Review Article

Integrating Technology into Classroom Learning

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Abstract

Technology and Education have been two sides of the same coin since mid-1600's when picture technology was invented. In the last 30 years, there has been a marked interest towards integration of technology into every aspect of classroom learning. Many research studies have proved that higher order thinking skills can be inculcated by integration of technology into the instructional design. Many scholars have come out with various models and integration approaches towards building a blended learning environment. This review article covers details of some of the most popular technology integration models such as SAMR, LOTI, TPACK, Tripe E to name a few. Despite having different approach towards integration, each of the frameworks puts learner at the center of focus and tries to improve learning experience & higher order thinking skills (HOTS). No single framework fits across all learning environments. As part of this review article, we look at some comparative assessment of these integration models.

Keywords: Technology Integration, Blended Learning, HOTS (higher order thinking skills), Education, TPACK, SAMR

Introduction

It was during mid-1600's that the first textbook was published titled 'Orbus Pictures' or 'World in Pictures' (Figure - 1). This marked the beginning of printed text usage in education field.

Figure – 1: Snapshot from Orbus Pictures – first children textbook
Source: http://www.openculture.com/2014/05/first-childrens-picture-book-1658s-orbis-sensualium-pictus.html

Similarly, chalkboard came into existence in the 1800's and that's something that is still widely used in many classroom setups. It is very interesting to see how some of these technologies has had significant bearings on the educational settings and practices and transformed the field of learning and education. Clearly, technology has been synonymous with education. More so in early 1900's when motion pictures started to be used for educational purpose. This generated significant interest in the learners and educationists due to the nature of visual instructions. Termed as 'wonder technology', radio truly transformed the nature of education with the establishment of educational radio station in 1920's and 1930's. During the 1990's, there was a technology overload with its availability and ease of use. Terms like, digital technology were introduced. Information could be recorded, transformed and transmitted. This also included all educational content. Things such as mobile and internet further accentuated the process of digital technology & its spread among the new generation or millennials. As seen in last 30 years, introduction of a new technology such as mobile, web technologies, Virtual reality, etc. may initially help to engage students better and develop interest, but this may not be sustainable.

In last 15 years, there has been a lot of attention being paid to integration of technology into education. In the United States of America, guidelines have been laid down on integration of technology for K-12 education. Similarly, in Europe, we are seeing a growing interest in technology integration in education and even across APAC (Asia Pacific – India, Australia, etc.) countries. The rapid growth of technological tools with their declining prices, spiralled the growth &

usage. The advantages of integrating technology into education are well documented and some of them being:

- Versatile education set up such as distance education, satellite classrooms, to name a few
- Many-fold increase in learning opportunities for learners
- Possibilities of massive information storage which helps to record & then transmit or teach again (repetitive learning)
- Low cost of building technology infrastructure

With such a focus on educational technology, one of the major tasks of school is how technology could help transform the learning process. It is important that slowly schools' transition from low-value use of digital technologies to high-value use of digital technologies. Students who graduate should be technology literate and assumptions are that technology would have aided in the overall learning process. Teachers and books, which were the authoritative source of all knowledge has completely been transformed. Technology has enabled access to multiple sources of authentic knowledge which is verifiable. Education has entered a new phase of profound disruption. Any disruption changes the status-quo. Role of teachers is going through a big change with this technological disruption. Teachers are key to transforming this learning paradigm where technology is enabling the new learning process. However, as quoted by researchers Roberto and Miguel in the year 2013 (Computers in Human behaviour), Teachers are lagging in the adoption of new technologies and unless significant time contribution is made towards it, its adoption will be slow and weak. But more concerning is the fact that many teachers still are afraid / reluctant to embrace technology to move from teacher centric learning approach to student centric learning approach and induce HOTS (Higher order thinking skills) among students. Even though many empirical researches in 1990's to 2010's seem to indicate a positive correlation between achievement in school and usage of technology, however, one critical thing that is missed is the long-term effect of such interventions.

Without structural reforms in school system, these changes may not have a long-term impact on students' learning and achievement.

If we look at modern pedagogy principles, they are based on some of these foundations:

1. Learning builds on previous experiences
2. Learning in a social activity
3. Context is very important in how content is presented
4. Content should be well-connected, organized and relevant.
5. Feedback and active evaluation

Since the 1990's there have been numerous technology frameworks that have been created which help in evaluation of the current state of technology integration and suggest on best approach on how to move ahead.

In this paper we will look at some of these frameworks, their creation, philosophy, current usage & challenges. Let's look at some of the most popular

Technology integration models. In this paper we will do our analysis on the following technology integration models

1. SAMR Model
2. Level of Teaching Innovation (LOTI) Model
3. Technology Integration Matrix (TIM)
4. Technology, Pedagogy and Content knowledge framework (TPACK)
5. Triple E framework (Extend, Enhance and Engage)
6. T3 framework

One thing to be watchful of is that technology integration models are theoretical models that are designed to help teachers, researchers, and others in the education field to think about technology integration in meaningful ways. The key advantage of using one of these frameworks is that it helps in better evaluation of technology integration efforts in learning and teaching process.

SAMR Model

Origin

Ruben Puentedura in the year 2009 came out with this model, namely SAMR, which describes four levels of technology integration. This model has its origins in the year 2006 where Ruben had worked on Maine Learning Technology Initiative. The main objective was to improve the quality of education using technology integration in the state of Maine. The four levels of SAMR model proposed by Ruben were:

1. Substitution – Technology substitutes what you might already be doing as-is.
2. Augmentation – Technology once again is a direct substitute, but there is a functional improvement as technology is now involved
3. Modification – Significant re-design of the task is enabled with technology
4. Redefinition – Something which could not be done earlier, is now achievable using technology and being redefined

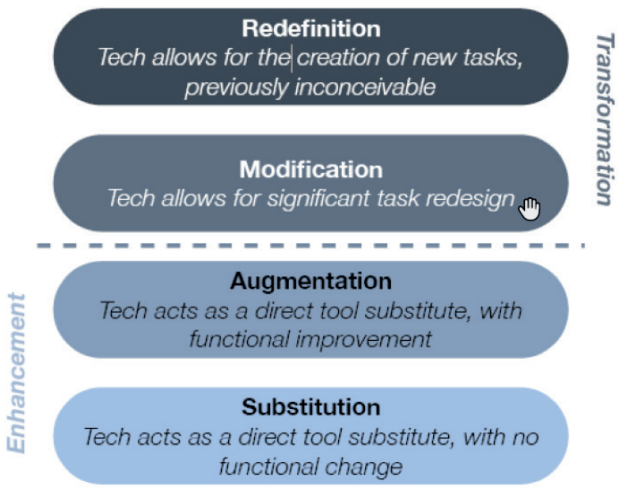

Figure – 2: SAMR Model by Ruben Puentedura, 2009

Technology Integration and Researches

Some of the areas where SAMR model has been used with success are in areas of vocational education. Romrell, Kidder, and Wood (2014) explained that one of the frameworks to evaluate technology integration for instructional activities used is SAMR. According to Romrell et al. (2014), SAMR can help to improve quality of classroom instructions by implementing technology.

SAMR model draws many similarities to Bloom's taxonomy model since both share similar levels. Another area where SAMR model has been used is to evaluate mLearning activities and in which of these four levels do they fall and finally trying to measure impact on quality of education. Hockly (2013) used SAMR model in context of mLearning with special focus on English language teaching. To understand the concept in-depth, let's look at the above four levels from the lens of mLearning vs conventional learning (Table - 1).

Table – 1: Four levels from mLearning Vs conventional learning

Substitution	Augmentation	Modification	Redefinition
Instead of giving lecture, the same is recorded and can be played as a podcast (audio podcast) or Recording of a lecture being played	For revision, instead of students creating flash cards or small notes, students are provided sms or small snippets on their mobile which summarize the same.	Using Google groups and google docs for building a presentation on a topic and then sharing that using various collaboration features. Instead of just a presentation being shared, it became a collaborative and highly enriched learning environment.	Using technology and Augmented reality explaining the concept of a black hole or very abstract concepts

Clearly true potential of mLearning is realized with Modification and Redefinition levels and how SAMR models explains that so clearly. However, there are differing views on implementation of SAMR model and there are many challenges that are also cited. The biggest challenge is the adoption of technology tools. Teachers are bombarded with so many technology tools such as VR experiences, laptops, tablets, smartphones, smartboards, etc. How do they find time to learn these tools and build their confidence in using these new tools? As a result, teachers

may choose the easy path out and keep focusing on levels – Substitution and Augmentation. These will also enhance learning but not to the degree the other two. Cochrane et al (2014), also confirms that SAMR helps represent the evolution of new technology with its four phases of substitution, augmentation, modification and redefinition. As late as 2018, Budiman et al have carried out research in the area of ICT integration in English as a foreign language using SAMR model. The research concluded that ICT integration can have profound effects on quality of education. In a research undertaken by Hilton (2016) in case of iPad integration for social studies, between SAMR & Technological Pedagogical Content Knowledge (TPACK), SAMR gives a better perspective on use of a technology to accomplish an instructional objective and since it helps teachers strive to achieve higher levels is a motivational factor.

Level of Technology Innovation (LOTI) Model

Origin

Level of technology innovation (LOTI) framework was a conceptual framework that measured level of technology implementation and assist schools to include concept/process-based instructions, authentic uses of technology & qualitative assessments. It was conceptualized by Cristopher Moersch in year 1995. LoTi is aligned conceptually with the work of Hall Loucks, Rutherford, and Newlove (1975); Thomas and Knezek (1991); and Dwyer, Ringstaff, and Sandholtz (1992). There are seven (7) discrete levels of technology implementation. As the teacher progresses from one to another, changes in how curriculum is taught can be observed and focus of teaching shifts from being teacher centred to learner centred. The seven levels as outlined in the LOTI model have been given in Table- 2.

Table – 2: Seven levels outlined in the LOTI model

Level	Category	Description
0	No use	Lack of know-how or time to pursue technology-based learning.
1	Awareness	Use of computers via computer labs is prevalent. Computer based learning apps have little to no use for the teachers at large.
2	Exploration	Technology based tools supplement existing teaching methods. They aid in extension or enrichment activities.
3	Infusion	Technology tools such as, multimedia application, graphics or spreadsheets are used when teaching.
4	Integration	Technology tools are used to ensure that learners get rich context on the concept and their understanding improves. The scope is still limited to classroom only.

5	Expansion	The scope of technology integration expands outside of classroom. With technology application and networking from outside of classroom to enhance the learner's learning. Such as video conferencing with ISRO scientists on space related topics.
6	Refinement	Technology scope increases to be the process, product and tool in hands of learners to achieve their learning and learner takes the center-piece and objective is to learn the best and use any technology means for the same.

Technology Integration and Researches

LOTI framework has been used in many research publications to assess the impact of student achievement as technology integration happens in school. One such research is to assess the technology integration and impact off same in rural Nigerian schools. LoTI questionnaire was used to measure the extent of technology integration in schools. The results were not conclusive to indicate that level of technology integration in schools was leading to better quality of education & students learning. But, one of the aspects that did come to light was around teacher's phobia around technology and usage of technology. Clearly an area to be addressed during teacher's pre-service education and with regular in-service education programs that can address the same. In the year 2012, Berkeley was able to prove a positive correlation indicating a relationship between teacher Levels of Technology Implementation (LoTi) and student achievement scores on the Texas Assessment of Knowledge and Skills (TAKS) tests at the junior high level, 6th, 7th, and 8th grades for English Language Arts and Mathematics. Farsaii (2014) conducted a study on how administrators were sensitized on technology integration using LoTi framework. Many other researches such as Stoltzfus (2006) and Lin Janet Mei Chuen et al. (2010) have used the Levels of Technology Implementation (LoTi) framework for assessing technology integration & how learners can move to higher order thinking skills and leads to better learning outcomes.

LoTI framework has gone through a refresh to becoming the LoTi® Digital-Age Survey that helps creates profiles basis NETS technology standards. Initially what was the Level of Technology implementation have become Levels of Technology Innovation. Instead of focusing on technology integration in teaching curriculum basis the new 21st century paradigm, it has been refreshed to focus on how across various levels we move from teacher-centred approach to a learner-centred approach. Some of the marked changes in the new LOTI framework are:

1. Moving from knowledge and comprehension at lower levels to evaluation, problem-solving and issues resolutions at higher levels.
2. Moving from simple classroom constructs of providing feedback to building hypothesis & validating those

LoTI framework consists of two models. CIP (Current instructional practices) and PCU (Personal Computer Use). CIP focuses on how in a classroom teaching evolves from teacher or instruction led learning to student centric learning. PCU focuses on understanding the level of fluency in using various technology tools. A new framework that is increasingly being used is H.E.A.T. framework from Chris. H.E.A.T.—higher-order thinking, engaged learning, authenticity, and technology use can significantly add value over LoTI framework (Figure-3).

Figure – 3: H.E.A.T. framework;
Source: www.loticonnection.com

Several researches over the course of last decade have used LoTi and its new age survey to assess the technology integration in classrooms and areas to further improve the same. The recent one from 2017 is around K-12 schools

and analysis to assess the level of LoTi, CIP and PCU usage and substantiate the findings with qualitative insights to arrive at areas to further improve the technology integration in school. The key findings are around professional development of school teachers and directing them towards elevated LoTi. In a study conducted in the year 2015 by Roth, among various frameworks for integration of digital technologies focuses on LoTi and H.E.A.T (Moersch, 1995; Rielley, 2015) and how these connect to HOTS (higher-order thinking) and engaged learning.

Technology Integration Matrix

Origin

Technology Integration Matrix (TIM) is a framework for using technology to enhance learning. The Technology Integration Matrix (TIM) (Allsopp et al.) was developed by the University of South Florida in conjunction with the Florida Department of Education to identify the level of technology integration in the class. The TIM is well accepted throughout the academic community as a valid instrument for this purpose (Arizona K12 Center at Northern Arizona University, 2012; Allsopp et al., 2007; Bruder, 2010; Cozakos, 2013; Rhode Island Department of Education [RIDE], 2013; Ulster BOCES School Library System, 2011; The Virginia Department of Education, 2008). TIM is a framework which is 5X5 matrix. On one axis are five meaningful learning environments namely:

- Active
- Collaborative
- Constructive
- Authentic
- Goal-directed

On the other axis are five levels of technology integration namely:

- Entry
- Adoption
- Adaptation
- Infusion
- Transformation

Together this creates a 5X5 multi-dimensional matrix consisting of 25 cells. The origins of TIM framework are in Florida Center for Instructional technology in the year 2005.

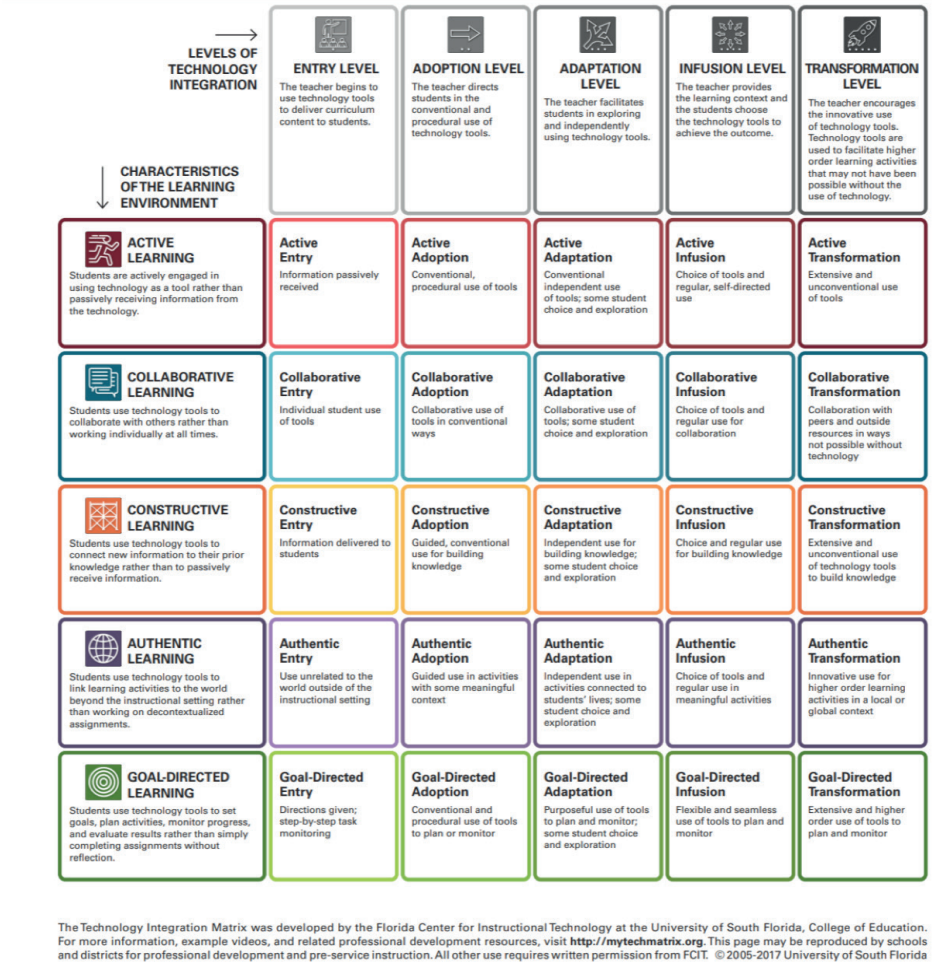

Figure – 4: TIM framework

As with other models, the ideal state is to be at the highest level across both learning environment and technology integration. Starting with Active learning environment where technology integration is at entry level to being at a level where learning environment which is Goal-directed and Transformational technology integration. The final goal is to use higher order tools to plan and monitor students learning.

Technology Integration and Researches

There have been numerous researches in which using TIM Framework, impact on student learning can be seen. In one study conducted in Bangalore, for a Physics experiment this test was done with students using traditional approach for measuring certain parameters manually versus using TIM enabled Science laboratory. The difference was huge and students learning and understanding of the concept was vastly different than in

traditional classroom. Clearly, reaching to higher levels as mentioned in TIM framework leads to higher order thinking skills. Hornack (2011), Jonassen, Howland, Moore & Marra (2003) and Barbour (2014) discuss how TIM can be a great asset to improve student engagement by integrating technology in the classroom learning and improve from initially active to finally goal directed learning.

In Kansas (2010) for high school teachers when evaluation was done with TIM framework, a good mapping of the current state helped the school and education administration at large to better understand what is required from professional development stand point to move the needle towards higher levels of attainment and to further improve the learning opportunities for students in these schools. Likewise, teachers will be able to reflect on their individual practice, become aware of ways they can increase the level of technology integration, and facilitate increased student engagement.

Technology, Pedagogy and Content Knowledge (TPaCK)

Origin

TPACK has its origin in 1986 work of Shulman who focused on knowledge of pedagogy applied to teaching of specific content. Shulman (1987) describes how understanding pedagogical knowledge needs to be combined with understanding content knowledge. He explained how teachers need to "understand deeply, not only the content that they are responsible for, but how to represent that content for learners of all kinds" (p. 202). Shulman argues the most effective teachers knew more than their subject matter and more than just good pedagogy. He asserts teachers also know how students understand & misunderstand their subjects. Figure - 5 describes Schulman's model (1987).

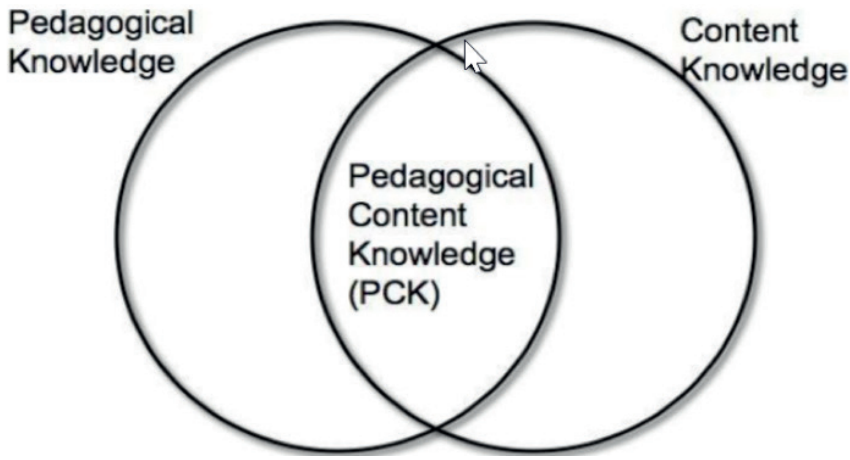

Figure- 5: Schulman's Model (1987)

Effective teachers know how to check for these misunderstandings, and how to deal with them when they arise. In the year 2006, Kohler and Mishra proposed TPACK by introducing the concept of Technology in PCK framework from Shulman. They described an integrated connection between content knowledge, pedagogical knowledge & technological knowledge in order to aid with integration of ICT tools in classroom environment for enhanced learning of students. The more interesting amalgamation which is part of this framework is the part where P (pedagogy), C (content) and T (technology) overlap. This framework can be very helpful tool in hands of educators to develop teachers' competencies in school teaching and ICT integration. In numerous case studies published on the success of TPACK, the approach followed is mostly around

1. Evaluation of the current teaching practice
2. Figuring out which are the areas which are amiss from the perspective of TPACK.
3. Discussing and addressing those in the teaching pedagogy

Technology Integration and Researches

During initial enquiry questions such as "I can adapt my teaching style to XYZ" or "I frequently play around with the technology" help to gauge teacher's confident on the seven domains defined in TPACK. Mostly TPACK survey based investigations are good to get an overall understanding however things such as pedagogy are quite complex and involve planning, teaching, assessment or any other aspects which are hard to measure in a survey. In recent times, TPACK model has further been refined from assessment to implementation perspective (Figure-6).

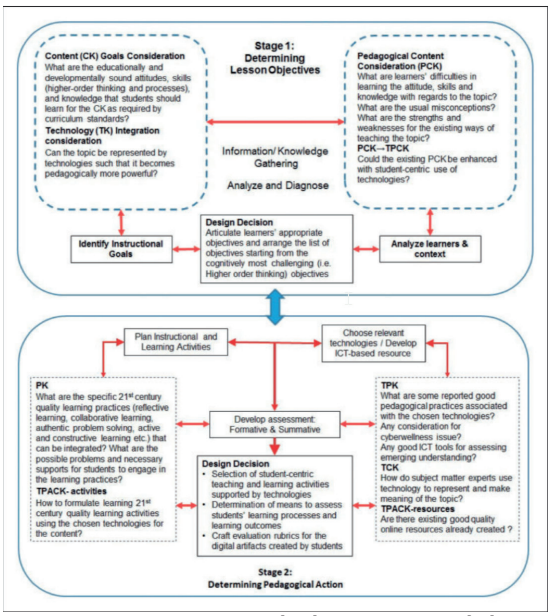

Figure – 6: Detailed TPACK Model

TPACK as a conceptual framework gives good insights on how teachers can integrate technology into pedagogy and this has been validated in various researches such as Chai et al., 2011; Jimoyiannis, 2010. TPACK has also been used as a framework to develop competencies of teachers in school teaching by Doering et al., 2009; Lee & Tsai, 2009; Voogt et al., 2009. In another study Srisawaasdi (2012) where for pre-service physics teachers, TPACK model was used to build best practices for physics teaching method. In the year 2011, Wetzel et al. observed a middle school teacher and how they applied TPACK theoretical framework and integrated technology with content (language arts) and pedagogy (project based learning).

In last few years there have been multiple enhancements suggested to TPACK model. Another variant that has come out is TPACK-21CQL which considers aspects such as Reflective learning, Authentic Learning, Collaborative Learning, Active Constructive Learning, Belied of New Culture of Learning, Design Deposition, Design thinking efficacy & Teachers as Designers. These design beliefs are important for the 21st century teacher.

Triple E (Extend, Enhance and Engage) framework

Origin

Triple E framework was developed in 2011 by Professor Liz Kolb with the aim of bridging the gap between the researches on education technologies and teaching practice in classrooms. Some of the key differentiators in Triple E framework over other technology frameworks are as below:

- Focus is on learning goals rather than technology tools
- Significance of instructional strategies along with using technology tools
- Quality of technology usage rather than quantity
- Understanding that technology is an amplifier and cannot lead to higher achievement. It needs to be applied correctly along with other learning methodologies to achieve the same
- Technology is applied to lesson plans from the purpose on how it can add value to learning goals rather than applying the same to increase technology usage.

Triple E framework can aid earlier technology frameworks towards practically implementing technology for classroom lessons with focus on learning improvement and measuring the same (Figure-7).

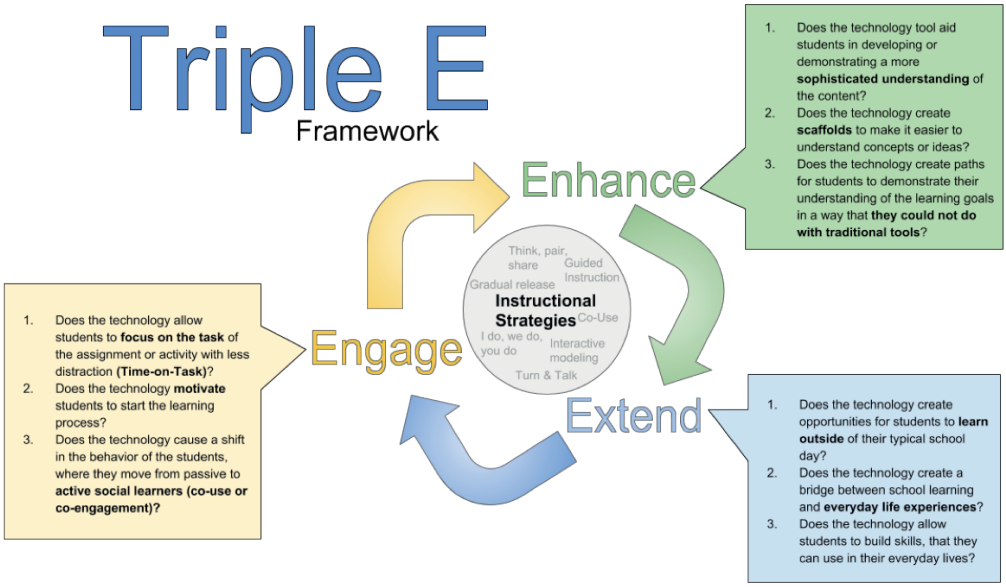

Figure – 7: Triple E Framework

(Source: https://www.tripleeframework.com/)

Technology Integration and Researches

In 2019, there have been two researches related to Triple E framework. In one case, Ibrahim et al. (2019) used HSP (HTML5 package) application in teaching architecture theory and history module to transform facts and dry content to a rich, fun & engaging learning activities based on Triple E framework. Its usefulness in tertiary education could be gauged easily by the increased student's performance in the module. Similarly, Ruzaman et al. (2019) used mobile learning application for teaching science in a study titled - "SIM for Science: Scaffold in Inquiry- Based Learning".

T3 framework

Origin

The T3 Framework is designed by Sonny Magana (2017) to disrupt the current application about educational technology by contextualizing its use into 3 stages:

1. Translational

2. Transformational

3. Transcendent

T1: Translational refers to the act of transferring. When we translate a message from one language into another, we are really transferring a method of generating meaning to another language but keeping the original message as intact. When one engages in translational technology use, one is transferring or translating the task or experiences from an analog mode to a digital mode. The two stages of translational technology are:

T1.1: Automation – When teacher or the student uses technology to automate i.e. to translate from an analog to a digital mode. Thus, saving

time, increasing the efficiency and accuracy.

T1.2: Consumption - The teacher or the student uses the digitized content information in teaching learning experiences. As so much information is available in digitized form that the teachers have to consume it. Thus, aiding the learner to consume content related text, images, videos, pictures or any combination.

T2: Transformational – A shift from Translational stage to transformational use of technology in classrooms where the locus of control of learning experience, transforms from teachers to learners. When this shift happens there is an active learning reflection of the learner. The two steps of transformational technology use in education are shown in Figure - 8.

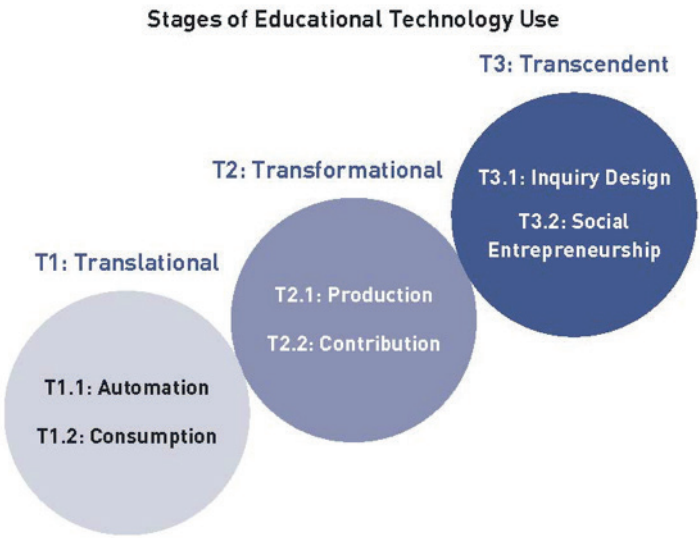

Figure – 8: Stages of Educational Technology Use

T2.1 Production – students use technology not only to experience new knowledge but to actively apply knowledge in the production of digital artifacts that represents what students know and how they came to know it.

T2.2 Contribution -Students are given opportunity to use digital tools to teach others what they know, what they can do, and how they think about their knowledge being transformational. Students' role changes from that of student to teacher. Thus, students will contribute not only to their knowledge but also to the knowledge of others. Students get the opportunity to develop empathy and consideration for the way others interpret and experience.

T3: Transcendent -Students use technology in transcendent ways that result in growth of knowledge, contribution, and value – generating performance. The students engaged in constructing and applying knowledge and skills in ways that transcend common curriculum standards. They contribute something of value to the society. The two steps in the transcendent stage of educational technology are

T3.1: Inquiry Design – Students use technology tools to resolve a problem that matters to them

T3.2: Social Entrepreneurship – Students use digital tools to engage in the process of creating solutions to the problem that matters to them.

Technology Integration and Researches

T3 Framework is designed to support the classroom technologies to unleash student learning potential. Teachers instructions should be based on T2 and T3 stages, pushing themselves to transform education by having students produce and contribute, and to "transcend" by using technology tools to facilitate inquiry and solve world problems that matter. Recently, Carpenter (2019) in her doctoral dissertation identified one of the areas which were lagging in TPACK namely guidance or measurable standards to help teachers attain the actual knowledge, something which has been addressed as part of T3 framework. This guidance in TPACK framework hinders self-assessment by teachers on their current knowledge and then improve.

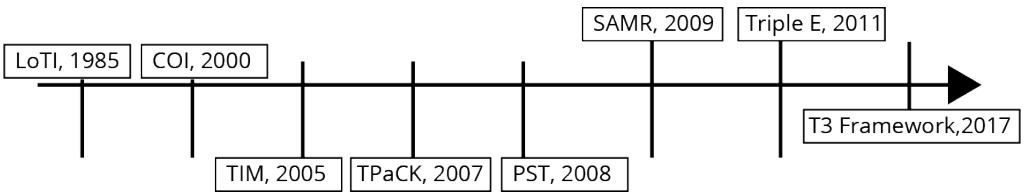

Figure - 9: Timeline of Technology Integration Models

Here (Figure - 9) is a timeline of the various technology integration models. Post-2000, with increase in focus on technology and education at large, three new models have been introduced in a matter of 5 years. Each unique and addresses aspect around technology integration and how to fill the gaps around the same. All these models talk about various aspects as described below:

- Student-centric learning
- Integrate technology into learning
- Induce higher order thinking skills for students

Comparative Review

It is difficult to compare one over the others. Each of these have had researches and validated case studies in last 10 years. Depending on the context of classroom, one or other technology integration model can be used. While the initial frameworks focused more in terms of what was the current level of technology integration for a classroom, lately most frame works have started suggesting how to improve this integration with focus being on learning for learners.

For example, in case of SMAR model, the integration approach is across a single axis with focus being more on technology tools & how as one moves from one technology tool to another, one case see changes in learning. Various levels indicated in LoTi model

also focused more on technology tools and their use but with the introduction of H.E.A.T. model in conjunction with LoTi, focus shifted from technology tools to learners' ability to gain Higher order thinking skills (indicated by H.E.A.T. intensity levels). TIM model was one of the first few models which had two-dimensional view on technology and learning. On one axis, like SMAR model, it had technology augmentation levels but on the other axis the focus was on achieving higher learning and balancing out both technology and learning to achieve maximum in both.

TPACK, though one of the most widely used models, has its origin from PCK model or Pedagogy, Content and Knowledge model that was had its origin in year 1987 by Shulman. Typically, in classroom education, teachers prepare lesson plans which mention the pedagogy of teaching that lesson plan followed by content that would be covered and heavily relies on teacher's knowledge on the subject. TPACK brought in additional factor of technology into the existing PCK framework. Starting from how lesson plans need to be created to final evaluation methodology (learning to assessment), these new frameworks try and address this wide spectrum of classroom learning.

Triple E Evaluation Rubric- *When to Use Technology* by Liz Kolb

Engagement in the learning	**0=No**	**1=Somewhat**	**2=Yes**
The technology allows students to focus on the assignment/activity/goals with less distraction (Time on Task).			
The technology motivates students to start the learning process.			
The technology causes a shift in the behavior of the students, where they move from passive to active social learners (through co-use or co-engagement).			
Enhancement of the learning goals	**0=No**	**1=Somewhat**	**2=Yes**
The technology tool allows students to develop or demonstrate a more sophisticated understanding of the learning goals or content (using higher-order thinking skills).			
The technology creates supports (scaffolds) to make it easier to understand concepts or ideas (e.g. differentiate, personalize or scaffold learning)			
The technology creates paths for students to demonstrate their understanding of the learning goals in a way that they could not do with traditional tools.			
Extending the learning goals	**0=No**	**1=Somewhat**	**2=Yes**
The technology creates opportunities for students to learn outside of their typical school day. (24/7 connection)			
The technology creates a bridge between students school learning and their everyday life experiences (connects learning goals with real life experiences).			
The technology allows students to build authentic life soft skills, which they can use in their everyday lives.			

Figure- 11: Triple E Evaluation Rubric

An example of Triple E framework and rubric evaluation has been given in Figure - 11. Against each lesson plan, rubric evaluation should be done with the thought through technology integration. On a total score of 18, the following is the way to evaluate if technology enhances learning for the learner for this lesson plan or it should not be used at all.

If number of points are 10 or above, it means technology is leading to enhancements or extending the learning goals. However, if score is below 10 but above 7, the current technology tools thought through for lesson may not be helping to enhance or extend the learning goals, so either teacher should re-look at the tools being leveraged or should all together look at not using technology for this lesson.

Similarly, other frameworks offer an approach towards evaluating use of technology and considerations on lesson plans so that learning is significantly enhanced. From a learner's perspective it is important to look at a model and see how it can be used in day-to-day usage from teacher's perspective to improve learning experience. It may also become useful for faculty/teachers to form an inquiry group of few teachers to discuss and figure out next steps towards technology integration and their observations. Lately, most popular frameworks have been TPACK and Triple E framework. Another important aspect to consider with these frameworks is that an educationist should not make efforts to forcefully fit technology into a lesson plan. Where ever technology can significant en hance the leaner experience, those are the areas of lesson plans where technology integration needs to be looked at.

Conclusion

In conclusion, teaching with technology is about learning first and the tool second. Aim for any technology integration must be learner's ability to learn. Most of the models that have been talked about have both positives and negatives. Though SAMR and TIM are both practical frameworks, but technology tool selection is the first aim followed by learning. TPACK is going through number of changes to better showcase the practical aspect of the framework. Triple E framework which has been introduced few years back addresses some of the concerns raised for other frameworks. The recommendation would be to use technology framework judiciously and integrate technology wherever it makes logical sense towards improving learner's ability to learn.

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