UNIVERSITY OF PIRAEUS

Department of Digital Systems

"Online Professional Learning Community for PYP Teachers in Technology Integration"

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Statements

I declare that this dissertation is my own original work. Where other people's work has been used, this has been properly acknowledged and referenced in accordance to the department requirements.

Abstract

Technology Integration has been a topic widely discussed in education. Ministries of Education around the World are investing huge amounts of money in order to equip classrooms with the necessary tools to effectively integrate technology in the classroom. However, the research shows that many technology integration plans do not succeed with the most common barrier or limitation, teachers' professional development. Professional development for teachers is usually provided through a one-time workshop. Communities of Practice (CoP) for teachers, else known as Professional Learning Communities (PLC), have proven to be an effective method of professional development for teachers, as it provides teachers with opportunities for reflection, collaboration, sharing and participation in authentic contexts. Moreover, online learning can allows PLC to expand out of classroom walls and collaborate with other teachers regardless of their location. With that in mind, an online Professional Learning Community has been created to foster continuous professional development of the Primary Years Programme (PYP) teachers in technology integration, that are members of the Central and Eastern European Schools Association (CEESA). This pilot project aims to improve collaboration among its members in regards to technology integration and the creation of best practices for effective technology integration, in the PYP curriculum. The online Community is created and hosted on Moodle and its core members are PYP teachers and Technology Integrators of the PYP curriculum.

Keywords: Professional Learning Community, Online Learning, Primary Years Programme, Technology Integration, Professional Development

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Abbreviations

TPACK	Technological Pedagogical and Content Knowledge
SAMR	Substitution, Augmentation, Modification, and Redefinition
K-12	Primary and Secondary Education
PYP	Primary Years Programme
CEESA	Central and Eastern European Schools Association
F2F	Face to Face
PD	Professional Development
TPD	Teacher Professional Development
CPD	Continuous Professional Development
TCPD	Teacher Continuous Professional Development
MOOCS	Massive Open Online Courses
SDL	Self-Directed Learning
IT	Information Technology
IB	International Baccalaureate
BYOD	Bring Your Own Device
ICT	Information Communication Technology
ISTE	International Society of Technology in Education

CHAPTER 1

Introduction

1.1. The purpose of this dissertation project

Teacher professional development (TPD) is a topic widely discussed. According to the literature review, the TPD models mostly used are one or two day workshops. As teachers are expected to be life-long learners, their TPD should focus on providing an ongoing learning-a continuous form of professional development.

The purpose of this paper is to propose and pilot an online professional learning community (PLC) that aims to assist Primary Years Programme (PYP) teachers in the effective integration of technology into the PYP curriculum. Specifically, the target audiences are PYP teachers that work at International Baccalaureate (IB) World schools, and are members of the Central and Eastern European Schools Association (CEESA) region. Members of the PLC are also technology integrators that are currently employed by IB World Schools in the CEESA region.

Teachers and technology integrators currently employed at IB World schools in the CEESA region have limited collaboration and communication. Annual face-to-face meetings are offered for certain groups of employment, such as technology directors, school directors, IB coordinators etc. The number of teachers employed at all IB World schools within the CEESA region is too high to financially accommodate annual meetings for PYP teachers, in order to share classroom practices and foster collaboration.

In order to foster sharing of best practices in technology integration and collaboration among PYP teachers within the CEESA region, an online PLC is created and proposed.

CEESA's mission is to create and foster a collaborative community of international schools which enhances school effectiveness and inspires student learning and development. Therefore, an online PLC can help support its mission statement. In addition, one of the main CEESA's strategies is to be a catalyst for the effective use of technology in support of educational transformation, therefore an online PLC is created to help develop collaboration among PYP teachers in technology integration within the CEESA region.

The members of the community can share technology integrated unit plans, student works, resources, ideas and concerns. They are also able to participate in courses that have been created to foster collaboration among PYP teachers in the CEESA region through collaborative unit planning. Moreover, separate, private courses have been created for technology integrators, where they are able to develop

The online PLC is developed on the Learning Management System (LMS), Moodle and is appropriately configured and customized to serve the needs of the PLC memebers.

The development of this project can be summarized and is driven by one question:

How can an online professional learning community act as a continuous professional development tool for PYP teachers in effectively integrating technology in the classroom?

In order to answer the above question certain areas had to be researched and considered prior to developing the online professional learning environment. Greater focus was given to teachers' professional development (TPD) and how the online professional learning community can work as a continuous professional development experience for teachers, within an informal learning environment.

1.2. Structure of the dissertation project

This thesis has been separated into five chapters. The first chapter is an introduction to the purpose of the thesis project and its structure. The second chapter examines the current state of technology integration in education and the importance of appropriate planning for the effective implementation of any technology integration plan. The third chapter focuses on the importance of teachers' continuous professional development and principles for designing learning environments, offline and online, to support their needs. In addition, the definition and importance of participation in a Community of Practice (CoP) for teachers' professional development is reviewed and examined. The fourth chapter introduces the pilot, online PLC designed and developed to support PYP teachers within the CEESA region, in effective technology integration. Phases of the development of the online PLC are outlined and presented. The fifth chapter describes the development of the PLC on Moodle and the structure of the courses. Last, limitations and further suggestions are examined.

CHAPTER 2

Planning for Effective Technology Integration in K-12 Education

2.1. Literature Review

Much has been said and reported about technology integration in education and the steps needed to transform pedagogy and what we think of teaching and learning. Reigeluth and Joseph (2002) distinguish between technology integration and technology transformation. They point out that technology integration focuses on "how to use technology to support the way teaching is currently done in the schools" (p.9) whereas technology transformation emphasizes the use of technology to teach that which was not possible when the technology was unavailable (Su, B., & Bay, C. M., 2009). There is no blueprint for technology integration, however, it is suggested that effort be made to link technology for instruction to all levels of pedagogical processes and activities as described next (Okojie, M. C., Olinzock, A. A., & Okojie-Boulder, T. C., 2006).

Identifying learning objectives in a technology-based instruction requires teachers to select and/or adapt instructional technology to match the objectives based on the students' needs. Presenting instruction using technology as part of the instructional process requires teachers to choose the methods that are relevant to the objectives, the technology selected, learning styles, modes and pace of learning. Evaluating technology-based instruction requires teachers to select appropriate evaluation techniques that are relevant to the objectives, methods of instruction, and to technologies that have been used. Designing follow-up

activities using technology requires teachers to select appropriate follow-up materials that are relevant to the objectives of the instruction and technologies that are accessible to the students as well as easy to use. Developing course enrichment materials using technology requires teachers to provide opportunity for students to explore issues related to the course materials and to provide them with the opportunity to select and analyze course enrichment materials using technology in ways that broaden their problem-solving skills. Locating sources for additional instructional materials using technology requires teachers to use the internet and multimedia networks to develop additional learning materials and expand instructional resources aimed at broadening the knowledge and the skill gained. Designing a dynamic classroom using technology requires teachers to provide a learning environment that is colorful, engaging, exciting, interactive and energetic as a way of encouraging students to venture into the world of technology and to discover knowledge for themselves.

Much research has been conducted throughout the World to evaluate the positive effects of technology on learning, and to investigate the kind of enhanced learning environment that technology provides in the classroom (Jhurree, V., 2005). Worldwide, Ministries of Education are investing tremendous amounts of money in order to provide schools with the appropriate equipment to create the learning environment that can smoothly and seamlessly integrate technology on a daily basis. In addition to investments in different types of classroom technologies (projectors, interactive boards, etc.), schools have begun making large technology investments in terms of the quantity of computers, gradually decreasing the ratio of computers to students (Allen, S. A., 2015), leading many schools to adopt a 1:1 Program providing every teacher and student with their own device. The

implementation of 1:1 programs is directly affecting teachers because the locus is shifting from inadequate access to technology, to teachers as change agents who meaningfully incorporate technology into teaching and learning (Moen, M. H., 2015). Moreover, many schools are taking it a step further with implementing a "Bring Your Own Device (BYOD)" Program, which decreases the need of a school to invest in student laptops, tablets and iPads, allowing at the same time, students to personalize their learning, adapt their devices to their needs and excel at their own pace.

Nations have recognized not only the positive effects of technology in education, but also the pivotal roles that it plays in securing jobs in the competitive job market of the 21st century (Jhurree, V., 2005). A recent article in "Wired" (2015), had the title "Digital literacy should be 'as important as English and maths'", where the significance of being digitally literate was pointed out in becoming competent for the future workforce. Digital Literacy is a range of knowledge and skills that are essential to being successful citizens in today's technology rich World (Moen, M. H., 2015). Hence, technology is no longer a question of whether or not it should be integrated in a school setting, but a question of when and how to integrate technology involving all related parties, students, teachers, administrators and parents.

The factors influencing teacher decisions about technology integration have been identified as teacher professional development and training, administrative support, positive school environment, adequate technological resources, technology access, technical assistants, adequate planning time, sustained funding for technology, instructional styles, attitudes toward learning, pedagogical beliefs, and personal characteristics (Liu, S. H., 2011). Technology has become part of the

educational process, but too often it is separate and not integrated into the learning experience. Technology Integration Specialists and Digital Coaches agree that technology is no longer and should not be a standalone subject, which students attend to learn computer usage skills. Technology integration is not just about the technology, either hardware or software-it is rather a combination of content, pedagogy and technology. Edutopia (2008) has offered this definition: "*Technology integration is the use of technology resources -- computers, mobile devices like smartphones and tablets, digital cameras, social media platforms and networks, software applications, the Internet, etc. -- in daily classroom practices, and in the management of a school. Successful technology integration is achieved when the use of technology is routine and transparent, accessible and readily available for the task at hand*". When used well, education technology has allowed teachers to make more engaging lessons, students to delve into content they would not have otherwise had access to, and administrators to reconsider the ways they think about the traditional classroom model (Allen, S. A., 2015). Effective technology integration is a tool to promote and extend student learning on a daily basis and is achieved when the use of technology is routine and transparent and when technology supports curricular goals (Edutopia, 2008).

There is no "one best way" to integrate technology into curriculum. Rather, integration efforts should be creatively designed or structured for particular subject matter ideas in specific classroom contexts (Koehler, M., & Mishra, P., 2009).

Innovative pedagogical practice using technology has been discussed in research and practiced in the education milieu for over two decades, since the emergence of ICT not only in computer science, but also as a lever for pedagogical change

(Koehler, M., & Mishra, P., 2009). Teachers in the 21st century are facing new challenges as a result of the expanding possibilities of ICT integration in every aspect of the school milieu (Albion, P. R., Tondeur, J., Forkosh-Baruch, A., & Peeraer, J., 2015). For many teachers, a lack of personal experience with technology presents an additional challenge. In order to incorporate technology-based activities and projects into their curriculum, those teachers first must find the time to learn to use the tools and understand the terminology necessary for participation in those projects or activities. Teachers often do not have adequate experience and knowledge with using digital tools in learning and teaching. Many teachers earned degrees at a time when educational technology was at a very different stage of development than it is today (Koehler, M., & Mishra, P., 2009). Therefore, one of the most important factors in effective technology integration is teachers' training and professional development. While schools do allocate limited monies and release time to professional development, a view of teachers as life-long learners is a perspective that is missing in most schools given the limited scope, quantity, and quality of professional development available to teachers (Keller.J, 2002).

2.2. Implementation of an effective Technology Integration Plan

Education as a social enterprise is a very complex system that involves many stakeholders, with the three fundamental ones being the teachers, school and parents, and should be considered at the outset in making decisions on ICT integration in education. As in any education technology program, comprehensive planning for infrastructure, financing, and teacher supports are important and must

be taken into account before the implementation of the program. The success of education technologies in schools depends on both the quality of the material presented through technology in terms of content and pedagogy and also the quality of the implementation of the program (Allen, S. A., 2015). Thoughtful planning for learning is essential for the success of any technology program.

Plans should be prepared by responsible and qualified persons in light of information gathered on real school needs, goals and objectives, availability of resources, training and staff development needs, and funds (Jhurree, V., 2005). Implementation of any type of new technology and transformation in the workforce will come across barriers. These barriers are as outlined below, according to the literature review, and can be seen as means of considerations when implementing an educational technology integration program into the learning equation.

2.2.1. Barriers in Implementation

The understood and yet unspoken connotation of a barrier is that its removal acts as an aid towards the achievement of the objective. Therefore, the study of barriers as they pertain to technology integration is essential because this knowledge could provide guidance for ways to enhance technology integration (Schoepp, K., 2005). Implementation of any type of technology in schools is a complex process and may encounter various difficulties and barriers. There are a number of considerations that leaders must make when determining how to best incorporate technology into the curriculum for students (Allison Gulamhussein., 2013). Although teachers are aware of the importance of technology integration

into daily process of teaching and learning, they tend to face a number of barriers when it comes to effectively integrating technology into their curricula (Su, B., & Bay, C. M., 2009). Hadley and Sheingold (1993) conducted a study involving known technology integrators at the 4-12 grade level, and found that the most cited barriers to technology integration were (Schoepp, K., 2005) :

1.Poor Administrative Support

2.Problems with time, access, space, supervision and operations

3.Poor Software

4.Curriculum Integration difficulties

7.Teacher's knowledge and attitudes towards computers

8.Computer Limitations and inadequate number of computers.

9.Lack of technical support

Similar findings have also been reported in other cases. Other parallels between these cases was that lack of time, lack of equipment and lack of training were the top rated barriers to technology integration (Schoepp, K., 2005). Other cases mention lack of motivation and social awareness, lack of vision or rational for technology use and lack of relevance to the curriculum (Su, B., & Bay, C. M., 2009). Nowadays, most schools have invested and continue to do so in devices, software and Internet access to support technology integration. Therefore, equipment and resources, such as high-speed Internet, are becoming less and less a barrier factor. Though, these barriers can be overcome it does not mean that technology integration is effective and adopted to it's full. Many technology integration projects have failed in the past because they lacked successful classroom and curriculum integration strategies (Su, B., & Bay, C. M., 2009). The lack of time and inadequate generic teacher training still remains and has been

found to be the barrier even in technology-rich schools. According to Ertmer (1999) teachers would not automatically integrate technology into teaching and learning even if barriers such as access, time, and technical support were removed. The literature addresses a range of barriers that schools and teachers face in implementation and also provides a series of useful frameworks for thoughtful implementation and programs. According to Ertmer (2005), these barriers can be classified in two groups: The *first-order* barriers are the ones that are external to the teacher and are either missing or provided inadequately. Such examples are resources, equipment, teacher trainings, time and support. The *second-order* barriers are the ones that relay on each individual, their mindset and beliefs and they are thought to be more difficult to overcome, which is why many schools focus on overcoming first-order barriers first. It is not always clear as to which barrier causes the lack of technology use and insufficient technology integration. In order to effect transform education with ICT, Ertmer and Ottenbreit-Leftwich (2013) suggest consideration of how contextual, cognitive and affective factors may act as barriers or enablers.

First-order **Barriers**

First-order barriers are those that are often seen initially as "the" obstacles, e.g., the issues of adequate access to the technologies, training, and support without which it is almost impossible to talk about technology integration. Access and technical issues are often cited as common barriers. Broadband access and slow networks are common problems that prevent teachers from effective use. With a

slow network, teachers are left waiting for websites, having difficulties with printers, and often being disconnected from the Internet. The insufficient numbers of computers and teachers' lack of knowledge and skills (Allen, S. A., 2015) underlie under this category as well. Many schools do not have the funds to equip the school with technologies, such as projectors, laptops, mobile devices, 3D printers, film and sound systems and licenses for learning platforms and management solutions. Moreover, the cycle of changing older equipment with new also depends on the financial circumstances from school to school. A low level cycle can result in the cause of technical difficulties for teachers and limited capabilities, keeping them away from using them. Therefore, a maintenance plan is necessary for every school and ways of replacing old devices. However, new, expensive devices and materials do not mean that technology integration will be effective. One of the most cited school-level barriers is the lack of time (Allen, S. A., 2015). Integrating technology, planning and aligning technology/digital with curriculum standards are a time consuming process and requires teachers to experiment and become familiar with technology tools and resources. Though schools attempt to address these obstacles through teacher training, additional resources, and technology support, teacher level barriers remain a large hurdle for any education technology program (Allen, S. A., 2015). Many studies report problems with support and training, as it is common that professional development is not specific or updated or not connected to teacher practices in the classroom. Schoepp K (2005) reports in his research that the barrier most referred to was the belief that faculty are unsure as to how to integrate technology.

Second-order barriers

Barriers can also be related to teacher beliefs, attitudes, perspectives, organizational and management styles and practices in regards to technology in education, which according to Ertmer (2005) they are considered the second-order barriers and the hardest to overcome. For example, if a teacher believes that technology would not help student achievement it is most likely that this teacher will resist to technology integration and would not put effort into changing her/his pedagogical and teaching views. Old assumptions about how teaching and learning turn out to be the most difficult barriers to overcome (Su, B., & Bay, C. M., 2009). Ertmer (2005) indicated that teachers who have strong constructivist pedagogical belief were more likely to use technology in the classroom than teachers who have traditional pedagogical belief. Most teachers have been taught though in different methods, in a traditional learning setting and those methods are the ones they are familiar with and most likely to follow in their own instructional strategies. There others that accept the difference and change in student-teacher roles but still are hesitant to incorporate more technology as they feel that they lack the skills and confidence to get the highest degree of efficiency out of it. The main difficulty to overcome such barriers is that people tend to resist change when their old assumptions and values are challenged (Su, B., & Bay, C. M., 2009). In addition, teachers are expected to be innovative and life-long learners. Many of them, even though they are aware of the necessity, do not know what methods to use to do so or expect guidelines to come from the administration of their school. Teachers often get caught up the way they were taught and do not engage in informal learning techniques. Recommendations as to the methods of eliminating technology integration barriers differ according to the type and intensity of the barrier (Schoepp, K., 2005). Besides school support, the

process of technology integration can be expedited if parents and the community also show their respect and appreciation for such changes (Su, B., & Bay, C. M., 2009).

Technology integration should be well planned prior to implementing. It should involve all stakeholders: teachers, administration team, students, and parents. Every school, district, or community should share the same vision as to what technology integration means for them, what strategies will lead to the effective implementation of it and what methods will be developed to continuously progress and seek opportunities for growth. Teachers need to be provided with more time and opportunities for professional development. Nonetheless, their professional development should be related to what teachers can implement in the classroom and take into consideration the level of technology skills of the teacher. Regardless of the barriers involved, if teachers do no receive sufficient equipment, time, training, or support, meaningful integration will be difficult, if not impossible, to achieve (Ertmer, 1999).

2.2.2. Planning for Implementation

Fullan (1991) lists a set of key themes considered to be particularly important for successful implementation of educational innovations: vision-building, evolutionary planning, initiative-taking and empowerment, staff development and resource assistance, monitoring and coping with problems and restructuring. The plan should be produced, not for the sole purpose of putting technology in the classroom but to reflect the real needs of schools in order to make effective technology deployment and to produce enhanced learning environments (Jhurree,

V., 2005). Levine (1998) proposes the following the components of an effective technology integration plan in schools:

• Formulating a planning team

• Collecting and analysing data

• Formulating the visions, goals, and objectives

• Exploring available technology

• Determining training and staffing needs

• Determining a budget and funding sources

• Developing an action plan

• Implementing the plan

• Evaluation

Still relevant today is a three-phased approach to the process of systematic planning and implementation of computers in schools formulated by Cheever et al. (1986). The three phases are (Jhurree, V., 2005). :

Strategic planning. This involves establishing a vision, which would include institutional goals at district/state level, identifying the necessary resources to achieve goals, planning the acquisition, deployment and disposition of the resources. Examples of strategic planning activities are the writing of long term plan for the integration and use of computers in schools, which would include annual steps and short-term goals. This can be defined as the vision of technology integration. Many researchers and teachers have agreed that the barrier in achieving high levels of technology integration, are due, at least in part, to the lack of a clear definition or vision of what this means (Ertmer, 1999). It is important to note here that the administration, teachers and staff should all be on board and guided by the school's mission and vision. Teachers need to be able to

accomplish small daily tasks that are related and representative of the school's vision. Moreover, the appointment of citizens and committees to work towards funding acquisition is a significant element of the strategic plan. It is important that the plan for financing incorporates sustainability and that the planning phases adequately prepare teachers for a full implementation. Schools need to find ways of funding, coming from internal or external resources. They need to determine the most appropriate way to account for expenses between the operating and capital budget (Barnett, H., 2001). Schools and administration Boards can find ways of creating external funds or some type of financial assistance as the school and the technology progresses over the years. To make the jump to a technology-intensive environment, schools sometimes opt to apply for outside grants to seek increases in the district budget allocation to technology (Allen, S. A., 2015). "Parent-Teacher Associations (PTA's)" can become involved in school systems and are able to assist in raising money for new equipment or programs. Further decisions will need to be taken into account as to whether the devices will be leased or purchased, what software expanses should be taken into account and budget for repairs and maintenance of the equipment as they move forward with their technology plan and goals.

Management control. This is concerned with the actual acquisition of the necessary resource and planning their integration in the classroom to meet the institutional goals. Examples of management control activities are the formulation of instructional objectives of a certain subject at a certain grade level when computers are introduced to teach and learn that subject, and the development of school-level budgets for resource acquisition and staff professional development. In more depth:

The forming of an ICT Committee team can play a valuable role throughout the implementation phase of any technology integration plan. The committee should conduct a strategic review of the current state of ICT at the school, including:

- ICT philosophy
- The role of ICT to support teaching and learning
- The position of ICT in the curriculum
- Organizational structures and staffing
- Management practices
- Resources and budget
- Professional learning
- Existing policies and procedures.

Evaluating and selecting appropriate technology standards and the alignment of those with core curriculum standards are important when designing units and integrating technology into the curriculum. Ertmer (2005) further indicates that modeling, reflection, and collaboration are good strategies to show teachers what technology can do for them and their students, how it can be done effectively, and how they can start (Su, B., & Bay, C. M., 2009). The hire of Technology Integration Specialists or Digital Coaches, to co-plan and co-teach with teachers can be extremely beneficial for teachers as well as help meet easier goals and objectives in the strategic plan.

Teacher professional development (TPD) also falls under this umbrella. Schools need to offer on-going professional development to teachers that promote innovative practices. The professional development opportunities can also give teachers the chance to engage in new pedagogy, and learn how to teach “in a

different way" (Allen, S. A., 2015). With strong administrative support, teachers can be given the time and the resources to use technologies not only in their own teaching but also in sharing their experiences with other teachers (Su, B., & Bay, C. M., 2009).

Another vital component is the creation of Responsible Usage Policies/Agreements (RUP/RUA), outlining clearly the rights and responsibilities of every student and staff member in regards to IT, whether referring to digital citizenship, privacy, personal devices, downloads and usage of software and applications or school owned equipment. Schools should not neglect the importance of appropriate and clear policies, as they will be referred to frequently through any technology integration plan and help develop responsible and respectful persons when incorporating any technology tools in learning.

Operational control. This has to do with the day-to-day usage of computers in the classroom. Examples of activities are the scheduling of computer access to teachers and students, and the computer usage policies. Operational control also includes the Information Technology (IT) infrastructure, the adequate technical support provided to teachers on a daily basis and the total of whole school's equipment and their use, from hardware to software. Mobile learning should be encouraged with wireless connection to the Internet in any area on campus. The internet speed and bandwidth should be able to support the needs of the school, including students' and teachers' workload.

Lack and poor planning in any of the above elements could lead to ineffective and failure of technology integration. The effectiveness of the plans and milestones achievements should also be monitored and evaluated. Moreover, plans should be changed in light of the deliberations of the evaluation process." (Jhurree, V.,

2005). With more and more institutions removing the barrier of access through the implementation of programs such as a laptop program, the degree to which technology is being integrated into teaching and learning must be further explored (Schoepp, K., 2005).

2.3. Frameworks for Technology Integration

Scholars have proposed different models over the years to identify and/or measure technology integration (Moen, M. H., 2015). When properly implemented, a technology integration framework supports 21st century learning, content-area achievement, higher-order thinking, and workforce preparation. A technology integration framework is a method, often graphically represented, that is used to understand, apply and evaluate technology use and understanding in a given setting (International Baccalaureate Organization, 2011). Frameworks are very useful for guiding thinking and planning, which is particularly important for educators as they develop a curriculum. Students can also use frameworks to plan their projects: frameworks are very helpful in providing basic principles that they can use to think about their work. Practically speaking, technology integration frameworks may be used in a number of ways, for example:

- for discussions within the school community about technology integration
- to encourage new mindsets around innovation and technology education
- as part of infrastructure design and planning
- as part of curriculum design and planning
- to frame the acquisition of media and digital resources used by the school community

- for professional development
- for evaluating new technologies

Technology integration frameworks are most effective when used consistently in school planning, just as any conceptual or pedagogical framework would be. Our research identifies four widely-implemented frameworks for technology integration: TPACK (Technological Pedagogical Content Knowledge), SAMR (Substitution, Augmentation, Modification, and Redefinition), TIM (Technology Integration Matrix), and the Technology Immersion Pilot (TIP) model. Furthermore, the International Society for Technology in Education (ISTE) National Educational Technology Standards (NETS) highlight several "Essential Conditions" for technology integration in the classroom that support integration frameworks. Since most frameworks are developed for specific contexts, some may be better fit for purpose than others. In addition, districts, curriculum leaders, practitioners and organizations such as the International Baccalaureate (IB) Organization (IBO) develop their own framework that fit better with the specific curriculum and values. The IB has developed their own framework, entitled "Agency, Information and Design" (AID).

2.3.1. TPACK

At the heart of good teaching with technology are three core components: content, pedagogy, and technology, plus the relationships among and between them (Koehler, M., & Mishra, P., 2009).

The TPACK framework described the knowledge that teachers need to have in order to effectively integrate technology into the learning equation. The TPACK

framework emphasizes how the connections among teachers' understanding of content, pedagogy, and technology interact with one another to produce effective teaching. The TPACK framework suggests that teachers need to have deep understandings of each of the components of knowledge in order to orchestrate and coordinate technology, pedagogy, and content into teaching. This knowledge is unlikely to be used unless teachers can conceive of technology uses that are consistent with their existing pedagogical beliefs (Ertmer, 2005). The three major components formulated from the TPACK framework are:

1. Content Knowledge (CK): This component examines teachers as subject matter experts. Knowledge and the nature of inquiry differ greatly between fields, and teachers should understand the deeper knowledge fundamentals of the disciplines in which they teach Koehler, M., & Mishra, P. (2009). Therefore, teachers are expected to be experts when teaching a certain topic or subject, with the use of appropriate teaching methods, practices and evidence, according to the nature of the topic.
2. Pedagogical Knowledge (PK): Pedagogical knowledge refers to teacher knowledge about a variety of instructional practices, strategies, and methods to promote students' learning. It includes It includes knowledge about techniques or methods used in the classroom, the nature of the target audience, and strategies for evaluating student understanding. Therefore, pedagogical knowledge requires an understanding of cognitive, social, and developmental theories of learning and how they apply to students in the classroom (Koehler, M., & Mishra, P., 2009).
3. Technology Knowledge (TK): This refers to teachers' knowledge about older and newer technology and ways of integrating them into the

curriculum. 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).

The TPACK approach goes beyond seeing these three knowledge bases in isolation. TPACK also emphasizes the new kinds of knowledge that lie at the intersections between them, representing four more knowledge bases teachers applicable to teaching with technology, as shown in Figure 1.

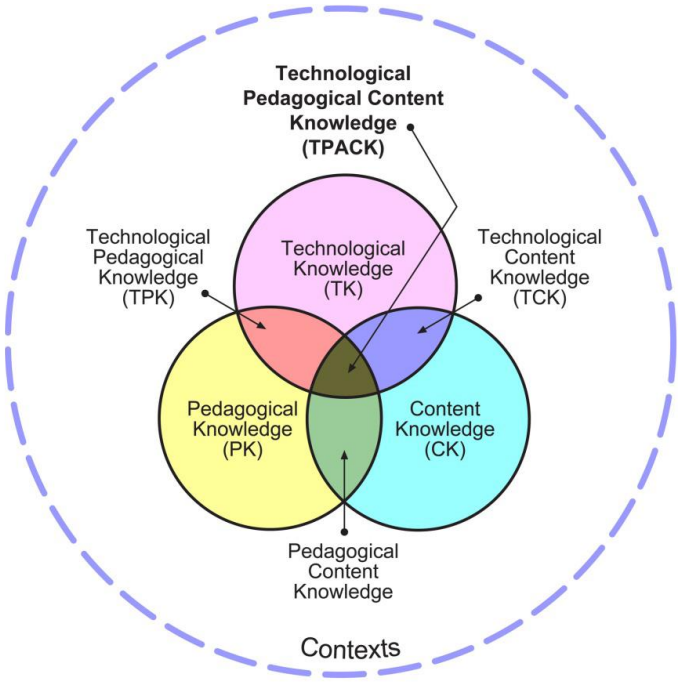


Figure 1: TPCK Framework and its knowledge components

Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and the intersection of all

three circles, Technological Pedagogical Content Knowledge (Koehler, M., & Mishra, P., 2009). More specifically:

- Pedagogical Content Knowledge (PCK): PCK covers the core business of teaching, learning, curriculum, assessment and reporting, such as the conditions that promote learning and the links among curriculum, assessment, and pedagogy (Koehler, M., & Mishra, P., 2009). It examines teachers' knowledge of representing content knowledge and adopting pedagogical strategies to make the specific content/topic more understandable for the learners.
- Technological Content Knowledge (TCK): This component refers to the way a certain subject or content area influences and constrains technology and vise versa. According to Koehler and Mishra (2009), teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa.
- Technological Pedagogical Knowledge (TPK): This refers to teachers' beliefs of how technology can transform pedagogy and they ways we perceive learning and teaching. This component asks for teachers to be creative, innovative and open-minded, in order to advance student learning and understanding. As technology changes rapidly teachers need to have a deeper understanding of the constraints and affordances of technologies and the disciplinary contexts within which they function is needed (Koehler and Mishra, 2009).
- Technological pedagogical content knowledge (TPACK): TPACK is the basis of effective teaching with technology, requiring an understanding of

> the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones (Koehler and Mishra, 2009). 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. As there are different groups of students, teachers, various cultural backgrounds, and other factors, there is no one right and unique to apply TPACK, but rather it can be adapted to respective factor-circumstances.

The TPACK framework can be used in many ways-from research to professional development, to software development. While it can play the role of a guide when developing technology integrated lesson plans, the need of teachers' beliefs of technology and its role in transforming education and our perception of pedagogy is vital. The TPACK framework seems to provide some solutions, though additional effort should be devoted in helping the teachers to deal with contextual constraints and addressing their beliefs. The need for continuous teacher professional development can play a significant role in the further and more effective application of the TPACK framework.

2.3.2. SAMR

SAMR is a model that has been designed by Dr. Ruben Puentedura, to help teachers evaluate their instructional practices in terms of technology integration. Teachers can use the SAMR model to reflect on their technology integration skills and enables them to use it in order to design, develop, and infuse digital learning experiences that utilize technology. Figure 2 represents the four phases of the SAMR model.

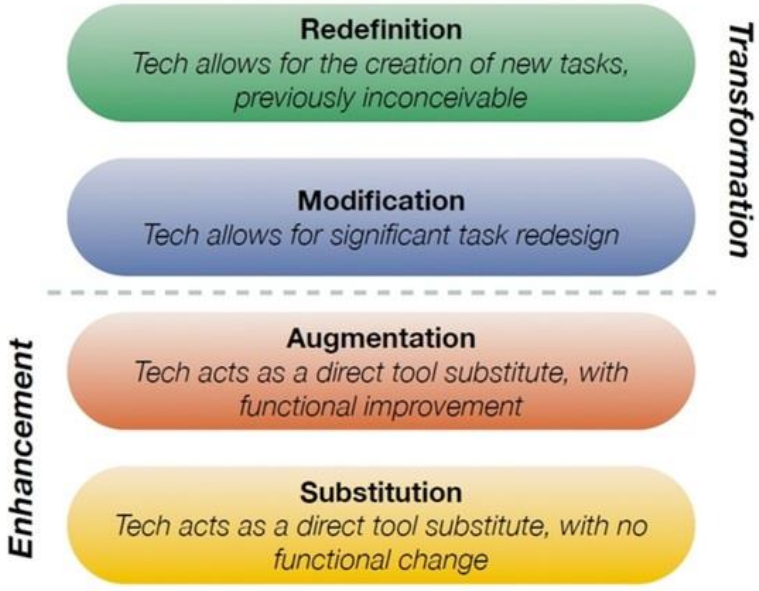


Figure 2:SAMR Model of Dr. Ruben Puentedura, Ph.D.

http://www.hippasus.com/rrpweblog/

SAMR is divided into four phases, which consist of:

- Substitution: This is considered the lowest and earliest level of technology integration. Teachers and students in this phase do not acknowledge any

change. New technology is used to replace the old and teachers' perception and mindset remain the same as before.

- Augmentation: In the Augmentation phase little improvement has been accomplished but the improvements in terms of functionality are evident. The mentality remains the same as in the Substitution phase, but in this case additional and more advanced functionalities of the learning tool or technology are added.
- Modification: In this phase learning tasks are redesigned allowing space for additional more functional technologies to be integrated. Combination of tools and tasks work together to create a greater, more fulfilling meaning. Higher-order thinking skills are more present at this phase, while teachers start to develop more complicated digital competencies.
- Redefinition: This is the highest phase one can achieve in the SAMR model. During this phase, technology is seamlessly integrated and new tasks are created-tasks that without the use of technology were inconceivable. This is the phase where students are able to achieve higher order thinking skills.

Though, as Dr. Puentedura mentions, it is not about the technology. It is rather a ladder that teachers day by day manage to climb higher on. This is achieved through the creation of new tasks. Those tasks and the way we define what we think about teaching and learning is what makes a teacher climb up the ladder higher faster. There is no timeframe either. It is more of an on-going process that is influenced by the continuous emergence of technologies. When teachers are placed in the redefinition phase, tasks can take place beyond classroom walls,

leading to experiences never thought before and students to higher order thinking skills.

CHAPTER 3

Teacher Continuous Professional Development (TCPD)

3.1. Introduction

As content areas, teaching approaches, and pedagogies change and develop teachers must grow and develop over the course of their career (Vrasidas, C., & Glass, G. V., 2007). Educators of the 21st century are expected to look across the curricula and be able to see the potential in the emerging tools and web technologies, grasp these and manipulate them to serve their needs.

For the past several decades, there has been a growing recognition of the importance for lifelong learning in response to greater competitiveness in a world market, especially in regards to the rapidly changing technological advances in the workplace (Moen, M. H., 2015). While schools do allocate limited monies and release time to professional development, a view of teachers as life-long learners is a perspective that is missing in most schools given the limited scope, quantity, and quality of professional development available to teachers (Keller.J, 2002).

Teachers are being pushed to better prepare students to be college and career ready with a new set of digital literacy skills. Despite government expectations that ICT should be used to enhance the quality of education there has been little movement toward using ICT to assist teachers with accessing the knowledge that might enhance their practice (Leask & Younie 2013), (Koehler, M., & Mishra, P., 2009). Research suggests that the paradigm of instruction needed to prepare

students for college and 21st century careers is not the paradigm of instruction most teachers currently use in their practice (Allison Gulamhussein., 2013).

Teachers are expected to grow as professionals and need to learn while they are teaching if students are to receive an optimal education (Keller.J, 2002). With the rapid change of technology and the expansion of the Internet and speed, one must be adaptable and a life-long learner, in order to remain competent and up to date. Teachers are not excluded. In contrast, they are the ones expected to engender life-long learning skills and attitudes in children (Keller.J, 2002). But without paying attention to developing those same skills and attitudes in the teachers of those children, how would students develop to life-long learners? The idea of what PD should look like is also fundamental.

According to Donnelly, et al. (2002), studies have shown that teachers need three to six years of sustained practice to integrate ICT fully into the classroom (Vrasidas, C., & Glass, G. V., 2007). Unfortunately, many teachers report inadequate training in their preparation to use technology effectively and in an innovative manner in their teaching (Albion, P. R., Tondeur, J., Forkosh-Baruch, A., & Peeraer, J., 2015). According to Webster-Wright (2009), the first trend driving the need to look at PD differently is the concept that teachers need to keep up with the rapid technological changes by being lifelong, learners (Moen, M. H., 2015), leading to the need of continuing professional development (CPD). Review shows that, in addition to effective professional development, supporting technology integration also entails the following elements: (1) establishing communities of practice, (2) providing administrative support, and (3) creating relevance to context and curriculum. This information is a valuable resource for

schools or districts establishing or refining their approaches to delivering effective professional development to support technology integration.

3.2. Limitations and Barriers of TPD in technology integration

Ertmer and Ottenbreit-Leftwich (2013) note that most teachers are not using technology to effect meaningful changes in student outcomes but primarily as aids to delivering content. They characterize the most common experiences of students as learning from computers through searching for information online and writing assignments. In their view the problem arises from the emphasis having been placed on the technology while the solution lies in shifting the focus toward pedagogy, emphasizing *how*, rather than *what*. It is important that practicing teachers and in-service teachers recognize that technology in education is considered part of pedagogy (Okojie, M. C., Olinzock, A. A., & Okojie-Boulder, T. C., 2006). Pre-service teacher education programs are by no means sufficient to prepare teachers to be effective users of ICT in the classroom (Vrasidas, C., & Glass, G. V., 2007).

Below are outlined the most common limitations and barriers that occur in TPD for effective technology integration according to the research:

Limited time for TPD

Though a school can have the ability to fund all the equipment, if appropriate professional development (PD) is not provided the integration plan will most likely fail. Many teachers do not have the digital competences to achieve a high level of technology integration. This ultimately derives from the limited time that

they are offered and poor or inadequate PD. Adelman, et al.(2002) found that teachers identified time as the most significant barrier to integrating ICT in the classroom (Vrasidas, C., & Glass, G. V., 2007). Teachers as adults have busy lives, which results into a lack of time for developing their professional learning. Teachers should be allocated time during their working schedule. In addition, new means for professional development should be explored, such as online professional development opportunities. The demands of work and family life for teachers, many of whom are women, underline the need for professional development activities that can be delivered anytime, anywhere (Vrasidas, C., & Glass, G. V., 2007).

Online professional development activities as well as blended learning solutions can help this type of delivery and meet students' needs. Online learning allows teachers to adapt their learning experience to their schedule rather than the other way around. Nonetheless, online learning provides opportunities for adapting the learning experience to each teacher's needs, therefore allowing them to skip activities and/or courses that they feel are not necessary or already are familiar with and use their time for other professional activities.

Limited teacher participation in decision making regarding their PD

During the planning phase of a technology integration plan the focus is on providing, efficient equipment and an adequate IT infrastructure, though professional development in many cases is poorly carried out and seen from a traditional perspective. Teachers' participation in technology decision-making is limited, even though they are the ones who implement technology at the classroom level and they are the ones that have the responsibility of facilitating

instruction. Teachers, administrators, policy makers, and other stakeholders should collaborate and participate in the decision making process, as well as in the design, implementation, and evaluation of professional development programs (Vrasidas, C., & Glass, G. V., 2007).

Teachers selecting their own PD focus or activities, can have a hugely positive effect on motivation, enthusiasm and take-up of any new ideas, with frustration resulting from the school-level direction of CPD, and compulsion being seen as having negative consequences in the impact of CPD (Edmonds and Lee, 2002; Hustler et al, 2003; Jones and Moor, 2005; Smith et al, 2004).Rose, J., & Reynolds, D. (2006). Such an approach also supports teachers to be self-directed learners and leaders in their effort to develop professionally.

Ineffective Approaches to TPD

As stated by Allen, S. A. (2015), the most common barriers to using technology in the classroom for teachers according to the literature are a lack of confidence and a lack of training (Becta, 2004). Teachers' pedagogical beliefs play an important role in the use of ICT in the classroom (Hermans et al. 2008; Prestridge 2010) and should be considered as major foci in any approach to TPD (Koehler, M., & Mishra, P., 2009). This means that professional development should be developed in ways that can meet the needs of a diverse environment. A teacher that believes technology is not important and necessary will show resistance to change and most likely be less likely to develop and participate in technology integration professional development.

Many approaches to teachers' professional development offer a one size-fits-all approach to technology integration when, in fact, teachers operate in diverse

contexts of teaching and learning. For example, a faculty member who claims that there is not yet enough evidence regarding the efficacy of integrating technology into teaching will require a very different intervention than a faculty member who is convinced of the value of technology integration but is struggling to find the time to use technology in their lessons (Schoepp, K., 2005).

A report from the U.S. Department of Education (2000) suggests that schools lack systematic approaches to professional development (Keller.J, 2002). Although teachers are required to have a certain number of hours of professional development each year, these PD sessions tend to be useless when it comes to the practice of technology integration (Su, B., & Bay, C. M., 2009). Given the rapid changes occurring in ICT and the relative lack of related transformation in education the need for effective TPD relative to ICT is apparent but it is less clear what TPD would be most beneficial and how it should be most effectively delivered (Albion, P. R., Tondeur, J., Forkosh-Baruch, A., & Peeraer, J., 2015). The concept of continuing professional development (CPD) in education is often ill-defined, with the separate notions of formal training and on-the job learning serving to confuse the issue further (Rose, J., & Reynolds, D., 2006). Effective professional development for teachers has several characteristics that are common across various subjects (e.g., science education, math education): focusing on content, engaging teachers in active learning (Vrasidas, C., & Glass, G. V., 2007). However, there are some issues that are unique to ICT-related professional development.

Inappropriate TPD models

In a survey sponsored by the U.S. Department of Education, 35% of the teachers who responded reported that professional development activities specifically designed for education technology integration did not prepare them to make effective use of it in the classroom (Moen, M. H., 2015). Direct teaching or training, the traditional perception of CPD, is often perceived as a top-down delivery model of CPD, where information on methods is passed on to teachers for them to implement. Teachers are often provided with a one-time workshop and expected to be able to implement the practices learned in their classroom. The one-time workshop assumes the only challenge facing teachers is a lack of knowledge of effective teaching practices and when that knowledge gap is corrected, teachers will then be able to change (Allison Gulamhussein, 2013).

In addition, pre-service teacher preparation programs should not simply offer one isolated course in educational technology; rather, they should demonstrate sound use of ICTs in teaching teachers' content and pedagogy (Vrasidas, C., & Glass, G. V., 2007).

TPD should be an ongoing learning process, with traditional approaches to professional development to be abandoned. Current professional development guidelines and models must abandon traditional approaches and turn toward professional development models and theories that promote teachers as life-long learners (Keller, J., 2002) and continuous professional learning.

3.3. Online Professional Development for Teachers

Our understanding of teacher learning of technology integration has also been limited by the narrow focus of research on formal PD which are designed around

a combination of approaches such as peer mentorship, train the trainer, individualized learning, collaborations, content focused inquiry, and lesson design models (Moen, M. H., 2015). Little focus has been given to learning outside of the formal context. Some experts have responded by proposing the need to completely change the way we think of professional development from formal episodic events to one of continuous professional learning (Easton, 2008; USDOE, 2010). They argue that in continuous professional learning, teachers can personalize their own learning and adapt the learning experiences to their own interests and needs throughout their career.

One of the greatest barriers in technology integration is the lack and inadequate professional development provided, as they tend to still follow traditional models and approaches. Current dissatisfaction with formal professional development for technology integration has prompted an interest in teacher informal learning practices (Moen, M. H., 2015). Learners in the pursuit of lifelong learning are empowered to determine what is worth learning and to use self-directed approaches for addressing a range of learning tasks (Garrison, 1997). Given the explosion of Open Educational Resources and free curriculum materials found online, the number of informal learners is likely to dramatically increase during coming decades (Cross, 2007) and so will their demands for high quality and effective learning resources.

Many global organizations and companies, nowadays, invest in online education to help them keep up with increasing information demands in their field.Many adults want to take advantage of online learning environments, primarily due to their busy schedules and the online format's convenience (Cercone, 2008). Teachers are no exception. In fact, many teachers are already taking advantage of

online communities, social media, read, create and share blogs and posts and developing personally and professionally, without the necessity of formal education. According to research from the eLearning Guild, informal learning has become a "catchall phrase to describe a wide range of new approaches to workplace learning, covering everything from non-traditional approaches to training to autonomous, unplanned individual and team learning." Now more than ever, organizations are looking for ways to quantify informal learning so that systems can be embedded for informal learning activities to happen more frequently and in ways that can be measured. Professional development must honor the complexity of teachers' practices, be continuous, coherent, and based on adult learning theory (Vrasidas, C., & Glass, G. V., 2007).

3.3.1. Adult Education: Teachers as self-directed learners

Adult Education

One of the most rapidly developing areas within education is the study and practice of education for and about adults (Sellers, 2010).Adult education is concerned not with preparing people for life, but rather with helping people to live more successfully. Thus if there is to be an overarching function of the adult education enterprise, it is to assist adults to increase competence, or negotiate transitions, in their social roles (worker, parent, retiree etc.), to help them gain greater fulfillment in their personal lives, and to assist them in solving personal and community problems. (Darkenwald and Merriam 1982: 9). In adult education the curriculum is built around the student's needs and interests. Every adult person finds himself in specific situations with respect to his work, his recreation,

his family-life, his community-life et cetera – situations which call for adjustments (Lindeman 1926a: 4-7). As andragogy defines how adults learn, its methods must be taken into account when designing a learning experience for such students regardless of its final format. The context can play an important role here. Prior knowledge of a topic area, learning styles, and culture differences can become some great factors to decline SDL as the design approach for the development of a learning experience. SDL has been treated as a broader concept in the sense of learner's freedom to manage his learning activities and the degree of control the learner has (Saks, K., & Leijen, Ä., 2014). It is the learner who defines the learning task. Therefore, further research is necessary as to how self-directed learning can be applied in a learning context and how learning experiences can be developed having SDL in mind as a design principle.

Self-directed informal learning includes intentional job-specific and general employment related learning done on one's own, collective learning with colleagues of other employment-related knowledge and skills, and tacit learning by doing (Livingstone, 2001). Businesses and industries in human resource development recognize that in a highly competitive global economy, employees can no longer be taught everything they need to learn in order to help their organizations remain relevant and productive (Friedman, 2005). As a result many adults turn to external resources and learning environments to foster their skills, seeking further knowledge. These environments take on forms such as multimedia resource centers, settings for individualized training, or e-learning. Instructional design in these environments endeavors to support the expression and development of the learner's selfdirection (Carré, P. ,2011). SDL as a design feature of the learning environment stresses students' freedom in the pursuit of

their learning (Loyens , Magda, Rikers, 2008). Greveson and Spencer (2005) consider SDL to be a prerequisite for lifelong learning, while Candy (1991) describes SDL and lifelong learning as having a reciprocal relationship. Candy subsumes lifelong learning under one of four dimensions of SDL. Specifically, SDL is the principal activity in the independent pursuit of learning, while the goal of lifelong learning is "equipping people with skills and competencies to continue their own 'self-education' beyond the end of formal schooling" (Candy 1991, p. 15). Therefore, SDL can be considered both a means and end to lifelong learning, which adult educators can promote through their instruction within the learning environment.

Teachers as self-directed learners

The idea that teachers take responsibility for their own continuous learning, as adult learners, is built on Knowles' (1975) adult learning theory of self-directed learning (SDL) (Moen, M. H., 2015). This means that teachers as adults, self-directed learners are capable of identifying where they lack in certain skills or content knowledge as well as developing self-motivation, which will likely engage them voluntarily in informal learning activities. Learning environments should also foster such characteristic and allow the learner to make choices during his/her learning experience, from *what* to learn to *how* to learn. Among all of the andragogical factors, self-directed learning is one of the most prominent and important (Wang, 2011). SDL has a tradition of being conceptualized as a design feature of the learning environment (sometimes SDL is even called a method of instruction in adult education literature, e.g., Fisher et al. 2001) as well as a process of learning. SDL falls under the umbrella of lifelong learning where

learners take the initiative to identify what they need to learn, resources to use, in what context to learn, and in what types of learning activities to participate (Moen, M. H., 2015).

As with all adult learners, not all teachers have their self-directed learning skills developed at that same level. As a matter of fact, adults' dependence on the instructor is based on their previous levels of knowledge of the topic. If they have limited knowledge, they will depend on the instructor more. Therefore, professional development should be adaptable to the needs of every teacher, giving them the freedom of choice in their learning experience as well as the ability to follow their own pace.

Teachers' self-directed learning through technology

With the rapid growth of technology and the opportunities of learning given through the use of the Internet the percentage of teachers engaging in self-directed learning activities for technology integration has increased (Moen, M. H., 2015). Social networking technology tools that enable educators to proactively create personalized learning opportunities for themselves on demand 24/7 access to information and resources on the web that minimize time and distance constraints personal learning networks that allow educators to continuously improve their skills through interactions with others micro-blogging tools such as Twitter to connect with experts and resources for professional and online professional development modules or webinars that have the potential to reach large audiences at a fraction of the costs of face to face workshops. Having access to the Internet anytime, anywhere open up more opportunities to learning out of school and

formal learning situations. Learning can occur through social media, a Google search, a webinar or podcast.

Types of Learning: Formal, Informal, Non-formal

Online resources provide a valuable asset for self-directed learners, giving them wide access to useful learning content (Kim, M., Jung, E., Altuwaijri, A., Wang, Y., & Bonk, C. J., 2014). According to Candy and Merriam (1991, 2007) SDL experiences can take place in three different types of settings: formal, informal and non-formal. Non-formal and informal learning are usually defined in contradistinction to formal learning. The definitions adopted by the European Commission (European Commission, 2001, p. 32-33) read as follows:

Formal learning is typically provided by education or training institutions, structured (in terms of learning objectives, learning time or learning support) and leading to certification. Formal learning is intentional from the learner's perspective.

Non-formal learning is not provided by an education or training institution and typically it does not lead to certification. However, it is structured, in terms of learning objectives, learning time or learning support. Non-formal learning is intentional from the learner's point of view;

Informal learning results from daily life activities related to work, family or leisure. It is not structured (in terms of learning objectives, learning time and/or learning support). Typically, it does not lead to certification. Informal learning may be intentional but in most cases, it is non-intentional (or incidental/ random).

Current dissatisfaction with formal professional development for technology integration has prompted an interest in teacher informal learning practices (Moen,

M. H., 2015). Mid-way between the first two, non-formal learning is the concept on which there is the least consensus, which is not to say that there is consensus on the other two, simply that the wide variety of approaches in this case makes consensus even more difficult. Non-formal learning occurs in community settings and is sponsored by organizations such as libraries, community centers or professional organizations. Non-formal learning environments are usually led by an expert or facilitator and there may or may not be a formal curriculum or learning outcomes (Moen, M. H., 2015). The advantage of the intermediate concept lies in the fact that such learning may occur at the initiative of the individual but also happens as a by-product of more organized activities, whether or not the activities themselves have learning objectives. In some countries, the entire sector of adult learning falls under informal learning; in others, most adult learning is formal. With the advent and ubiquity of online learning where teachers are not present, informal learning has come to have a whole new meaning. The advancement of learning technology in recent decades has broadened the possibilities for online learning in all three formal, non-formal and informal settings (, M., Jung, E., Altuwaijri, A., Wang, Y., & Bonk, C. J., 2014). An awareness of less formal and traditional forms of CPD is slowly growing, with calls for teachers to become more creative in their approaches to their own professional development, and move away from more traditional transmission-based methods (Muijs et al, 2004).

Teachers are expected to take responsibility for their own development of knowledge and skills in technology integration. They are expected to be life-long learners and keep up with the pace of technology in education. New strategies of professional learning are needed that provide teachers with learning opportunities

in more relevant and authentic ways. Professional learning is critical in transforming schools and empowering students to learn through technology. If traditional professional development is not working then more current models need to be explored (Moen, M. H., 2015).

Learning can become part of teachers' daily routine in informal settings both inside and outside of school. Moreover, online learning opportunities, with their anytime anywhere nature, have the potential to support a model of continuous professional learning (Moen, M. H., 2015). A main theme guiding the development of online professional development is that of communities of practice (Vrasidas & Glass, 2004; Wenger, 1999). Such online communities provide both formal and informal professional development opportunities for teachers (Vrasidas, C., & Glass, G. V., 2007). It is apparent that the research based on teacher's non-formal and informal learning needs to grow because it is an important piece of teacher professional growth (Moen, M. H., 2015).

3.3.2. Online Education

One of the biggest benefits of online education is that it can take place anywhere at any time allowing adults to arrange their learning around their daily busy schedules. Instructional designers and other professionals working in the design of online educational environments need to understand the relationship between andragogy and distance learning. Continuing educators in professional disciplines may first become introduced to andragogy and then associate it with the profession of adult education (Davenport, J., & Davenport, J. A. (1985)). According to Moore and Kearsley (1996), "most distance education students are

adults between the ages of 25 and 50. Consequently the more one understands the nature of adult learning, the better one can understand the nature of distance learning" (p. 153).

Elearning solutions are based on learning theories when it comes to shaping educational content and molding students' behavior, namely behaviorism, cognitivism and constructivism (Codreanu, A., & Vasilescu, C., 2013, January). These learning theories place the learner in the center holding an active role, allowing him/her to construct their own understanding and integrate it into prior knowledge. Additionally, instructors and instructional designers must understand and be guided by the adult learning theory, especially in terms of its relationship to distance or online education. Adult learners, whether they are particularly interested in a topic and are learning for the mere sake of expanding upon their knowledge, or they are learning to acquire a specific skill, they rely on new knowledge to progress themselves towards a purpose (Daly, N. F.,1980).

Technology components for adult learners must be designed in ways to adapt to their needs, such as promote interactivity with the content, follow a learner-centered approach throughout the learning experience, facilitate self-direction and individualization by enabling each learner to make choices and to follow their own pace.

A simple definition of e-learning is that of education (that is both the teaching and learning processes) delivered via the Internet, Extranet or Intranet. Depending on the time and place constraints, e-learning was also called distance learning to refer to the asynchronous communication that occurs between the teacher and the learner, or synchronous/distributed learning to emphasize the availability of the

study program any time and any place (Codreanu, A., & Vasilescu, C., 2013, January).

E-learning design, including computer-based training, web-based training and other electronic delivery forms of training and teaching, requires a delicate balance between education and technology to provide a truly effective learning experience (Wang, M., Brown, F., & Ng, J. W. ,2012). There are several types of e-learning to choose from and after taking into consideration the advantages and limitations of each, the elearning designer must find the best way to present the training materials. Toward this end, Clark and Mayer (2008) present the following list of the variety of eLearning types:

- Standalone courses: Courses designed for the solo learner. Consists of self-paced training with no instructor or classmates.
- Virtual-classroom courses: Online class structured similar to a normal classroom course. May include synchronous online meetings. Includes instructor interaction of some kind.
- Learning games and simulations: Learning activities involving simulated activities. Embedded e-learning: Learning activities imbedded in other programs or processes (such as a computer program help feature, or a troubleshooting process or procedure).
- Blended learning: As the name implies, these are a blend of various forms of learning activities. These may include classroom, learning experiences, and e-learning or various forms of e-learning or some combination of all three.
- Mobile learning: Courses that utilize use of mobile devices such as PDAs and smart phones.

- Knowledge management: eLearning courses used to educate large groups rather than individuals.

One of the initial steps in instructional design is the determination of the learning objectives, or in other words "what is it that learners should be able to do after the end of an online learning experience?" In order to answer this question one must start from knowing the content that the whole learning experience will orbit around from.

Further, online learning suggests that assignments should be relevant to what the student will need and use outside the virtual classroom (Duffy, 2001). Learners should be able to easily understand how the content can benefit them and how they will be able to apply what they learn when the online course or module is finished. To meet this principle instructional designers must find ways to make the content feel hands-on and incorporate real-life problems. A way to accomplish this in an online self-directed course is through modeling real-life problems that are relevant to the learner (Braet, David, 2009). The goal of eLearning is to build transferable skills and abilities (Steen, H.L., 2008). Because studies have shown that the learning experience is greatly enhanced when exercises or activities are incorporated into the learning process, content engagement is critical.

Many e-learning companies and instructional designers remark that, in a typical classroom setting more content than less may be considered a good technique but when it comes to e-learning small chunks and concise strategies work. As described in the "elearning industry" content chunking refers to the strategy of making a more efficient use of our short-term memory by organizing and grouping various pieces of information together. In addition, as adult learners

have many responsibilities, small bit-sized content with a small duration, can better fit into their busy schedules. Therefore, what learning activities will consist a learning module is important.

The sequence of the content, and how learning objectives will be organized and met in smaller learning modules, should not be overlooked. It is possible that adult learners may come to the learning with prior knowledge that affects their sequencing choices and it may not be effective to force them to follow a specific path (Lim, J., 2016). Learning is structured in ways that reflect the needs of learners and the nature of the subject matter (Horton, W., 2011). Self-paced learning elements could be considered and introduced, allowing them to have the choice of sequence and interaction with the content.

Rich content itself is not enough when developing an online course. The way it is organized, from the navigation steps to the form an activity will take, from the colors and font styles to the blocks of text, are significant design factors and may engage or withdraw the learner from their experience. Therefore, graphic and web design elements must be carefully considered during the process of developing an online learning experience.

To facilitate the use of andragogy while teaching with technology we must use technology to its fullest (Alkadhi, S.). One of the current perception mistakes is that if you can use a computer you are then technical savvy enough to get involved in (e)learning (Codreanu, A., & Vasilescu, C., 2013, January). E-learning is a blend of colors, styles, sounds, videos and graphic/web interfaces. In order to be truly effective, first that blend must have the following characteristics: easy accessibility, consistency and accuracy in the message, user friendly, entertaining, being memorable, and relevant (Steen, 2008). Second, according to

Brown and Voltz, 2005, it must provide learner activity, feedback, scenario-based learning experiences, proper delivery methodology, sequential context, and influential effects. According to Steen, H.L. (2008), eLearning consists of a variety of media formats:

- Audio - MP3's, cassettes, CD's
- Collaborative - shared digital spaces such as interactive boards;
- Electronic text - webpage's, eBooks, electronic documents
- Integrated - Using combinations (possibly in a single interface)
- Software - simulations, complex interactive animations
- Video - digital (CD, DVD), VHS, streaming video
- Visuals - pictures, diagrams, simple animations
- Other types (electronic Braille devices, etc).

Steen H.L. (2008) also recognizes that each format has its good and bad points. It is up to the eLearning designer to select the ones that best fit and when, according to learning needs and that will work within the real-world constraints and organizational limitations, while proving the best educational experience possible to the students.

In the context of an online training course, most typically use course management systems (CMS) or learning management systems (LMS) to aid in structuring material and content for the learner (Braet, David, 2009). These systems can be customized in order to support the goals of the online learning experience and serve better the needs of the students. Technical details must also be well considered before it becomes a barrier between the learner and the interaction with the content. At this stage, appropriate software are evaluated and carefully

selected, such as video, audio and photo editing tools. According to Wang, Brown Ng (2012), another important factor in elearning is the Graphic User Interface (GUI), which is the format of design for the instructional interface. The way students navigate throughout the course should be simple and they should always be able to access instructional and navigation panels, even at the time of exploring instructional content.

Online Instructor's Role

Online course facilitators should know their audience as well as understand their needs, backgrounds, characteristics, and expectations (Alkadhi, S.), and set clear objectives for their learners. The one acting in the role of a facilitator needs to have thorough knowledge of adult learning psychology, pedagogy and andragogy, as well as medium to high understanding and ability to employ Internet based technologies, communication studies (especially mediation techniques) (Codreanu, A., & Vasilescu, C., 2013, January). The lack of technical skills and knowledge may lead teachers to dumping materials onto a platform and sequencing its perusal by resorting and complying with pedagogical principles (Codreanu, A., & Vasilescu, C., 2013, January). But such approaches can not be considered eLearning. In the present research, Berge's instructor's roles - pedagogical, managerial, social, and technical - have been used as a starting point to analyze instructor postings in online settings, and to help organize the literature

on the role of the online teacher (Liu, X., Bonk, C. J., Magjuka, R. J., Lee, S. H., & Su, B., 2005).

Pedagogical: This role revolves around the educational process, from designing a variety of learning experiences, to providing feedback and referring to external resources. It is also related to encouraging and facilitating online debates while being able to balance discussions.

Managerial: This role includes agenda setting, decision and rule making, and clarifying expectations for online interactions as well as coordinating assignments. Managerial roles are necessary for maintaining a successful online learning environment (Liu, et al., 2005).

Social: This role is more related to creating a friendly social online environment. Instructors are the ones that model the social roles to online students and support them by giving appropriate feedback while using a friendly personal tone.

Technical: The main task of this role is to promote comfort with the technical bits of the online experience. The instructor can support this idea by referring students to technical support resources, addressing technical concerns, diagnosing and clarifying problems encountered, and allowing appropriate time for learning a new software or tool. According to the research, as the online learning experience evolves, the importance of this role decreases for learners and instructor as well.

Even though an instructor is not an instructional designer, he/she should have an appreciation of the fundamentals of instructional design. To help online instructors make a successful transition from traditional teaching to online teaching, there is a need for institutions not only to plan future roles, but also to

provide substantial training support and best practices for implementing those roles (Liu, et al., 2005).

Finally, eLearning should also emphasize metacognition in the design where learners can guide their own instructional experience. Online facilitators must release control of the virtual classroom to learners and allow them to apply their experience and knowledge to learning, while remaining cognizant of learner needs for guidance (Daly, N. F.,1980). Likewise, according to Burge (1988), learners must be willing to draw on available resources and exercise self-responsibility to seek help when needed.

3.3.2. Principles for designing effective Online ICT-related TPD

Effective ICT-related professional development for teachers is a topic that has been discussed many times over the years. One of the most popular discussions in teacher professional development focuses on the importance of the successful integration of ICT into current curricula (Vrasidas, C., & Glass, G. V., 2007).

By taking into account the concerns of faculty, one is better able to design appropriate interventions and avoid a focus on generic technology training that is often “irrelevant to teachers’ specific needs” (Schoepp, K., 2005). Ertmer (1999) explains that less advanced levels of professional development could mean that teachers will need opportunities to observe models of integrated technology use, to reflect on and discuss their evolving ideas with mentors and peers, and to collaborate with others on meaningful projects as they try out their new ideas about teaching and learning with technology (Schoepp, K., 2005). Researchers found that TPD is most beneficial when the focus was on both technology

mechanics and the integration of meaningful technology into the curriculum (Bebell & Kay, 2010).

According to "*Teaching the Teachers. Effective Professional Development in an Era of High Stakes Accountability*", a report published by the Center for Public Education (Center), by Allison Gulamhussein (2013), there are five principles of effective TPD that should be kept in mind when designing PD related to ICT as well:

- **The duration of professional development must be significant and ongoing to allow time for teachers to learn a new strategy and grapple with the implementation problem.** Today, as in previous decades, most professional development for teachers comes in the form of occasional workshops, typically lasting less than a day, each one focusing on discrete topics (such as classroom management, computer-based instruction, student motivation, assessment, the teaching of phonics, and so on), with their connection to the classroom left to teachers' imaginations (Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S., 2009). Teachers need ongoing professional development, as it helps them realize the effectiveness and benefits of activities, as they are sustained over time.
- **There must be support for a teacher during the implementation stage that addresses the specific challenges of changing classroom practice**. Indeed, in recent years, many schools and districts across the country have invested in school-based coaching programs, one of the fastest growing forms of professional development today (Wei, R. C., et. Al. 2009).

Coaching, mentoring and induction programs, can benefit teacher's practices and boost their confidence.

- **Teachers' initial exposure to a concept should not be passive, but rather should engage teachers through varied approaches so they can participate actively in making sense of a new practice**. Just like students, teachers as well can make a better sense of a concept through active learning activities. These activities can include: readings, role playing techniques, open-ended discussion of what is presented, live modeling, and visits to classrooms to observe and discuss the teaching methodology.
- **Modeling has been found to be highly effective in helping teachers understand a new practice**. For example, researchers have found that teachers are more likely to try classroom practices that have been modeled for them in professional development settings (Wei, R. C., et. Al. 2009). The opportunity to observe other teachers, and to be observed has long been acknowledged as a beneficial process, and observation is now seen as an integral part of coaching and sustained learning (Da Costa, 1993; Joyce and Showers, 2002).
- **The content presented to teachers shouldn't be generic, but instead specific to the discipline (for middle school and high school teachers) or grade-level (for elementary school teachers).** If teachers sense a disconnect between what they are urged to do in a professional development activity and what they are required to do according to local curriculum guidelines, texts, assessment practices, and so on—that is, if they cannot easily implement the strategies they learn, and the new

practices are not supported or reinforced—then the professional development tends to have little impact (Wei, R. C., et. Al. 2009).

Teachers who are part of reform-oriented professional development are teaching, doing, researching, reflecting, discussing, producing, planning, learning, reading, writing, and designing. Such approaches to TPD can also be applied in technology integration professional learning. External support, particularly when it comes to delivery of CPD, should be pedagogically expert, and flexible enough to fit in with the varying demands of school life. Education programs depend heavily on context, learners, and goals; therefore, program designers should carefully choose those strategies that best serve their needs.

Key Issue	Strategy
Learning Designs	Design programs based on what we know about how ICT can support learning
Authentic engagement within teacher's contexts	Situate programs in teachers' context so that activities are authentic
Opportunities for reflection	Design activities that encourage participants to use ICT and reflect on their practice

Collaborative efforts	Encourage the use of ICT for collaboration among all stakeholders in the design, implementation, and evaluation of programs
Ongoing support	Use ICT and online technologies to provide ongoing support
Informal learning	Provide opportunities for informal learning and support
Systemic effort	Coordinate professional development with broader ICT and school improvement efforts
Leadership	Foster leadership which nurtures innovation, change, and the creation of schools as learning organizations

Table 1: Key issues and strategies for ICT related professional development. (Vrasidas, C., & Glass, G. V., 2007).

Teachers are being called on to take responsibility for their own self-development to integrate technology and engage students in learning experiences mediated by digital technologies. TPD should be developed in ways to promote self-direction. One of the advantages of ICT-related professional development is that it can support reflection in ways that help teachers unlearn the old ways of thinking

about teaching and learning. ICTs afford multiple kinds of interaction and the design of learning environments that support the development of communities of inquiry, collaboration, negotiation, and problem solving within authentic contexts. (Adelman, et al., 2002; Vrasidas & Glass, 2005).

This means that rather than generic technology training, methods such as peer discussions, sharing sessions, peer coaching, and team teaching should be utilized (Boyd, 1997; Caverly et al., 1997; Garet, Porter, Desimone, Birman, & Yoon, 2001). Moreover, since fragmentation often plagues learning opportunities for teachers, courses, workshops, and institutes must be coordinated or sustained over time so that teachers get both depth and breadth in what they need to know and be able to do (Bybee & Loucks-Horsley, 200. Long-term professional development programs, not just events, are required for technology integration to succeed.

ICT is always used within a context (e.g., to teach math, social studies, and the like), yet it always gets in the way since current ICTs used in the classroom are not transparent, generally added onto the curriculum rather than integrated with it (Vrasidas, C., & Glass, G. V., 2007).

3.4. Communities of Practice

Communities of practice can be found in just about any field, where formal or informal learning takes place, from religious organizations to business to social work to medicine and others. Cultivating communities of practice in strategic areas is a practical way to manage knowledge as an asset, just as systematically as companies manage other critical assets (Etienne Wenger Richard McDermott William M. Snyder). Communities of practice are groups of individuals bound by

what they do together—anything from engaging in informal discussions to solving problems—and by what they have learned through their mutual engagement in these activities (Wenger, E., McDermott, R. A., & Snyder, W., 2002).

3.4.1. CoP Definition

Anthropologist Jean Lave and Etienne Wenger coined the term Community og Practicr while studying apprenticeship as a learning model (Wenger, E., 2011). According to Wagner and Trayner (2002) there are three characteristics that define a CoP:

The domain: A community of practice is not merely a club of friends or a network of connections between people. It has an identity defined by a shared domain of interest. Membership therefore implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people. (You could belong to the same network as someone and never know it.) The domain is not necessarily something recognized as "expertise" outside the community. A youth gang may have developed all sorts of ways of dealing with their domain: surviving on the street and maintaining some kind of identity they can live with. They value their collective competence and learn from each other, even though few people outside the group may value or even recognize their expertise.

The community: In pursuing their interest in their domain, members engage in joint activities and discussions, help each other, and share information. They build relationships that enable them to learn from each other. A website in itself is not a

community of practice. Having the same job or the same title does not make for a community of practice unless members interact and learn together. The claims processors in a large insurance company or students in American high schools may have much in common, yet unless they interact and learn together, they do not form a community of practice. But members of a community of practice do not necessarily work together on a daily basis.

The practice: A community of practice is not merely a community of interest--people who like certain kinds of movies, for instance. Members of a community of practice are practitioners. They develop a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems—in short a shared practice. This takes time and sustained interaction. A good conversation with a stranger on an airplane may give you all sorts of interesting insights, but it does not in itself make for a community of practice. The development of a shared practice may be more or less self-conscious. The "windshield wipers" engineers at an auto manufacturer make a concerted effort to collect and document the tricks and lessons they have learned into a knowledge base. By contrast, nurses who meet regularly for lunch in a hospital cafeteria may not realize that their lunch discussions are one of their main sources of knowledge about how to care for patients. Still, in the course of all these conversations, they have developed a set of stories and cases that have become a shared repertoire for their practice.

CoP General Characteristics

In addition communities have lifecycles-they emerge, they grow and they have life spans (STEP by Step Educause). Each phase of the lifecycle is supported by different strategies in order to achieve the goals of the community and grow to the

next step. Successfully facilitating a CoP involves understanding these lifecycle phases and ensuring that the expectations, plans, communications, collaborative activities, technologies, and measures of success map to the current phase of the community's development. Without conscious facilitation, momentum may be lost during the launch phase and the CoP may not achieve the critical mass needed to evolve into a sustainable entity.

It is through the process of sharing information and experiences with the group that the members learn from each other, and have an opportunity to develop themselves personally and professionally (Lave & Wenger 1991). Communities of practice are important because they Cambridge, D. and Suter, V., 2005). :

- Connect people who might not otherwise have the opportunity to interact, either as frequently or at all.
- Provide a shared context for people to communicate and share information, stories, and personal experiences in a way that builds understanding and insight.
- Enable dialogue between people who come together to explore new possibilities, solve challenging problems, and create new, mutually beneficial opportunities.
- Stimulate learning by serving as a vehicle for authentic communication, mentoring, coaching, and self-reflection.
- Capture and diffuse existing knowledge to help people improve their practice by providing a forum to identify solutions to common problems and a process to collect and evaluate best practices.

- Introduce collaborative processes to groups and organizations as well as between organizations to encourage the free flow of ideas and exchange of information.
- Help people organize around purposeful actions that deliver tangible results.
- Generate new knowledge to help people transform their practice to accommodate changes in needs and technologies.

Communities of practice began with open-ended possibilities that evolved into more accurate representations of their work. These transformations occurred continually as communities moved through each stage at their own pace. Research suggested there were "five stages of development for a community of practice: potential, coalescing, maturing, stewardship, and transformation" (Wenger et al., 2002, p. i). Stages 1 and 2 defined the process in launching a community of practice while 4, 5, and 6 spoke to the challenges of sustaining a community through its later stages of growth (Arnell, R., 2014).

Stage 1: Potential. In this initial stage, groups formed as loose networks of people who discovered others with similar problems or interests. Informal conversations began to refocus the members' relationships and a shared domain emerged. As a core membership developed, the community built momentum and identified common knowledge needs. This period allowed for envisioning of possibilities to which they can aspire. A strong community coordinator was essential during this stage, acting as a catalyst to get the group established and skillfully supporting the group as members found value in participation. Coordinators served as the liaisons between members and prospective resources

beyond the group as they recognized the group's potential and worked to build upon it (Wenger et al., 2002).

Stage 2: Coalescing. In this transformational stage, the community was focused on supporting members as they built trust and relationships. Community members began to seek each other out for help, which helped establish a strong foundation. It was essential that during this stage community members were able to have honest discussions, knowing they were safe in their disclosures. It was only through these types of experiences that relationships deepened and a collective mentality around problem solving developed. During this stage, the community coordinator took time to establish the solid underpinnings of a successful community while continuously moving the group forward. Formal meetings were held and the organization of the group was solidified while private interactions between members were also facilitated. As the community began to take shape, more common ground was established and opportunities for sharing began to materialize. A new chemistry within the group emerged as it begins to unite (Wenger et al., 2002).

Stage 3: Maturing. It is in this stage that members experienced a more collective identity. The group members became more intentional about their techniques and strategies as they commit to their shared practice. Discussions and activities became more focused on problem solving and completing projects. Artifacts were generated and documentation of community knowledge took form. The members began to find gaps in the community's knowledge and reached beyond the scope of the group to find solutions. Group membership also changed requiring a refined process for welcoming newcomers (Wenger et al., 2002).

Stage 4: Stewardship. With an established identity, the group was comfortable changing focus and undertaking new projects during the stewardship stage. As this new vitality sustained the community, many changes occurred. Participants moved on and leadership changed. During this time, reflection was effective in reevaluating shared values and refocusing on new goals that helped the group develop its potential. The community leader role became intensified as he or she continued to maintain energy and keep the community in the forefront in its field. Rejuvenating the community through workshops, recruitment, and new leadership helped to align the growth of the community with their practice. Building relationships with organizations outside of the group served to keep the community from becoming complacent as members carried on their practice and became authoritative voices in their domain (Wenger et al., 2002).

Stage 5: Transformation. During this final stage, the focus of the group became diluted and members felt less ownership and less connected. This natural disbanding or restructuring of the group indicated that the community had outlived its purpose. The group's original domain branched in many directions and no longer provided a singular emphasis. This transformation made mergers with other communities possible or the community dissolved itself altogether (Wenger et al., 2002).

While almost every community evolves along a lifecycle, every community is indeed unique, with distinct goals, member characteristics and needs, and purpose. All design choices (for technical or social architecture) must be driven by purpose, so community purpose is paramount (CoP-Step By Step). The next topic examines a step-by-step guide on developing effective communities of practice.

3.4.2. Communities of Practice in TPD

The concept of continuous professional development in which teachers are given time to collaborate with colleagues and update knowledge and skills and are expected to assume much of the responsibility for their own professional growth and development has been identified by teachers as a critical element in school reform (Kathleen P. Fulton, Margaret Riel, 1999). In schools with strong norms for innovation and strong professional communities, teachers find motivation, direction, and accountability for continuous learning and development (Schlager, M. S., & Fusco, J., 2003). Social learning theory underscores how individuals work and learn together through shared interactions and meaningful exchanges. Communities are important for three reasons:

1. First, communities sustain participation in professional learning over a longer period of time. Sustained participation has been identified as a critical structural component of professional development efforts that improve teacher learning and student outcomes (vlc narrative).
2. Second, communities provide a means for teachers to become critical of their teaching practices and learn from others. Such collaborative, authentic learning communities of teachers foster the development of teaching practices that are publicly scrutinized and refined, rather than enacted in isolation without reflection.
3. Finally, community can allow teachers to marshal a collective voice about their learning goals and needs, which can result in a shift from passive professional development to more active professional learning (Webster-Wright, 2009). Such communities value the experiential knowledge that

teachers have, something that is often forgotten in the current era of telling teachers what tools to use and how they work.

But the questions of what assemblage of people constitute a community of practice in education and how, and under what conditions, a community of practice catalyzes positive learning outcomes remain largely (Schlager, M. S., & Fusco, J., 2003).). For TPD, a Community of Practice (CoP) is considered as an effective and situated learning environment for enhancing teachers' capacity for teaching and learning in practice through collaborative learning processes (Schlager, M. S., & Fusco, J., 2003). CoPs have the ability to provide support as teachers accommodate the constant changes and the need to acquire new skills and knowledge. The strength of this method of PD lies in its ability to be self-sustaining and generative. Teachers have access to authentic, relevant and flexible learning that is not constrained by time and can be accessed according to members' needs.

According to UNESCO's project in Bangkok (2015) within a CoP, teachers can:

- Interact with others who have different levels of expertise in teaching practice and have various experiences in diverse contexts,
- Share personal experiences, thoughts, information, skills, knowledge, and resources with others who have common interests, issues, concerns, and practice.
- Reflect and develop their practice by authentic interaction with others.
- Collaborate with others to achieve a shared common goal.
- Explore new possibilities, solve problems, and build new knowledge together.

- Engage in ongoing professional learning, sustained interaction and communication, and transfer of knowledge in practice.

Both inside and outside the field of education, experts agree that collective engagement on the job helps staff be better at developing shared vision, identifying and resolving problems, and encouraging learning. CoPs depend on shared commitment to improve learning opportunities and achievement for all students. CoPs, done well can improve learner outcomes, change professional practice and empower practitioners, create sustainable change, and develop system wide leadership capacity. Networking offers teachers the opportunity to be exposed to new ideas and practices (Huberman, 2001; Strehle, Whatley, Kurz & Hausfather, 2001) and by establishing critical communities of teachers, pedagogy may be improved via a process of critical reflection (Duncan-Howell, J., 2007). Defour (2004) points to PLCs as a design for educational reform that helps improve the achievement of all learners. Boyle et al. (2004) proposed that collaborative networks are effective as they are often conducted over a longer period of time allowing teachers to learn and reflect on their teaching practices (Duncan-Howell, J., 2007).).

A CoP, as well as a PLC can be formed in a face-to-face (F2F), online/virtual, or a blend of online and F2F contexts. Barriers to the implementation of PLCs include lack of shared meeting time and a shortage of teachers who share the same subject areas or common goals and interests. Teachers from various districts can alleviate this problem. Technology and ICT tools, such as video-conferencing tools, can serve as means of creating opportunities for professional learning community development (McConnell). As Information and Communication Technologies

(ICT) evolve, they can be used in a CoP for teachers, and allow teachers to have more opportunities to interact with other teachers and to participate in collaborative learning activities regardless of differences of time and place more easily and dynamically. A Virtual CoP can have great advantages on teachers and can play a significant role in their professional development.

3.4.3. Design of CoP: Step-By –Step Guide

Written by Darren Cambridge and Vicki Suter for the EDUCAUSE Learning Initiative (ELI), this guide provides practical steps and advice for the creation of Communities of Practice (CoPs). The authors have drawn on their experience working with corporations, nonprofits, associations, government organizations, and educational institutions to create a structure that clarifies the steps of defining, designing, launching, and growing CoP. Its application is useful in both online and face-to-face situations.

<table>
<tr><th colspan="2">Phase 1: Inquire</th></tr>
<tr><th>Key Questions</th><th>Supporting Activities</th></tr>
<tr><td>Audience: who is this community for? Who are the community's important stakeholders?</td><td rowspan="3">1. Conduct a needs assessment through informal discussions, formal interviews, surveys, and/or focus groups.
2. Define the benefits of the community for all stakeholders, including individual sponsors, individual community</td></tr>
<tr><td>Domain: Given the intended audience, what are the key issues and the nature of the learning, knowledge, and tasks that the community will steward?</td></tr>
<tr><td>Purpose/Goals/Outcomes: The primary purpose of the community.</td></tr>
</table>

	members, defined subgroups, the community as a whole, and the sponsoring organization. 3. Create a mission and vision statement for the community, tying these into the sponsoring organization's mission and vision if appropriate. 4. Identify the major topic areas for community content and exploration. 5. Create an estimate of the cost for community technology, special technical development, facilitation, and support. 6. Begin the recruitment of a core team of individuals who represent the community audience.

<table>
<tr><th colspan="2">Phase 2: Design</th></tr>
<tr><th>Key Questions</th><th>Supporting Activities</th></tr>
<tr><td>Activities: What kinds of activities will generate energy and support the emergence of community presence? What will the community’s rhythm be?</td><td rowspan="5">1. Identify tasks that community members are likely to want to carry out in the community.
2. Develop a series of scenarios that describe various synchronous and asynchronous experiences of the different personas (identified in the first phase) that would be necessary to carry out the tasks and that demonstrate the potential benefits defined in the first phase.
3. Identify any face-to-face meeting opportunities for community members and define how these will be incorporated into the community experience (conferences, etc.).
4. Lay out a tentative schedule for the community (weekly, monthly, quarterly, and/or annually),
5. Create a timeline for the community’s development.</td></tr>
<tr><td>Communication: How will members communicate on an ongoing basis to accomplish the community’s primary purpose?</td></tr>
<tr><td>Interaction: What kinds of interactions (with each other and with the content of the community) will generate energy and engagement?</td></tr>
<tr><td>Learning: What are the learning goals of the community, and how can collaborative learning be supported?</td></tr>
<tr><td>Knowledge Sharing: What are the external resources (people, publications, reports, etc.) that will support the community during its initial development? How will members share these resources and gain access to them?</td></tr>
<tr><td>Collaboration: How will community members collaborate with each other to achieve shared goals?</td></tr>
</table>

Roles and Social Structures: How will community roles be defined (individuals, groups, group leaders, community administrators, etc.) and who will take them on?	6. Create a directory or folder structure for organizing discussions, documents, and resources. 7. Determine facilitator roles and recruit the first community facilitator(s).

Phase 3: Prototype	
Key Questions	**Supporting Activities**
What short-term pilot goals will help establish the community as a viable and valuable entity? What community-oriented technologies will be used to support the pilot community's social structures and core activities? What sort of brand image does the community want to project, given its audience, domain, purpose, and mode of operation? What are the meaningful metaphors to use with the community's audience? What is the tone of interactions and activities that facilitators want to model? How will community identity be formed and shared? How will success be measured and communicated to the broader stakeholder groups?	1. Select the most appropriate community-oriented technology features to support the goals of the pilot. 2. Design the community environment and have a group test the functionality through case scenarios. 3. Decide on the community metaphor and how it will be represented in the community's organization and appearance. 4. Implement the community prototype and give access to the core team and pilot audience. 5. Seed the community with content. 6. Facilitate events and activities to

	exercise the prototype, focusing on achieving short-term value-added goals. 7. Ensure that roles are clear and that support structures are in place. 8. Measure success and report on the results of the prototype to sponsors and stakeholders.

Phase 4: Launch	
Key Questions	**Supporting Activities**
Why should someone join the community? What are the benefits? What is the business model behind the community? How do new members learn about the community? What are the community's norms for behavior? How do new members become oriented to the community environment? Based on insights from the pilot, what kinds of community	1.Using experience and results from the prototype, design and implement the community environment (include graphics that support the community metaphor, predefined content from a variety of sources, prepopulated online discussions, links, databases with best practices and other information, online meeting spaces, etc.). 2.Establish the community charter, which includes an articulation of the mission, vision, goals, and member norms and agreements.

activities will generate energy and engagement and support the emergence of community "presence" (activities, communication, interaction, learning, knowledge sharing, collaboration, roles and social structures)? What will the community's "rhythm" be? Based on insights from the pilot, how will roles and community social structures be defined and supported over time? How will success be measured?	3.Define various roles available for community members, depending on their desired level of participation, goals, and previous experience. 4.Implement communications and marketing plans. 5.Determine the member profile/directory structure. 6.Recruit new members. 7.Set up new member accounts or enable self-joining membership and group affiliations. 8.Provide synchronous welcome to new members when they first log in. 9. Provide orientation to new members. 10.Finalize and publicize a community calendar of events. 11.Design and deliver synchronous and asynchronous events and activities. 12.Set up communication channels (news, announcements, newsletters, integration with face-to-face meetings, etc.).

Phase 5: Grow	
Key Questions	**Supporting Activities**
What are the emerging benefits of the community for members, subgroups, the community as a whole, the community's sponsors, and other key stakeholders? What are the emerging roles that one could play within the community? What are the different groups to which one could belong? How do members get recognized and rewarded for their contributions? How do members create their own community identity and presence? What work products can members contribute to support individual and community goals? What are the most important elements of community culture that are emerging that should be recognized and represented in the online environment, as well as in formal policies and procedures?	1.Continue implementation, including facilitation and communication. 2.Create and share stories of individual and community successes (e.g., digital stories) to capture best practices and create excitement and momentum. 3.Identify emerging community roles and recruit members to fill them. 4.Create and assign members to subgroups to support emerging group activities. 5.Conduct a resource inventory (freshness, relevance, usefulness, use) then identify and upload additional content to meet the community's needs. 6.Create opportunities for sponsored projects (projects with defined work products that may or may not require additional commitments from community members and sponsors). 7.Design activities with recognition and awards attached to encourage desired

What are the emerging technical needs of the community environment (e.g., the community-oriented technology/platform and the "place" that it creates) to support the evolving purpose, processes, and community culture?	behavior and participation. 8.Conduct focus groups, interviews, surveys, and other data collection activities to assess and measure the success of the community. 9.Facilitate discussions about the community itself, including the community culture, processes and practices, technology, and individual motivations for participating in the community.

Phase 6: Sustain	
Key Questions	**Supporting Activities**
What are the ongoing community processes and practices that will contribute to the liveliness and dynamism of the community and keep members engaged? How does the community support members across a wide range of roles? How are new potential community leaders (official and unofficial) going to be identified, chosen, developed, and	1.Provide opportunities in the community for members to play new roles, experiment with new community activities, and examine new technology features. 2.Develop a support infrastructure including documentation, mentoring, and development as well as recognition programs for different roles.

supported by the community? How is persistent community "presence" maintained in the minds of the community members? To what extent is the community serving its intended audience and accomplishing its stated purpose and goals? How might it do a better job? How does the community demonstrate return on investment (ROI) for its sponsor(s)? From the perspective of each individual community member and from that of the community as a whole, what is the perceived return on participation? How should the knowledge and products created by the community be shared beyond the community?	3.Ensure that procedures, practices, and the technology support structured data sharing. 4.Identify opportunities for capturing new knowledge, including establishing new roles related to harvesting and creating best practices (e.g., "gardeners," summarizers, synthesizers). 5.Develop policies and processes for harvesting and sharing knowledge outside the community. 6.Encourage publication of articles about the community and its projects. 7.Test for "persistence of presence" by evaluating member and group activity reports as well as member focus groups and surveys. 8.Review community audience, purpose, goals, and domain; watch for shifts in expectations and needs.

The recognition that communities of practice can play important direct and catalytic roles in teacher learning has spurred great interest in how to harness the

power of communities of practice in the context of systemic school reform and professional development projects (Schlager, M. S., & Fusco, J., 2003). Collaboration is widely identified as an important activity in encouraging teacher learning (Duncan-Howell, J., 2007). Traditional professional development programs appear to be failing to achieve effective change in teachers' practice because the process of how teachers change has been misunderstood. Therefore, communities of practice for teachers and their role in TPD should be further explored and implemented to support the professional growth and continuous learning of teachers.

3.5. Professional Learning Communities (PLCs)

The concepts of professional learning communities and communities of practice both emphasize on social learning. They are defined by the interaction and participation of their members. The principle focus of an instructional learning community is to create a collaborative and democratic environment in which authority and decision making was shared as teachers cultivated their professionalism to bring about student academic gains (Hord, 1997).

The first applications of PLC's have been on teacher training. The perspective of communities of practice affects educational practices along three dimensions (Wenger, E. (2011) :

- **Internally:** How to organize educational experiences that ground school learning in practice through participation in communities around subject matters?

- **Externally:** How to connect the experience of students to actual practice through peripheral forms of participation in broader communities beyond the walls of the school?
- **Over of the lifetime of students:** How to serve the lifelong learning needs of students by organizing communities of practices focused on topics of continuing interest to students beyond the initial schooling period?

The definition of a PLC according to the literature review is outlined in the next section.

3.5.1. Definition of PLC

Professional learning communities are local teams of teachers working to enhance student achievement by developing their professional knowledge (Arnell, R., 2014). Pancucci (2008) considers professional learning communities to be: "A group of individuals engaged actively in learning from one another while adhering to: 1) a collaborative mindset; 2) focus on learning; 3) focus on results; 4) orientation toward action; 5) collective inquiry; 6) timely, relevant information; and 7) commitment to continuous improvement (p. 14-15). Richard Dufour (2004), a leading proponent of PLCs as a tool for educators, emphasizes three ''big ideas'' for professional learning communities: (1) an emphasis on learning, (2) developing a culture of collaboration, and (3) a focus on results. (p. 6–7). Wijarn Panich (2012) mentioned about professional learning community or PLC that means the continual process of teacher and educators to work together to ask question and do action research for the better learning achievement of the students (Insa-ard, S. A). PLCs operate under the assumption that the key to improve

learning for students is continuous job-embedded learning for educators. Only when teachers reflect on their instructional practice, consider the effect instruction has on students, and implement insights gained from a meeting to improve their teaching performance, can this process be called a professional learning community (Pirtle, S. S., & Tobia, E. insights SEDL).

Dufour and Eaker define a professional learning community as "educators creating an environment that fosters mutual cooperation, emotional support, and personal growth as they work together to achieve what they cannot accomplish alone" (p. xii). DuFour (2004) acknowledges that different people define PLCs differently. Consequently, he prefers to explore what PLCs are by looking at three big ideas that are the central focus of any successful PLC: 1) ensuring that students learn, 2) establishing a culture of collaboration, and 3) focusing on results.

These communities may be large, the task general, and the form of communication distant, as in a group of mathematicians around the world developing math curriculum and publishing their work in a set of journals. Alternatively, they can be small, the task specific, and the communication close, as when a team of teachers and students plan the charter of their school (Adada, N. N., 2007). For example, a large community of practice can be a group of Math Teachers in Secondary Education within a State district and a smaller community of practice could be a community of Math Teachers for Grade 6 students in one of the district's schools. A member is not restricted to being part of one and only community of practice.

Over time, communities can become sustainable "communities of practice", with the teachers conducting the learning but being learners themselves. Such "active

learning" by teachers has been linked to changes in instructional practices. Researchers and reform advocates consistently cite participation in communities of practice as an integral factor in achieving effective, sustainable professional development systems (Schlager, M. S., & Fusco, J., 2003).

3.6. Online Professional Learning Communities in TPD

3.5.1. Introduction: Overview

In the past, for teachers, the school would have been the community but now with Internet access, larger communities are being formed. Initially, a CoP was envisaged as being established within an individual's local environment but the Internet has provided a much wider scope for CoP (Duncan-Howell, J., 2007). Research studies involving online communities of practice in professional development describe using CoPs to improve professional skills and competencies in public schools, higher education, and in the corporate world. In 2010, The Stanford Center for Opportunity Policy in Education created a technical report on professional development in the United States. They noted that short-term workshops had very little influence on teacher professional learning and their refining of instructional planning. Their recommendations indicated that professional development should be designed to engage teachers in active learning on topics that were meaningful to them, be connected to teachers' collaborative work in school-based professional learning communities and learning teams, and be presented in an intensive, sustained, and continuous manner over time. Many programs lack key pedagogical, content, and structural characteristics of effective professional development that are needed by the teachers they serve. Few

professional development providers have the resources to address all stages of career development or the capacity to provide support on an ongoing basis (Schlager, M. S., & Fusco, J., 2003).).

3.5.2. Online PLC

The concept of community is fundamental to an understanding of how people learn and how professional development can take place online (Vrasidas, C., & Glass, G. V., 2007). Wenger's et al. (2002) social learning theory emphasized the need for new professional development opportunities and venues as we each become a more socially connected global network. Today, it would be rare to find a professional development project of any magnitude and duration that does not use at least some generic Internet technologies to foster dialogue and/or information sharing (Schlager, M. S., & Fusco, J., 2003).). Online professional development communities that are grounded in a social framework have the potential to transform teacher professional development where teachers join colleagues in learning how to promote desirable instructional and pedagogical changes, included transformation of pedagogy with the integration of technology. Strong virtual communities allow distant participants to feel connected to the entire team (Wenger et al., 2002). Engagement and participation, depending on the member and its skills can be gradually developed through time. Members frequently begin by using just a few resources on a website. Later, as the community evolves and as members feel part of an established culture, they expend their work and participation. Online Communities of Practice are not constrained by time thereby allowing members to move through periods of high to low activity over longer periods of time.

Rather than seeing Virtual Communities as separate from face-to-face ones, the research suggests that designers of online educational communities need to look at the broader social networks of community members-both off and online and how their internal structure and media use affect peer-to-peer learning. Engagement in a professional learning community requires teachers to explore best practices, while simultaneously taking a critical look at the reality of daily life in their classrooms, through both current teaching methods and student levels of learning. Being an effective member of a professional learning community requires that the participant be aware of and willing to act to improve a situation when it is found. One of the key attributes within a PLC is the commitment to continuous improvement. As teachers become involved in redefining their teaching practices, they become more responsible for their learning and endeavor to be more effective. It is an active learning environment in which learners participate in conversations and inquiry, via chat rooms, email lists and postings that authentically establish relevance and meaning (Vrasidas, C., & Glass, G. V., 2007).

3.5.3. Differences with Traditional CoP

Online CoPs display different characteristics to traditional CoP due to the added element of facilitative technology (Duncan-Howell, J., 2007). The reality of being a member of an online CoP, as opposed to a traditional or physical community, is that there is little or no face-to-face social contact with others. An individual in an online CoP is situated in front of a computer terminal and participates through this interface thereby maintaining the locus of knowledge creation with the individual. This is necessary and complementary as knowledge is constructed, as previously

discussed in this section, individually and collectively, that is, by both social interaction and in the learner's mind (Vrasidas, C., & Glass, G. V., 2007).

A community of practice moves through several key stages of development (Wenger, 1998) which are characterized by initial periods of intense activity through to a lower intensity in the final stages. This natural attrition is the result of the skill or knowledge having being learnt and absorbed. Once the member of the CoP has reached this point, participation and membership are no longer necessary. However, the nature of online Communities of Practice may result in a different outcome due to the technology being used and this potential is demonstrated by Table X. The stages of development are; potential, coalescing, active, dispersed and memorable. Table X: A comparison of the stages of development between a Community of Practice (Wenger, 1998) and an online Community of Practice.

Stages of Development	**Traditional Communities of Practice (Wenger, 1998)**	**As evidenced in online Communities of Practice**
Potential	People face similar situations without the benefit of a shared practice	Potential members familiarise themselves with the learning opportunities the online community

		may offer and examine the available facilities
Coalescing	Members come together and recognise their potential	New members familiarise themselves with group activities and tentatively join discussions, whilst learning the norms of the community, this is the process of belonging.
Active	Members engage in developing a practice	Members confidently participate or initiate learning activities.
Dispersed	Members no longer engage very intensely, but the community is still alive as a force and a centre of knowledge	Members regularly participate in learning activities, but may no longer initiate as frequently as previously.
Memorable	The community is no longer central,	Members have the opportunity to

	but people still remember it as a significant part of their identities	return to the community when they need to acquire new knowledge and receive confirmation or support from fellow members. Contact is maintained by regular information sent via email lists.

Table 2: A comparison of the stages of development between a Community of Practice

The dynamic nature of online membership maintains a freshness and variety that traditional CoP may not be able to achieve. Contact may be maintained between members via group email lists and newsletters allowing members periods of inactivity, yet still maintaining their membership Duncan-Howell, J. (2007). A distinguishing difference is that online CoP would appear to have the potential to avoid the final stage of development, "Memorable," but instead remain perpetually at "Dispersed" and may be cyclical or continuous as opposed to traditional CoPs which appear to be linear (Wenger,1998). Learning in online CoP occurs primarily through informal interactions among members (Schlager, Fusco, & Schank, 2002) and is a social activity that occurs as new members move through the stages of development and by interacting with experienced members.

3.5.4. Examples of Online Professional Learning Communities

To design online technology and services that support effective professional development, education technologists must understand the participants, processes, and structures that comprise effective professional development, the extent to which existing professional development projects reflect those components, and the local professional norms and practices that support or inhibit effective professional development (Wenger, E., McDermott, R. A., & Snyder, W., 2002).

Other efforts have been made, in order to support TPC through online technologies and with the creation of an online professional community service. Few existing PLC's are outlined below:

1. **http://www.flatconnections.com/**: Flat Connections is an Australian Organization which aims to provide K-12 teachers, students and other organizations, opportunities to participate in collaborative projects around the globe and to develop intercultural understanding. The project aims are:
    - Core content objectives united between classrooms,
    - Unique, individual, personalized learning experiences for each student,
    - The 'merging' and 'flattening' of classrooms for learners to get to know each other and work together,
    - Innovative implementation of modern learning skills supported by Web 2.0 tools,
    - Customizable components based upon the unique situation of each classroom's curricular objectives,
    - Supportive Project Managers and lead teachers

Flat connections includes professional development resources that can be found online and uses Web 2.0 tools to support connection, communication,

collaboration and creation. Intended outcomes include amplified awareness of what it means to live and work in a flat world through researching and discussing new ideas and actions for future learning. The Flat Connections Global Project (FCGP) has built a community of practice to help achieve its goals. Participants are separated in group roles, such as:

Project Managers: They have one or more managers who are contracted through Flat Connections to oversee and direct the project. They host regular online meetings, are available via email or the various online spaces and places, and support all teachers through the project at all times.

All Projects Coordinators: All Flat Connections projects have a coordinator who is contracted to be available for help with technical challenges and requests to do with software (e.g. ning, wiki, Voicethread). The coordinator is the best go-to person to support use of project places and spaces and methodology for doing certain things. A 'Help' platform is constantly in development to support teachers as well.

Classroom Teacher: The classroom teacher is responsible for crafting lesson plans and pedagogy for helping students understand the content of the project (starting with the Horizon Report K-12) and the structure of the project. They must also observe the project timeline and workflow in order to stay inline with expectations.

The teacher is asked to attend regular online meetings or listen to meeting recordings to understand current requests and challenges concerning the project.

They are also asked to be part of various online groups that contribute to carry out the projects, interacting and monitoring not only with their students but with a range of students.

Student: Students are grouped in mixed-classroom teams and work on ONE of the topics from the Horizon Report (each project will have a different report allocated). Each team has two student leaders who help encourage and motivate contribution and collaboration.

Student Leader

Each team has two student leaders. In brief, these leaders encourage interaction, lead discussions, make suggestions for wiki development and are responsible for the final eBook production. Leaders meet regularly online as a group during the project with lead teachers to discuss progress, issues, and challenges and to contribute to the overall development of the project.

Student leaders have a very important role to play as they become another bridge to understanding. They are also able to influence project decisions and timelines based on student team needs and work alongside teachers to build an exciting and meaningful project and learning experience. A Student Leader job description is provided to accommodate the smooth progress of the project.

1. **http://www.classroom20.com/** : Classroom20 is created on Ning (an online platform to create a social community) and has a number of over 80.000 members from more than 80 countries. It positions itself as a "social network for those interested in Web 2.0 and collaborative technologies in education. It includes various activities and features, such as:
    - Forums: Discussions are categorized and separated by subject, area (such as assessment) and tool.

- Webinars: Another feature are the weekly webinars which are announced in advance. The format used for the webinars, is interactive allowing screen sharing, chat and other tools to create a dynamic environment experience.
- Videos: From members and beyond enabling members to view at their own pace resources and contribute to them with their own.
- Blogs: Blogs are embedded allowing members to contribute and follow. Features, such as “like” and “share” are also enabled, which provide participants the re-sharing of resources and communication that is topic focused.
- Calendars: Calendars allow members to participate in online events, plan ahead and schedule for important to them online meetings or other events.
- Groups: The group function is also enabled and allows members to follow their interests, personalizing their path in the online community.

In addition the platform has embedded blogs, upcoming events posts as well as badges for community members that they earn after accomplishing certain tasks based on criteria set by the clasroom20.

Overall, professional development can be treated as a socio-organizational system that requires communication and close cooperation among several stakeholder groups to assure access to professional development opportunities for all teachers, continuity and cohesion of professional development pedagogy across providers, capacity to support sustained adoption and practice, sharing of knowledge and

professional norms of practice, and formation of coherent policies (Schlager, M. S., & Fusco, J., 2003).

CHAPTER 4

Design of Online PLC for PYP teachers in Technology Integration

4.1. The purpose of the online PLC

The work of teachers is often isolated, and there are seldom opportunities for professional collaboration. Professional Learning Communities address this issue by giving teachers time and space to learn together and work toward common goals. Web tools can provide teachers with an avenue for creating a PLC or enhance an existing PLC. Among the most promising and relevant forms of online professional development are Learning Communities, which include: professional learning communities (PLCs), personal learning networks (PLNs), and communities of practice (CoPs). Adult learners tend to prefer self-directedness: allowing the adult learner to participate in the planning of the learning, making choices on the sequence of instruction, or learning activities (Lim, 2016). Instructional design strategies and models are key in order to develop appropriate adult online learning experiences.

Within the context of informal learning, an online professional learning community (PLC) is developed for teachers teaching in the Primary Years Program of the International Baccalaureate curriculum. More specifically the PLC's domain is Technology Integration in the PYP. This project is a pilot project

for CEESA schools, which the International School of Estonia (ISE) is a member of. It aims to bring PYP teachers from ISE in connection with other PYP schools within the CEESA region and serve as an online, informal professional development tool. The Learning Management System (LMS) Moodle is utilized in order to develop and host the PLC experience.

4.2. The PYP Curriculum

The PYP curriculum is the curriculum designed by IBO for students aged 3-12. The PYP curriculum contains three key components, which explain how students learn, how educators teach, and the principles and practice of effective assessment within the programme. It prepares students for the intellectual challenges of further education and their future careers, focusing on the development of the whole child as an inquirer, both in the classroom and in the world outside. The PYP aims to create a curriculum that is engaging, relevant, challenging and significant for learners in the 3–12 age range. The curriculum is transdisciplinary, meaning that it focuses on issues that go across subject areas. It is underpinned by six transdisciplinary themes around which learning is planned and these are (IBO, 2010):

- Who we are.
- Where we are in place and time.
- How we express ourselves.
- How the world works.
- How we organize ourselves.
- Sharing the planet.

These themes are selected for their relevance to the real world. They are described as transdisciplinary because they focus on issues that go across subject areas. The transdisciplinary themes help teachers to develop a programme of inquiry. Teachers work together to develop investigations into important ideas, which require a substantial and high level of involvement on the part of students. Through the PYP curriculum framework, schools ensure that students examine each theme.

4.2.1. The role of ICT in the PYP

In June 2011 the IBO posted an article referring to the role of ICT in the PYP curriculum. As in many other research, the IBO also emphasizes on the focus of ICT is not in the technology but rater its goal is to enhance learning throughout the transdisciplinary programme of inquiry, across the subject areas, the IB learner profile, and the essential elements of the PYP. In the PYP students are expected to become digital literate students in order to participate in a digitally connected World. IBO also outlined the importance of the pedagogical leaders in every school in order to successfully use ICT throughout the curriculum. "*The effective use of ICT in teaching and learning will have a profound impact on schools in areas such as resourcing, staffing, professional learning, classroom structures and the definition of the learning community*" (IBO, June 2011).

As IBO indicates, the following six ICT skills are relevant to all learners: investigating, creating, communicating, collaborating, organizing and becoming responsible digital citizens. Each skill is transdisciplinary and will support

learning both within the transdisciplinary programme of inquiry and within the subject areas. These skills interact with each other to support the development of learners. Therefore, teachers should consider these skills when planning for teaching and should look for evidence of them in student learning.

In addition IBO reports the importance of teacher reflection and collaboration among teachers of the PYP: "*Teachers should engage in reflection on their own practice, both individually and in collaboration with colleagues, with a view to sharing ideas and strengths, and with the primary aim of improving their teaching to improve student learning. In doing so, they will be modelling the skills and attitudes that have been reflected in the IB learner profile*". Figure 3 shows examples of good ICT practice created by the IBO for IB schools as an aid to reflection and continual improvement of practice.

Increase emphasis on:	Decrease emphasis on:
concept-driven and transdisciplinary teaching taking place both inside and outside the programme of inquiry	teaching an isolated subject or topic
using ICT to investigate, create, communicate, collaborate, organize and be responsible digital citizens	learning ICT as a series of skill sets for their own sake
authentic embedding of ICT across the curriculum	stand-alone ICT lessons
viewing teachers and students as collaborators in the learning process	viewing the teacher as the sole deliverer of skills and knowledge
providing opportunities for student choice to encourage students to take responsibility for their learning	using specific ICT tools exclusively for particular tasks
learning as part of a broader community of learners	learners learning in isolation as a dominant feature
adapting multiple systems or approaches (for example, platform or application) according to the situation and needs of learners	reliance on one system or approach (for example, platform or application)
collaborative planning and reflection	planning for ICT instruction in isolation
professional learning as a continual process	professional learning as a one-time event or opportunity
professional learning provided within authentic contexts	stand-alone professional learning
learning beyond the classroom through global connections	learning restricted to the classroom or ICT lab
management of ICT resources to meet educational goals	management of ICT resources without strategic planning
publishing content for an authentic audience, for example, using social media tools to communicate a message to a wider group of people.	printing student work for display on the school bulletin board only.

Figure 3: Examples of good ICT practice. The role of ICT in the PYP

4.3. Design Structure of the Online PLC

Online communities may actively address issues or problems of practice that are relevant to the daily work of educators. Their purpose may center on collaboration and content development, providing mentoring or support to new teachers, focusing on professional conversation of broader issues in education, or some combination of those purposes. Online communities can serve multiple purposes,

but successful communities explicitly state and reiterate their purpose(s) to members through various channels.

Approaches to extending the benefits of individual excellence include professional learning communities in schools, communities of practice, and networks that enable sharing more widely on the Internet (Twining, et al. 2013).

Certain design steps must be followed prior to setting up and running an effective PLC. As noted by Wagner and Trayner (2002) there are three characteristics that define a CoP: domain, community and practice, that need to be clarified and defined in the early steps of designing a CoP and/or PLC. In addition, the platform on which a community is built and the interface through which users interact are key. Activities within the PLC need to provide space for collaboration, constructive discussion, build on the sense of community, allow interaction and follow a student-centered learning approach. As with any formal or informal adult learning environment, adult students' needs and the andragogy theory should also be examined.

Professional development research and implementation projects often treat community of practice as an artifact to be built in the context of some form of intervention, suggesting that infrastructure for supporting interventions and communities of practice are synonymous and that both are divorced from practices and practitioners that are not part of the intervention (Schlager, M. S., & Fusco, J., 2003). While it may seem challenging to apply SRL interventions to the design of

e-learning environments, there are multiple prompting and training strategies that can be employed toward achieving this goal. Both pedagogical interventions as well as the design of learning activities and course content can take advantage of a

vast array of software and tools that are readily available through a LMS. It is important to acknowledge when considering these recommendations, however, that attention should be placed on the learning objectives and pedagogical goals and not the tool, as a number of other technologies can be configured to accomplish the same task.

The design process of eLearning and instructional design requires a marriage between three major components (Wang, M., Brown, F., & Ng, J. W., 2012). :

- The pedagogical or andragogical requirements of e-Learners
- The content from the subject matter expert (SME)
- The work of graphic designers and web Song, L., & Hill, J. R. (2007).

Following the three structural components of a CoP, first the domain this project is focused on is technology integration in the PYP curriculum. For the design and development of the Online PLC for PYP teachers in Technology Integration. IB has defined the role of ICT in a transdisciplinary curriculum, as the PYP. In a PYP school, the focus of ICT is not only on the use of technology for its own sake, but to enhance learning throughout the transdisciplinary programme of inquiry, across the subject areas, the IB learner profile, and the essential elements of the PYP (ICT in the PYP). With that in mind, Directors, Principles, Technology Leaders and Integrators as well as PYP teachers try to develop learning opportunities that effectively integrate technology in the PYP.

Second, in terms of the community, the PYP teachers and Technology Integrators meet once a year to promote collaboration and best practices sharing across within the CEESA region. In order to support the sense of community and promote the core values of CEESA and its mission, an online professional learning community is created for PYP teachers in the CEESA region. The PLC is hosted on a learning

management system (LMS) and is developed and customized in order to support three main goals at the early stage of a PLC:

1. Sharing of technology integrated practices in the PYP curriculum, resources, students' works, concerns and ideas.
2. Collaborative technology integrated unit planning according to the PYP curriculum and based on the ISTE student standards.
3. To support CEESA meet one of its core strategies: Become a catalyst for the effective use of technology in support of educational transformation

Third, practice is built through the iterative processes of participation and reification. Teachers get to reflect on their own practices, share them with other members of the community, evaluate and comment on others' as well as collaboratively develop new ones.

4.3.1. Phases of Design: The Intended Outcome of the PLC

According to the literature (Cambridge, D. and Suter, V, 2005) there are certain steps/phases one must undertake prior to conducting a successful community of practice, keeping members engaged and the community a continuous process, which are described in Chapter 3. This project has been developed as a pilot project for PYP teachers within the CEESA region. Therefore, certain steps of the step-by-step design guide for Communities of Practice, written by Darren Cambridge and Vicki Suter for the EDUCAUSE Learning Initiative (ELI), have been excluded. Interviews have been carried out prior to designing and prototyping the CoP, from the future members of the community (PYP teachers and Technology Integrators). The needs and expectations of both groups are taken

into consideration as well their role within the schools that they are employed at, during the development of the online CoP. The project has been developed on Moodle. The phases that this project has accomplished, up to the point of the written form of this thesis project, are:

Phase 1: Inquire: The main goal of this phase is to identify the audience, purpose, goals, and vision for the community.

Phase 2: Design: The main goal of this phase is to define the activities, technologies, group processes, and roles that will support the community's goals.

Phase 3: Prototype: The main goal of this phase is to pilot the community with a select group of key stakeholders to gain commitment, test assumptions, refine the strategy, and establish a success story.

Phases 4, 5 and 6 of the step-by-step guide have been excluded from this project. More precisely the phases that have not been examined are:

Phase 4: Launch: The main goal of this phase is to roll out the community to a broader audience over a period of time in ways that engage new members and deliver immediate benefits.

Phase 5: Growth: The main goal of this phase is to engage members in collaborative learning and knowledge sharing activities, group projects, and networking events that meet individual, group, and organizational goals while creating an increasing cycle of participation and contribution.

Phase 6: Sustain: The main goal of this phase is to cultivate and assess the learning, knowledge, and products created by the community to inform new strategies, goals, activities, roles, technologies, and business models for the future.

Due to the exclusion of the "launch phase" limitations of the Online PLC have been identified. Without the launch of the CoP, feedback is not collected from the end users of the community, which are the PYP teachers and technology integrators of the CEESA region. Even though the social structure, roles and activities follow the literature review and best practices in order to accommodate the values and mission of the online PLC, it has not been tested with real users in an authentic setting. Staff in schools wishing to promote and sustain a PLC should monitor and evaluate the development of their characteristics and the implementation of their processes over time, and take appropriate follow-up action to maximise their effectiveness (McMahon, A., Stoll, L., Thomas, S., Wallace, M., Greenwood, A., Hawkey, K., ... & Smith, M. (2005). However, the PLC will be launched in August 2016. Design features, such as the creation of groups activities within the LMS, have been created and are able to accommodate the next phase of the PLC development plan. In addition, new members can easily be added as well as enrolled in courses created on the PLC. Badges have also been created that can support members engagement as well the development of one members role in to another after reaching a certain step of engagement and participation based on specific criteria, such as a Teacher Leader Role. Different levels are fostered as not all teachers are equally qualified or have the same years of experience. In addition, not all teachers have the same beliefs in technology integration nor the skills to effectively plan technology integrated units or lessons.

Another limitation arising from not launching the PLC in a real environment, is the opportunity to identify its growth over time. According to the literature review, Communities of Practice grow with time and the effectiveness can only be counted by teachers' participation, growth, professional development and student

achievements. A PLC might vary over time in the extent to which the characteristics of effectiveness were expressed (McMahon, A., et. Al, 2005). The role of an individual in a community changes over time. One may start out engaged and slowly fall back or the opposite. The four roles that represent how a member behaves within a PLC are:

- Consumer - reads and explores
- Commenter - makes comments on others posts
- Contributor - initiates new threads on discussion forums; puts forth own ideas
- Commentator - analyzes and synthesizes the contribution of others

Not having launched the PLC in a real environment the two Phases of the CoP guide, "Growth" and "Sustain" are also not examined. As a result, data about member participation and the growth of each one within the community has not been examined. Without examining the growth of a Community of Practice, the initiator or creator dows not have the appropriate data in order to continue and sustain the PLC. The success of the community can not be assessed, including the community culture, processes and practices, technology, and individual motivations for participating in the community. Though, discussion forums and feedback activities, to collect members'' data, have been created on the LMS. In addition, to support the growth and sustainability of the online PLC, face-to-face meetings will be sponsored and reward systems have been created.

The PLC created for PYP teachers in regards to technology integration is based on the step-by-step guide and outlined below:

4.3.2. Phase 1: Inquire

<table>
<tr><th colspan="2">Phase 1: Inquire</th></tr>
<tr><th>Key Questions</th><th>Supporting Activities</th></tr>
<tr><td>Audience: The online PLC is developed for PYP teachers of IB schools within the CEESA region. The main stakeholders of the community are PYP teachers and Technology Integrators/Leaders of the schools.</td><td rowspan="3">Interviews and discussions were held with PYP teachers, of IB schools within the CEESA region (Appendix I). According to teachers' answers the main topics that they would want to be covered in a PLC for them to be active participants are: sharing of students' works (examples of outcomes), sharing of Unit Plans that indicate the central idea and lines of inquiry, and the involvement of tech experts.
The sponsoring association is CEESA. CEESA's mission is to create a collaborative community of international schools which enhances school effectiveness and inspires student learning and development. With that in mind the PLC gives the opportunity for collaboration and inquiry among PYP teachers.
One of CEESA's strategies is to be the catalyst for the effective use of technology in support of educational transformation. As the</td></tr>
<tr><td>Domain: The domain of this online PLC is technology integration into the PYP curriculum by utilizing the ISTE student standards.</td></tr>
<tr><td>Purpose/Goals/Outcomes: The purpose of the online PLC for PYP teachers in technology integration is to support teachers in the development of life-long learning skills through an informal professional development environment. The goal is to become a best practice sharing community of technology integration in the PYP curriculum, with the main outcome of having PYP teachers broaden their horizons in terms of pedagogy and technology integration.</td></tr>
</table>

	domain of the online PLC is technology integration, through collaboration and practice sharing, it is aligned with CEESA's strategies and mission statement. 4. The major topic areas to be covered in the online PLC are, unit planning that integrate appropriate technology standards, practices and unit sharing. 5. The core team of individuals who represent the community are PYP Teachers and Tech Leaders at the International School of Estonia.

4.3.3. Phase 2: Design

Phase 2: Design	
Key Questions	**Supporting Activities**
Activities: The main components for supporting the development and sustainability of the online PLC, are communication and collaboration. The rhythm is based on a self-directed and self-paced learning approach for the most part. A course is created for collaborative planning which can be described as a more formal learning approach. The self-paced courses that are created are: 1. Grade 1-5: Teachers of Grade 1 through 5 enroll in the correspondent course on an annual basis, in order to share Unit Plans, students' works and feedback. Resources are shared as well as, classroom practices. These courses are open to all members of the community and do not have a time-frame or deadline. 2. Let's Collaborate: Teachers and technology integrators are the only participants in this course. They need to sign-up for it and will be expected to collaboratively develop Unit Plans, guided by appropriate facilitators. Teachers work in teams to create Unit Plans, integrating the ISTE Student Standards and self-asses their Unit Plans with pre-made rubrics.	1. There are two roles that can be assigned to members of the online community. First role is the teacher role. Teachers play the role of the student as they are the ultimate goal. Tasks involving this role are leadership, as they will need to create teams, collaborate on creating unit plans, as well share practices and resources. The second role, are the technology leaders/integrators who play the role of the online facilitator plus the integration specialist when designing unit plans. These members maybe interested in more technical details, but also in classroom practices. Tasks that these members could also carry out, are discussions and idea sharing in creating evaluation and assessment strategies as to how teachers meet the digital competencies of the 21st

3. All about iPads: This course is open to all members of the community and is self-paced. It includes resources such as apps, and activities, that a teacher can easily implement in a classroom setting. It also includes technical details and common troubleshooting issues.	century. 2. An annual F2F meeting is held for members of the community to establish a better trustworthy relationship. 4. The collaboration courses for teachers take place each semester (3 months).Grade level courses are self-paced and do not have a deadline. 5. Within the first year of launch, teachers are expected to have shared at least and reused at least 2 Unit Plans. Within the second year teachers are expected to start collaborating in order to develop Unit Plans. 6. Appropriate Directory, discussion threads, and activities have been created for every course on the LMS. 7. Each Tech Leader and one Teacher per course are assigned with a Facilitator Role. Teachers are given student roles but with editing rights on the LMS.
Communication: As the PLC is created to take place fully online synchronous and asynchronous methods of online communication are utilized. An annual F2F meeting will supplement the online PLC. More specifically, forums, discussion threads and chat systems will be implemented, which are selected and developed on the LMS.	
Interaction: The learners, teachers interact with other teachers of the same area, teaching the same curriculum and content areas. They interact through discussion forums and chat systems. In some courses, teachers are separated in groups, where they get interact with their team members in order to collaboratively develop unit plans. In addition, teachers interact with teach integrators. Tech integrators, are also members of the community and apart from the shared courses with teachers, they also get their own private courses and discussion threads where they are able to not only discuss more technical and strategic details but also develop their own frameworks, assessment plans, and further development of technology integration topics within their schools.	
Learning: Collaborative learning is supported through the	

sharing of experiences, resources, unit plans, students' works and other topics related to technology integration. In order to promote collaboration among the PYP teachers members, specific courses have been developed within the LMS, where teachers are expected to create unit plans collaboratively following appropriate models and standards. To achieve this goal, teachers are separated into smaller groups-each group with at least one technology integrator. Moreover, technology integrators, have their own collaboration space where they are expected to develop models of assessment, share tools and experiences, develop professional development plans that lead to innovative practices as well as s strategic plan for effective technology integration within the PYP curriculum of schools in the CEESA region.	
Knowledge Sharing: For all members of the community an account will be provided in order to login to the LMS. Publications and sharing of practices are supported by CEESA. Members will be able to share unit and lesson plans through sharing tools on the LMS.	
Collaboration: Community members collaborate in different ways depending on their profession. Teachers collaborate on creating unit plans through collaboration tools provided through the LMS. Technology integrators collaborate in the same way, but have their own space of collaboration (through private	

courses) where they can share their learning practices.	
Roles and Social Structures: The roles that are defined in the community are: -Teachers: Teachers have a student role in the LMS. -Technology Leaders/Integrators: They have facilitating roles in the community. -Administrators: The LMS administrator is one or more of the facilitators. As a result, one person can play more than one role to serve learning purposes within the PLC. Within the online PLC, certain courses are created to be accessed only by certain role members. For example, the Technology Leadership courses can only be accessed by technology integrators. In addition, within the collaboration courses for teachers, groups are created. Teachers are free to create their own groups under certain criteria.	

4.3.4. Phase 3: Prototype

Phase 3: Prototype	
Key Questions	**Supporting Activities**
The online PLC is developed on the LMS Moodle. Forums, chats, video conferencing tools are embedded to encourage communication. At this stage, the main activities supporting the collaboration among community members are practice sharing and co-planning. Members have different roles depending on	1. The pilot was given to 10 technology integrators within CEESA schools and their PYP

the needs of every course they enroll in. Some courses need teachers and technology integrators to have editing rights. As this project is a pilot project sponsored by CEESA, it aims to support CEESA's mission and strategies. More specifically, it aims to improve education transformation through the effective use of technology-one of CEESA's core strategies. Members will be able to interact by using synchronous and asynchronous methods. Facilitators want to model best practices in technology integration in the PYP curriculum. Success and the progress of the community will be measured by member engagement and participation. CEESA directors will be informed and further steps will be planned. Roles are predefined and created in Moodle. Members do not have the same role within Moodle courses. Roles are given to members according to the needs of each course.	home-room teachers. Feedback was gathered from the Technology Integrators/Leaders and the PYP teachers. 2. CEESA stakeholders were involved and gave their feedback on mission statements, logos, mottos, and collaboration activities, as well as expanses and sponsorship methods.

CHAPTER 5

Development of PLC on Moodle

Moodle is a free online learning management system (LMS) designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalised learning environments Moodle: http://www.moodle.org is a popular open source software solution for advanced learning. Moodle can be extended with social media services like forums, wikis, databases and glossaries for collaborative knowledge management, quizzes to test knowledge. The design and development of Moodle is guided by a "social constructionist pedagogy"(MoodleDocs,Philosophy) and can also be used to develop a community of practice for a company or a professional network.

For the design of the online PLC for PYP teachers in technology integration capabilities of Moodle were taken into account and the LMS was customized in order to serve the goals and learning outcomes of the PLC. The online PLC for PYP teachers in technology integration can be found at the website:

http://edutech-integration.com/login/index.php

As shown in Figure 4, all members are created manually as this is a private space where only PYP teachers and technology integrators of IB World schools in CEESA can enter.

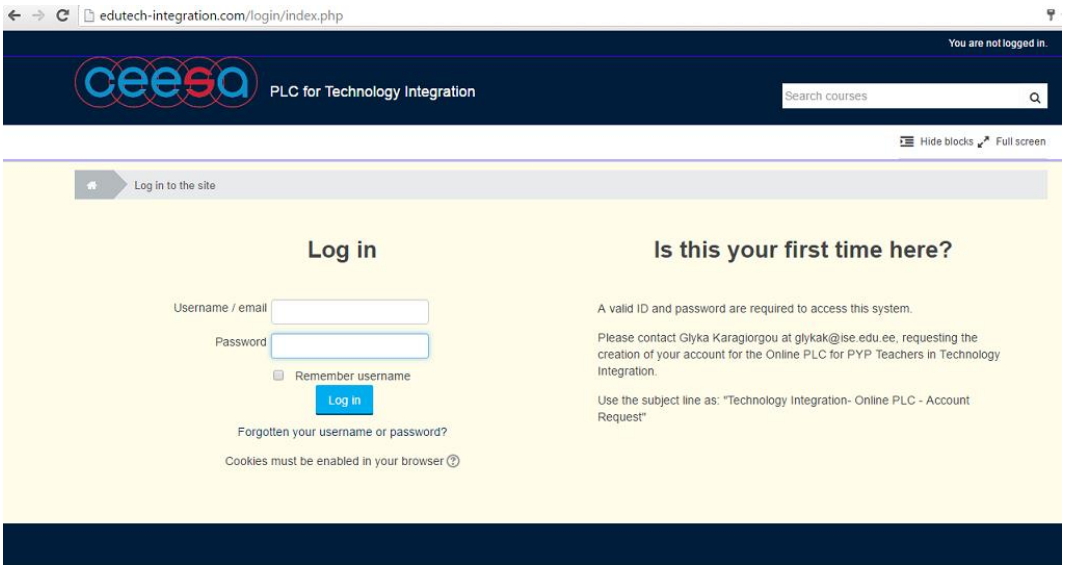


Figure 4: Login Screen

5.1. Social Structure of the PLC on Moodle

In order to achieve the appropriate social structure on the online PLC, various roles within the system has to be created, as every individual does not play the same role in every course or course category. The predefined roles of Moodle that are also used in this online experience are the Student Role, Course Creator and Site Administrator roles. In addition to those, two extra roles have been created:

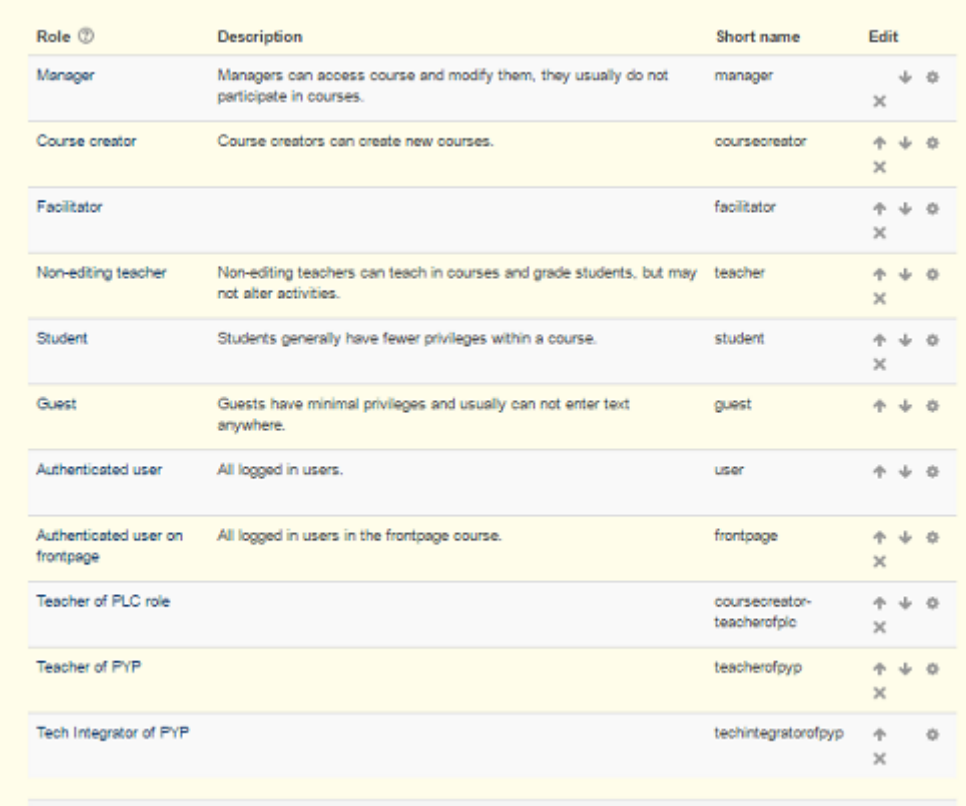
The Teacher of PYP role and the Tech Integrator of PYP. The assigned roles for every member according to the course category are:

- **"Grade Levels" Roles:** In this category the PYP teachers are assigned the *"Teacher of PYP"* role. This role in Moodle is based on the predefined *"Teacher"* role and provides them with editing rights, enabling them to create their own area of sharing. Technology Integrators are assigned the role "*Tech Integrator of PYP*" role. This role in Moodle also is based on the predefined *"Teacher"* role and provides them with editing rights, enabling them to create their own area of sharing.
- **"Let's Collaborate" Roles:** In this category the PYP teachers are assigned with the *"Student"* role-predefined in Moodle. PYP teachers are also assigned to groups. Each group needs to have at least three teachers and at least one technology integrator. Technology Integrators are assigned the role *"Tech Integrator of PYP"*, which gives them editing rights in order to create their section of work.
- **"General Technology Integration Courses" Roles:** In this category, both PYP teachers and Technology Integrators are assigned a student role. As these courses aim to provide members with a variety of resources from websites, tools, tutorials, practices and videos, none of the community's members need editing rights. However, all members can and are encouraged to create their own technology courses. In that case courses are created following certain requirements and the course creator's role is changed accordingly.

5.1.1. Additional Roles and Badges in Moodle

Each additional role has been configured with appropriate rights and permissions throughout the whole Moodle environment in order to allow members to carry out their tasks. For example, teachers do not have the permission to create a new course, view grades, delete and edit other members' comments. These are rights that have been assigned to the facilitators.

As the community evolves with time, new roles are also added and assigned, with the goal to provide leadership, encouragement and motivation. Such roles are: "Teacher Leader" and the "Technology Integrator Leader". These roles are assigned to members that have been identified throughout the PLC experience as the most active ones. The total of roles used for the online community are shown in Figure 5.



Role	Description	Short name	Edit
Manager	Managers can access course and modify them, they usually do not participate in courses.	manager	
Course creator	Course creators can create new courses.	courseoreator	
Facilitator		facilitator	
Non-editing teacher	Non-editing teachers can teach in courses and grade students, but may not alter activities.	teacher	
Student	Students generally have fewer privileges within a course.	student	
Guest	Guests have minimal privileges and usually can not enter text anywhere.	guest	
Authenticated user	All logged in users.	user	
Authenticated user on frontpage	All logged in users in the frontpage course.	frontpage	
Teacher of PLC role		courseoreator-teacherofplc	
Teacher of PYP		teacherofpyp	
Tech Integrator of PYP		techintegratorofpyp	

Figure 5: Moodle Roles

In addition, badges are created within the Moodle environments in order to promote leadership and reward members for exquisite participation and engagement. More precisely the badges that have been created up to this point of development are:

1. **Profile Completion Badge:** This badge is automatically issued to users after completing the appropriate fields for their profile, as shown in Figure 5.

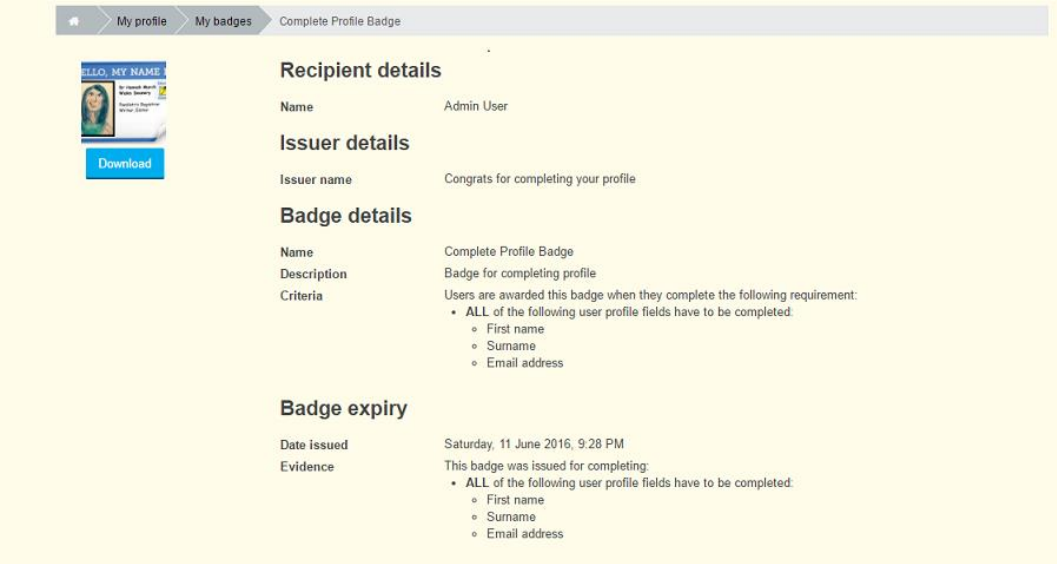


Figure 6: Profile Completion Badge on Moodle

1. **Contributor Award Badge:** This badge has been created to be awarded to members of the community that are identified as the most active and contributing members, as shown in Figure 6. This badge is sent manually once a month to a member of the community and sent by the site or course manager. It can be awarded to Teachers or Technology Leaders within the community.

More precisely criteria that define the ways one member can be promoted to another role and earn a badge have been defined at the initial stage of the creation of the PLC. The criteria to be rewarded the

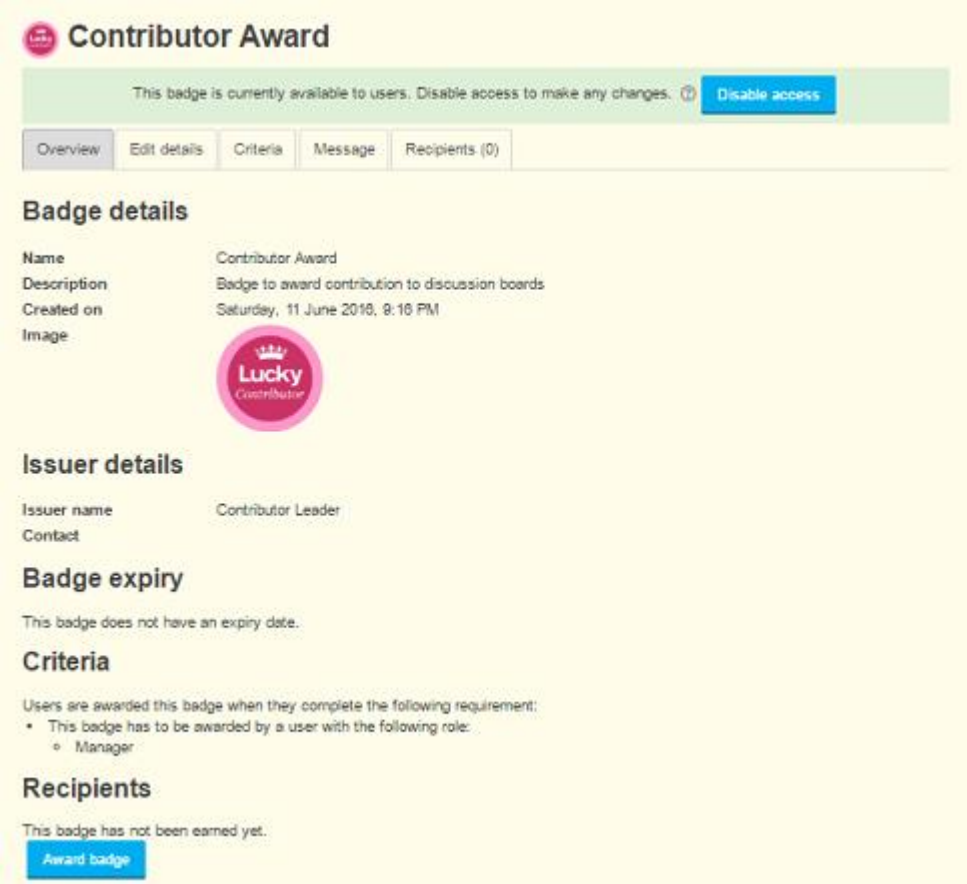


Figure 7: Contributor Award Badge

5.2. Courses and Course Categories

Three course categories have been created on Moodle, as shown in Figure 7. Each course category consists of a number of courses depending on the purpose that each category serves. Roles and rights for members of the community in each category is predefined in Moodle, during the creation of the social structure of the PLC, as described in section 5.1.

The course categories and the courses within them define the framework of the structure of the PLC on Moodle. As the PLC grows, more course categories and courses are added, depending on the needs of its members.

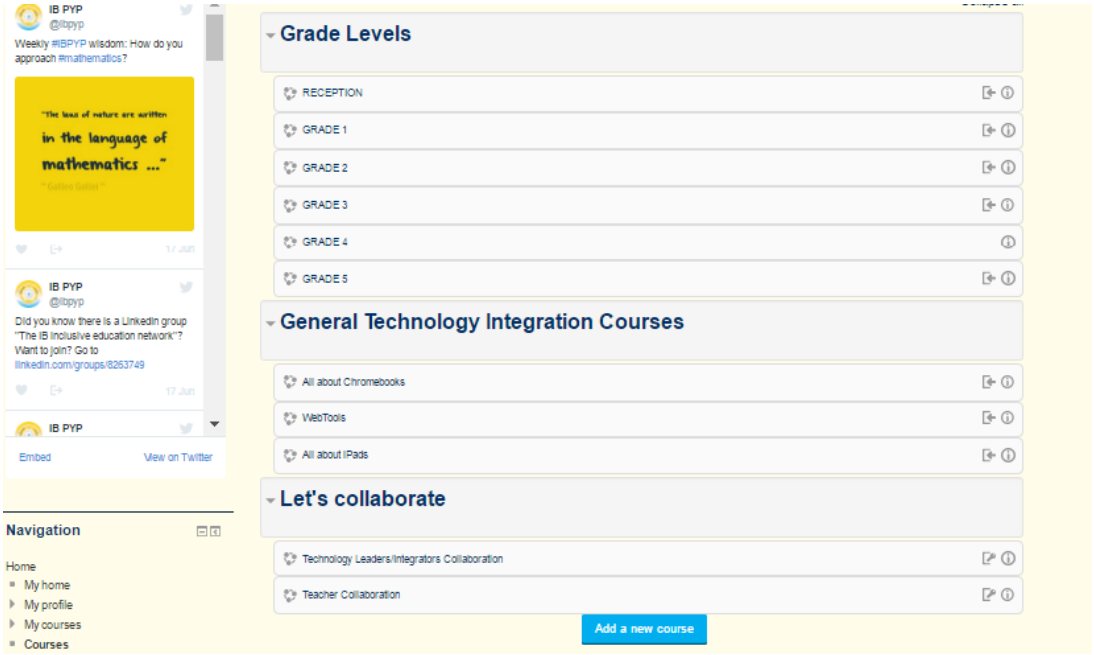


Figure 8: The courses and course categories in Moodle

The three course categories that frame the online PLC are:

1. **Grade Levels:** This category consists of courses that are created according to grade levels of the PYP curriculum. These courses are for teachers and technology integrators. It is the space where sharing of unit plans and classroom experiences are shared.
2. **General Technology Integration Courses:** This category consists of courses that are created according to various technology integration topics. These courses are for teachers and technology integrators. They are

informative and aim to help members to quickly find information and ideas regarding various technologies, from hardware to software.

3. **Let's Collaborate:** This category consists of two courses. One is created only for technology integration specialists, whereas the second one is created for teachers and technology integrators. The purpose of this category is to foster collaboration among members of the community, through co-planning, depending on each individual's role.

5.3. Grade Levels Category

Course Category->Grade Levels: This category consists of six courses which represent the PYP Grade Levels. Those courses are: Reception, Grade 1, Grade 2, Grade 3, Grade 4, and Grade 5 and are shown in Figure 8. Every teacher enrolled in one of these courses is assigned to the "Teacher of PYP" role. As this role has editing rights, teachers are able to create activities and resources in order to share their unit plans, classroom experiences, students' works and resources.

Figure 9: Grade Levels Courses

Every course is structured in six topics which represent the six transdisciplinary themes of the PYP curriculum, as shown in Figure 9.

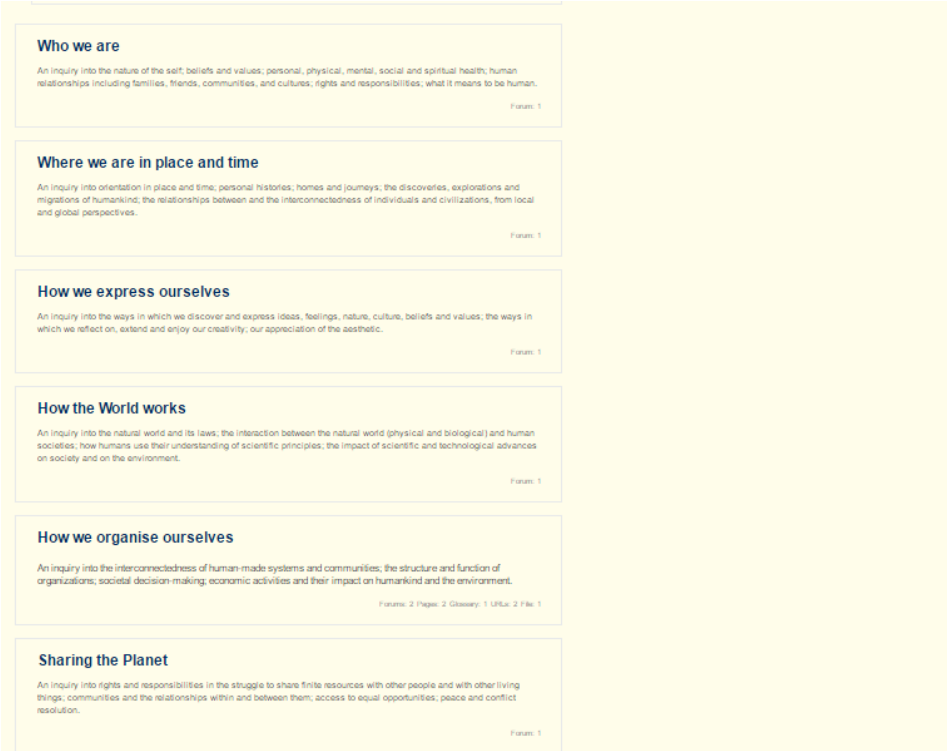


Figure 10: Grade Level Course organized by the 6 transdisciplinary themes of the PYP Curriculum

In these courses all members of the community (teachers and technology integrators) can self-enroll. These are the courses where teachers are asked to share classroom practices, student works as well their unit plans. Teachers, first need to chose the appropriate transdisciplinary theme that represents the category their Unit Plan falls under. They then need to use Moodle activities and resources to share their Unit Plan. An example of how to share has been created but teachers have the freedom to chose the activities and/or resources that they believe best fits their needs for sharing their classroom experience with other members. The goal of these courses are:

1. To promote classroom practices sharing in terms of technology integration.
2. To encourage communication among PYP teachers within the CEESA region.
3. To reuse materials and resources that are adapted to the PYP curriculum.

An example of a sharing experience is shown in Figure 10 and is from the Grade Level: Reception:

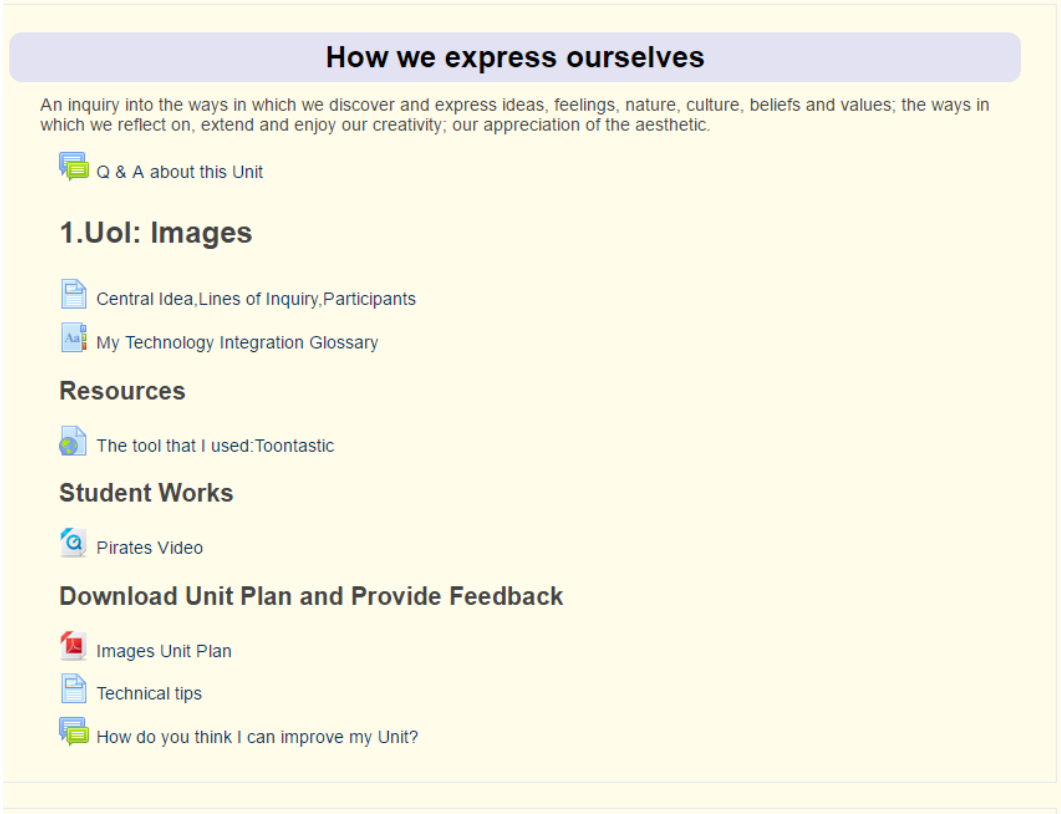


Figure 11: Section Format in every transdisciplinary theme in the Grade Levels Courses

5.3.1. Structure of each course

Each course consists of the six transdisciplinary themes of the PYP curriculum. Within every theme various Moodle activities and resources are utilized in order to create the appropriate structure for teachers to follow and share their technology integration classroom experience. The figures below have been captured from the course "RECEPTION" and are presented as an example course structure.

Every theme is created in the same way and with the same sections. Those sections are:

- **Unit of Inquiry:** This is the section where the teacher provides the title, central idea, the lines of inquiry and participants of the unit. The first section also includes the technology integration glossary that was used for the Unit. This section is shown in Figure 12.

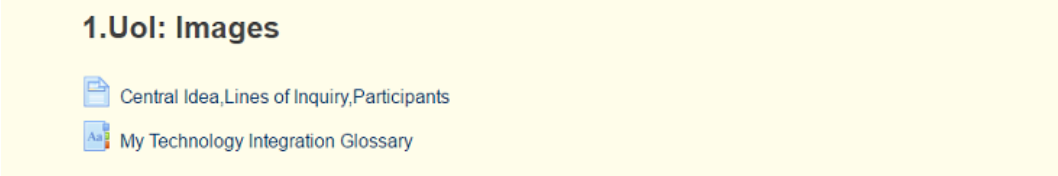


Figure 12: Unit Plan Section

- **Resources:** This is the section where the teacher provides the tool(s) used in the Unit through a URL that leads to an online link. This section is shown in Figure 13.

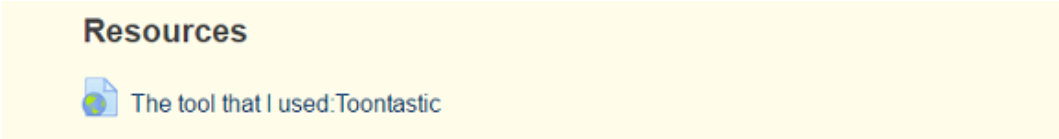


Figure 13: Resources Section

- **Student Works:** This is the section where the teacher provides examples of students' works as part of the shared unit. This section is shown in Figure 14.

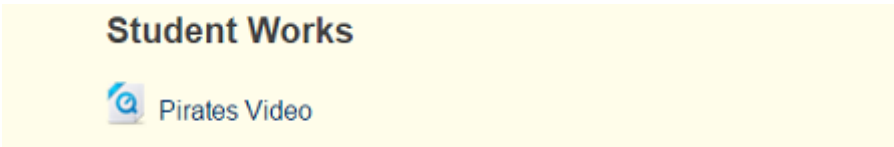


Figure 14: Student Works Section

Download Unit Plan and Provide Feedback: This is the section where the teacher provides the Unit Plan for download, technical tips as well as a discussion

forum to other teachers and technology integrators asking for feedback, in regards to the shared unit. This section is shown in Figure 15.

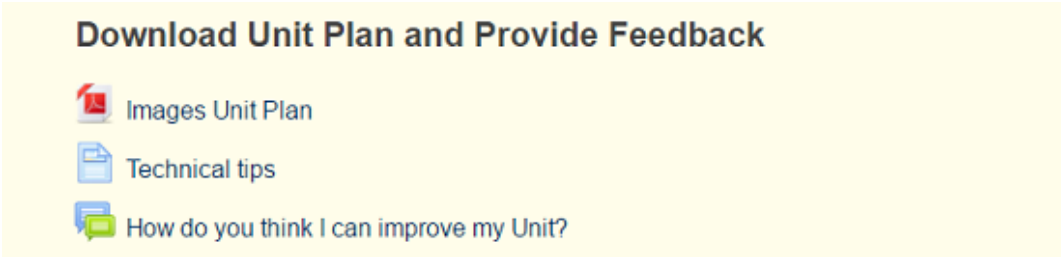


Figure 15: Download Unit Plan and Provide Feedback Section

5.4. General Technology Integration Category

Course Category->"General Technology Integration Courses": This category consists of courses that are related to various technologies and tools for members to refer to, as shown in Figure 16. The courses included in this category are "All about iPads", "All about Chromebooks" and "Web 2.0 tools". Any member of the community can self-enroll in these courses and follow them for as long as they want. They include general information, resources and links for teachers to refer to when in need. Teachers do not have editing permissions in these courses. The goal of these courses is to provide teachers with a variety of resources, materials, websites and tips based on the device they are using in the classroom. Teachers and Technology Integrators do not have editing rights in these courses therefore are assigned with a "Student" role.

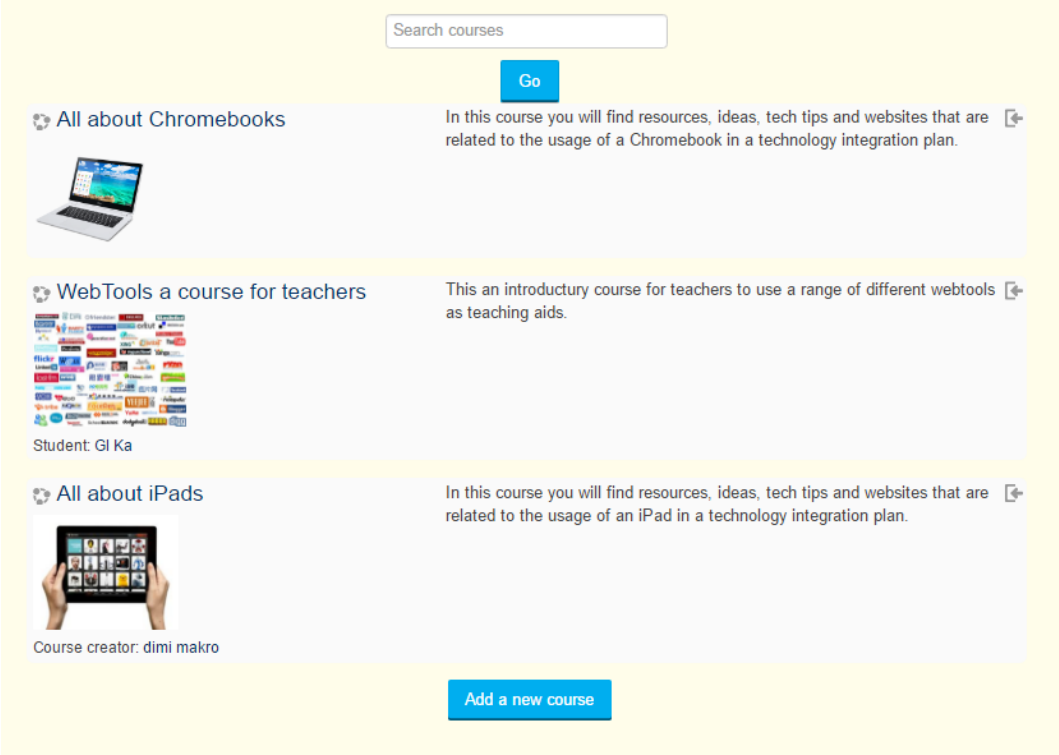


Figure 16: Courses included in the Category "General Technology Courses"

5.4.1. Structure of each course

These courses are designed to be informative and provide teachers with tools, resources, tips and answers to technical issues in regards to software, hardware and technologies. Each course in this course has a different structure. Each course is described below in detail.

5.4.2. All about Chromebooks Course

This course is designed to provide members with information in regards to the usage of Chromebooks in education. Activities include resources that provide technical problems and solutions as well as ways to integrate them in education. It

includes guidelines for integrating Chromebooks in unit plans and the planning prior to implementing such hardware in classroom practices.

5.4.3. Web Tools Course

This course is to provide members of the community with appropriate resources in regards to online tools, regardless of the operating system utilized and hardware in classrooms across schools. Resources include video editing, mind-mapping tools as well as Google Apps activities. The course is divided in sections according to the topics that are covered within the course, and is as shown in Figure 17.

Figure 17: Web Tools Course Structure

5.4.4. All about iPads Course

This course is designed to provide members of the community with information in regards to iPad matters. It is a course in which all members can self-enroll. Members in these course do not have editing rights. However, all members are encouraged to create their own courses or contribute to the existing one. In that case a new role is assigned to the respective member. This course is divided in sections according to various topics. Sections focus on:

- Apps that can be used in various activities and ways of integrating them into subjects and activities
- Ways and online websites to find resources such as apps
- Design templates for Units
- Troubleshooting tips regarding iPad matters from creating accounts to restoring and technical hardware solutions.

Figure 18: All about iPads Course Structure

Moodle activities and resources that are used to create this course:

Book: This resource is used to present content in regards to iPad usage in the classroom in a form of a booklet.

Forums: This activity is used for members to comment and discuss topics that are included in this course.

Pages: These resources are used to embed information from online resources for members to refer to at their own pace.

URL: This resource is used to provide members with weblinks that lead to information from online resources.

5.5. Let's Collaborate Category

This category of courses aims to promote collaboration between teachers with technology integrators, teachers with teachers and technology integrators with technology integrators. This category includes two courses: "Teacher Collaboration", "Tech Leaders/Integrators Collaboration". These courses have a more formal structure and are not self-paced. They have a starting and ending general collaboration among PYP teachers within the CEESA region. Teachers are expected to create and work in teams of five in order to complete a unit plan collaboratively date and members need to enroll with an enrollment key.

5.5.1. Teacher Collaboration Course

This course has been designed to promote collaborative planning and. Small group projects, sponsored by the community, help members create personal relationships and also provide a way to produce the resources for developing the practice: cases, effective practices, tools, methods, articles, lessons learned, databases, heuristics, models and websites (Cambridge, D. and Suter, V., 2005). Teachers are free to create their own teams, with every team consisting of at least three PYP teachers and at least one technology integration specialist. These courses are set to take place once every semester and teachers need to sign up for the course prior to its starting date. A teacher posts the lines of inquiry and the central idea in a forum and plays the role of the Teacher Leader during the

time of the course-planning. In the next phase, other PYP teachers are expected to show interest and sign up for the one that interests them the most. It follows a first-post, first-serve policy for the units that will be selected in order to collaboratively work on. Every section then becomes the working are of each group. The works of every group are private to their group and only, till the end of the course. An example of how a group work section has been design in Moodle, is shown in Figure 19.

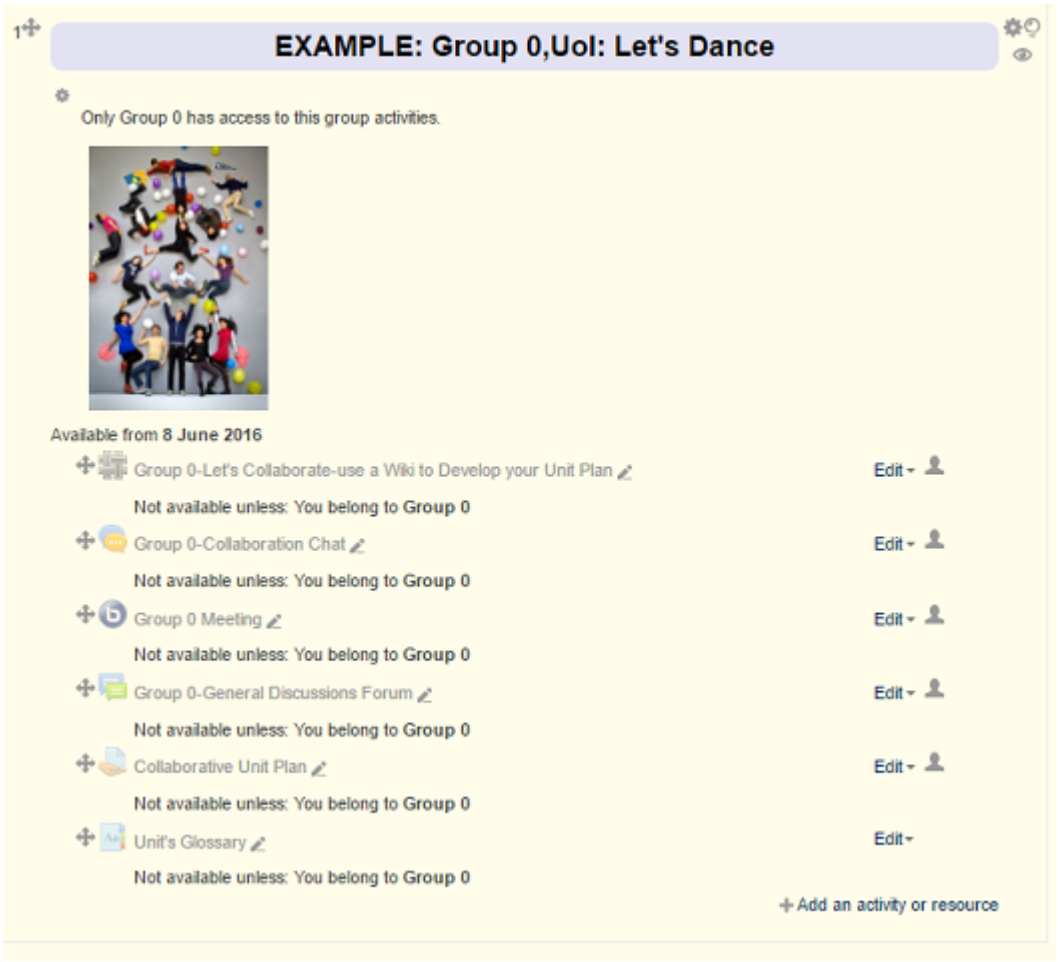


Figure 19: Design of a Group Work Space

Moodle activities and resources that support this course are:

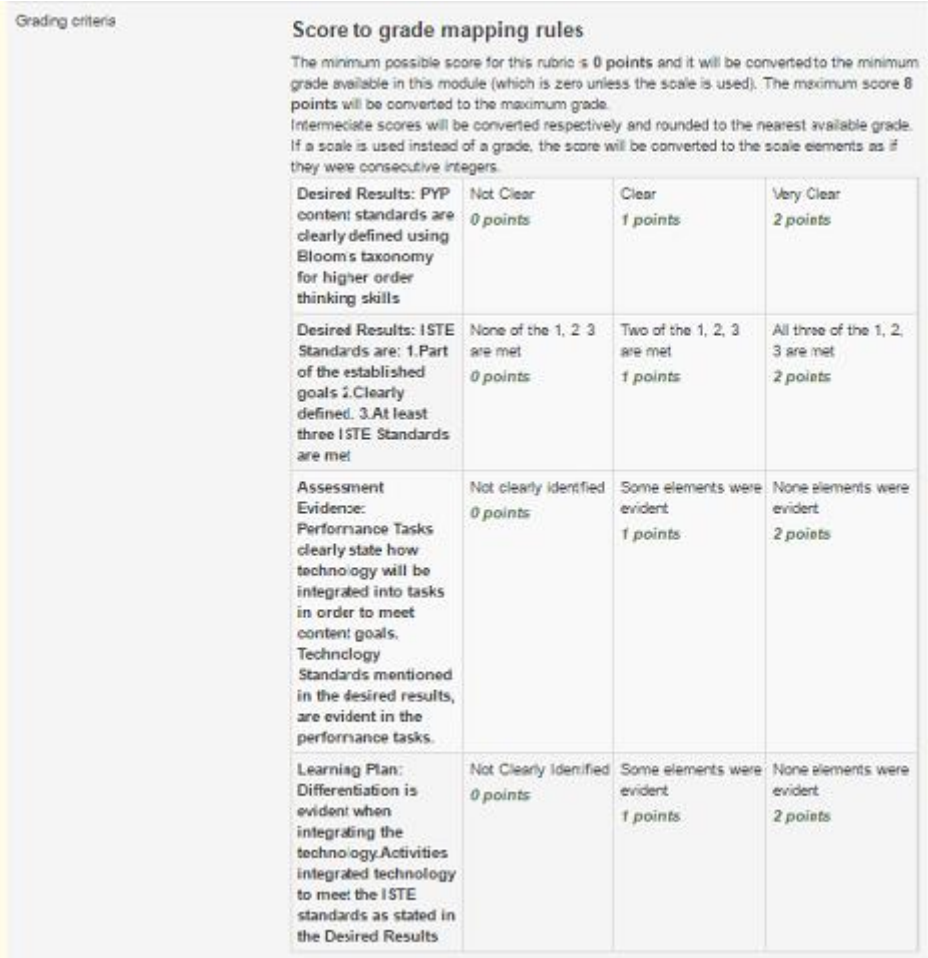
Wiki: This activity is used by teachers of the group to create a collaborative unit plan.

Chat: This activity is used to support synchronous communication among the members of the group.

BigBlueButton: This activity is used by the group members for an online conference to discuss matters regarding the collaborative unit plan design.

Forum: This activity is created to support asynchronous communication among members regarding the unit plan or any other concerns.

Assignment: This activity is created for the group members to submit the unit plan that has been created on the wiki activity. Only one submission is necessary by the group and is provided through a URL. A rubric has been created for group members to self-assess their unit plan design and is shown in Figure 18.



Grading criteria

Score to grade mapping rules

The minimum possible score for this rubric is **0 points** and it will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score **8 points** will be converted to the maximum grade.
Intermediate scores will be converted respectively and rounded to the nearest available grade. If a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

Desired Results: PYP content standards are clearly defined using Bloom's taxonomy for higher order thinking skills	Not Clear *0 points*	Clear *1 points*	Very Clear *2 points*
Desired Results: ISTE Standards are: 1.Part of the established goals 2.Clearly defined. 3.At least three ISTE Standards are met	None of the 1, 2 3 are met *0 points*	Two of the 1, 2, 3 are met *1 points*	All three of the 1, 2, 3 are met *2 points*
Assessment Evidence: Performance Tasks clearly state how technology will be integrated into tasks in order to meet content goals. Technology Standards mentioned in the desired results, are evident in the performance tasks.	Not clearly identified *0 points*	Some elements were evident *1 points*	None elements were evident *2 points*
Learning Plan: Differentiation is evident when integrating the technology.Activities integrated technology to meet the ISTE standards as stated in the Desired Results	Not Clearly Identified *0 points*	Some elements were evident *1 points*	None elements were evident *2 points*

Figure 20: Rubric for creating collaborative Unit Plan

Unit's Glossary: This activity is created for the group members to create a common language that supports the unit in a format of a glossary.

In regards to the roles, for this course, at least one technology integrator is assigned to every group.

The goals of this course are:

1. To promote collaboration among PYP teachers in terms of planning a technology integrated unit.

2. To promote the development of best practices in technology integration in the PYP curriculum.
3. To open up teachers and technology integrators to new ideas, resources and ways of integrating technology in the PYP curriculum.

5.5.2. Technology Leaders/Integrators Collaboration Course

This course has been design for technology integrators/leaders in the PYP curriculum. It aims to promote collaboration among these members and promote effective technology integration planning, assessment methods, curriculum mapping, evaluation of technology integration plans and teachers' continuous professional development in regards to technology integration. The members of this course are expected to develop appropriate materials that can be used by every school within the CEESA region. Each section of the course represents a relevant topic. The design is shown in Figure 20.

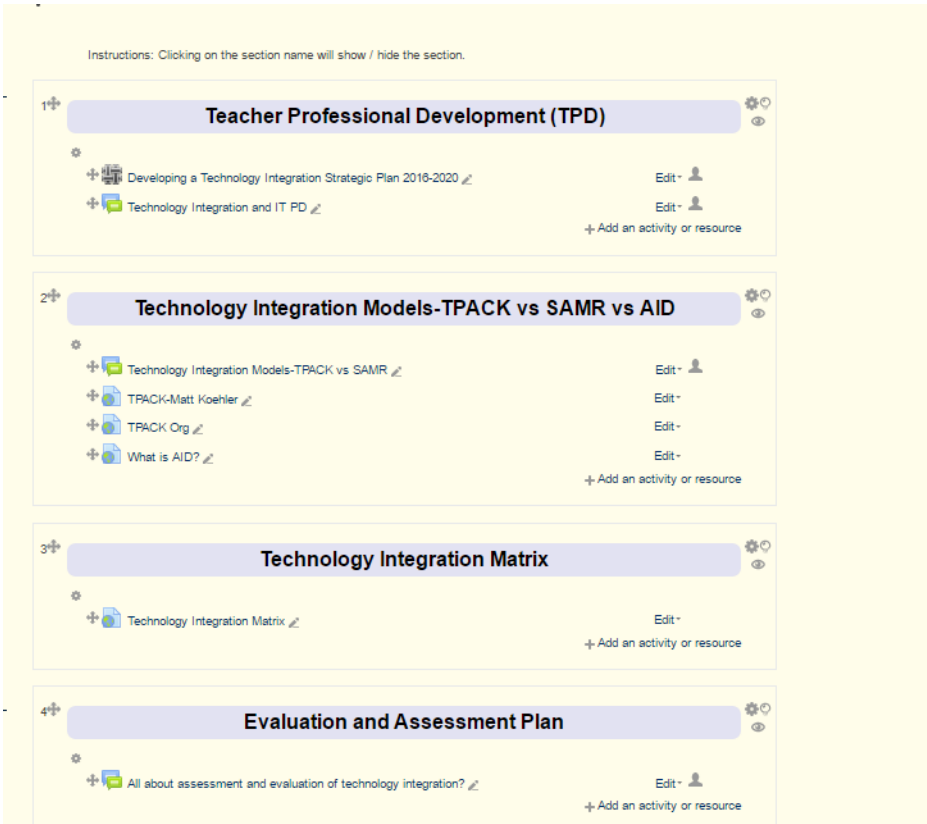


Figure 21: Design of the "Technology Leaders/Integrators Collaboration" Course

Moodle activities and resources that support this course are:

Wiki: This activity is used from technology integrators in order to collaboratively work on developing a technology integration plan from 2015-2020 for CEESA IB World schools.

URL: This resource is used to provide urls from online resources and support collaboration and planning.

Forums: These activities are used to promote communication among these members regarding various topics included in this course.

In regards to the roles, for this course, only technology integrators are permitted for enrollment.

The goals that this course aims to achieve are:

1. To promote collaboration technology integrators in the creation of a common technology integration philosophy and matrix.
2. To promote the development of best practices in technology integration evaluation and teacher assessment.

5.6. Additional Moodle features utilized for the courses

Blocks: Various Moodle blocks are included in order to foster and achieve the goals of the online community. Those include, RSS feeds block including news feed from the respective Twitter Group, “IB PYP” as well as a block with news feed from the official blog of the IB in regards to PYP news.

BigBlueButton: This plugin has been installed to enable online synchronous conferences and is used in many courses throughout Moodle where members need to meet in order to discuss process and various topics.

Badges: Badges are created throughout the lifecycle of the online community in order to support and encourage participation of members of the community. Badges are manually assigned by course facilitators based on certain criteria that are relevant and dependent on the goals of each course.

5.7. The learning outcomes of the PLC experience in regards to TPD

The IBO offers a wide variety of online and face-to-face professional development opportunities that are focused on the IB curriculum, the IB programs: Diploma, Middle Years and Primary Years Programs and subject matter topics. However, there are no face-to-face nor online formal professional development opportunities offered for teachers in terms of effective technology integration. It is rather, up to each school how they will go about and implement a technology integration plan including teacher professional development in this area. Most IB schools hire a technology integrator/digital coach and are relying on in-house professional development in regards to technology integration.

Professional learning opportunities for teachers in effective technology integration take the form mostly of informal learning through blogs, social media groups, such as Facebook and Twitter. In addition, under IBO there is the Online Curriculum Center (OCC), mainly used as a repository, where an IB teacher can find appropriate resources, publications and forums regarding curriculum matters. However, there is no online professional learning experience that is devoted only to effective technology integrated practices in the IB curriculum, and more specifically the PYP curriculum. With that said, an online professional development experience is developed, in an informal and continuous context, followed by appropriate TPD strategies. It aims to connect PYP teachers around the World and able to share technology integrated experiences and Unit Plans. Learning activities and resources are based on the PYP curriculum and Units of Inquiry, and aim to assist PYP teachers in developing technology integrated Units, and implementing them independently into their classrooms.

Harland and Kinder (1997) suggested the following nine possible types of outcomes of CPD:

- Materials and resources – provisions for teaching, such as worksheets or activities.
- Informational outcomes – fact-based information, e.g. about new policies or schemes.
- New awareness – a perceptual shift, teachers becoming aware of new ideas and values.
- Value congruence – the extent to which teachers' own values and attitudes fit in with those which the CPD is trying to promote.
- Affective outcomes – how teachers feel emotionally after the CPD, may be negative (e.g. demoralised) or positive (e.g. confidence).
- Motivation and attitude – such as enthusiasm and determination to implement changes.
- Knowledge and skills – both curricular and pedagogical, combined with awareness, flexibility and critical thought
- Institutional outcomes – on groups of teachers, such as consensus, collaboration and support
- Impact on practice – The ultimate aim of CPD: what effect does it have on the pupils?

With that in mind an online PLC has been created to serve the needs of PYP teachers in technology integration in terms of TPD within the CEESA region. Collaboration, communication and becoming a best practice sharing community in technology integration in the PYP curriculum is the main goal of the pilot project.

CHAPTER 6

Further Development and Suggestions

This project has been created as a pilot project. As with all communities of practice, either for educators or not, they need time to evolve. Communities of practice depend on trust, communication and common values when it comes to its growth. In order to accomplish the goals laid out within this paper the launch of the online PLC in a real, authentic setting are recommended. Even though interviews were held prior to developing the online PLC environment on Moodle, the environment has not been tested with actual users-PYP teachers and technology integrators of the PYP curriculum.

It is evident that feedback from the end users would provide us with more info on how to better design the online environment as well the content materials that should be included within, to serve better the needs of the teachers, to accomplish effective technology integration practices. The development of this project has followed the step-by-step design for creating and maintaining a Community of Practice. The last three steps of the design include the launch, growth and maintenance of the community. The community development on Moodle for PYP teachers in technology integration within the CEESA region, has not been launched. Therefore, the potential growth and maintenance of the project have only been suggested as necessary steps without included realistic information as feedback from the end users.

The purposes of this project is focused on the need for a different approach towards teachers professional development to a continuous professional

development approach that does not necessarily fall under a formal learning environment. This project also emphasizes on the need for teachers to participate in a collaborative environment and grow professionally through authentic learning opportunities that allow reflection on classroom practices, related to technology integration as technology integration was the domain of the community and the area of content. As online learning provides capabilities that go beyond time and space, allowing adult learners, as teachers are, to adapt their learning to their schedules, an online Community of Practice for teachers has been suggested.

Last, the online PLC has been developed with the aim to serve as a pilot online PLC for PYP teachers within the CEESA region and build on one of its main strategies: to become catalyst for the effective use of technology in support of educational transformation.

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APPENDIX I

Questions and Answers for and from PYP teachers in Phase 1: Inquire of PLC development: Answers are summed up as most answers among teachers were the same

Questions	Answers
1. What type of activities would you like to see in training or PD in terms of technology integration?	• Student works. I don't want an environment where people just chat and share concerns. • The unit plans. It would be useful to see what activities and tasks they integrate technology in. • The lines of inquiry, central idea and how technology was integrated. • How a tool works, such as a tutorial and how it is implemented in a real case scenario. • Not too committed resources and activities but broader that can be used in different activities and units such as a video editing app or tool. • At the moment, I think I am using the most technology I possibly can as I have to cover the content. That is my priority. So an online

	community in regards to technology would not help. I would definitely want technology experts to be part of my planning/training/participation.
2. What online professional learning communities do you participate in?	• The PYP blog from IBO • The OCC-but it is rarely used. • I don't participate in any. • I follow the PYP group on Twitter
3. Do you know what is happening in other PYP classrooms in CEESA or around the World?	• No, I have no idea • What I know is only from friends that I speak to or previous colleagues in other schools I've been in. • CEESA does not provide conferences for PYP teachers-let alone for technology integration. However, conferences for IT Directors/Technology Leaders and Integrators are provided once a year.
4. What is the hardest part of technology integration?	• Limited teachers' time to do and explore more. • Limited collaboration between Technology Intgrators and teachers, as they many times have to devote more time in technical support bits.

	Therefore, we don't have much time to plan a Unit together. • The technicalities are one the hardest points. You may be offered a training or workshop and when trying in the classroom it does not work due to technical issues. • There is limited time to collaborate with other teachers as people wear multiple hats and have many responsibilities. Sometimes you just end up going with what you already know and done before.
5. Do you know how to use Moodle?	• I wouldn't call myself a proficient user but yes I do as in my school we used to use Moodle before implementing ManageBac. • We used to use Moodle but I don't remember much. • Yes, pretty much but I don't know any technical details. I mostly use it to assign assignments and have students upload them. But in Upper School they use it more effectively.
