

Technology Integration: Implication for Teachers' Professional Development

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Abstract

The technology of today shortly becomes the technology of yesterday in education. The demand for Technology Integration is increasing as schools in the Philippines and abroad were required to keep up with the 21st century learners. It is quite a challenge to point out a starting ground without having to understand what it is and what is not. Studying related literature and reports have made it possible for the researcher to identify models which can effectively bring up success in the process of integration. Teachers must keep abreast with the changing nature of technology and provide learning opportunities effectively. This is because the integration process does not just fall on the specification of technology and application to be used, but more on understanding how to adapt it in the pedagogy of each subject area, how to equip teachers through continuous training programs, and most especially, moving towards professional development to empower the teachers. In order to understand Technology Integration, it would be helpful to look into how scholars define the term, explore how teachers can prepare, and how it is implemented as an educational experience. It is best when the focus lies on learning with technology rather than learning about technology, technology integration becomes more achievable because it is beyond what the tangible products may serve. The focus is how to use and when to use it more appropriately, having the pedagogy in mind.

Keywords: Pedagogy, Technology Integration, Professional Development

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Introduction

In the Philippine setting, schools have been trying to make efforts in Technology Integration. The Enhanced Basic Education Act under RA 10533 imposes quality education that is globally competitive through the Information and Communications Technology. One of the pressing issue today is how to prepare the teachers in implementing it. By the beginning of the 21st Century, School leaders were still faced with a major dilemma on how to effectively integrate technology into student learning experiences (Graesser, 2013). The onset of using technology in the classroom has been in the field for practice. Paperless classrooms have developed and teachers were becoming more aware of the usefulness of technology. It is when opportunities for professional growth and development come with more collaborative tasks for students in the classroom setting. What is very interesting in this study is the dilemma that the teachers face when it comes to integration. It is but a necessity today to be at par with globalization, but the starting ground may still be vague and needs full direction.

Today, school leaders have been in the process of keeping their teachers and staff updated through workshops, with the goal of bringing technology in a more proactive use. Administrators can only do so much in providing seminars and workshops, new technologies for usage, building computer laboratories, and the like. Conversely, one cannot just expect overnight success even if when all the technology at hand. There will always be different perspectives on how teachers use it in their level of teaching. Needless to say, the teachers are the key persons in implementing this as a classroom experience. According to Stobaugh and Tassell (2010), the application of digital technologies is no longer considered optional skills in the workforce. This is the time where technology is constantly changing, thus, it requires continuous adaptation to new tools. Considering that technology -- integrated with learning, - is perceived to be difficult, research indicates that specific uses of technology support the improvement of student outcomes (Moeller & Reitzes, 2011).

It can be quite a drastic move to replace teachers with technology in the sense of leaving the technology on their hands without proper intervention. Teachers will always play a very important role in making the students realize how technology can be useful in enhancing learning experiences. Our students deserve to have teachers, including novice teachers, who are fully- prepared to meet their needs. In today's technology-rich world, it means educators need to be prepared to meaningfully incorporate technology into their practice immediately upon entering the classroom. Given the rapid pace at which technology evolves, faculty members need regular opportunities to both refresh their capacity and share innovative tools and strategies with other professors and teachers in the field, to ensure their technology use is contributing to learning and achievement. (Stokes-Beverley, C., Simoy, I., & Department of Education (ED), O. T. 2016). Technology integration perhaps has its way to alleviate not only the learning process of the students, but also the professional development of the teachers. New opportunities for growth are expected for both student and teacher because integration is a process of testing what is more likely conducive in a particular lesson, class, or setting.

One can expect the highs and lows of technology integration in every institution. Challenges will always be a learning ground to adapt and manage technology in ways that can provide an avenue for growth and development. It should be considered as an investment because there is no other way but to move towards innovation. This movement will not only support the needs of the students, but it will guarantee the entire institution a steadfast foundation when it comes to collaboration. Although it has been becoming a trend in the 21st century

curriculum, welcoming birth pains in accordance to the curriculum, content, and implementation, may not be free from criticisms and setbacks. Some researchers attribute the deficiency of effective technology-integration transfer in student learning to teachers simply not integrating technology into content areas, while other researchers believe that teachers struggle in using proficiency with technology (Davies & West, 2013).

Teachers are important providers of educational sustainability. Teachers' ability to adapt themselves to rapidly-developing technologies applicable to learning environments is connected to technology integration (Bentham, 2013). The factors influencing technology integration include human resources, as well as technological resources. In addition, administrators must also be aware of the current availability of resources that their school could offer. It is through an open mind that investments shall be made in order to provide quality technology. The market today has built varied computers, laptops and tablets which are kid-friendly, but the main concern lies on the planning. Teachers must be equipped with the skills to integrate technology seamlessly into their instruction, in ways that move beyond mere presentation and communication, to a place of creation, innovation, and problem-solving (Stokes-Beverley, C., Simoy, I., & Department of Education (ED), O. T. 2016). Therefore, there should be a significant move with the use of technology, from mere substitution to exploring further on the active use of technology.

If the curriculum dictates how our lesson plans should be conducted, then integration should also be first rooted on how curriculums are crafted. Technology may become so overwhelming, that it may not give desired results. When educators are driven with informal and vague instructions to implement such efforts, then proper orientation must first be made. In order to alleviate common problems and enable teachers to use technology effectively in their own teaching, teachers should be equipped with knowledge and skills to enable them to use such technology. (Erdemir, Bakirci., & Eyduran, 2009). Therefore, it is important that training should include technological tools appropriate to the subject matter, and provide teachers with on-going professional development.

Statement of the Problem

Technology integration in education has a multidimensional structure that consists of various components and indicators. In this vein, the factors influencing technology integration include human resources, as well as technological resources. Technology integration is defined as an efficient and effective use of technology embracing all aspects of learning and teaching processes, including learning and teaching environments, curriculum, and infrastructure (Yalin, Karadeniz & Sahin, 2007).

Specifically, this research essay will answer the following questions:

1. What are the important benefits of technology integration?
2. What are some of the suggested models being discussed in technology integration?

Review of Related Literature

This chapter presents a review of the literature and studies made about technology integration, models and framework, and the challenges of teaching with technology.

What is Technology Integration?

In order to understand Technology Integration, it would be helpful to look into how scholars define the term, explore how teachers can prepare, and how technology integration is implemented as an educational experience.

A study by Jolene Dockstader discusses the integration of technology into elementary and secondary school classrooms based on experiences at the Jerome Joint School District in the state of Idaho in the US. A definition was made possible by first determining what it is not, then gathering points on what constitutes its definition. She places importance in the notion that Integration is not putting computers in the classroom without teacher training. Integration is not substituting 30 minutes of reading for 30 minutes of computer skill development. It is, however, using computers to teach 30 minutes of reading. Integration is not providing application software, such as electronic encyclopedias, spreadsheets, databases, etc. without purpose. It is not pre-packaged programs that are often unrelated activities clustered around a particular topic that address few higher concepts or goals. Nor is it teacher-created programs that cover special interests and/or technical expertise, but do not fit content-area curriculum. Defining what technology integration is and is not is the first step in deciding how to integrate it into the classroom.

Integration is incorporating technology in a manner that enhances student learning. It is using software supported by the business world for real-world applications, so students learn to use computers flexibly, purposefully and creatively. Technology integration is having the curriculum drive technology usage, not having technology drive the curriculum. Finally, it is when the goals of curriculum and technology are well-coordinated and harmonious whole.

Dockstader proposes that in order to prepare 21st century students, teachers need to take the challenge of finding instructional techniques that will best suit their profile, and integrate the curriculum with technology.

In this regard, the teacher has been marked as a prime mover of the process. The teacher is the one who determines what and when a technology will come to play in the classroom's day to day activities. The choices made are based on the beliefs and practices that can contribute more into the learning experience of students.

Technological advances have led to a revolution in education, a revolution which has caused a multitude of changes not only in the way we learn, but also in the way that teachers are able to teach their students. With this, we have also seen an important change in the way education is perceived. We are now constantly researching and developing new teaching methodologies, which have radically changed the way teachers now approach the practice of teaching (Peris-Ortiz, M., Garrigós-Simón, F. J., & Gil Pechuán, I. 2014).

It has been well-established that technology is not a cure-all for improving classroom instruction (Ertmer, 2005); and within the classroom, an instructor must be able to use technology and connect it to the content (Pierson, 2001; Stobaugh & Tassell, 2011). A deficiency in either area can lead to failure; yet content and pedagogical knowledge are often seen as precursors to successful technology integration - a good teacher should be able to use technology in a pedagogically-sound way. Research over the last ten years suggests that in order for technology integration to be fully accepted in the classroom, the teacher needs to be a key stakeholder in the adoption process and help create the active learning process that will

allow technology to take root and grow as an indispensable tool of education (e.g., Arrowood et al., 2010; Ertmer et al., 2012). Both theoretical and practical research have focused on teacher beliefs (Dexter & Anderson, 2002; Hadley & Sheingold, 1993) in order to pinpoint how technology is integrated effectively into the classroom.

Theoretical Framework for Technology Integration

TPACK: Technological Pedagogical Content Knowledge (TPACK) Framework

Technological Pedagogical Content Knowledge (TPACK) attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge. The TPACK framework extends Shulman's idea of Pedagogical Content Knowledge.

Technology knowledge is about certain ways of thinking about, and working with technology, tools and resources and working with technology can apply to all technology tools and resources. This includes understanding information technology broadly enough to apply it productively at work and in everyday life, being able to recognize when information technology can assist or impede the achievement of a goal, and being able continually adapt to changes in information technology (Koehler & Mishra, 2009).

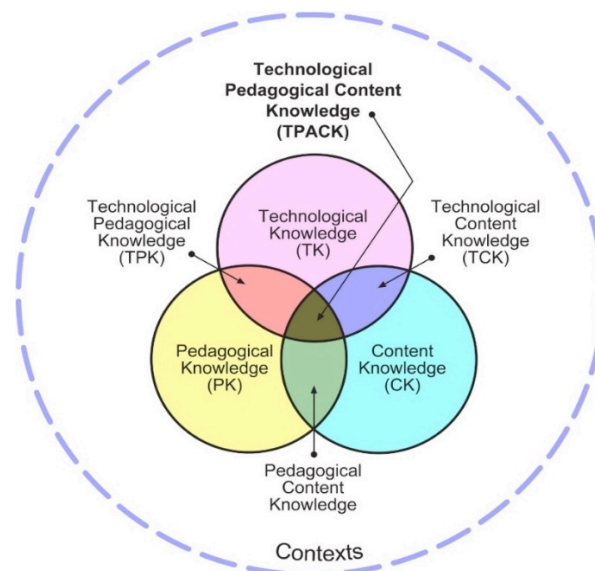


Figure 1: TPACK Framework

At the heart of the TPACK framework is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). The TPACK approach goes beyond seeing these three knowledge bases in isolation. The TPACK framework goes further by emphasizing the kinds of knowledge that lie at the intersections between three primary forms: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).

Successful technology integration is rooted primarily in curriculum content and content-related learning processes, and secondarily in savvy use of educational technologies (Harris, Mishra, & Koehler, 2009). To effectively integrate educational technologies into instruction, K–12 teachers' planning must occur at the nexus of curriculum requirements, students'

learning needs, available technologies' affordances and constraints, and the realities of school and classroom contexts. The complex knowledge needed for such planning is known as technological pedagogical content knowledge (Mishra & Koehler, 2006) —“the total package” of technology, pedagogy, content, and context knowledge (TPACK) (Thompson & Mishra, 2007–2008).

Effective technology integration for pedagogy around specific subject matter requires developing sensitivity to the dynamic, transactional relationship between these components of knowledge situated in unique contexts. Individual teachers, grade-level, school-specific factors, demographics, culture, and other factors ensure that every situation is unique, and no single combination of content, technology, and pedagogy will apply for every teacher, every course, or every view of teaching.

TPACK is not a brand new idea, nor is it owned by anyone. A range of other scholars have argued that knowledge about technology cannot be treated as context-free, and that good teaching requires an understanding of how technology relates to the pedagogy and content. The TPACK framework is gaining popularity among researchers and scholars. This makes tracking the progress of TPACK difficult, but for those getting started, the seminal description of TPACK (by that particular name) can be found in Mishra and Koehler, 2006.

Note that the emphasis in this approach to technology integration was upon content-based learning activities rather than the affordances and constraints of educational technologies that can support learning activities for students (e.g., Freidhoff, 2008). Because teachers' planning is conceptualized around content goals and organized according to learning activities, technology integration methods should be similarly focused. Possibilities for technology use should be considered according to the types of learning activities that have been selected, which, in turn, have been chosen to match students' learning needs and preferences (Harris, J. & Hofer, M. 2017).

SAMR Model

The Substitution, Augmentation, Modification, and Redefinition (SAMR) model is a four-level, taxonomy-based approach for selecting, using, and evaluating technology in K-12 settings (Puentedura 2006).

Puentedura's (2006) Substitution, Augmentation, Modification, and Redefinition (SAMR) model is a recent addition to K-12 teacher learning and professional development with respect to educational technology. According to the International Society for Technology in Education (2015) website, at the 2013 ISTE conference, only one session out of approximately 800 included the term SAMR. The 2014 Conference program featured 30 SAMR-related workshops and presentations out of approximately 900 total sessions; and among 1000 sessions at the 2015 ISTE conference, only 44 included SAMR (Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. 2016).

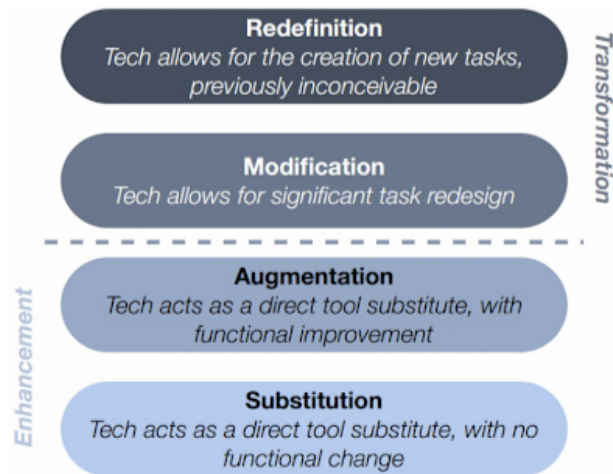


Figure 2: Puentedura's (2006) Substitution, Augmentation, Modification, and Redefinition (SAMR) Model (Retrieved from <http://www.hippasus.com/rpweblog/>)

According to Puentedura, the SAMR Model consists of the following four classifications of technology use for learning activities:

- **Substitution:** The technology provides a substitute for other learning activities without functional change.
- **Augmentation:** The technology provides a substitute for other learning activities but with functional improvements.
- **Modification:** The technology allows the learning activity to be redesigned.
- **Redefinition:** The technology allows for the creation of tasks that could not have been done without the use of the technology.

The SAMR model is rooted in its essence of proving an evolution of knowledge through the use of technology. Its vital part is identifying the use of various technology in the overall instructional design at each level of the SAMR model. It is progressive in nature and enhancements were made to transition from one level to another.

SAMR is a model designed to help educators infuse technology into teaching and learning.”⁷ The model's purpose is to help teachers and professors design, create and implement learning activities which make use of technology, to transform and improve the learning experience for students. The model makes it possible to classify the cognitive levels applied in each learning activity paired to a specific level in the framework which has a form of a ladder (Schrock, K. 2018).

Despite its increasing popularity, there is not yet a theoretical explanation of the SAMR model in the peer-reviewed literature. Moreover, the only reference to its lack of theoretical explanation was found in Linderoth's (2013) blog post, in which the author shared in an open letter to Puentedura, inviting further dialogue and discussion. Puentedura shares his SAMR-related work—which largely consists of copies of presentation slides—via his website. Within these web-based materials, there exists limited explanations or details on how to understand, interpret, and apply the SAMR model – in part or as a whole. Moreover, there are few connections to theory and prior research, and there is limited qualitative or quantitative evidence to support the differentiation of the SAMR levels. As a result of this lack of theoretical explanations or explorations of the SAMR model, both teachers and others involved with educational technology integration, such as professional development

providers and technology specialists, may be led to interpret and represent the SAMR model in different ways.

In the SAMR model, the emphasis remains on the levels of technology use that teachers should align themselves with in order to move themselves along the hierarchical continuum of SAMR. This minimizes the more important focus on using technology in ways that emphasize shifting pedagogy or classroom practices to enhance teaching and learning (Hennessey et al. 2005; Hughes 2005; Windschitl and Sahl 2002).

Holistic Technology Integration: The P4 Framework for Professional Development

The P4 Framework for Professional Development considers not only the “tools” but the use of technology to enhance instructional practices, as well as the professional development of the teacher and general workplace productivity. This framework encapsulates more than just the use of technology in the classroom, but also extends to the pedagogical practices extending into the practical aspects of technology and teaching.

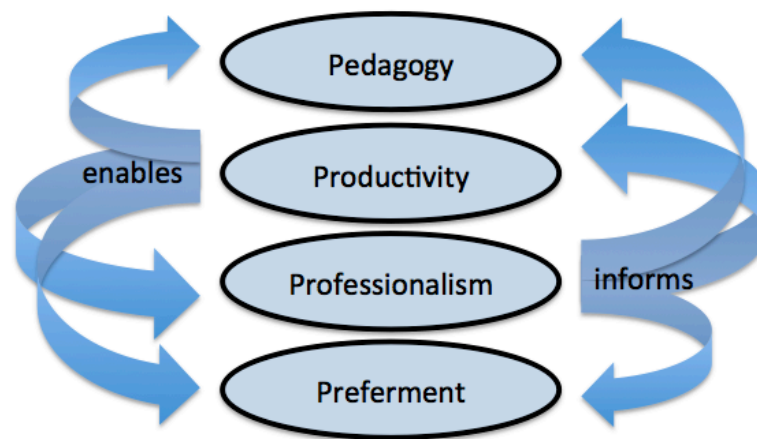


Figure 3: The P4 Framework p.11 (Jason, S. 2017)

It is important to understand the model by discussing Professionalism and Productivity first as a pre-requisite of the next elements which are Preferment and Pedagogy. Such order was made by Siko in the attempt to have teachers take ownership of their professional development (Professionalism); provide teachers with skills and knowledge needed to efficiently expand their knowledge base and create network of peers (Productivity); provide teachers with the underlying currents in educational technology (Preferment;) and relating technology decisions to pedagogy (Pedagogy).

Professionalism

Siko has taken the course of debate to define what a profession is. He acknowledged Finn (1953), as he was able to describe a profession as having:

1. an intellectual technique
2. an application of that technique to the practical affairs of man
3. a period of long training necessary before entering into the profession
4. an association of the members of the profession into a closely-knit group with high quality of communication between members
5. a series of standards and a statement of ethics which is enforced
6. an organized body of intellectual theory constantly expanding by research.

Having so, this builds into a Personal Learning Network (PLN). Teacher educators and leaders need to encourage teachers to seek out knowledge rather than expect it from their leaders. Teachers leaving a pre-service preparation program should have the tools to continue to learn outside of the classroom. Veteran teachers need the ability to continue their learning and access just-in-time learning. This is the goal of a Personal Learning Network (Siko, J. 2017).

The four Ps enable and inform the other, and thus are helpful in reaching a more efficient technology integration more appropriately based on the helpfulness in the learning environment. There has been a lot of framework made that focuses on the Pedagogy of the subject matter like Dewey's (1902) ICCE framework was an early attempt to define how instructional media could be used for student learning. More recently, the TPACK framework (Koehler & Mishra, 2009) emphasizes specific knowledge of teaching content as well as the application of technology in that content. Hughes et al. (2006) created a continuum of educational activities using technology and how it alters the activity in minor to transformative ways. However, this framework focuses more on the professional growth of the teacher having the pedagogy in mind and what it does to the educator in his attempt to enrich his professional growth with the use of technology (Jason, S. 2017).

Productivity

Educators may often complain that eight hours a day of teaching and grading is not enough. Some may tend to bring home paper works due to the high demand of tasks given, aside from usual teaching work such as preparation of reports, committee works, and other co-curricular activities. Therefore, when given technology-development courses, time is of the essence to study and implement new strategies in a given period. However, it is very important to identify the benefits of technology into their system.

Malcolm Knowles's theory of adult learning has listed six traits of adult learners that should drive professional development initiative. It is the learner's need to know; self-concept of the learner; prior experience of the learner; readiness to learn; orientation to learning; and Motivation to learn (Knowles, Holton & Swanson, 2005.)

According to Siko, one of the major hurdles when incorporating technology in professional development is getting staff to buy in. Teachers who want to further professional development must dedicate a substantial amount of their time. The instructional routine in integration takes a long period of time to alter current procedural practices.

He explains how avenues such as infrastructure, department or grade level, and the individual, can affect productivity in the school setting. Addressing the issues requires attention and resolution from the management in order to prepare and implement integration plans. Therefore, proper communication must be made to open the channels for specific needs and actions to be taken.

Preferment

Siko settled on the term *preferment*, which means advancement. Preferment is not simply teaching students how to use technology, but more importantly, giving them an assigned task which utilizes technology in a different way more than just substituting pen and papers.

Furthermore, it is not enough to simply teach students how to use technology. Many of them already know how, and many can probably operate devices better than the teacher in the classroom. However, just plunking down laptops or tablets in the hands of every student in the room does not increase academic achievement, nor does it create tech wizards of the future. He insisted that the problem is that we often mistaken consumption for production. Achievement has not increased because what teachers give them is basically the same and repeated. So then, the interest in technology wanes.

There is a wide variety of technology and how K-12 suggests using it. Taking into consideration the benefits of technology before having them use it is a very important aspect. The sense of using the technology to claim integration is not a shortcut to integration. The choice of technology, how and when to use it, should be carefully planned before any implementation.

Pedagogy

Pedagogy can be very specific to a content area and grade level. Siko's perspective in the planning stage suggested that teachers should be more hands-on when deciding on the range and content of pedagogies. Those who are well-versed on the everyday classroom setup and daily routine have the most knowledge on what the students need. In other words, the teacher in science has more profound ways of identifying pedagogies compared to a teacher from another subject. The best practices and strategies can be identified and determined from the previous experiences and the learning objective. In line with this, technology comes in with the instructional strategy of the teacher.

According to Siko, the approach with technology should be to solve some problems associated with the learning outcome. He pointed out how essential it is to identify what we want our students to attain that is measurable and not just the usual "what the students will know..." Specificity on the content areas are much appreciated in terms of identifying the instructional strategies. Alongside, the collection of data must be made while the strategy is being implemented.

Conclusions

Technology Integration is a struggle in today's curriculum. If not clearly defined, the efforts and financial initiative may not deliver a successful implementation. It is very important to first identify the definition of what it truly means to integrate technology in the school setting. Following Jolene Dockstader's view, technology integration is using computers effectively and efficiently in the general content areas to allow students to learn how to apply computer skills in meaningful ways. Discrete computer skills take on new meaning when integrated within the curriculum. Integration is incorporating technology in a manner that enhances student learning. It is using software supported by the business world for real-world applications, so students learn to use computers flexibly, purposefully and creatively. Technology integration is having the curriculum drive technology usage, not having technology drive the curriculum.

However, the definition may not supply sufficient answer on how to do it. During the course of literature review, strong and effective technology integration includes professional development. The paper suggests following Jason Siko's P4 Framework for Professional Development, A Holistic Technology Integration approach.

The same framework with TPACK and SAMR, which focuses on the pedagogy and level of cognitive use being defined, The P4 Framework added the value of Professional Development and Productivity. This addresses the importance of the teachers being the facilitator inside the classroom. The model suggests to empower the teacher to play a role in the decision making instead of being imposed on without proper consultation and background orientation. Policy makers in the school should consider providing proper guidance and distribute decision making at the system level. Collaboration with colleagues are highly recommended because when teachers, administration, staff and IT personnel exercise good collaboration practices, it brings about effective technology integration in the classroom.

In addition, it highlights the confidence of the teachers to implement and see the value of the process when being guided and equipped with professional development activities and support. Aside from the usefulness of TPACK and SAMR to strengthen pedagogical use of technology, the research essay found out that preparing teachers is more than just the technical skills. Studies suggests to dig deeper into *what* these technologies can offer and *how* those can contribute to teachers and students. It is best when the focus lies on learning *with* technology rather than learning *about* technology, technology integration becomes more achievable because it is beyond what the tangible products may serve. The focus is how to use and when to use it more appropriately, having the pedagogy in mind.

Professional development is a process and not an event. In order to alleviate the barriers with the digital divide, on-going professional development activities should be addressed. It is a learning process for teachers to incorporate it successfully in the classroom. Training is the key to on-going and relevant professional development, and so essential that it can greatly benefit the success of Technology Integration.

The study highlighted that Technology Integration is not a product of overnight planning and one-time implementation. It is not buying technology without further study of when and how to use it. Technology integration is a process and is significantly related to the teacher, who plays a very important factor in the success of the process. The study found out that what is lacking in today's famous models or framework is the involvement of professional development in teachers. It aims to introduce the importance of training and continuous involvement of teachers to empower them because professional development provides opportunities essential to effective use of technology.

While the P4 Framework needs more significant testing for validation of its success, the author believes firmly that Technology Integration when implemented along with Professional Development activities can provide educators the opportunity to understand new advancements in technology and adapt it to their teaching style and pedagogy.

Based on the studies, models and barriers of Technology Integration discussed, the author concludes that technology, pedagogy, teacher training, and professional development must be taken into consideration in the process of integration. This is because the integration process do not just fall on the specification of technology and application to be used, but more on understanding how to adapt it in the pedagogy of each subject area, how to equip teachers through continuous training programs and most especially, moving towards professional development to empower the teachers. This makes the teachers more engaged in the decision making and implementation of the effective use of available educational enhancements. It is important to note, however, that learning about technology is not technology integration per se but it is learning with technology that makes it more meaningful.

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