



Progression of Teacher Competence in Technology Integration: A conceptual Analysis of Niess et. al.'s Five- Stage TPACK Developmental Model.

Shri. Anil Singh Roka, Dr. S.C. Subudhi

Research Scholar, Professor

Department of Education

North Eastern Hill University, Tura Campus, India

ABSTRACT:

Education has undergone a significant transformation in how it is delivered to the learners by the teachers. Education is no longer confined to traditional lectures and text-book reading but the evolution of technology has played a pivotal role in facilitating and enhancing the learning process. In-fact, the importance of Technology Use and its Integration in Education is recommended in National Policy of Education (NEP)-2020. It also mention the creation of an autonomous body, the National Educational Technology Forum (NETF) to provide a platform for the exchange of ideas on the use of technology to enhance learning, assessment, planning, administration and so on, for all the levels of education. For the technology to be properly utilized in education, the teachers must be tech-savvy so as to effectively integrate technology while transacting lesson, making it more accessible and engaging for learners. It is no doubt that most of the teachers in India are tech-savvy these days, but there are some exceptions to it. So it is very important for the teachers to get acquainted with technology use to be at par with the changing dynamics of Education System. The Niess et al.'s Five- Stage TPACK Development Model can be used as a roadmap by the teachers to develop their Technological Knowledge and use it effectively in content delivery by adapting specific pedagogical approaches.

The present study will explore and analyze Niess et al.'s Five-Stage TPACK Development Model's theoretical foundations and propose its potential applications and implication for teacher education by conducting literature review of articles and journals related to the topic.

Keywords: Technology, NEP-2020, NETF, TPACK, Niess et al.'s Five-Stage Development Model, theoretical foundations.

Introduction:

The 21st Century marks the dawn of the age of technology, characterized by rapid advancement that has transformed every aspect of life, including communication, industry and education. The importance of technology in education became particularly evident after the outbreak of COVID-19, as it played a crucial role in ensuring the continuity of learning during school closures and lockdown. The pandemic accelerated the adoption of digital tools and online learning platforms, highlighting the need for robust technological infrastructure and digital literacy in the education sector. Today, technology plays a pivotal role in educational institutions. With the introduction of technology in education, learning has become more accessible, interactive and engaging to the student. Now a learner can learn any course from any part of the world by connecting digitally. The geographical barrier is no more a hindrance to learning. The learner can also learn at its own pace from recorded lessons. Various types of technological education platforms such as Moodle, Google classroom, Zoom, Microsoft Team etc provides easy access to learning.

Despite the numerous benefits of integrating technology in education, its proper utilization is often hindered by various challenges faced by the teachers. The challenges faced by the teachers prevent the effective use of technology to enhance teaching-learning process. Many teachers have limited exposure and skills to effectively integrate technology in their teaching practices. Some may not have the adequate training to effectively use technology to keep pace with the rapidly evolving technological tools and teaching strategies. Some teachers may consider using technology as burden and time consuming because they are already overloaded with lesson preparation, classroom management and other regular responsibilities and also there may be some teachers who are resistant to change as they are comfortable with their traditional methods of teaching and so on. The challenges will be there, but it is the responsibility and duty of the teachers to address these challenges and enhance their technological knowledge for the benefit of oneself and students as a whole. Harris, J.B. and Hoffer, M.J. (2014) study remarked that if teachers have mastery upon TPACK, then they can easily integrate technology across different subject areas in the school curriculum. TPACK is a framework which is utilized by teachers to effectively integrate technological knowledge with the content knowledge and transact the lesson to the learners using the pedagogical knowledge and the skills. Therefore, TPACK is defined as “a framework of teacher knowledge for technology integration. Teacher knowledge is defined as a complex interaction and intersection among three bodies of knowledge within the framework of TPACK: content, pedagogy and technology” (Koehler and Mishra, 2008). According to Niess, M.L. (2009), a teacher can effectively blend technology, content and pedagogy by working through different stages of professional development. One such model of professional development of teachers was given by Niess, M.L. and his colleagues which depict the criteria for integration of technology by a teacher who have sound pedagogical and content knowledge. This model is called Niess et al.’s Five- Stage TPACK Developmental Model.

Niess et al.'s Five- Stage TPACK Developmental Model

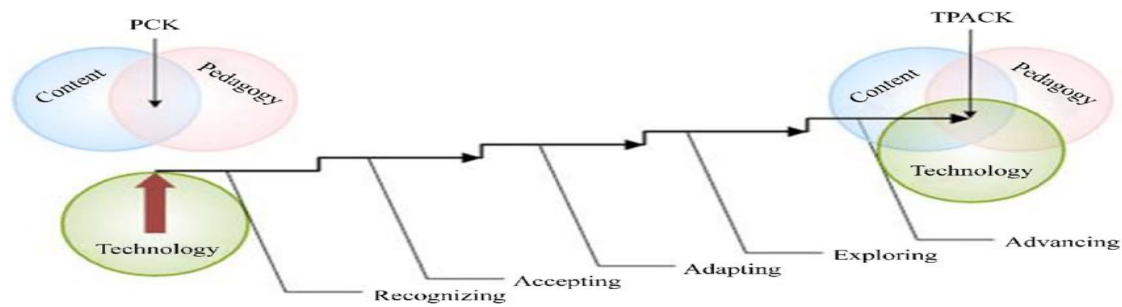


Figure 1: Niess et al.'s Five- Stage TPACK Developmental Model (Source: Research Gate)

Association of Mathematics Teacher Educators (AMTE) believe that students at all levels, benefit from technology enshrined learning environment (www.amte.net). In 2006, the AMTE confirmed the idea of the importance of technological knowledge in the preparation of mathematics teachers along with their knowledge in content and pedagogy. AMTE indicated that, “Mathematics teacher preparation programmes must ensure that all mathematics teachers and teachers candidates have opportunities to acquire the knowledge and experiences needed to incorporate technology in the context of teaching and learning mathematics”(AMTE, Technology Position Statement). With the integration of technology in the pedagogical and content knowledge of Mathematics educators, AMTE framed four major themes in Mathematics Teacher TPACK Development Model: Curriculum and Assessment, Learning, teaching and Access. Mathematics teachers with sound pedagogical and content knowledge passes through the stages of recognizing, accepting, adapting, exploring and advancing with technology for each of the four major themes mentioned above. The various stages of TPACK Development Model as proposed by Niess, et.al. (2009) which helps the teachers to integrate technology effectively into their teaching for successful progression in the development of their TPACK is described below:

- 1) **Recognizing (Knowledge):** At this stage, the educator understands the importance of technology and is also aware of the potential of technology in supporting the content of mathematics in teaching-learning process. The educator at this stage believes that technology integration may be useful to deliver the lesson properly but hesitate to do so as they feel that it will be time consuming and wastage of time. The educators at this stage give priority in content completion rather than technology integration.
- 2) **Accepting (Persuasion):** At this stage, the educator tries to overcome the challenges and difficulties that they are facing with respect to technology integration. The educators at this stage start appreciating the benefit of technology integration in the lesson and start implementing it in the classroom. To enhance the technological knowledge the teachers start attending workshops and training for the professional development.
- 3) **Adapting (Decision):** This stage is basically experimental stage where the educators integrate technology in their lesson in a limited and controlled manner by using various technological tools and observes its impact on learners. Based on their experiences in using technological tools they will decide either to adopt or reject the tools. The educators at this stage use the skills they have developed after attending the workshop and training in technology integration and its management.

- 4) Exploring (Implementation): At this stage, the educators gain confidence in the use of technological tools in their lesson. They begin to implement technology systematically and regularly in their teaching. The educators at this stage become familiar with the use of technological tools and they even review traditional lesson plans to integrate with it. They also modify their instructional strategies by examining the performance of the learners and also by getting the learners feedback. The educators will be technologically motivated and will also advice and help the colleagues in using technology in teaching-learning process.
- 5) Advancing (Confirmation): At this stage, the educators become fully aware about the importance of integrating technology in teaching-learning process by their own experience. They reflect on its effectiveness and continuously refine their use of technology to enhance learning. The educators at this stage focus on the enhancement of learners' level of understanding through technology. They also become mentor or leader in using technology, sharing best practices with colleagues and continually improving their approaches.

The educators in order to effectively integrate technology in their teaching had to pass through these stages and develop their Pedagogical Content Knowledge to Technological Pedagogical Content Knowledge. Since 21st century is marked as technological age and India being a global leader in Information and Communication Technology, it is important that the education sector in India should not be left behind in the technology use. NEP-2020 also advocates in technology use and integration in education. So the use of technology by the educators in their teaching passes through the various stages as proposed by Niess, et. al.,(2009) TPACK Development Model.

Applications of TPACK Development Model

TPACK Development Model has the following advantages:

- 1) In pre-service teacher training programs, the use of TPACK Development Model will enable the teachers to get the clear idea about how to integrate technology in their teaching. Activities such as micro-teaching, peer assessment etc can be designed using technology.
- 2) In the Continuous Professional Development (CPD) of teachers, TPACK Development Model is used by them to enhance their teaching practices using suitable technology.
- 3) TPACK Development Model promotes interdisciplinary and multidisciplinary learning by facilitating the design of curriculum that integrates technology across different subjects and different discipline.
- 4) It promotes the use and integration of technology in education and thereby encourages the development of innovative teaching strategies.
- 5) It caters to the diverse students needs through the integration of appropriate technological tools.

Implications and Conclusion

The present paper on Niess, et. al., TPACK Development Model provide us with the clear picture that teachers equipped with the TPACK can make proper decision about how to integrate technology in teaching so as to make teaching-learning process more interactive and effective for the learners. The model propagates for improved pedagogical practices by promoting a deeper understanding of the interplay between technology, pedagogy, and content. Many challenges and obstacles like unavailability of technological resources, incompetence in the use of technological tools etc., faced by teachers at the personal and institutional level may be the hindrance in implementing TPACK Development Model among teachers both pre-service and in-service. So, the successful integration of technology in the content transaction using specific pedagogy depends on the thoughtful implementation of TPACK Development Model among pre-service and in-service teachers by properly addressing challenges related to resource availability, equity and others.

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