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Exploring Teacher's Techno-Pedagogical Competency to Achieve Process Oriented Skills of Learners: A Multimedia Context

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Abstract

In the modern progressive technological era, there is increasing interest in the incorporation and integration of technology in the classroom. To incorporate and integrate technology in the instructional strategies adequate and apposite knowledge and teacher's competency in pedagogy and technology is the prime requirement. Lack of any one will not serve the purpose of developing process oriented skills of learners. The process oriented skills are the lifelong experiences of our juvenile learners to cope with the hazards and threats of the constant changing environment. In this analytical article we are to explore teacher's techno-pedagogical competency, ways to enhance them and how their classroom practices help to develop process oriented skills of learners in a 'Multimedia Context'.

Keywords:- Multimedia based tools, Integration of technology in Education, Techno Pedagogical competency, Process oriented skills.

Introduction

Liberalization, Globalization, Modernization and Digitalization in the Education system has made a paradigm shift from the conventional chalk-and-talk methodology of teaching to a digital pedagogical or techno-pedagogical approach through multimedia based technical devices. Such type of transformation in Education is not only boosting the potentiality of the teachers but also developing and expanding the information base of students so as to make them competitive in the international sphere. In this progressive technological era most people need to keep on updating both their skills and knowledge to take the challenges of the modern day life. In the National Curriculum Framework (2005) this importance of digitalization is well reflected and stated that -"ICT if used for connecting learners and teachers with scientist doing research in universities and educational institutions would also help in demystifying scientist and their

work". To incorporate and integrate technology in classroom teaching each and every teacher should be familiar with how to employ technology, pedagogy and subject area or content effectively in their daily instructional strategies. It is clear that simply introducing technology to the educational process is not sufficient enough. The appropriate integration of technology in the educational process is the prime requirement since technology by itself will not lead to change. Hence teachers should have the competency to incorporate and integrate technology that has the potential to bring transformation in the educational process through the development and nurturing of the process oriented skills in the learners. So, teachers need to be competent and fluent in the usage of educational technology with the latest tools to understand, develop and author the complex web of relationships among tools, technologies, practices, and users. Teachers must realize their function in technology oriented classrooms (Nabin Thakur, 2015).

Operationalizing the terms involved

a) **Process oriented skills:** These skills are intellectual skills and can be practiced, learned and developed by children through the learning process (Balfakiha, 2010) making the student better able to meet the challenges of the 21st century. There are six basic process oriented skills:

- Observation: using different senses to collect information about an event or object.
- Communication: using words or graphic symbols to represent an act, event or object.
- Classification: grouping or ordering events or objects into different categories based on characteristics or criteria.
- Measurement: using either standard and non standard measures or estimates to describe the dimensions of an object or event.
- Inference: making an logical guess about an event or object based on earlier collected data or information.
- Prediction: stating the outcome of a upcoming event based on a pattern of facts.

These basic process oriented skills can be nourished by the teacher applying their techno pedagogical skills or competencies in the classroom. They can also be integrated together

thoughtfully to design higher order process oriented skills establishing cause-effect relationship, formulation of hypothesis, problem solving, critical thinking, information processing, experimenting etc and with the help of which scientists can design and carry out experiments or in everyday experiences when we all pursue fair test experiments. Integrating the process oriented skills with classroom lessons and field investigations will make the learning experiences richer and more meaningful for students.

b) **Pedagogical skills:** The art-science of teaching is the literal meaning of 'pedagogy'. Pedagogical knowledge comprises basic knowledge about students' learning procedure, knowledge of different learning principles and theories, teaching approaches and methods of evaluation (Harris et al., 2009 and Shulman, L. S. 1986). With the advancement of technology, new educational teaching learning theories and modern resources specifically multimedia oriented resources, the traditional teaching strategies are no longer appropriate and adequate in this new situation to support the classroom teaching learning process and the mass education system. For meaningful and joyful learning it is necessary for a teacher to possess not only sound knowledge of the teaching content to be taught but also well developed understanding of how students learn, different modern instructional strategies, updated resources etc. and their classroom application i.e. the new pedagogical skills.

c) **Techno-pedagogical skills:** The knowledge of these skills is based on to enhance the efficiency and effectiveness of teaching and learning practices for professional improvement by technology integration. (Archambault, L., & Crippen, K. 2009 and Cox, S., & Graham, C. R. 2009). The techno-pedagogical skill help the students for further improvement in their learning, achieving of learning maturities and help to maintain the context of planning classroom based resources through the utilization of ICT by the teachers. Therefore, the competency in techno-pedagogical skills and method is an essential constituent of teacher education (Beaudin and Hadden 2004).

d) **Teacher's Techno pedagogical competency:** It is nothing but the potential to make utilization of technology efficiently in teaching. The term techno-pedagogy consist three regions of knowledge, that is: content, pedagogy, and technology. The Content is the subject matter compiling different concepts that is to be taught. Pedagogy depicts the gathers practices, processes, strategies, procedures, and methods of teaching -learning. It also includes knowledge about the instructional objectives, assessment, and student learning. Technology comprises

modern technologies for instance computer based utilities, internet, digital video and usually used classroom technologies including overhead projectors, white boards, and different study materials. So techno pedagogical competency covers the knowing of pedagogical affordances and variety of technological devices as they describe and relate to academically and developmentally proper pedagogical devices and strategies (Koehler, and Mishra, 2009).

e) **Multimedia:** It is the permutation of various digital media types such as text, images, animations, clippings, sound and video tracks, into an integrated multi-sensory interactive presentation to transmit an information or message to listeners. Further, multimedia may be depicted as an individual or a small grouping using a computer interface to interact with information that is represented in more than a few media, by repetitively picking what to see and hear next (Agnew et. al, 1996).

In the modern progressive technological period, our way of communication is willingly changing by the use of Multimedia. Recently the way of sending and receiving messages is more effectively accomplished and better realized. The inclusion of different media elements strengthens the message and the delivery, which leads to a better learning rate. The strength of multimedia is its multi-sensory operation and stimulates the several senses of the learners simultaneously. It helps also in mutual interaction and enables the end-users of the application to manage the content and flow of information (Vaughan, 1998). This has initiated important changes in our educational structure and affects the manner we communicate information to the learners (Neo & Neo, 2000). The progression of multimedia in the teaching learning process has facilitated learners to become easily engaged in their learning effort. Using multimedia based technologies; they can construct multimedia mediated utilities as part of their project requisites. In this way they can participate actively in their own learning process, rather than just being passive learners of the educational context. The necessary integration of ICTs or multimedia in the conventional classroom situation depends on the teachers' competency to scaffold the teaching learning setting by effectively using ICT or multimedia based pedagogies (Monsiváis, McAnally and Lavigne 2014).

1. A brief journey from lecturing to pedagogy, to techno-pedagogy

At the beginning of civilization, the education was confined within a very small section of the society. When there was no any written material, priestly institutions had worked out a

most incredible and efficient system of transmitting knowledge to successive generations in form to hymns. Orally transferring of knowledge from one generation to another was the main device of teaching and learning in ancient time. And the education was restricted only to those, who possessed gleaming feats of memory and potential to keep its great holiness. In that ancient time the “Guru Shishya Parampara” was the only method of teaching and learning. In the Gurukul system the disciple was staying with the Guru or Acharya and share maximum time to get complete knowledge of the subject. In this period the mass population remained away from formal education. Even if when educational resources are available as written teaching learning materials, the teaching at the ancient universities were mostly confined to lecturing.

With the establishment and development of the different learning theories viz. classical, behaviouristic, cognitive and constructivist learning theory, the teaching process changed abruptly from chalk and talk to activity based or teacher centered to the more learners centered. This lead to generation of different learning designs and eventually the need of development of the art-science of teaching is revealed, which refers to the new theory of pedagogy. Pedagogy comprises how the teacher communicates and interacts with learners and intellectual community of the society the teacher seeks to institute (Shulman, Lee 1987).

In the 21st century, the transition of pedagogy to techno-pedagogy occurs through the rapid and innovative changes in science and technology and integrating them into traditional classroom situation. These changes require individuals to have digital competence or techno-pedagogical skills, the ability to use digital technologies effectively and efficiently with the aim of developing their life skills and fostering their knowledge capacity in society (Yavuz-Konokman, Yanpar-Yelken & Sancar-Tokmak, 2013). Thus development of information technologies creates opportunities to use innovations in teaching environments (Altan & Tuzun, 2011). The integration of information and communication technologies (ICT) or multimedia into education is becoming more important every day with the effect of theoretical transformations and technological progresses in the teaching and learning processes (Cuhadar, C., Bulbul, T. & Ilgaz, G 2013).

There are three core components to develop teacher’s techno-pedagogical competency: content, pedagogy and technology, which constitute the TPACK model, i.e. technology,

pedagogy and content knowledge (Koehler, M. J., & Mishra, P. 2009). This TPACK model is the extension of Shulman's pedagogical content knowledge (PCK) and adding technology to it.

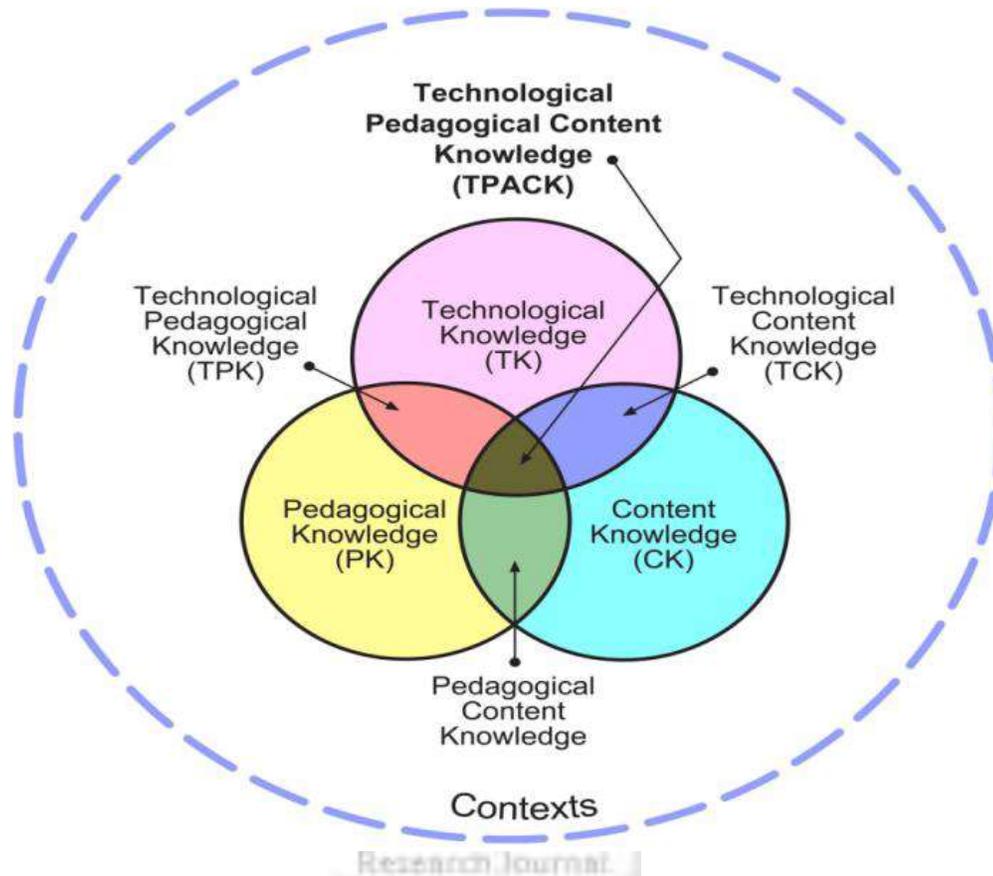


Figure 1 The dimension of the Techno-Pedagogical Content Knowledge Approach (Koehler, M. J., & Mishra, P., 2009)

2. Methodology

Our methodology involved the examination of a diverse range of publications from which the relevant information was gathered and then critically analyzed to explore teacher's techno pedagogical competency, ways to enhance them and how their classroom practices help to develop process oriented skills of learners in a 'Multimedia Context'.

3. Integration of Technology in educational system

Technology is one of the most precious tools that we can access very easily any time. Incorporation and integration of Technology in our educational system generates two terms: a) technology in education and b) technology of education.

By the term “technology in education” is meant application of machines, gadgets or equipment to develop the quality of education. This aspect is depicted as the “hardware” approach to educational technology. It entails the utilization of different elements of instructional materials i.e. individual media such as audio media, visual media, graphical media, projected media, computers and other teaching learning machines including multimedia. It is important to note that hardware/machines are means through which information are extracted from their corresponding software.

The term “technology of education” refers to application of theories and laws/rules in education and related disciplines for the purpose of improving the quality of education. Such related disciplines include: sociology/sociology of education, philosophy/philosophy of education, psychology/psychology of education, communication, technology, etc. Technology of education is a component of educational technology that is involved in the use of systems approach to promote high quality education. Further, this feature of educational technology is complied the logical, methodical, systematic and scientific processes in educational practice. Simply put, technology of education refers to the application of the systems approach to educational enterprise. Its main shortcomings comprise issues bothering on identification of educational problem, analyzing the problem, setting objectives, suggesting solution strategies, synthesizing the processes, assigning on evaluation and supplying feedback (Balogun, T.A. & Abimbade, A. 2002, Agun and Imogie 1988).

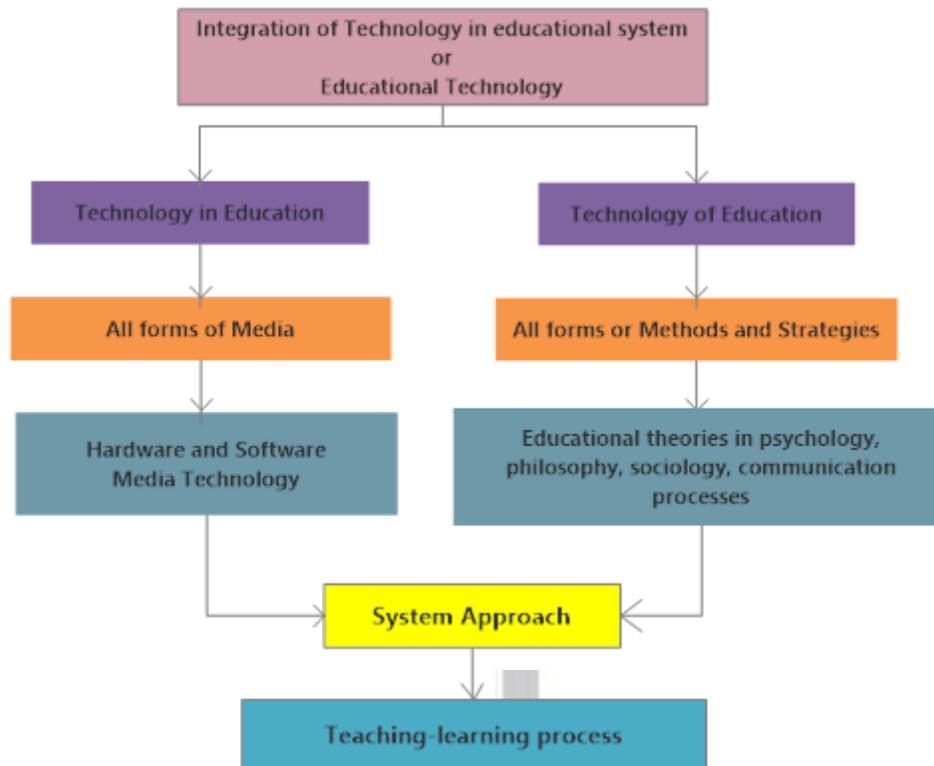


Figure 2: Interpretation of Technology in educational system

4. Ways to enhance teacher's techno-pedagogical competency

The rapid development in Educational technology has redefined the teaching and learning process to a greater extent. So, the teachers should need to be familiar with the application of recent technological theories and devices in their teaching and develop the techno-pedagogical competencies. Technology can be integrated in the following four general classroom situations where teacher's techno-pedagogical competencies are the prime requirement:

- i) Technology in preparation for teaching,
- ii) Technology in providing motivation,
- iii) Technology in presentation and
- iv) Technology in evaluation.

The presence of techno-pedagogical competency in teachers can be examined from the following techno-pedagogical skills:

- Proficiency in linguistic abilities
- Aptitude to develop teaching learning process

- Ability to improve multimedia based study materials
- Capacity to design multi-grade instruction
- Talent to plan specific pedagogy
- Supportive in Distance Education through e-learning
- Guide and Counsel for career options
- Ability to stimulate Self Learning
- Improve enrolment and examination process
- Assist in research activities
- Competence to reinforce for cognitive learning

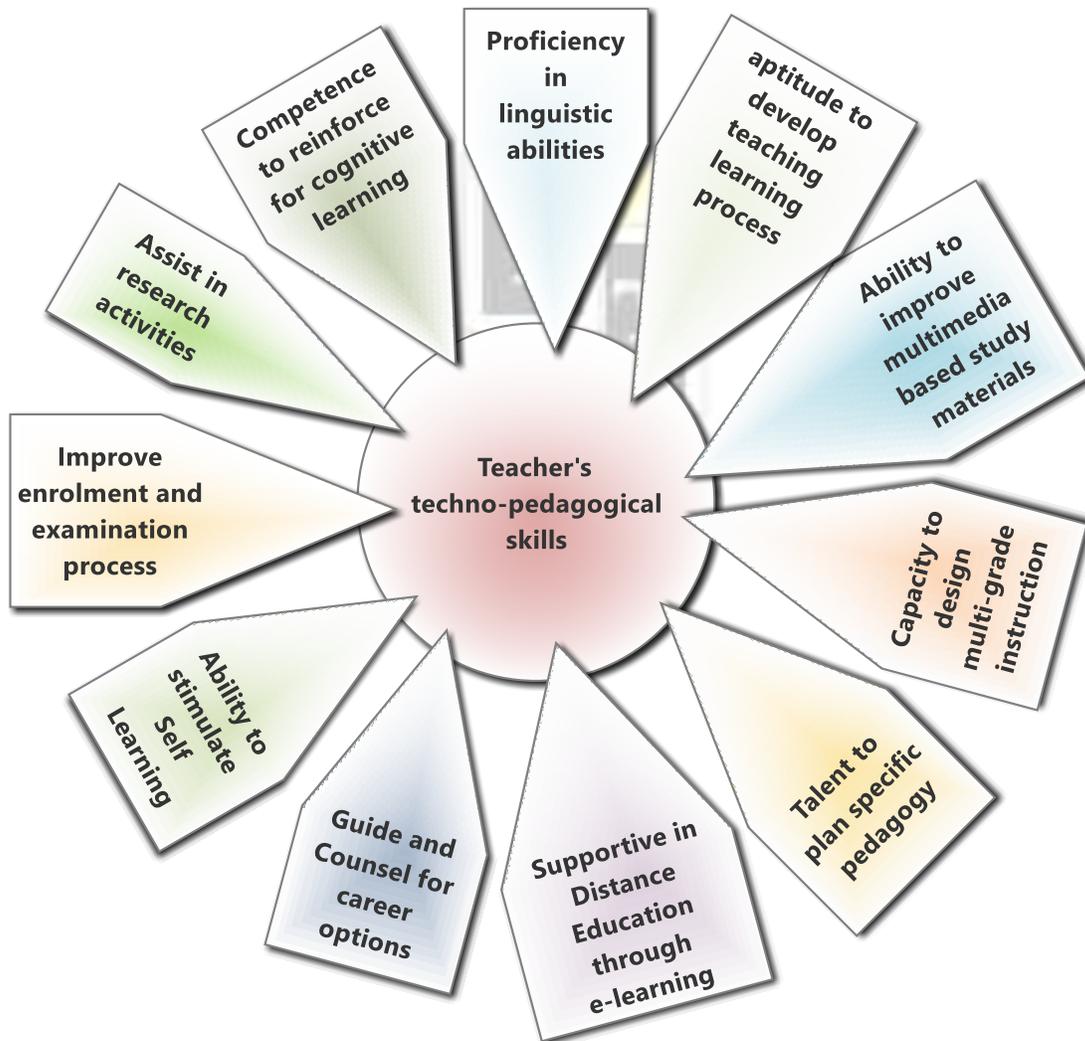


Figure 3: Teacher's techno-pedagogical skills

The general techno-pedagogical competencies of teachers can be developed and enhanced by the following strategies.

- a) **Enhancing proficiency on English language and online content:** The proficiency in English language is important as this is the dominant language of internet to get the maximum benefits of using World Wide Web.
- b) **Developing techno-pedagogic skills:** Multimedia mediated instruction demands techno-pedagogic skills. In teacher education programme teacher educators need to move from pedagogues to techno pedagogues. There should be efficient integration of micro and simulated teaching skills, media skills and techno-pedagogic skills.
- c) **Encompassing understanding of existing techno-pedagogical services:** There seems to be healthy awareness among teaching staff of the breadth of technology services available to them. There should be focus on networking of all educational institutions as well as developing low cost and low power consuming access devices.
- d) **Creating Eternal techno-pedagogy supportive resources:** Sharing of infrastructural resources and innovations, learning materials can reduce development costs. Some effort should have been made on the development of instructional material in the form of Audio Cassettes, Video Films, Computer Assisted Learning Material, Educational Radio Programmes, Educational TV programmes, and Web Bases Instructional Material. Apart from having enabling telecommunications and ICT policies, governments and higher education institutions will necessitate to develop strategies for efficient media expansion and sustainability. Sound techno-pedagogical skills leads to superior learning outcomes for students.
- e) **Developing techno-pedagogical E-Content:** The best practices in creation of techno-pedagogical E-content, its dissemination, criteria for selection and evaluation require large scale networking among E-content users and producers.
- f) **Establishing Computer Based Learning Resources Management Systems:** Learning Resources in various media forms such as, CDs, Video films should be available in every libraries of educational institutes. Libraries need to be progressively converted into digital libraries in which teachers will able to assemble the materials for construction of techno-pedagogical frame.

- g) **Scope of Research and Development:** A sound research base will put forward the opportunity for the two way communications need to be developed through two ways audio and two ways video communication. On the other hand college or university should make available of digital resources like digital libraries where the students, teachers and professionals can access course material and research material from any place at any time.

5. Multimedia based Classroom practices to develop process oriented skills

Both the challenges of the technological growth of 21st century and the rapid emergent requirements of the professions, teachers require to integrate the modern technology in their classroom practices. Taking the technological possibilities into account, multimedia and network-based solutions in the virtual learning environment can further develop and nurture process oriented skills of the learners. Since the virtual classroom provides comparable services as a conventional classroom (Kartyas, G. and Gati, J., 2006) like programmed and interactive learning, project submissions or consultations. In a virtual classroom, learners feel comfortable and are encouraged to shape their ideas freely. In this learning environment mistakes are considered as possible learning opportunities and not indicators of serious lack of knowledge. Teacher, of course, still have professional competence and should the discussion go sideways, to intervene by asking questions and send the discussion back to the right direction.

In a virtual classroom or multimedia based learning environment, the following classroom practices help to develop and nurture the process oriented skills in the learners for preparing their future lifelong experiences.

- **Use of Computer Reading-Based Programmes:** Reading-based computer programs can be used to develop the word vocabulary, fluency, and understanding of the learners. Computers assisted reading based programmes can also be utilized to correct responses for the learners, and to simulate tests in an easy to understand approach.
- **Use of Multimedia Software:** Multimedia based computer programs use a mixture of text, graphics, sound, video, and animation. They can enhance the motivation for learners to build up their glossary and reading skills.

- **Browsing the Internet:** Internet web sites contain a lot of resources available in the form of newspapers, magazines, journals, electronic libraries, dictionaries, encyclopedias, and newsletters.
- **Use of Electronic Dictionaries:** The electronic dictionaries have numerous integral functions and tools that are not supplied in book dictionaries. Electronic dictionaries are also easy to use and represent quick tools for vocabulary acquisition.
- **Reading CD-ROM Based articles and books:** These compact discs (CDs) are utilized to store up huge information in a digital manner. CD-ROMs can offer an efficient and easy manner for getting and reading information to enhance the learner's background knowledge and vocabulary of words.
- **Use of Internet Voice Chatting:** It is the procedure of voice based communication technique connecting the speaker and the listener through the internet connection. This process may be very beneficial to the learner to acquire knowledge and get face-to-face instructional feeling in a virtual classroom.
- **Use of Speech Synthesis Programs:** Recent computer based programs can create signals of voice tones and decode human made sounds. These types of programs are described as artificial intelligence computer programs and can be a very helpful tool for improving the speaking potential.
- **Use of Computer utilities:** Different Computer utilities can be used to develop the writing skills and creative innovation.
- **Writing E-mails:** E-mail is a recent manner for writing and transferring messages through the internet. Learners can utilize it to realize how to respond to the inward messages using some statements and meaningful language.
- **Use of Internet Text-Chatting:** Text chatting offers a live and fast device for conveying thoughts, transferring ideas, and replying instantaneously with the other side writer.
- **Blogging:** Blogging is the act of posting text content- own thoughts, ideas on a blog though online website. It is an individual online diary where one can state journal which permits to share own thoughts and ideas , add video, games, pictures, music and read comments visitor leave on the blog.

In a multimedia based virtual classroom environment the modern technology oriented teaching-learning practices not only develop and nurture the six basic process oriented skills viz. observation, communication, classification, measurement, inference and prediction but also enhance the higher order process oriented skills like establishing cause-effect relationship, formulation of hypothesis, problem solving, critical thinking, information processing, experimenting etc.

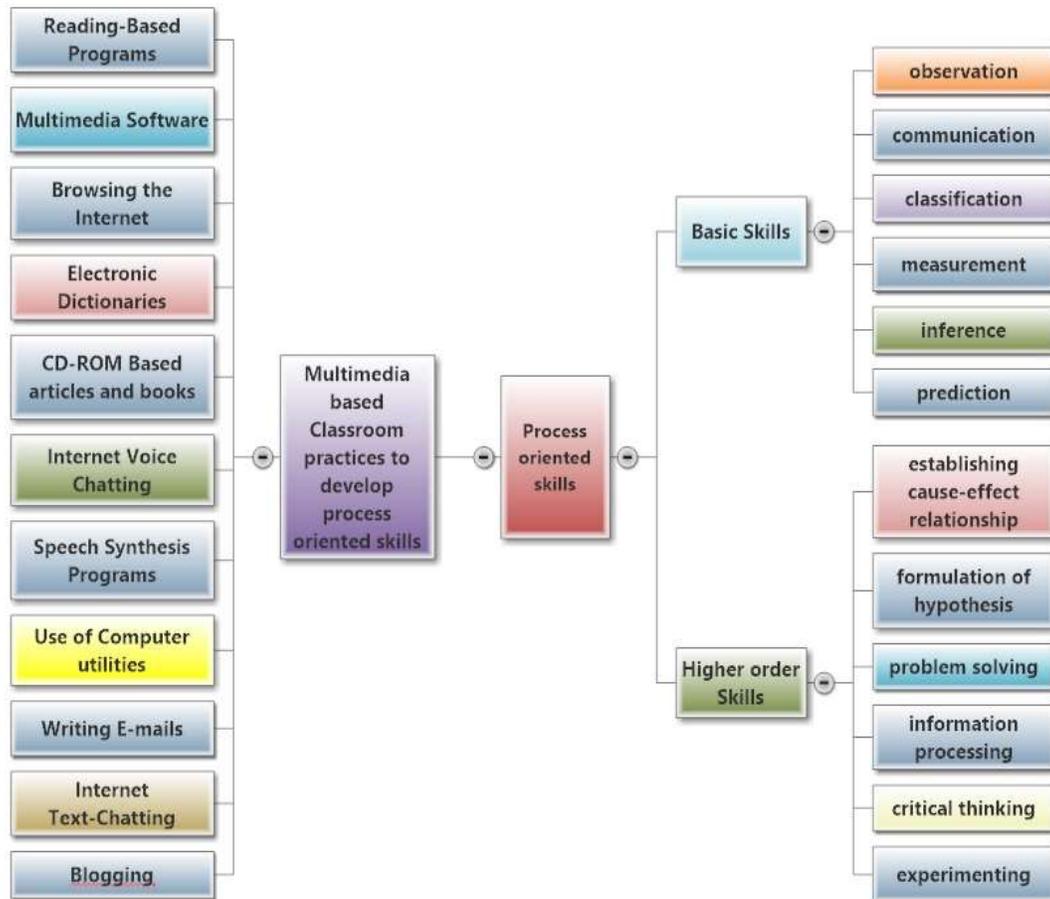


Figure 4: Multimedia based Classroom practices to develop process oriented skills

6. Conclusion

Techno-pedagogy is the main deciding feature for the recently most discussed hybrid approach of meta-teaching. In the previous two decades, it has been observed that the progressive addition of developments in techno-pedagogical competencies in the educational systems around the globe. Use of techno-pedagogical competencies can crash several obstacles that lead to underachievement, student disaffection and educational exclusion. The efficient

integration of technology into education is a sophisticated and multi-dimensional process that requires up-to-date technology and consideration of a series of administrative, instructional and theoretical variables. The insufficiencies of teachers in terms of knowledge, skill or competency are the leading obstacles to technology integration in Secondary Education. In spite of the fact that planning and execution of initiatives for enhancing role of techno-pedagogical competencies in the education system have received priority, analysis of the existing scenario reveals number of factors which have been impeding the integration of technology in classroom teaching. Aside from the policies related to the technology, governments will need to expand and develop strategies for successful techno-pedagogical competencies and media deployment and sustainability. Finally, technology is never an alternate for good teaching. Without techno-pedagogical competent teachers, no electronic presentation system can achieve good results.

References

- Agnew, P. W., Kellerman, A. S. & Meyer, J. (1996). *Multimedia in the Classroom*, Boston: Allyn and Bacon.
- Agun, I. & Imogie I. (1988). *Fundamentals of Educational Technology*. Ibadan; YBooks.
- Altan, T. & Tuzun, H. (2011). The Place of Technologically-Rich Individual Learning Environments in FATIH Project, *XIII. Academic Information Conference Bulletins*, 2 - 4 February, Inonu University, Malatya.
- Archambault, L., & Crippen, K. (2009). Examining TPACK among K-12 online distance educators in the United States. *Contemporary Issues in Technology and Teacher Education*, 9(1), 71-88.
- Balfakiha, N. M. (2010). The assessment of the UAE's in-service and pre-service elementary science teachers in the integrated science process skills. *Procedia Social and Behavioral Sciences*, 2, 3711-3715.
- Beaudin, L., & Hadden, C. (2004). *Developing technopedagogical skills in preservice teachers*. In Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2004, 492-498.
- Cox, S., & Graham, C. R. (2009). Diagramming TPCCK in Practice: Using and elaborated model of the TPCCK framework to analyze and depict teacher knowledge. *Tech Trends*, 53(5), 60-69.

- Cuhadar, C., Bulbul, T. & Ilgaz, G. (2013). Exploring of the relationship between individual innovativeness and techno-pedagogical education competencies of pre-service teachers, *Elementary Education Online*, 12(3), 797-807.
- Harris, J., Mishra, P., & Koehler, M. (2009). Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. *Journal of Research on Technology in Education*, 41(4), 393-416.
- Kartyas, G. & Gáti, J.(2006) *Important Issues and Methodological Elements in Virtual Classrooms, in Proceedings of 4th Serbian-Hungarian Joint Symposium on Intelligent Systems*, SISY 2006, Subotica, September 29- 30, 397-408.
- Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60-70.
- Monsivais, M. I., McAnally, L., & Lavigne, G. (2014). Application and validation of a technopedagogical lecturer training model using a virtual learning environment. *Revistade Universidad Sociedad del Conocimiento*, 11(1), 91-107.
- National Curriculum frame Work (2005). NCERT, New Delhi.
- Neo, M & Neo, T. K. (2000). Multimedia Learning: Using multimedia as a platform for instruction and learning in higher education. *Paper presented at the Multimedia University International Symposium on Information and Communication Technologies 2000(M2USIC'2000)*, October 5-6, 2000, Petaling Jaya, Malaysia.
- Shulman, L. S. (1896). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Shulman, L. S. (1986) Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*, 15(2), 4-14.
- Thakur, N. (20015) A Study on Awareness of Trained Teachers in relation to Information and Communication Technology. *J. of Res. & Method in Ed.*, 4(1), 06-11.
- Vaughan, T. (1998). *Multimedia: Making it Work* (4th Ed.), Berkeley, CA: Osborne/McGraw-Hill.
- Yavuz-Konokman, G., Yanpar-Yelken, T., & Sancar-Tokmak, H. (2013). *Technological pedagogical content knowledge based instructional design*, Ankra, Turkey: Ani Publishing. 1-12.