Integrating Design Thinking into peer-learning community: Impacts on professional development and learning

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Abstract

Purpose – This study aims to develop a pedagogy which would help a school become a workplace for learning and professional development. Essentially, this objective addresses the following critical question. How can a school become an attractive workplace where learning and professional development of teachers positively contribute to better teaching and learning for the students?

Design/methodology/approach – The research is considered as a case study. The pilot project or experiment has taken place at Mattayom Suwitserianusorn School which is part of Bangkok Metropolitan Administration. Design Thinking and Finnish practices have been explicitly integrated into peer-learning community (PLC). Design Thinking, through the use of empathy, helps highlight the interrelationships among motivation, emotion and cognition of students. Follow-up meetings provide insights into teacher’s professional development and impacts on student’s learning. The verification is based on award and recognition gathered over the past years for students and the school.

Findings – PLC helps improve a school as a place for learning and professional development. The significance of integrating Design Thinking is extensively discussed. The project shows how co-teaching can be applied, given a proper selection of a problem. Higher motivation and better behavior among students are
noticeable. The pilot project reinforces the importance of PLC in the current pedagogical development as it helps transform a school into workplace learning for both teachers and students. Blending Design Thinking helps strengthen the sustainability of PLC, as a lesson plan should be revised according to the students’ background and needs.

Research limitations/implications – The study responds to the call by several international studies for better pedagogical development and in-service training for teachers’ continuous learning and professional development. More vigorous comparisons with other schools will be needed to help verify the study’s findings. This is due to the need to have a longitudinal study of PLC’s impacts.

Practical implications – For teachers, an understanding of their common interests and the recognition on the need to learn from one another is important. For students, an understanding of their psychology and emotional intelligence through the use of Design Thinking is highlighted. Motivation, emotion and cognition of students are interrelated and can help transform a school into learning space.

Originality/value – The study contributes to the transformation of a school as a workplace for learning and professional development which is based on the aforementioned pedagogical development. Also, Design Thinking helps strengthen PLC as an alternative pedagogical practices.

Keywords: Professional development, Workplace learning, Pedagogy, Design Thinking, Peer-learning Community or PLC
Introduction

The teaching profession requires continuous learning and development, as it directly deals with human capital (Harris and Jones, 2010). Teachers are traditionally expected to constantly evaluate new information, practices, methods to improve the ability, aptitude and attitude of the students (Lieberman, 2000). Pedagogical knowledge is critical for the teachers, as it represents the body of knowledge on learning processes and environments for the students (Hord, 2009; and O’Riordan, 2018). Classrooms today have changed over time owing to more diversity and have become more complex because of digital technology and generational gap (Sonmark et al., 2017; and Gomes et al., 2015). As a result, a school is not only a place for students to learn new knowledge and skills but also a workplace where teachers can learn and improve their profession. Essentially, they need to frequently update their profession’s knowledge.

Despite the recognition on the importance of teachers’ learning and development, the competency in pedagogical knowledge recently appears to be lacking (Hallinger and Bryant, 2013; and Sonmark et al., 2017). In-service teacher training (which takes place after a teacher graduates from a teacher college or university) is often conducted outside a school and relies on external experts who traditionally work outside a school. This contradicts the notion that the teachers themselves seriously need a lot of soft skills to prepare their students. In fact, one study reveals that approximately 40 per cent of teachers in the OECD countries have had neither an opportunity nor an experience to teach alongside another teacher(s), observed another, or given feedback [1].

Recently, several studies have clearly pointed to the need for a more effective way for teachers’ learning and development (Sigurðardóttir, 2010; Saeheaw et al., 2013; and Sonmark et al., 2017). The reason is that traditional in-service teacher training may not be sufficient due to the increasing importance of emotional intelligence and cognition for student learning. Working environment in schools has changed drastically over the past decade. This is due to the demographical change of the students, especially emerging Generation Z (while many teachers are part of Generation X) (Sonmark et al., 2017). Student’s needs have to be better understood and accommodated.
Because the contemporary discussion on improving pedagogical knowledge focuses on both teachers and students, a sense of a learning community within a school becomes critical (Lieberman and Miller, 2008). It is essential that teachers’ learning and development need to take place more within a school (Stoll et al., 2006; and Campbell et al., 2014). Learning from their peers through sharing classroom experiences and collaborating with each other for an assignment on a complex problem or project is inevitable (Nelson et al., 2010). This is consistent with an overall trend in science teaching which has transformed from a subject-to a phenomena-based learning. In addition, more interactive and collaborative learning among students and constant feedback to the students needs to become an integration of any pedagogical development today (Lieberman and Miller, 2008; and Hallinger and Bryant, 2013).

This change in the teaching and learning environment is due to several emerging trends:
1) the high internet penetration and long usage hours of mobile phone and related communication devices among younger students;
2) the need to insert the transferable (i.e., soft and life) skills into classroom teaching and learning; and
3) the ongoing change in science teaching (when the term of life science reflecting the subjects of physics, chemistry and biology and the term earth science indicating the fields of geography, ecology and environment (Fry and Bi, 2013; Delahunty, 2016; Sonmark et al., 2017; and Ratten et al., 2017). This ongoing development underline the importance of learning and development of the teachers to adapt to these changes while preparing the students for the future.

**Problem statement**

The fundamental question for this study is as follows: How can a school become an attractive workplace where learning and development of teachers positively contribute to better teaching and learning for the students? Successive studies have highlighted the need for the teachers to change how they teach (which needs to be more collaborative) and to adapt to more contemporary practices such as more teamwork (or co-teaching) (Fry and Bi, 2013; and Sonmark et al., 2017). In
this case, the attractive workplace implies that a school in which learning constantly takes place and benefits both teachers and students. A school needs to become a more appealing and innovative workplace for the teachers which will also result in better teaching and learning for the students (Ratten et al., 2017).

To tackle this problem, it is important to recognize that how the teachers learn is an integral part of how they teach (Riveros et al., 2012; and Campbell et al., 2014). Because of the need to have a school as better learning space, the pedagogical development is the study’s main focus. Peer-learning community (PLC) was earlier chosen as part of the improvement in a current pedagogy for the schools belonging to Bangkok Metropolitan Administration (BMA). BMA's Department of Education is a dedicated unit responsible for handling primary and secondary educations. BMA has more than 435 schools with 350,000 students and 15,000 teachers. The PLC is considered in-service teaching training, as it allows professional development through knowledge sharing from past mistakes and good practices. It also utilizes a network or a group of teachers to introduce new practices from the external sources (Lieberman and Miller, 2008).

Creating PLC in a school depends on both teachers and students (Hord, 2009; and Harris and Jones, 2010). Despite the willingness of the teachers to assist the students, the success of PLC can be attributed to better understanding of the students, and their needs and motivation. Based on the past experiences at BMA schools, any attempt to establish PLC would fail like previous initiatives such as problem-based learning, project-based learning and flipped classroom. In addition, a lack of insight and knowledge to motivate more learning and students’ collaboration would contribute to another expected failure. And, traditional practice of text-centered and teacher-controlled classroom environment classroom (due to the teachers focusing on individual work and routine) would prevail (Harris and Jones, 2010).

Any change in pedagogical practices has proven to be difficult for BMA schools. There has been a lack of teacher collaboration, so there were simply many in-depth problems and projects for the students. One in-depth homework problem in Chemistry could take a lot of time that a student may not have sufficient time to complete a project in Biology. Secondly, the students who are not motivated in learning were still not interested in any pedagogical changes. Therefore, a new initiative would eventually become less effective over time.
These reasons are based on how the country’s national curriculum is structured and assessed (Hallinger and Bryant, 2013).
Research objective

The study aims to develop a pedagogy which can transform a school to become better workplace for learning. This is expected to benefit teachers’ professional development while improving teaching and learning for students. Design Thinking is an integral part of this development.

Research methodology

The research is considered as a case study. The study provides the narrative on what has happened. The pilot project has taken place at one BMA secondary school. Design Thinking and Finnish pedagogical practices have been explicitly integrated into PLC during this pilot project. Follow-up meetings with three BMA teachers who developed and deployed integrated lesson plan and activities provide the insights into teacher’s professional development and the impacts on student’s learning and transferable skills. It is important to recognize that they are from three different schools but agreed to work together in one school. The verification of this assessment is based on the award and recognition that this pilot project has gathered.

The suggestion to use PLC stems from the perceived viewpoint that there is tremendous variability among teachers. This variability has negatively contributed a lack of passion, motivation and creativity in pedagogical development of a lesson plan that motivates students’ learning and development (O’Riordan, 2018; and Harris and Jones, 2010). The variability stems from teacher education (as the quality of teacher education in Thailand needs more consistency in pedagogical and pre-service teacher training) and career development (as teachers can opt to pursue an administrative track which does not require classroom teaching).

PLC is suggested as a pilot project to help address the following concerns:

- pedagogical development in science education for upper secondary students at Year 10;
- in-service teacher training as teachers are allowed to jointly develop a lesson plan and discuss classroom-related matters with each other; and
illustration to students the importance of teamwork and collaboration in a workplace.

PLC is part of the new initiative at BMA schools so called “Eco School.” This initiative focused on one complex problem facing both a school and its surrounding communities. For this pilot project, this complex problem is polluted waterway which runs near the school and the communities where the students stay. The PLC is based on collaborative learning from Mr Weeraphong Phimsarn (Mattayom Suwitserianusorn School), Mr Apichart Intha (Kaenthong Upatham School) and Mr Nonnut Nomrawee (Naluang School). The school directors from the three schools have agreed to have these three teachers participate in PLC at Mattayom Suwitserianusorn School.

The school is located in Prawet District where most waterways are polluted and are not suitable for household use. The Eco School initiative was initially planned in 2014 to help introduce students with more contemporary science teaching and learning such as environment and energy instead of the silo way of teaching physics, chemistry, biology and mathematics independently. The PLC is adapted to help implement the Eco School initiative which has been deployed since 2015 at Mattayom Suwitserianusorn School. For each of the three subsequent years, there have been around 40 students who have enrolled in the science subjects and have participated in this initiative. This Eco School initiative focuses on learning outside a classroom or a laboratory when attempting to tackle a polluted waterway.

Design Thinking is adapted to help strengthen the application of PLC as an alternative pedagogy in this pilot project. Design Thinking, through the use of empathy, helps highlight the interrelationships among motivation, emotion and cognition of students (Snowden and Halsall, 2017 and Meyer and Turner, 2005). These components are critical for any future pedagogical development. Design Thinking provides an opportunity to learn from and engage with the students as part of the development of a lesson plan (Sonmark et al., 2017; and Razzouk and Shute, 2012). Design Thinking is incorporated in this pilot project as the reminder for the three teachers to explicitly consider the needs from students before their development of a lesson plan.

For instance, almost all of the students who attend BMA schools do not plan to attend higher education. Vocational education, adult education or going directly
to work are their common options. Thus, a regular lesson plan for in-depth physics, chemistry, biology and mathematics is not suitable since these lessons, designed by the central government, aim to prepare the students to take a national examination for a university’s admission. As a result, there has been a lack of enthusiasm and motivation among BMA students to study science-related topics. Frequent absences and poor behavior are often used to describe the classrooms for upper secondary schools.
Case study’s background

In Thailand, the schools belonging to Ministry of Interior – local municipalities and two special administrative zones (i.e. BMA, and Pattaya City Administration) – have traditionally performed poorly in national assessment and are perceived to have low quality in students’ development. The primary reasons for this ongoing problem stem from: student background and family well-being and school readiness to apply the centralized curriculum. In particular, the families whose children attend these schools are generally regarded as poor and less-educated. The parents likely work as the daily wage earners and often move from one place to the next (Fry and Bi, 2013; and Hallinger and Bryant, 2013). See Table I.

For these schools which belong to Ministry of Education, there are two openings for new students are accepted; i.e. Grade 1 (the beginning of a primary level) and Grade 7 (the beginning of a secondary level). For Ministry of Interior’ schools, the students can walk in anytime (even during the semester) without a restriction. The continuity and uniformity of the students have contributed to the quality of teaching and learning.

These schools under Ministry of Interior have been viewed to be a place that provide and extend the opportunity for education to the poor and are perceived to be inferior to other school categories by the parents. In other words, these schools are not known for high-quality teaching and learning (Fry and Bi, 2013 and Hallinger and Bryant, 2013). In fact, many teachers often request the transfer from Ministry of Interior to Ministry of Education, as they view that they would have a better career path. Adding to the widening gap of quality of teaching and learning is the strict use of the national or centralized curriculum in which it dictates the knowledge and skills that all students need to have, notwithstanding the context and readiness, including the details on how to teach the subject matters.

Many schools under Ministry of Interior could not meet the national standards, as the local municipality’s domain of responsibility has been on law and orders such as safety and security. Often, education and human services are not the top priority. Therefore, the readiness in laboratory, classroom and others has not been sufficient. Recruitment of qualified teachers subsequently has become problematic, as newly graduated teachers often prefer to apply for the
teaching positions at the Ministry of Education. For BMA, its schools are located in both densely populated urban and less-crowded areas. To meet the centralized curriculum is considered a serious challenge. The academic achievement score reflects the gap among the three categories of public schools in Thailand (OECD/UNESCO, 2016).

Due to the diversity in customers, the need to fully understand and involve the extreme group of the customers - those who refuse or have not used a product/service and those who adore and glorify this product/service (Matthews and Wrigley, 2017). By focusing on the extreme group (i.e. students who feel they have been left out of the education and have not been part of the society), the solutions to this extreme group can potentially create positive impacts (Lockwood, 2010). See Figure 1.

For Design Thinking, there are two implications when considering the two extreme groups (Dorst, 2011). The first implication is that the voice of the most dissatisfaction group can provide useful insights into a problem and also can point to potential unconventional solutions. In other words, the teachers often do not have an opportunity to hear the voice of disgruntled students who refuse to participate in classroom teaching and learning. From the BMA viewpoint, transforming those who are not motivated at school to become active participants in teaching and learning should change the mindset of teachers and their pedagogy.

The second implication is that, often, a drastic change is occasionally needed when working on a solution (Lockwood, 2010; and Razzouk and Shute, 2012). Although, the purpose of engaging with the extreme group is not to develop specific solutions for this group, the problems facing or the needs from the extreme group overlap with all the students. For BMA schools, if the students who belong in the extreme group are more inclined to learn, then most students should feel the same way. The students feel lost and become disenfranchised with the society. See Plate 1 for the surrounding environment of BMA schools.

Finally, Thailand’s education system has been viewed as having too much emphasis on rote learning (OECD/UNESCO, 2016; and Hallinger and Bryant, 2013). Test, audit and inspection have been used extensively to demonstrate high quality of teaching and learning (Save the Children and World Education, 2015; and OECD/UNESCO, 2016). This has contributed to lack of creativity and innovation for classroom teaching and learning. Thus, compliance has been
prevailing mindset for teachers which results in long teaching hours and narrow focus only on the subject matters (and not the skills needed by the students).

A change in attitude among school administrators and teachers is needed when considering students’ needs (Hallinger and Bryant, 2013). The term production of students should be replaced from their mindset, as it has led to more inspection and audit which have not added real value to teaching and learning. The term building human capital should be preferred as it recognizes individual development and can raise the quality of counselling services at schools. A lack of integrating students’ needs and recognizing their psychology have been cited as one of many barriers to improve current pedagogical practices (Fry and Bi, 2013).

Finnish education was earlier examined by BMA's policymakers in 2013. The primary reasons were the use of integrated lesson plan for teaching science and mathematics (i.e. the concept of team teaching was widespread), the acceptance on the important of learning outside a classroom and a laboratory where appropriate and the balanced focus on skill development and academic knowledge. Active student engagement, and collaborative learning and teaching have been the trademark of Finnish education (Delahunty, 2016).
Findings

This case study started in 2015 after a batch of BMA teachers returned from the study visit to Finland. The trip was one of the key initiatives from Deputy Governor who oversaw BMA’s Department of Education from 2014-2017. Owing to the continuous decrease in the morale among BMA teachers (the annual request to transfer was approaching 10 per cent of the current teachers to Ministry of Education’ schools), the drastic change in the workplace (i.e. the school) was urgently needed. In addition, the failure of the students through the national examination became alarming, especially at the secondary level.

During their visit to Finland, team teaching or co-teaching was frequently demonstrated and highlighted to BMA teachers. It showed how different subject teachers collaborated and helped design a lesson plan for the students. They worked together in the areas of teaching, assessment and evaluation and student feedback. During this collaboration, they focused on the interrelationships among the subjects’ contents (referred to as a phenomena), the skills of the students and how they learn and more importantly their psychology. For many, it was their first time that they saw the importance of learning outside a classroom. In Finland, this practice is as important as conducting the lessons inside a classroom or a laboratory.

Tackling this problem requires the students to have a broad understanding of technical knowledge in the combination of physics, chemistry, biology and mathematics. For instance, measuring the surface of polluted water from the sunlight and estimating the volume of discharged water in the communities are important for problem analysis. Other critical soft skills for the students when dealing with these surrounding communities include data gathering, communication and team building, etc. When the three teachers began to apply PLC, the students were able to, for the first time, observe the importance of collaborative learning and teamwork.

Mr Weeraphong Phimsarn teaches chemistry and biology. He focuses on formulating and defining a problem as the basis for a lesson plan development. Mr Apichart Intha, with a background in physics and mathematics, helps develop an experiment dealing with water treatment for the students, including soil test acid or alkaline characteristics. On the other hand, Mr Nonnut Numrawee, given
his background in biology and extensive training in student psychology, comes up with different ways to engage and motivate student’s learning and development. They have examined Education Endowment Foundation’s findings [2] that constant feedback to the students, peer tutoring and collaborative group learning have the most impacts on student’s learning.

For many students, it is their first time to see and appreciate the teachers from different educational background and schools work together. This has contributed to more positive emotion and inspiration which the students often do not have. Student engagement through exchanging many ideas such as how to approach homeowners in the communities and how to experiment and test the effectiveness of water treatment are viewed as an important contribution to motivation and sustainability of this pilot project (see Plate 2).

The observation and interview are applied to help evaluate the effectiveness of the pedagogy’s development. The criteria for this evaluation include teacher feedback, public recognition and student engagement and participation. For teacher feedback, it illustrates how participating teachers feel about their skills and knowledge when involving with PLC. Essentially, they realized that teaching science to BMA students should not focus on the complexity of the subjects but, based on their experiences in Finland and exchanges of ideas among themselves, science and everyday life could not be separated. Instead of making the in-depth subject for the students to understand and visualize, they agreed that relating to students’ experiences and injecting more fun into science subjects would be a better way for the students to learn.

Then, the next important decision was to select the theme which would include all key science subjects. Given their experiences in how Finnish education approaches teaching and learning physics, chemistry and biology (as well as mathematics) as part of life science, they decided to work on the theme of water. In their views, water incorporates all four core science subjects – physics (e.g. movement and light), biology (e.g. living organism and ecology), chemistry (e.g. quality and property) and mathematics (e.g., quantity and measurement, and proportionality).

Water is considered as scarce natural resource. Water has received a lot of attention by the late King Rama IX through several royally initiated projects, especially water and soil and water conservation. In addition, based on the teachers’ experiences, focusing on water would allow the students to learn outside
a classroom and by experimenting different ideas. Because of the above rationale, team or co teaching with water as the focal point was initiated.

For this study, public recognition indicates the continuous commitment on sharing knowledge and collaborating the tasks. This recognition shows the success in developing the pedagogy which requires extensive integration of several teaching subjects. Public recognition shows the positive impacts from the proposed pedagogy on the development for both teachers and students. In other words, public recognition is part of the efforts to ensure the validity and credibility of the findings. See Table II for some of public recognition at Mattayom Suwitserianusorn School after PLC’s deployment.
Discussion

For BMA schools, PLC represents a new approach to train teachers or is regarded as in-service teacher training. PLC aims to minimize the variability in teachers’ expertise in academic subjects and experiences in student engagement (Ning et al., 2016; and Vanblaere and Devos, 2015). In this pilot project, PLC also includes students. PLC allows the students to learn more collaboratively and also to acquire soft skills that are needed (Stoll et. al., 2006 and Zhao and Kuh, 2004).

PLC application at several schools have proven to contribute directly to an increase in student learning by creating better learning environment (Ainscow, 2015; and McLaughlin and Talbert, 2006). This better learning environment stresses the importance of continuous improvement by linking the learning needs of students with the professional learning and practice of teachers and highlights collaborative learning which allows open dialogue among the learners on the continuous basis (Vanblaere and Devos, 2015).

This collaborative learning represents group work in which a team of teachers plans a lesson that allows individual group to design and develop own way of combining problem understanding with experimentations and experiences of learners (Nelson et al., 2010; and McLaughlin and Talbert, 2006). Experimental learning, learning through observation among the peers, sharing experiences among the learners are the highlights of using PLC for the students. More positive emotion, higher self-esteem and greater motivation for learning are characterized as the expected impacts from PLC (McLaughlin and Talbert, 2006, and Zhao and Kuh, 2004).

For this pilot project, by integrating Design Thinking into PLC, it shows the importance of considering the students’ characteristics during the development of a lesson plan. Their emotion and behavior (e.g. lack of learning motivation, lack of emotional connection to a lesson, lack of soft skills which will be critical for their future employment, etc.) should be taken into account at the early preparation stage (Meyer and Turner, 2005; and Zhao and Kuh, 2004). In other words, Design Thinking brings about a change in how teachers should prepare and develop a lesson plan and helps highlight the importance of student engagement. It reflects the efforts to blend a student-centered approach into
pedagogical practices (Matthews and Wrigley, 2017; Ning et al., 2016; and Razzouk and Shute, 2012).

By working side by side, despite their difference in academic background, the teachers learned a great deal, especially how to engage with the students with better appreciation of psychology and cognitive learning (especially comprehension, application and analysis) (Haemer et al., 2017; and Latoski et al., 2017). In addition, they could show the experiences on a lesson’s planning and preparation from one another. They realized that having a common theme which they could integrate the lesson plans together was viewed as positive and innovative.

The three participating teachers felt that the holistic approach to science was the drastic change from their previous practices in which the subjects had been separately and independently taught. Interestingly, during the interview, one teacher brought up one following comment. How it is possible to teach the twenty-first-century skills to students when most teachers do not even work together. PLC in fact can be viewed as part of pre- and in-service teacher training to help strengthen the twenty-first-century skills for teachers (OECD/UNESCO, 2016).

Some of the key lessons learned from this pilot project are as follows. Experimental learning has contributed greatly to PLC’s implementation (Ainscow, 2015; Sigurðardóttir, 2010; and Stoll et. al., 2006). It allows students to assist one another during an experiment. It also contributes to positive emotion among the students as they can learn outside a confined classroom and a laboratory. It does not add extra cost to deploy PLC since, in this pilot project, an experiment is conducted in an actual location with polluted water.

PLC provides a platform for problem and idea sharing for the students and teachers (McLaughlin and Talbert, 2006; and Stoll et al., 2006). For the three teachers, this platform is better than traditional in-service training. This is because they often sit and listen to a lecture given by a university instructor or expert who may not have complete understanding of the needs from school teachers. Simply put, PLC apparently helps motivate both teachers and students for teaching and learning (see Plate 3).

It is important to recognize the roles of Design Thinking in PLC. From the viewpoints of BMA teachers, working closely with and integrating the needs of the students belonging to the lower tail end in the normal curve helps bring them
closer during planning and developing a lesson plan. Design Thinking helps gain better understanding on why students do not want to come to school and why students are not motivated in classrooms. In addition, comprehending the needs of the most neglected group of the students in their schools is viewed as one of the meaningful ways to sustain teacher’s collaboration. Because of the background of BMA students, these three teachers through closed consultation among themselves and also with the students decided to extend the study of science into product development. The products needed to be environmental friendly which would extend the efforts to tackle polluted water. Such products included soap and detergents for household use as well as fertilizer made from water hyacinth which contributed to a lack of oxygen in water. Mattayom Suwitserianusorn School utilizes its existing cooperatives as a way to help promote the sales of these products. Some of the sales’ proceeds are for the students as well. Extending the products into a new setup like a social enterprise (which would be beneficial to strengthen entrepreneurial skills such as planning, marketing, customer data and product packaging) has become part of the ongoing study of PLC in BMA schools (see Plate 4).

The overall findings from the pilot project are seemingly consistent with the past studies on PLC and how to improve students’ motivation on learning. Hence, the impacts on the teachers and the students are compatible with the previous findings. Thus, the pilot project reinforces the importance of PLC in the current pedagogical development as it helps transform a school into workplace learning for both teachers and students. Blending Design Thinking helps strengthen the sustainability of PLC since a lesson plan should be revised according to the students’ background and needs.

**Implications**

The pilot project’s implications is divided into two groups: teachers and students. For teachers within the context of a school as a workplace for learning, PLC represents a platform for their professional development and students’ learning. It is regarded by three BMA teachers as a mechanism to learn from one another. PLC allows effective sharing among more and less experienced teachers (Hord, 2009). The communication barrier is removed because PLC allows free flow of ideas and information (Stoll et al., 2006). Together with Design Thinking, the
teachers can share their personal value when dealing with students, and key objectives of student’s learning through the viewpoints of the students from the lowest tier.

Through Design Thinking, the lesson that attempts to tackle a lack of motivation for learning and poor behavior requires more innovative ideas. These ideas are based on what was observed in Finland (e.g. co-teaching, making science teaching and learning compatible with students’ surrounding environment and active student’s engagement). At this moment, the local and national recognitions provide a good indication on how PLC has improved pedagogical development and students’ learning and development.

PLC provides an opportunity for their self-reflection, especially working on the common theme for group work and collaboration (Harris and Jones, 2010). Often, a teacher who only teaches Chemistry tends to provide in-depth discussion that is not relevant to other science subjects. This circumstance limits the students’ ability to apply or adapt the knowledge across science subjects and to their daily lives. This experiment has made a school a better work place for learning and development for their career. These teachers agreed that sharing knowledge and insights on students (e.g., the reasons for a lack of interests and motivation) is important for a selection of the theme and the outdoor activities. The teachers feel that blending Design Thinking has improved the effectiveness of PLC’s implementation.

PLC together with the use of Design Thinking allowed better understanding of the students’ behavior and mindset. The case also shows that PLC success comes from the premise that teaching and learning starts with the students, while the teachers’ role is to facilitate their learning. Design Thinking invigorates teachers’ enthusiasm, as they have an opportunity to work with the students who have been neglected. By integrating the experiences from Finland, they develop a new mindset that learning can take place anywhere, especially for the students in the present day. This is due to the impacts from using digital tools for learning and teaching. In addition, specifically when planning a science lesson, ensuring the problems are part of the students’ daily life or routine is essential.

For students, the findings and the impacts on students’ learning are consistent with the results advocated by Education Endowment Foundation (Education Endowment Foundation, 2017). Its study highlights the importance of constant feedback, peer tutoring and collaborative group learning as one of the most
essential aspects of learning and maturity. Throughout the pilot project, it is clear that students enjoyed having the feedback from their peers, teachers and people in the community. Feedback does not come from an examination alone. Feedback on how a problem is understood and analyzed, how students plan to engage with a community, and how they plan to tackle a problem is viewed to be an important motivating factor since they had not experienced constant feedback except the grades from the exams.

Peer tutoring and collaborative group learning are viewed by both teachers and students to be an important positive development. Students nowadays are more independent and could seek new knowledge and help from many sources outside their schools. The three teachers saw how Finnish teachers allowed the students to be able to better utilize information sources outside a classroom. Trust and responsibility were an integral part of Finnish pedagogy (Delahunty, 2016). By allowing students’ collaboration to effectively take place, the students who had participated in the pilot project expressed their satisfaction in how they were trusted by the teachers. In addition, working among their peers extensively strengthened their soft skills.

Finally, although PLC varies in shape and form, there are some essential core values and practices (Bolam et al., 2005). The educators can learn from one another by establishing and sustaining working environment that promotes collaboration, communication and desire to the individuals and the groups, including the students. For BMA teachers, they do not perceive their roles in a classroom merely as a technician or a mechanic who speak on the subject matters based on the given texts. They like to invent effective learning environment and positive sharing atmosphere which they and the students can develop and mature (Pastuszak et al., 2011).

**Current and future plans to sustain PLC’s deployment**

One of the unexpected benefits from PLC for the students is the perceived reduction in school’s bullying. BMA schools have had some difficulties in dealing with cyber bullying life skills and soft skills, including the issues such as cyber bullying. This problem has also happened at Mattayom Suwitsrianusorn School. Cyber bullying happens through digital devices such as smart/cell phones, computers and tablets. This bullying often includes sending, posting or sharing
negative, harmful, hurtful, wrong content about someone else. It also involves sharing personal or private information about someone else causing embarrassment or humiliation [3]. Teenagers, from 12 to 16 years of age, are at risk, especially female students.

By having applied PLC for the students, more willingness to defend those who are bullied has become noticeable. Quite a few students who had previously been on the fence or felt indifferent became more engaged. The students who experienced some sort of bullying were relieved to have somebody to discuss. This can be attributed to more time to work together which leads to better communication and teamwork. Other forms of bullying include physical (e.g. hitting and kicking), verbal (e.g. spreading rumors and threatening).

Note that, the behavior relating to anti-bullying is viewed as a surrogate of PLC’s positive impacts on students’ learning and development. This assessment is still in a planning stage with the support from the school administrators and Office of the Commission of National Digital Economy and Society (under Ministry of Digital Economy and Society). Student bullying has been one of the most serious problems at Mattayom Suwitsierianusorn School. More recently, cyber bullying has surpassed physical and verbal abuse as the most serious form of bullying. Lack of soft skills, student engagement and sense of belongingness have been cited as the key contributors. This follow-up study helps evaluate the interrelationships between the PLC and students’ behavior and attitude during the digital transformation in the society.

To ensure the sustainability of PLC, there are two stages to be considered. Sustaining PLC’s deployment in the immediate term needs to focus on teachers. International recognition and activities are part of this initial sustainability effort. Due to BMA’s collaboration with Finland (there was the Memorandum of Understanding signed between BMA and City of Oulu/Oulu University), the Finnish Ambassador has invited teachers, including the three participants in the pilot project, to attend the events at the residence. In addition, the Finnish Embassy has provided a platform for the three teachers to demonstrate their PLC activities in the Annual Congress for Teacher Professional Development (so called EDUCA). Note that the Finnish Embassy has annually contributed to EDUCA’s program. This short-term sustainability has revolved around the teachers.
The longer-term PLC sustainability focuses on students. By tackling polluted water, they have been able to come with the ideas on environmental-friendly products such as dish detergents and soaps. Introducing the new ideas on product packaging (e.g., a new label with a student’s story about water pollution), accounting and development of customer profiles by the practitioners from Joint Foreign Chambers of Commerce in Thailand has sustained their enthusiasm and PLC participation. Financial incentives from the sale proceeds have been recognized as a force for PLC sustainability which results in a school as learning space for students.

Finally, the pilot case is based on the premise that PLC needs to be sustained by the participants—teachers and students. Therefore, the pilot case is experimenting a concept of a social enterprise. This concept allows the students to produce a set of products based on what they learn at schools and within the context of tackling polluted waterway. To investigate how to sustain the PLC for BMA schools, the pilot case is to work with other schools (in two Thai provinces—Chiang Rai and Kalasin). The extension allows the three teachers to explore the PLC for the second time by working with other teachers from different locations. The three BMA teachers will play the roles of a trainer for the teachers in these two provinces.
Conclusion

The case study outlines the progress and the impacts of PLC’s implementation at BMA schools. It describes and illustrates the incorporation of Design Thinking for the integrated lesson plan development. PLC represents pedagogical improvement and development which is needed for BMA schools (as well as the schools under the jurisdiction of Ministry of Interior) due to the limitation in complying with the centralized curriculum. The case study covers a group of three BMA teachers who have piloted the PLC and have gained national and international recognitions. These recognitions are based on the students’ impacts. The feedback from these three teachers is collected and analyzed to gain more understanding on PLC success. PLC together with Design Thinking can have positive impacts on workplace or school’s learning for and professional development of teachers and also for students’ skill development. Finally, the next phase of the case study to examine the sustainability of PLC is briefly explained.
References


Delahunty, D. (2016), “Education export in the Oulu region: possibilities and advancement” (No. 84), Finland: Council of Oulu Region, Oulu,


Table 1. Comparison of international achievement scores from Trends in International Mathematics and Science Study (TIMSS) (2011)

<table>
<thead>
<tr>
<th>School category</th>
<th>Mathematics</th>
<th>Science</th>
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</thead>
<tbody>
<tr>
<td>Teacher training schools (an affiliate with Faculty of Education)</td>
<td>554</td>
<td>552</td>
</tr>
<tr>
<td>Ministry of Education' schools (only public schools)</td>
<td>460</td>
<td>474</td>
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<tr>
<td>BMA schools</td>
<td>425</td>
<td>447</td>
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<tr>
<td>Local municipality schools</td>
<td>424</td>
<td>440</td>
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*Minutes of the Meeting prepared by BMA’s Department of Education

Figure 1. Design Thinking and extreme group
Plate 1. Typical BMA Schools’ surrounding environment

Plate 2. Front view of Mattayom Suwitserianusorn School and PLC’s demonstrations
Table 2. Important public recognition during 2015- early 2017 for BMA teachers

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>Sponsoring Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>“Honorable Mention” on Urban Renewal: Use of Recycle Materials from Home for Everyday Use</td>
<td>Department of Environment, BMA</td>
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<tr>
<td>2015</td>
<td>“Honorable Mention” on Innovative Ideas for Water Conservation in the Community</td>
<td>Provincial Waterworks Authority</td>
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<td>2015</td>
<td>“Runner Up” for Living Community and Schools</td>
<td>RICOH (Thailand)</td>
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<tr>
<td>2015</td>
<td>“National Runner Up” on Community Engagement Initiative for Tackling Water Pollution</td>
<td>Young Ambassador of Virtue Foundation and Thai Health Promotion Foundation</td>
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<tr>
<td>2015</td>
<td>“Winner” on ASEAN Eco School Award</td>
<td>ASEAN (Association of Southeast Asian Nations) Secretariat</td>
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<tr>
<td>2015</td>
<td>“Winner” on Water for Life-long Learning Award</td>
<td>Teachers’ Council of Thailand</td>
</tr>
<tr>
<td>2016</td>
<td>“National Runner Up” on My Little Farm: My Community- My-School-My-Backyard</td>
<td>Department of Agriculture under Ministry of Agriculture and Cooperatives and Kantana Group Public Company Limited</td>
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<tr>
<td>2016-2017</td>
<td>“Winner” on Love Water with Brothers and Sisters: Pollution Prevention and Water Treatment in Waterways surrounding School and Community</td>
<td>Utokapat Foundation under Royal Patronage of H.M. The King</td>
</tr>
<tr>
<td>2017</td>
<td>Teachers were selected to be the trainers for 200 participating schools in environment and ecology</td>
<td>Department of Environmental Quality Promotion under Ministry of Natural Resources and Environment</td>
</tr>
</tbody>
</table>
Plate 3. Students’ collaboration on experimental learning

Plate 4. Product development as part of PLC and Design Thinking