need to plan to use computers in their classrooms. Vision is needed to motivate and direct their teaching and learning with the help of technology and using related instructional methods. There are various strategies used to make teachers understand and implement the integration of ICT in various curricula. They should serve as a basis for understanding computer operations and programming along with assisting pre- service teachers to learn computer concepts in developing a vision, value, and use of computers in learning. Many studies have been conducted on teachers' attitude and their use of ICT skills. It has been found that teachers' attitudes play an important role in the teaching learning process.

1.3 The various skills and competencies to be developed on the part of student teachers would be:

- *Surfing* the Internet and locating useful information from the Internet for the development of lesson plans.
- Developing lessons plans incorporating student use of technology in the learning process.
- Evaluating and selecting appropriate software for a particular subject and per student needs.
- Generating printed documents like student assignments, newsletters, communication, etc. utilizing a variety of applications software like word processing and desktop publishing.
- Managing student data; using data management tools for efficiently managing learning.
- Using technology to gather, organizes, and report information about student performance like Excel and Access for database management.
- Developing tools to evaluate technology-based student projects including multi-media, word processing, database, spreadsheet, PowerPoint, desktop publishing, and Internet/telecommunications.
- Using the Internet to support professional development including locating professional organizations, communicating with other teachers electronically, and participating in on-line professional development workshops and seminars.

- Developing assignments and project work for students; giving them broader and deeper knowledge in a field of study; developing critical thinking and infusing creativity among students.

1.4 Techno-Pedagogy a Skill

The aim of teacher education is to develop skills and appropriate knowledge among teacher trainees for using and integrating the correct technology in an appropriate manner. Every teacher should know how to use technology, pedagogy and subject area content effectively in their daily classroom teaching. It is clear that merely introducing technology to the educational process is not enough. One must ensure technological integration since technology by itself will not lead to change. Rather, it is the way in which teachers integrate technology that has the potential to bring change in the education process. Hence, attitude and self-efficacy towards technology play an important role. For teachers to become fluent in the usage of educational technology means going beyond mere competence with the latest tools to developing an understanding of the complex web of relationships among users, technologies, practices, and tools. Teachers must understand their role in technologically-oriented classrooms. Thus, knowledge about technology is important in itself, but not as a separate and unrelated body of knowledge divorced from the context of teaching--it is not only about what technology can do, but perhaps what technology can do for them as teachers.

In techno-pedagogy, there are three areas of knowledge, namely: content, pedagogy, and technology.

Content (C) is the subject matter that is to be taught.

Technology (T) encompasses modern technologies such as computer, Internet, digital video and commonplace technologies including overhead projectors, blackboards, and books.

Pedagogy (P) describes the collected practices, processes, strategies, procedures, and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment, and student learning.

Speaking truthfully, technology integration entails the understanding and negotiating of the relationships among the aforementioned three components. Good teaching is not simply adding technology to the existing teaching and content domain. Rather, the introduction of technology causes the representation of new concepts and requires developing sensitivity to the dynamic, transactional relationship between all three components suggested by the TPACK framework. (Koehler, M. J. and Mishap, P. 2005)

Depending upon the nature of content, scope of content, and level of students, appropriate technology integration must be sought. Technology as an aid enhances the process of learning and helps in achieving higher level objectives.

1.5 Blogs in Education

Blogs provide a communication space that teachers can utilize with students whenever there is a curriculum need to develop writing, share ideas and reflect on work being undertaken in the classroom.

Blogs are widely popular in education, as evidenced by the 400 thousand educational blogs hosted by edublogs. Teachers have been using them to support teaching and learning since 2005. Through years of practice, a common understanding has formed around the benefits of the use of blogs in education. Because blogs are connected, they can foster the development of a learning

community. Authors can share opinions with each other and support each other with commentary and answers to questions. For example, the University of Calgary uses blogs to create learning communities. Additionally, blogs give students ownership over their own learning and an authentic voice, allowing them to articulate their needs and inform their own learning. Blogs have been shown to contribute to identity-formation in students. (Bortree, D.S., 2005).

1.6 Need and Significance of the Study.

A flash back on the history of the use of multimedia technology in education reveals that computers are used in every sphere of human endeavour but we have been able to move much with respect to transacting knowledge to students through the combination of different technologies. Review of related literature shows that a number of investigations have been done to study the influence of computer based multimedia programe on the achievement of students.

Studies by Sarsani (2005), Sheeba(2006), Mahender reddy(2007), Yelland(2005), Rajan(2009), Sevin(2010) and Nachimuthu(2010) also showed the results regarding the effectiveness of digital learning strategies.

The syles of teaching and learning now a days go far beyond traditional pedagogic comfort within the four walls of the classroom. It is necessary to present a variety of strategies to maximize learning for heterogenous groups. Natural science classrooms of today are little different from those of yesterdays, despite the involvement of many creative minds in the development of innovative curricular materials.

With the recent developments in technology and computer science, our age old teaching methodology has been outdated .Under These circum stances, the role of the teacher as curriculum manager demands highest level of expertise and specialization to integrate technology and pedagogy. Teacher educators and student teachers have to be equipped with the skills and abilities from time to time to handle the latest technology as the quality and competence of teachers affect instruction imparted by them with strong impact on students learning.. due to heterogenous nature of the classroom and the high teacher-pupil ratio, teachers felt it difficult to cater to the varied needs and interest of learners.

Teacher training institutions have to conscientize student teachers about their future role. Depending on the nature of the subject, teachers may combine different strategies and instructional aids, utilize media supported teaching, organize field trips and other enriching activities.The prospective teachers are to be prepared so as to enable them to perform successfully in the pre- instructional and post instructional phases of teaching.

The integration of modern information and communication technology in to teaching and learning process has a great potential. Technologies are tools and their effectiveness depends on how they are employed. They allow materials to be presented in multiple media format thereby enhancing critical thinking and other higher levels of cognition skills and processes and provide access to world wide information resources. Teachers are now inclined to use Educational Internet site in the form of class room. The modern teacher has a variety of instructional tools at his disposal. He can choose an array of resources readily available before him on the internet. The World- Wide – Web, as no has been revolutionizing instructional practices across the world. The discerning teacher only has to make an appropriate

selection of the most reliable and useful tools, after indulging in a judicious process of selection.

Information and communication technologies are currently being used in education to assist students to learn more effectively by providing teachers with access to a wide range of new pedagogy. These technologies are also being used to enable teachers to do administrative tasks more effectively or efficiently. The Web based learning can support the four fundamental characteristics of learning. They are: Active engagement, participation in groups, frequent interaction and feedback.

Web Based Learning can improve the quality of teaching learning and management in schools and so helps to raise standards. From an educational aspect, the use of computers brings dynamism to lessons, putting students more in control of their learning, permitting independent progress and development. WBL has the potential to enhance individualized instruction without requiring an increase in the number of teachers. The web based learning replaces conventional classrooms, creating new opportunities and challenges for teachers and learners. The ever expanding technology and information of the internet offer amazing opportunities for the teachers to make their teaching successful. . According to Sharma, the goal of individualized instruction is that each child's learning becomes self-initiated and self directed. The use of computers in schools has been recognized to improve learning as well as enrich the process of education with the introduction of multimedia, which involves combining written text, sounds, still pictures, animation and net work.

Now a days teachers adopt conventional method for transacting biology in the classrooms due to lack of facilities, rigid time table and over- crowded class rooms. In this type of learning students undergo a passive type of learning. The

conventional method is against the principle of learning by doing and does not encourage the habit of independent thinking. It does not provide training in scientific method and does not help the inculcation of scientific attitude among students. Here emphasize is laid on the memory work which is against the principle of learning science. The present generation needs practical type of education. As a result more and more informations and new knowledge are being added day by day. Biology became an indispensable subject for those who wish to continue their studies in any branch of medicine, agriculture, biotechnology etc. The students who wish to continue their studies in the above fields require a thorough knowledge of biology. Like any other branch in science Biology is also cumulative in nature. So a thorough base and curricular knowledge should be provided to students at this level for clearing the entrance examinations and other competitive examinations. That is why there arises the need for introducing Web Based Learning in Biology teaching. More over the experience of the investigator as a teacher of biology and observations made during discussions with Higher Secondary School Biology teachers also high light the need for the preparation of web based learning material at Higher Secondary Level. Inspite of the significance of this area no study has been conducted so far to develop web based learning material in biology at higher secondary level in a scientific and systematic manner. It is presumed that a study of this type will be useful for curriculum planners, teachers and students.

The investigator has experienced for herself the inadequacies of the outdated methods of teaching – learning biological sciences at higher secondary level. One of the aims of teaching biology at higher secondary students is to prepare them for professional careers and to inform future citizens the nature and role of biology in every day life. Higher secondary level being a turning point in

the students academic life and a stepping stone to his higher studies. Today's world is the competitive world so it is very must to provide efficient learning situation for surviving such a type of world situation. Now there is knowledge explosion and the students should be made aware of new inventions and discoveries and also should have to go deep in to their areas of interest.

1.7 Need of including ICT at B.Ed level

ICT is introduced in secondary teacher training courses at various levels as a compulsory subject or a special field subject. Sometimes, it is also introduced as one of the subjects to be studied under a course titled 'Educational Technology'.

Various objectives/rationales for introducing the course are as follows:

1. Understanding the scope and importance of ICT in contemporary society.
2. Developing effective perspectives and attitude towards emerging technologies.
3. Developing skills in handling, maintaining and protecting different types of hardware and equipment in the institutions of learning.
4. Acquiring a theoretical basis of ICT and to develop an awareness about recent developments in the area of ICT.
5. Acquiring adequate knowledge about the fundamentals of computers and operating systems.
6. Acquiring the necessary skills of handling software packages for the purpose of education in the institutions of learning.
7. Acquiring knowledge about new Internet technologies and their place in the field of education.

In the majority of teacher education institutions, the syllabi exhibit less weight to practical than theoretical aspects. Since the nature of ICT subjects is more practical

and application-oriented, there needs to be more practical than theoretical input. This aspect seems to be neglected in designing and framing curricular objectives. The present approach for ICT integration is dismal as an “add on” approach for ICT course is adopted :

- ICT basics are taught to teacher trainers focusing on technical issues, but little emphasis is given to the pedagogical aspects
- Educational technology courses are taught in a rather traditional way and show little evidence of using new technology to support instructional innovations
- Students don't know how to use new technology in their classroom instruction when they go to schools
- Technology input is not integrated in the curriculum courses, especially method courses.

These are certain basic problems associated with the integration aspects of technology. These are major hurdles in the integration of ICT in the teaching/learning process. This scenario shows that the objectives of introducing ICT at the pre-service level are developing technological know-how and awareness regarding various other technologies and software packages. Further, the time spent for practical sessions is less, as more time is spent for theory sessions. The total approach of introducing ICT at the pre-service level is not very serious. It is very clear that student teachers will not get much scope in order to integrate ICT in curriculum or the teaching/learning process. In teacher training programs at the secondary level, the ICT education scenario is struggling with the following problems:

- Only at the awareness development level are objectives being achieved, but higher order thinking skills regarding the use of ICT tend not to be occurring.
- Technology, pedagogy and content area integration is a rare feature. All components are dealt with separately which creates confusion for students.
- There is a serious discrepancy among syllabi of teacher training institutions and secondary schools. Syllabi at various institutions are not on a par with school level curriculum.
- Time duration of the courses related to ICT education is too short to develop knowledge and necessary skills among students to achieve higher order thinking skills.
- There is a lack of availability of proper infrastructural facilities at most of the institutions.
- There is a mismatch between available hardware and software to develop required learning resources.
- Support from technical staff for maintenance is dismal.

The objective at the pre-service level is not to prepare technocrats, but to develop techno-pedagogues. Teachers should be in a position to integrate technology into teaching / learning as well as develop the art and skill of “webogogy” (i.e., to make use of Internet technology, exploring it, accessing information from it to use in teaching learning, etc.). So, objectives must be set at the attainment of application and skill levels rather than just at the knowledge and understanding levels. The professional development of teachers needs to be given importance. There must be congruence between the school curriculum and teacher training curriculum at the

secondary level. Otherwise, teachers are not ready to utilize their knowledge to effectively design teaching/learning processes, project work, and assignments. In addition to offering ICT as a compulsory and special course, integrated approaches need to be studied along with methods courses. This will help student teachers to develop the concept of 'techno pedagogy' to a greater extent.

Thus, management of change in teacher education is a complex and demanding task involving comprehension, concern, caution, and contemplation. Planners and administrators of teacher education have to provide academic leadership to prepare reflective teachers who can manage the educational system efficiently at various stages of education at the pre-primary, primary, elementary, secondary, and higher secondary levels. Effective change in schools is possible only when there are corresponding changes in the management of teacher education programs.

The investigator is under the impression that the use of a techno-pedagogical practices will ensure better student monitoring and better student achievement at the B.Ed level. The investigator hopes that this study will not only help student teachers for learning the selected topics, but also provide an additional support to the teacher educators who teach learning theories and psychological principles of learning.

CHAPTER - 2

2.1 Theoretical Overview

Information and communication technologies are currently being used in education to assist students to learn more effectively by providing teachers with access to a wide range of new pedagogy. These technologies are also being used to enable teachers to do administrative tasks more effectively or efficiently. The Web based learning can support the four fundamental characteristics of learning. They are: Active engagement, participation in groups, frequent interaction and feedback.

2.2 Techno pedagogy

The aim of teacher education is to develop skills and appropriate knowledge among teacher trainees for using and integrating right technology in an appropriate manner. This means a teacher should know about technology, pedagogy and content for using them effectively in day- to- day classroom teaching. It is clear that merely introducing technology in the educational process is not enough to ensure technology integration

Since technology alone does not lead to change, rather it is the way in which teachers integrate technology that has the potential to bring about change in the educational process.

In techno- pedagogy three areas of knowledge viz, Content, pedagogy and technology are important. Content (C) is the subject matter that is to be taught. Technology (T) encompasses modern technologies such as Computer, Internet, Digital videos and common place technologies including OHP, Blackboards, and books. Pedagogy (P) describes the collected practices, processes, strategies ,

procedure and methods of teaching and learning. It also includes knowledge about the aims of instruction, assessment and student learning.

2.3 Approaches to ICT integration in Teacher Education

Use of ICT within teacher training programs around the world is being approached in a number of different ways with varying degrees of success. These approaches were subsequently described, refined and merged into following approaches:

1. ***ICT skills development approach***: Here importance is given to providing training in use of ICT in general. Student teachers are expected to be skilled users of ICT for their daily activities. Knowledge about various software, hardware and their use in educational process is provided.
2. ***ICT pedagogy approach***: Emphasis is on integrating ICT skills in a respective subject. Drawing on the principles of constructivism, pre-service teachers design lessons and activities that center on the use of ICT tools that will foster the attainment of learning outcomes. This approach is useful to the extent that the skills enhance ICT literacy skills and the underlying pedagogy allows students to further develop and maintain these skills in the context of designing classroom- based resources.
3. ***Subject-specific approach***: Here ICT is embedded into one's own subject area. By this method, teachers/subject experts are not only exposing students to new and innovative ways of learning but are providing them with a practical understanding of what learning and teaching with ICT looks and feels like. In this way, ICT is not an 'add on' but an integral tool that is accessed by teachers and students across a wide range of the curricula.
4. ***Practice driven approach***: Here emphasis is on providing exposure to the use of ICT in practical aspects of teacher training. Focus is on developing lessons and assignments. Using ICT and implementing it in their work

experience at various levels provides students an opportunity to assess the facilities available at their school and effectively use their own skills.

Thus, ICT in teacher training can take many forms. Teachers can be trained to learn how to use ICT tools. ICT can be used as a core or a complementary means to the teacher training process (Collis & Jung, 2003). The various ways in which ICT teacher training efforts could be classified into four categories are shown below in Figure 1.

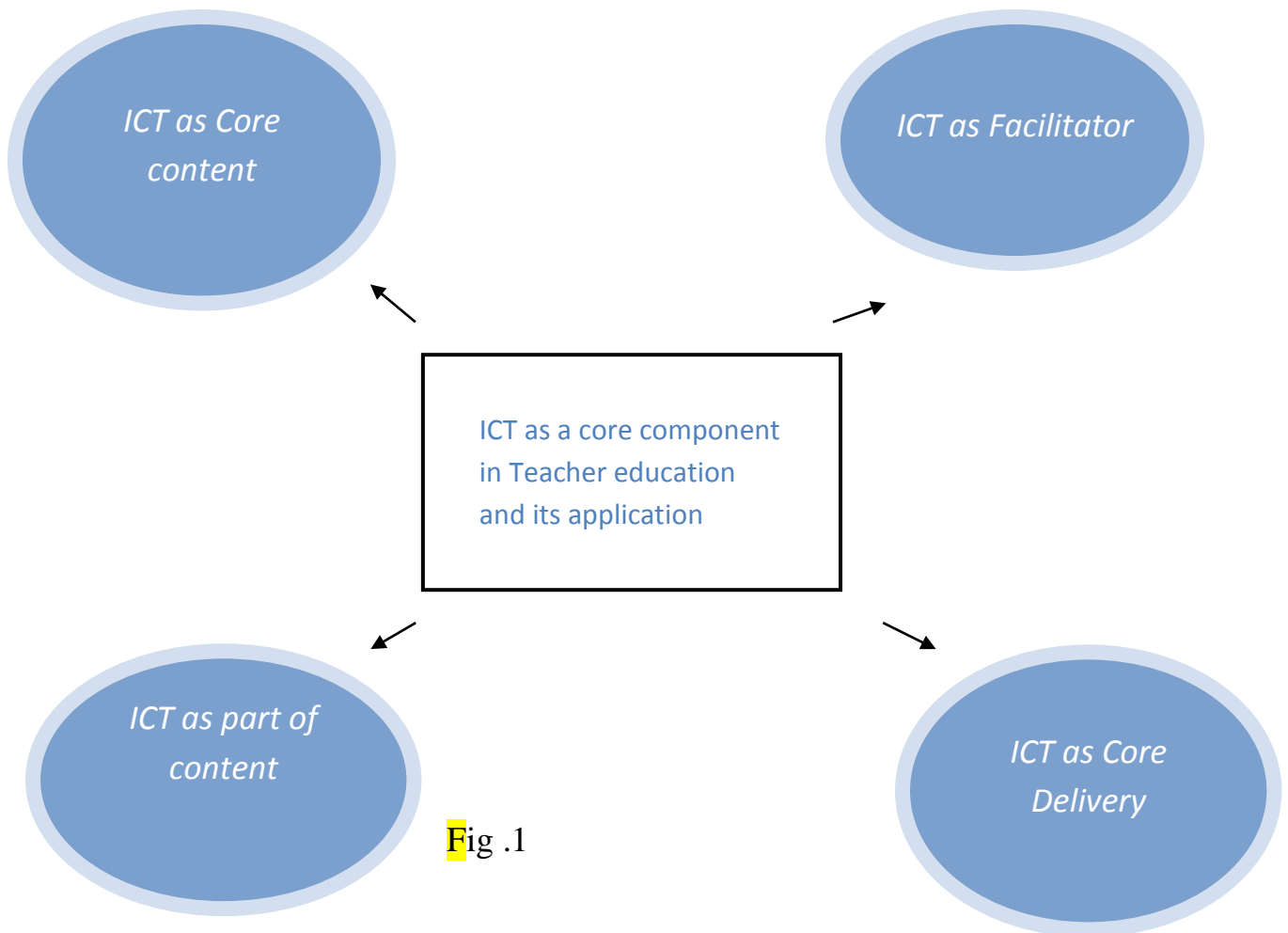


Fig .1

From the above suggested approaches, regarding ICT as a core component at the pre-service level, integration of all approaches would help in

developing proper attributes among prospective teachers. There should be joint efforts of educators and prospective teachers in implementing and sharpening ICT skills. Whatever approach is followed in educational institutions to develop knowledge about ICT, it has inherent limitations. Coupled with other reasons, we are not making student teachers fully confident in using ICT in their daily classroom activities. As reported by Larose F. in their study, the level of computer literacy of the teaching staff is satisfactory but there is little transfer of these competencies to teaching practices (Larose F., et al. 1999). Efforts are required on the part of teachers to make use of the available facilities for the best use in teaching /learning.

2.4 Psychological and technological bases of Techno-pedagogy

The psychological theories, informational sciences, knowledge of brain processes and technological matters, which to a greater or lesser extent influences the work of an instructional designer in techno-pedagogy. The theory of technology related instructional strategies must be based on the science of psychology. Human mind processes information, generate cognitive structures to be stored in memory and translates it into behaviours of learning. therefore instructions must be designed not to put knowledge in learner's heads but to put learners in position that allow them to construct well structured knowledge. The stages of intellectual development suggested by Jean Piaget, model of sequential learning proposed by Robert Gagne-the theory of cognitive subsumption by David Ausubel (1963) and the model of concept learning by Jerome Bruner(1961) etc emphasizes the importance in designing of human information processing models.

Techno-pedagogy has its roots in behavioural psychology researches (animal learning experiments) that are relevant to human learning processes. The important brain centers that take part in learning process to such as hypothalamus and hippo-

campus are just the same in man and animals. The difference is in the presence of large areas of poly sensory neo-cortex in human brain where abstract thoughts can be handled. A cat or rat does not have this much (though it has some). Therefore its used for human learning Skinner's work (1954) on learning and his emphasis on the importance of reinforcement in learning situations has revolutionized the field of educational technology. Advances in Technology have contributed to a constructivist learning theory.

Technology integration in pedagogy helps in the analysis of individual learner's (high, low and average) needs and interest in learning. active work in small steps and plenty of timely feedback from the instructional designers are the essential characteristics of techno-pedagogy. Technological developments and new research on the effectiveness of technology enhanced learning requires continuous planning or adjustments to existing strategies.

2.5 Advantages of TPI

The advantages of Techno-pedagogical Interface are many, Students can move at their own pace, continuous feedback, self corrective and self evaluation, students never gets impatient and never forgets, ideally suited, remedial instruction, storage large amount of information, dynamic interaction between student and instructional Programme lead to improve student programme in thinking logically, formulating problem solving procedures and understanding relationships, provide programmed control of several media such as films, slides, TV and demonstration equipments.

2.6 Educational Implications of TPI

The TPI may prove effective in teaching learning. Childrens are highly enthusiastic about working with computer and academic motivation usually improves. The appeal of computer can be traced in part to its inherent pedagogical strength which

ensures more active learning, more varied memory and an aid to abstraction. In the words of Amarel (1983). Computer contributes to education as

Aids to learning and instruction in the classroom and 2) as a tool in research on human cognition.

1)Computer are found to be active partners in the learning process which may be most effective in teaching subjects that are either not taught at all or not taught well.

CHAPTER - 3

3.1 Review of Related Literature

The review of related studies is an essential part of any investigation and it gives the researcher an understanding of the research methodology which refers to the way the study is to be conducted . It helps the researcher to know about the tools and instruments which proved to be useful and promising in the previous studies. Before taking up any specific research project in the development of a discipline ,the research worker should become familiar with the location and use of already accumulated sources of information .To assure this familiarity , every research project has to review the available research studies .

3.2 Studies related to web Assisted Instruction

‘Web Assisted Instruction is teaching and learning supported by the attributes and resources of the internet.’(Khan, 1997, Relan and Gillani, 1997). Thus web based learning can be used to deliver learning at any time to virtually at any place. Several research studies were carried out to study in detail regarding the web assisted teaching. Representative studies are those of Cargile(2000),Harvell(2000), Ludwig(2000), Mathai(2000), Michalasky(2000), Sansing(2000), Hill(2001), Joseph(2001), Lyke(2001),Nazer(2001), Gardinali(2002), Menon(2002), Quintana(2002) and George(2006).

Cargile(2000) conducted a study that offers a comprehensive examination of pedagogical designs for Internet based Instruction in technical and professional communication. The result of this study did not definitively demonstrate that one design was superior to the other, although the interactive design did appear to promote increased literacy achievement.

Chuang(2000) conducted a study to improve the guidance systems focused on web based instructional design and to provide more detailed and useful guidelines in a special context-the content being the teaching of music fundamentals at the pre-college level. The result revealed the importance of web based instruction.

Hall, et al.(2000) took up the study based on web assisted instruction. The study revealed that web based instruction was effective.

Harmon and Jones (2000) conducted a study on A Quantitative analysis of Web Based Instruction . This paper presents results of research on an intensive online graduate level course in Web Based Instruction delivered via the same medium. The findings were focused on the areas of interaction, the importance of technical powers, aids and barriers to the establishment of a learning community and the effective dimensions of web based instruction. The paper concluded that due importance must be gives to learner and learning environment.

Harvel(2000) conducted a study to identify and estimate the costs and benefits of incorporating web based materials as a supplement to traditional classroom. The result showed that inclusion of ineractivity and graphical representation resulted in high costs relative to the benefits perceived by the instructor.

Myint, Sive and Khine(2004) conducted a study on 215 pre-service trainee teachers and surveyed their perception of the importance of certain Web site characteristics. The result shows that Websites are informative and useful, the trainee teachers would guide their students on the use of those websites.

Rajasekhar(2003) conducted a study to investigate the attitude of B.Ed students towards computer and the study reveals that the students have a favourable attitudes towards computer more in the urban areas than in the rural area.

Mridula D and Ranade conducted an experimental study on teacher educators to find whether computer assisted instruction was very effective in bringing about learning. the result shows that The teacher educators showed positive attitude towards the use of computer and they were motivated the use of computer.

3.3 Studies on classroom use of on-Line teaching and learning

The Internet has the potential for effecting fundamental changes in the design of learning processes. The move to integrate internet in teaching and learning is rapidly gaining momentum. The studies based on classroom use of online teaching and learning include those of Anderson(1999), Zakari(2000) and Mathai(2000).

Zakari (2000) conducted a study to identify the uses of the internet by Saudi graduate students in the U.S and to determine whether the Internet should be adopted in Saudi Higher educational Institutions. The result suggested that Saudi graduate students are clearly motivated to use the internet by belief that it offers many academic benefits to their graduate studies. The study suggested that the Internet enables graduate students to obtain and have instant and easy access to a variety of information resources, do faster and easy academic communication and keep updated with the latest information resources.

Mathai (2000)conducted a study to find out the viability of using the internet as a tool to foster self directed learning is a viable teaching method in Maths and science for motivated adult learners and that Internet is a resourceful tool to facilitate it.

CHAPTER 4

4.1 Methodology and Results

The investigator adopted pre-test- post-test single group design for the present study.

Sample

400 prospective teachers of life science studying various B.Ed colleges all over the University of Kerala were selected as sample of the study.

Tools used: (1) Test as TPAQ(Techno-Pedagogical Awareness Test)
(2) Package in TPA

The investigator conducted a survey among the 400 prospective teachers of life science optional to analyse their awareness in ICT tools and resources. . For this purpose the investigator prepare and standardized the Questionnaire based on TPA, which contains 25 number of objective type items. Content validity and reliability of the questionnaire was established. The investigator designed a package of learning materials and strategies to develop the awareness on techno-pedagogy. This learning package includes various classes on ICT by experts in the same field- Blog, Moodles, were obtained in it. Hands on experiences were provided to every prospective teachers. After completing the experiment, the investigator tried to to find out the effects of the experiment using same test which was used as the pre-test for the study.

Statistical techniques

Mean, Standard deviation and T test were used for finding the effectiveness of Techno-Pedagogical inputs.

To analyse the effects of designed 'Learning package' on the awareness of prospective teachers in the lifescience, a group of 400 student teachers were selected as a single group and the result analysis of pre-test reveals that the prospective teachers have a little awareness regarding the techno-pedagogical awareness. The inputs given to the group was application of ICT in Higher education, blog preparation, Introduction to moodles etc.

As this project was intended to develop Techno-pedagogical interface using VASK approach(Values, Attitudes, Skill and Knowledge)

Table 4.1

Test	N	Mean	Standard deviation	't'	P <0.01
Pre-test	400	19.2	3.5	63.405	
Post test	400	36.7	4.3		

The 't' was used for finding the difference of pre-test and Post-test scores.

From the above table 4.1 the obtained 't' value 63.405 is greater than the tabled value of 't' at 0.01 level of significance. Which implies that the difference seen in the scores as the result of treatment. The investigator concluded that the treatments given to the sample were effective.

4.2 TECHNO-PEDAGOGIC PACKAGE

osmoregulation.blogspot.com

INTRODUCTION

Excretion is the process by which waste products of [metabolism](#) and other non-useful materials are eliminated from an [organism](#). Every organism, from the smallest protist to the largest mammal, must rid itself of the potentially harmful by-products of its own vital activities. This process in [living things](#) is called [elimination](#). Example of toxic waste materials are ammonia, urea, uric acid, CO_2 , H_2O , and ions like Na^+ , K^+ , Cl^- , phosphate, sulphate, etc. Through excretion organisms control [osmotic pressure](#) - the balance between inorganic ions and water—and maintain acid-base balance. The process thus promotes [homeostasis](#), the constancy of the organism's internal environment.

In [single-celled organisms](#), waste products are discharged directly through the surface of the cell. [Multicellular organisms](#) utilize more complex excretory methods. Animals have special excretory organs and different excretory organs constitute the excretory system. In man this is primarily carried out by the [lungs](#), [kidneys](#) and [skin](#).^[1]

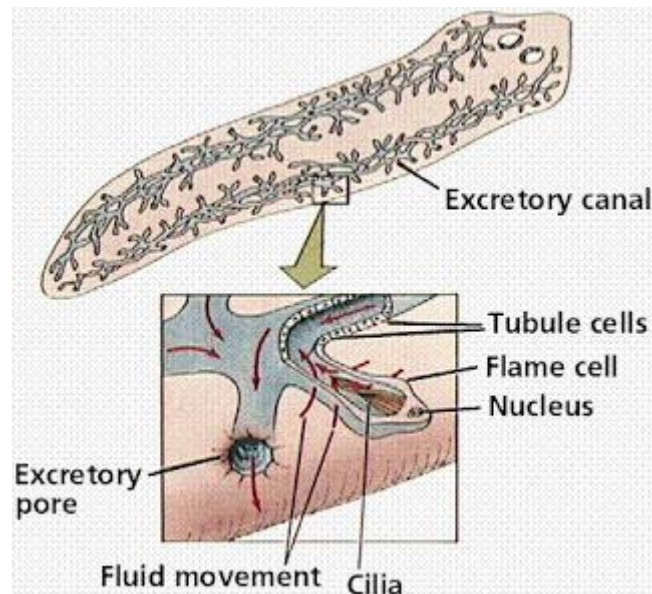
The main function of excretory system is to eliminate the nitrogen waste. In this chapter you will learn the mechanism of elimination of nitrogenous wastes. Ammonia, Urea, and Uric acid are the major forms of nitrogenous wastes. Ammonia is highly toxic and water soluble. The process of excreting ammonia is known as [ammonotelism](#). Such animals are called ammonotelic. It is found in aquatic animal groups like sponges, coelenterates, crustaceans, echinoderms, bony fish, tadpole larvae, and salamander.

Mammals, many terrestrial amphibians and marine fishes mainly excrete urea. They are called [ureotelic](#). It is commonly found in man, whales, seals, desert mammals like kangaroo rats, camels, toads, frogs, cartilaginous fishes, aquatic and semi aquatic reptiles like alligator, terrapins and turtles. Urea is far less toxic than ammonia. Ammonia produced by metabolism is converted into urea to the liver of these animals and released into the blood which is filtered and excreted out by the kidneys. To maintain a desired osmolarity, some urea may be retained in the kidney matrix of these animals.

Reptiles, birds, land snails, and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water. They are called [uricotelic animals](#). Uric acid is formed from ammonia mostly in the liver and to some extent in kidneys. But it is much less toxic than both ammonia and urea and it is almost insoluble in water and can be eliminated from the body in nearly a solid state, saving a lot of water.

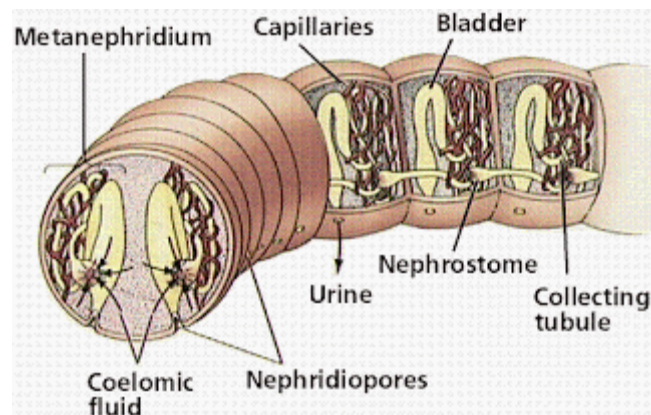
Other Nitrogenous wastes – Allantoin, creatine, creatinine and hippuric acid are some nitrogenous waste products excreted by mammals.

In most of the invertebrates, the excretory organs are simple tubular forms whereas in vertebrates, the excretory organs are complex. For example flat worms like Planaria have the simplest tubular excretory system called the [Protonephridia or flame cells](#).



Rotifers, some annelids and cephalochordates (Amphioxus) also possess protonephridia.

Protonephridia are generally concerned with osmoregulation i.e., the regulation of ionic and fluid volume. Earthworms possess a similar simple tubular excretory system called [metanephridia](#).



In cockroaches and other insects , the **malpighian tubules** are the excretory organs.



Crustaceans like Cray fish have a pair of specialised excretory structures called '**antennal gland**' or '**green gland**' that is situated at the base of the second antennae.

HUMAN EXCRETORY SYSTEM

THE EXCRETORY SYSTEM

Just as how we throw away the waste materials from our homes, our body too has a system to remove the waste. The system is called the excretory system. The excretory system consists of a pair of kidneys, ureters, the urinary bladder, and a urethra. The main organs of the excretory system are the kidneys. There are two reddish brown bean shaped organs located on each side of the lower abdomen. Each kidney of an adult human measures 10-12 cm in length, 5-7cm in width, 2-3cm in thickness with an average weight of 120-170 g. Towards the centre of the inner concave surface of the kidney is a notch called hilum through which ureter, blood vessels and nerves enter. The kidneys filter the blood. They help to get rid of waste in the form of urine. The urine is carried by tubes called ureters to the urinary bladder. The urinary bladder stores the urine. When the bladder is full, the urine is passed out through the urethra. In this way the excretory system removes the wastes from the body.

A detailed anatomy of the kidney is shown here. The longitudinal section of the kidney shows the location of the renal cortex, renal medulla, the renal pyramids and the renal pelvis.

The outer layer of kidney is a tough capsule. Inside the kidney, there are two zones. An outer cortex and inner medulla. The medulla is divided into a few conical masses projecting into the calyces. These conical masses are known as medullary pyramids. The cortex extends in between the medullary pyramids as renal columns called columns of Bertini.

Each kidney has nearly one million complex tubular structures called nephrons. Nephrons are the functional units and they are also known as kidney tubule.

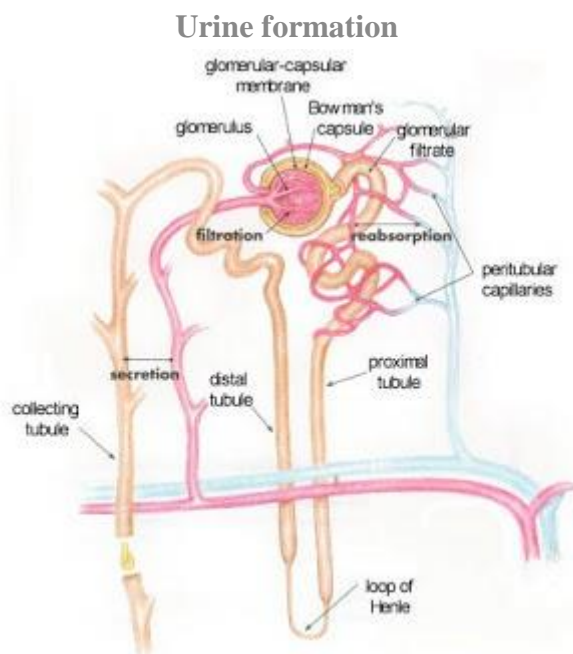
Observe the placement of the nephrons in the enlarged renal nerve. Seen here is the anatomy of nephron.

The main parts of nephrons are the Bowman's capsule, the glomerulus, the proximal convoluted tubule, the distal convoluted tubule and the loop of Henle.

Glomerulus is a tuft of capillaries formed by the afferent arteriole. Blood from the glomerulus is carried away by an efferent arteriole. The renal tubule begins with a double-walled cup-like structure called Bowman's capsule. The Bowman's capsule encloses the glomerulus. Glomerulus along with Bowman's capsule is called the Malpighian body or renal corpuscle (figure 4). The tubule continues further to form a highly coiled network called proximal convoluted tubule (PCT). A hairpin-shaped Henle's loop is the next part of the tubule which has a descending and an ascending limb. The ascending limb continues as another highly coiled tubular region called distal convoluted tubule (DCT). The DCTs of many nephrons open into a straight tube called collecting duct.

The efferent arteriole emerging from the glomerulus forms a fine capillary network around the renal tubule called the peritubular capillaries. A minute vessel of this network runs parallel to the Henle's loop forming a 'U' shaped vasa recta.

The structure of human excretory system, the kidneys and the nephrons can be observed here.



INTRODUCTION

Every one of us depends on the process of urination for the removal of certain waste products in the body. The production of urine is vital to the health of the body. We could not survive if we did not produce urine and eliminate it. Urine is composed of water, certain electrolytes, and various waste products that are filtered out of the blood system. A major part of “cleaning” of the blood takes place in the kidneys and, particularly in the nephrons, where the blood is filtered to produce the urine. Both kidneys in the body carry out this essential blood cleansing function. Normally, about 20% of the total blood pumped by the heart each minute will enter the kidneys to undergo filtration. This is called the **filtration fraction**. The rest of the blood (about 80%) does not go through the filtering portion of the kidney, but flows through the rest of the body to service the various nutritional, respiratory, and other needs that are always present. Urine formation involves three main processes namely, glomerular filtration, re absorption and secretion, that take place in different parts of the nephron. The three steps of urine formation are

1. Glomerular filtration,
2. Tubular reabsorption, and
3. Tubular secretion.
4. Glomerular filtration occurs in the glomerulus,

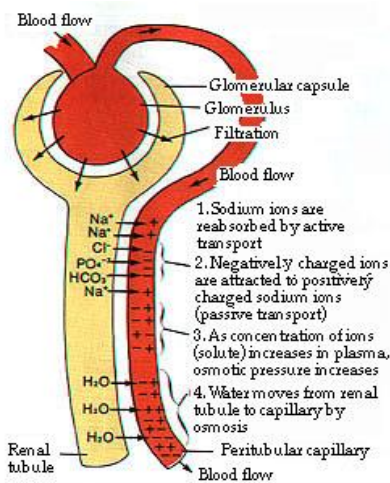
Tubular reabsorption occurs through the proximal convoluted tubule, and Tubular secretion occurs through the distal convoluted tubules.

Glomerular filtration is defined as the process of primary filtration taken place from the glomerulus in to the bowmans capsule.

tubular reabsorption is the process of reclaiming water and solutes from the tubular fluid and returning them in to the blood.

tubular secretion is defined as the process of movement of “wastes and excesses” from the blood in to the Distal and collecting tubule.

Filtration



MECHANISM OF CONCENTRATION OF THE FILTERATE

Mammals have the ability to produce a concentrated urine. The human body does not maintain a constant water volume, the kidneys use a transport system called the counter-current mechanism. The Henle's loop and vasa recta play a significant role in this. The particles and fluid removed from the blood, the filtrate, moves from the Bowman's capsule to the proximal tubule, loops of Henle, distal tubule, and collecting tubule. The flow of filtrate in the two limbs of Henle's loop is in opposite directions and thus forms a counter current. The flow of blood through the limbs of vasa recta is also in a counter current pattern. The name is based on the fact that concentration first increases in the direction of flow, then decreases as flow continues through the ascending parallel loop. The mechanism relies on the adjacent, parallel loops of Henle and vasa recta. In the ascending loop, Na^+ (or any solute) is actively pumped out of the tubule. As flow continues up the loop, the tubular concentration decreases as does the interstitial (the fluid surrounding the loop) concentration. Because water is impermeable in the ascending loop, the volume at the bottom of the loop is the same as that entering the distal tubule. At the bottom of the loop, the tubular and interstitial concentrations are equal. In the descending loop, the concentrations inside and outside the tubule are increasing with the current, with the maximum concentration being reached at the bottom of the loop. The increased concentration is the result of the passive diffusion of Na^+ into the tubule and water out of the tubule. When the filtrate reaches the distal tubule, a net loss of Na^+ and water has occurred through the loops of Henle. Inside the distal and collecting tubules, the filtrate is either diluted or concentrated to form urine. The Henle's loop and vasa recta are close together and counter current mechanism in them help in maintaining an osmolarity towards the tissue surrounded by Henle's loop in the renal medulla, i.e., from

300 mOsm/L in the cortex to about 1200 mOsm/L in the inner medulla. This gradient is mainly caused by NaCl and urea. NaCl is transported by the ascending limb of Henle's loop which

is exchanged with the descending limb of vasa recta. NaCl is returned to the interstitium by the ascending portion of vasa recta. Similarly, small amount of urea enter the thin segment of the ascending limb of Henle's loop which is transported back to the interstitium by the collecting tubule. This counter current mechanism helps to maintain a concentration gradient in the medullary interstitium. Presence of such interstitial gradient helps in an easy passage of water from the collecting tubule thereby concentrating the filtrate(urine).human kidneys can produce urine nearly four times concentrated than the initial filtrate formed.

Kidney functioning and regulating the volume and concentrating of body fluids

Kidney functioning and regulating the volume and concentrating of body fluids

The kidneys are responsible for keeping the homeostatically constant, which is achieved by regulating the volume and concentration of body fluids by selectively filtering and reabsorbing materials from the blood.

Blood volume control and kidney function

The volume of fluid in various fluid compartments in the body depends on the balance of fluid intake and fluid output. Fluid intake in response to thirst is a source of fluid, and receptor cells found in the hypothalamus activate thirst when exposed to hypertonic conditions - such as when water loss has been excessive or salt intake high.

Anti-diuretic hormone (ADH) and kidney function

ADH or antidiuretic hormone or vasopressin is the hormone produced from the hypothalamus of the brain. It is secreted into the blood from the posterior lobe of pituitary. ADH is secreted when the osmoreceptors of hypothalamus detect an increased osmolarity or lesser water concentration in the blood. This causes thirst, and the released ADH makes the distal convoluted tubule and collecting duct of nephrons permeable to water. The primary effect of ADH is to limit the amount of water being lost in urine,. It is done by increasing the amount of reabsorption of water into the blood. The ADH targets the cells of the tubules and collecting ducts, which causes an increase of permeability of the cell surfaces, where the water then leaves the renal tubules in to the blood by means of osmosis.

With more fluid being reabsorbed, the blood volume increases

Aldosterone hormone - regulation of sodium and potassium and kidney function

ADH is not the only hormone that helps with the regulation of kidney function - aldosterone (from the adrenal cortex) as well as parathyroid hormone (from the parathyroid glands) affects the balance and regulation of electrolyte content of the blood and body fluids.

When aldosterone is present in the blood, the distal renal tubules increase their re-absorption of sodium and the secretion of potassium. With this action, more water is retained in the body

Aldosterone is secreted by the adrenal glands when the level of the potassium in the blood is increased, as well as the self-regulatory action of the kidneys by means of the renin-angiotensin system.

Renin-angiotensin system regulation of kidney function

When blood pressure increases so does the glomerular filtration increase, but when blood pressure falls, the filtration level drops and the glomerular filtration rate then needs another system to increase the filtration rate.

This is made possible by a specialized region of the nephron - the juxtaglomerular complex

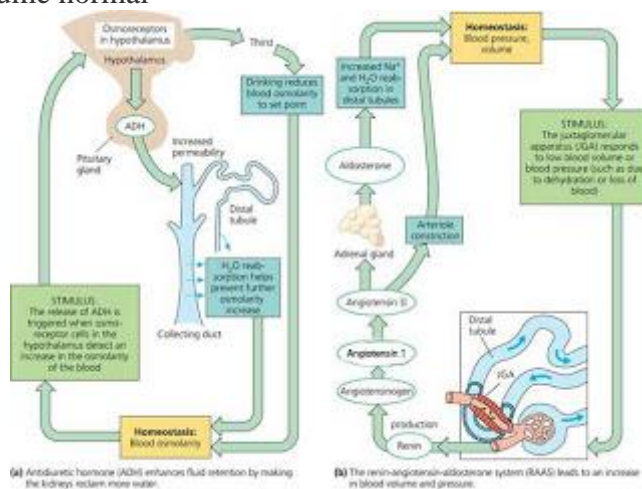
In mammalian nephrons the distal convoluted tubule forms a secretory tissue near the Bowman's capsule, in between the afferent and efferent arteriole, called Juxtaglomerular apparatus (JGA).It

has directed contact with the afferent arteriole. If the blood pressure or blood volume in the afferent arteriole is decreased, the JGA secretes an enzyme called renin into the blood stream. Renin converts and inactive plasma protein angiotensinogen to active angiotensin II. This angiotensin II behaves like a hormone and increase blood pressure and blood volume by the following mechanisms.

1. It constricts arteries to reduce arterial volume, thereby increasing blood pressure.
2. It stimulates the proximal convoluted part of the nephrons to reabsorb more water, Na^+ and Cl^- ; which increase the blood volume.
3. It stimulates the adrenal gland to release aldosterone, enhances the re-absorption of water and Na^+ by the distal convoluted part of nephrons. This activity further increase the blood volume.

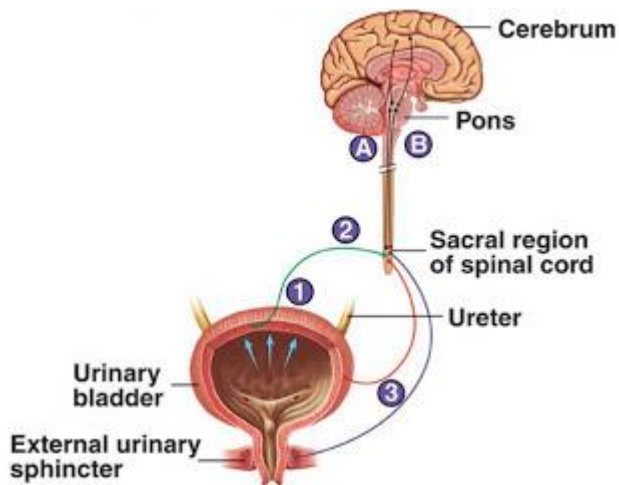
Thus the Renin- Angiotensin- Aldosterone system (RAAS) regulate the renal function to raise blood volume and blood pressure to a higher level.

Increased blood volume and blood pressure stimulates the auricular wall of heart to produce another protein called Atrial Natriuretic Factor (ANF). It inhibits the release of renin from JGA. Thus the balanced interplay between RAAS and ANF helps to maintain the blood pressure and blood volume normal



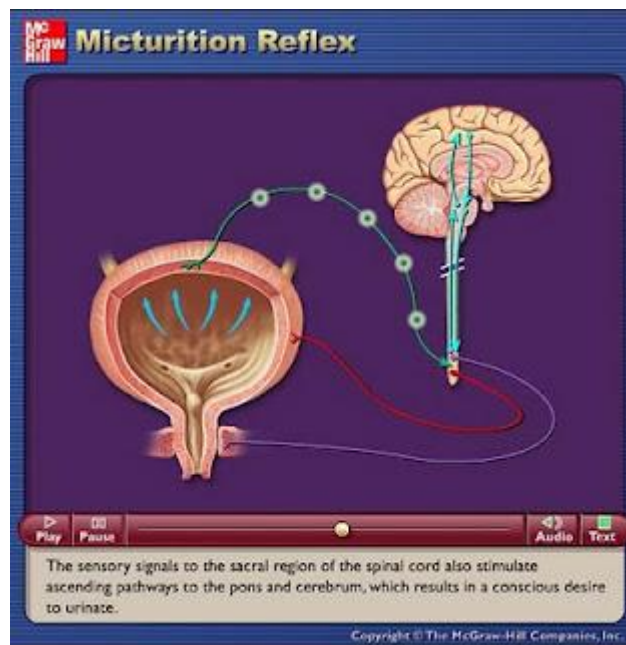
MICTURITION

Micturition is the process by which urine is expelled from the bladder. The neural mechanism causing micturition is called Micturition reflex. Micturition cycle occurs two phases . it consist of a filling phase and emptying phase. Each phase requires a coordination interaction between the bladder and the nervous system. Neural mechanism causing micturition called MICTURATION REFLEX. Urine formed by the nephrone is ultimately carried to the urinary bladder. Where it is stored till a voluntary signal is given by the central nervous system [CNS]. This signal is initiated by the stretching of the urinary bladder as it gets filled with urine. In response ,the stretch receptors on the walls of the bladder send signals to the CNS. The CNS passes on motor messages to initiate the contraction of smooth muscles of the bladder and simultaneous relaxation of the urethral sphincter causing the release of urine. An adult human excretes , on average , 1 to 1.5 litres oof urine per day. The urine formed is a light yellow coloured watery fluid .Analysis of urine helps in clinical diagnosis many metabolic disorders as well as malfunctioning of the kidney. For Eg: Presence of glucose & ketone bodies in urine are indicative of diabetes mellitus.



Micturition cycle occurs two phases. it consist of a filling phase and emptying phase. Each phase requires a coordination interaction between the bladder and the nervous system. Urine formed by the nephron is ultimately carried to the urinary bladder. Where it is stored till a voluntary signal is given by the central nervous system [CNS]. The signal is initiated by the stretching of the urinary bladder as it gets filled with urine. In response ,the stretch receptors on the walls of the bladder send signals to the CNS.

The CNS passes on motor messages to initiate the contraction of smooth muscles of the bladder .The simultaneous relaxation of the urethral sphincter causing the release of urine. This type urine releasing process are called MICTURITION



The urine formed is a light yellow coloured watery fluid . The urine is a slightly acidic and has a characteristic odour. An adult human excretes on average 1 to 1.5 litres of urine per day. Analysis of urine helps in clinical diagnosis many metabolic disorders as well as malfunctioning of the kidney.

For Eg: Presence of glucose & ketone bodies in urine are indicative of diabetes mellitus.

OTHER ORGANS IN EXCRETION

ROLE OF LIVER IN EXCRETION

The liver is a vital part of the excretory system, and the human body. It regulates glycogen storage, plasma protein synthesis, and drug detoxification. The liver secretes bile, a base used for breaking down fats. Therefore, it helps get rid of unneeded wastes in the body. It changes toxic ammonia, which is a poisonous gas , to urea, a harmless fluid. The kidney filters urea(a mix of sugar and waste) into a liquid called urine. The liver is the largest gland in the body.

ROLE OF LUNGS IN EXCRETION

Lungs are two-sponge like organs localized in each side of the thorax. They are constituted by pulmonary alveoli. They are not responsible for converting oxygen into carbon dioxide, but to maintain life supporting levels of these two gases in blood stream by excreting the extra carbon dioxide and keeping a regular supply of oxygen. Each and all organism's cells can take the oxygen through passive diffusion from the bloodstream and use it in its own metabolism, thus producing carbon dioxide that will be further excreted when passing through alveoli circulation.

ROLE OF SKIN IN EXCRETION

The skin is another part of the system, containing sweat that help regulate the concentration in one's body while also keeping him or her cool. The salt helps evaporate the water, cooling off the skin. Sweat is excreted through sweat glands. There are two types of sweat glands: Eccrine sweat glands and Apocrine sweat glands. The basic purpose of skin is to provide a waterproof, protective, covering for the body's complex internal environment. The skin also plays a key role in helping to maintain the circulatory and nervous system.

ROLE OF ECCRINE GLANDS IN EXCRETION

The eccrine glands secrete mostly water and salt and are used by the body for temperature control. These glands are located all around the body but are most profuse around the soles of the feet, palms of the hands, and the forehead. They look like coiled tubes, spiraling towards the exterior of the skin

ROLE OF BILE IN EXCRETION

Bile is a greenish or yellowish substance secreted by the liver used for breaking down fats, ethanol, and acidic wastes. It is composed of water, cholesterol, lecithin, bicarbonate ions, bile salts, and pigments. Bile is a strong basic substance, classified as alkaline. It is released through bile ducts in the liver. A digestive chemical that is produced in the liver, stored in the gall bladder, and secreted in the small intestine

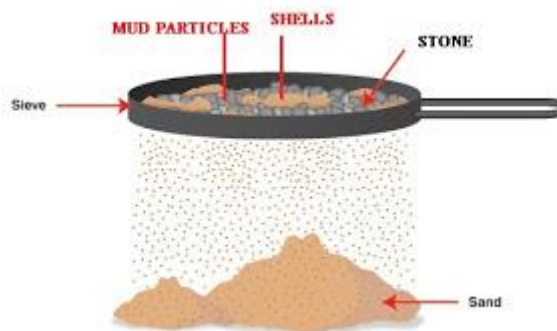
ROLE OF LARGE INTESTINE IN EXCRETION

The large intestine, or the colon, is the last part of the excretory system. It is the organ that removes solid waste from the body. Its function is not only to remove solid waste but to collect water from the waste that can be reused. It is part of the alimentary canal, a channel that flows through vertebrate animals. It is about 6 to 7 meters long and processes, transports, and excretes solid wastes.

summary of osmoregulation

SUMMARY

The sand used for the building purpose contains a lot of impurities like stones, shells, mud particles and decayed particles of living things. The workers commonly use sieves as the apparatus for the removal of these waste materials, like wise the living organism also produces waste material (nitrogenous substances, ions, CO_2 and water) as a by-product of various metabolic activities in the cell. Living organisms also have an apparatus like sieve called excretory organ. They are responsible for the process of excretion or elimination of waste materials in the body.



Here we are mainly focused on the mechanism of elimination of nitrogenous waste materials. The nitrogenous waste materials will vary from organism to organism based on their habitat.

where they located).Ammonia ,urea and uric acid are the different types of nitrogenous waste materials. Those organism which excretes

- a) Ammonia as the waste materials are called ammonotelic organism.eg:-Many bony fishes, Aq.amphibians and Aq. Insects.Ammonia is highly toxic in nature and their elimination require a large amount of water so most of the ammonotelic organism are seen in water.
- b) Urea as the waste materials are called ureotelic organism.eg:- Mammals,many terrestrial amphibians and marine fishes.urea is less toxic than ammonia and it require a less amount of water for their elimination .
- c) Uric acid as the waste materials are called uricotelic organism.eg:- Reptiles,birds ,landsnails and insects.

The excretory system in human being consist of a pair of kidney,a pair of ureters,a urinary bladder and a urethra. Each kidney has a millions of tubular structures called NEPHRONS.It is the basic unit of a kidney and has two portion.ie Glomerulus and renal tubule.Glomerulus is a group of fine capillaries formed from afferent arterioles .The renal tubule consist of double walled cup-like structure called Bowman's capsule,proximal convoluted tubule(PCT),loop of Henle and distal convoluted tubule(DCT).The DCT of many nephrons joints to a common duct called collecting duct that ultimately open in to a renal pelvis through medullary pyramids.

Urine formation involves 3-process.ie,1) Glomerular filtration 2) Tubular reabsorption 3)Tubular secretion.

The filtration is done by glomerulus due to high glomerular capillary blood preasure.about 1200ml of blood is filtered by the glomerulus per minute and forms 125ml of filtrate per minute in the bowman's capsule, this is called glomerular filtration rate(GFR).JGA plays a significant role in the regulation of the GFR.PCT is the major site of re-absorption and selective secretion.DCT and collecting duct allows extensive re-absorption of water and certain electrolytes which helps in osmoregulation : H^+K^+ and NH_3 could be secreted in to the filtrate by the tubule to maintain the ionic balance and pH of body fluid.

A counter current mechanism operates between the 2-limbs of the loop of Henle and vasa recta.The filtrate gets concentrated as it moves down the descending limb but is diluted by the ascending limb .Finally the urine is collected in the urinary bladder till a voluntary signal from CNS carries out its release through urethra. Skin ,lungs and liver.

4.2 Results

1. The provided techno-pedagogical inputs were suitable for enhancing awareness in Techno-pedagogy.

Conclusion

Techno- Pedagogic Interface (TPI) is a technique suggested for training the youth in literacy, e-enabled learning, web- based learning and cyber assisted learning. Certain pedagogical treatments have been made to strengthen the technological know-how and to sequence the same in lines with national values, desirable attitudes, social and personal skills and the construction of knowledge. Values, attitudes, skills and knowledge (VASK) approach suggests pedagogic treatments to students in decision making and choice making. Obviously the students will be in a position to make value additions in learning, innovations in learning and making a validation in learning.

The aim of education may be regarded as the development of the socially efficient individual. This is to prepare the pupil for participation in the social, civic, economic, vocational, and other activities of life. Through teaching Life science the students will develop different values such as, practical values, disciplinary values, inspirational values, recreational values, intellectual honesty etc. The individual act persistently and consistently in accordance with the values he has internalized. Like this the student develop scientific attitude also. The students develop open mindedness in receiving new ideas and facts, shows curiosity, pursues activities with consistency, develop a sense of dedication etc. Developing skill is very important matter in science teaching; they are experimentation skill, drawing skill, and observation skill. Acquisition of knowledge will become fruitful only through the inculcation of proper values, attitude and skills. So this is a new approach (VASK) integrating values, attitudes, skills and knowledge.

The relevance of techno pedagogy has been projected in my project so far. Incorporating technology in transacting the content can enhance its effectiveness. Learners find this way of learning more interesting and motivating as they provide a vicarious experience in learning. content can be easily comprehended and can be retained for longer periods. In a constructive context of learning, a teachers has to provide framework essential to build the concepts by the learners. To provide the framework, a technological basis, the teacher should require adequate knowledge and training in adopting technology in the right way.

For that teacher education courses can incorporate fundamental and practical aspects of technology in the curriculum. This will enable the prospective teachers to provide a technological frame work for teaching learning process while playing the role of facilitator in the future.

So this study suggests that the curriculum planners and policy makers should realize the significance of technology in transacting the curriculum and thereby should give due importance to it while planning teacher education curriculum.

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