



Exploring teacher collaboration: What's inside the Malaysian PLC black box?

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Exploring teachers' collaboration: What's inside the Malaysia PLC black box?

Abstract

Purpose: The purpose of this study explores the Mathematics teachers' collaboration for professional learning in Malaysian secondary schools. This article focuses on how authentic professional learning among Mathematics teachers make positive lasting difference to learners.

Design/methodology/approach: The study use qualitative approach with case study design where the sample were three high performing secondary schools (fully residential) in Malaysia that have consistently performed in national exams. Data collection methods mainly from in-depth interviews with the Head of Mathematics Unit. For explication and triangulation purposes, focus group interviews with Mathematics teachers, focus group interviews with students and document analysis were also conducted.

Findings: The findings indicate that disciplined teacher collaboration is the main factor to engage teachers in changed professional practice for improved student learning. Moreover, the role of the Head of Unit as the facilitator is imperative not only in ensuring a focused and meaningful collaboration among the teachers but also in producing efficacious teachers to realize the school's vision.

Originality: The study informs about developing countries Professional Learning Communities (PLC) practices at secondary school level.

Paper Type: research paper

Keywords: professional learning communities; Malaysia; teacher collaboration; teachers' collective efficacy; improved student outcomes

Introduction

Continuous teacher development is seen as vital in improving the quality of instructions as to retain teachers with the most relevant knowledge that may unfold with time (OECD, 2017). Teachers must keep their pedagogical knowledge current with the changes and demands of the present and the future educational needs. Among the most critical aspects of teachers' professional development is the need to ensure that any learning channels that teachers go through must contribute to the their professional competence. The present information revolution means teachers have to prepare the students to meet the present and future challenges and this results in teachers having to generate innovative instructions in order to stay competitive in their dynamic classrooms. Teachers are subjected to creating meaningful teaching and learning environment in their classrooms and this clearly demands teachers to be competent and innovative at teaching. As schools struggle to increase student achievement, school leaders and teachers are continuously exploring ways to upgrade teachers' professional knowledge.

Literature review

Collaboration matters

Since mid 1980's, there have been many empirical based literature that discusses about the informal and formal learning opportunities that were set up by school leaders to build their teachers' capacity. Rosenholtz (1985) went into schools to study the working conditions of teachers and school practices that brought about effectiveness in schools' performance. Her findings on this study among others, have surfaced the impact of teacher isolation versus faculty collaboration, one area which later became a prominent fundamental of professional learning communities (PLC). This theme has sparked more researchers to dwell into the area. However, it was not until later that the idea of collaboration among teachers caught on the attention of mainstream educational researchers. In 1995, a decade later, DuFour and Eaker offered practical guidelines on effective teacher collaboration through their published handbook *Professional Learning Communities at Work: Best Practices for Enhancing Student Achievement*. In the handbook, DuFour and Eaker promote the know-what and know-how of actual doings that are most likely to be effective in improving student outcomes when applied in an actual school context. Ever since, there was a growing interest in understanding teacher collaboration as an effective means to build teachers' capacity in schools. Recently, more international evidences show that the effort in building teachers' collective capacity has become the new direction in developing teachers professionally (Timperly et al., 2007; Mourshed & Barber, 2007; Hargreaves & Shirley, 2009; Hattie, 2015 ; Harris & Jones, 2017).

Authentic Professional Learning Community (PLC)

Collegiality alone is not enough to promote growth and skills of the teachers (Vangrieken et al, 2015). Contemporary educational researchers show more concern as to how the concepts of professional learning communities (PLCs) are defined and operationalized as they firmly believe that random actions are futile attempts. The real potential of PLC in improving teachers' classroom instructions lies on the premise that the PLC members need to demonstrate the discipline to focus on the right work that improve student learning (Stoll et al, 2006; DuFour et al, 2006; Barber & Mourshed, 2007; DuFour, 2011; Pirtle & Tobia, 2014; Harris & Jones, 2017). At this juncture, many experts have offered some kind of structured approach that can be used as guide by teachers to turn their PLC into a powerful infrastructure that can transform their teaching practices to be more impactful. At its best, a PLC must feature: a) a leader that creates the conditions for effective learning among PLC members; b) a purposeful collaboration c) a collective focus on improving learner outcomes; d) use of data as a basis for enquiry into teachers' classroom instructions; and e) effective interventions that are adaptable to teachers' instructions as a means to improve student learning outcomes (Hord, 2015; DuFour & Reeves , 2016; Sharratt & Planche, 2016; Harris & Jones, 2017; Vangrieken et al, 2015; Bill & Melinda Gates Foundation, 2014).

The development of Professional Learning Community (PLC) in Malaysia

Since Barber and Mourshed (2007) bring to the spotlight that developing teachers is equally important to recruiting and retaining high quality teachers in ensuring high quality teaching, many education systems in countries like Singapore, China, Hong Kong and Malaysia are starting to give heed to the call. However, the concept of PLC has only recently touched the Malaysian shore. PLC in Malaysia has started in 2011 when Teacher Training Division in the Ministry of Education took the initiative to implement PLC in 289 low performing schools across Malaysia, namely 274 secondary schools and 15 primary schools from 14 State Education Department and 99 District Education Office (KIT PLC, Ministry of Education, 2019). In tandem with this, the Ministry of Education introduced a PLC module named *Modul Komuniti Pembelajaran Profesional* with aim to assist school leaders and teachers in implementing effective PLC in their schools (Ministry of Education, *Modul Komuniti Pembelajaran Profesional*, 2011). Based on the content of the module, it can be seen that it was developed based on the PLC ideas of DuFour et al (2006) and Kruse, Louis, and Bryk (1994) to translate the Ministry's aspirations in achieving the goals of the Malaysia Education Development Plan (2013-2025). The Malaysia Ministry of Education in its aspiration to transform Malaysian education system faster and more effectively, has came up with several provisional initiatives that are focused in the creation of peer-led culture of professional excellence in schools (Malaysia Education Blueprint 2013-2025). In addition, more emphasis is suggested to be given to school-based training as it is believed to be more effective as it is more grounded in classroom instructional practices (Malaysia Education Blueprint 2013-2025). In Table 1 is a list of findings related to some of the PLCs in Malaysian schools.

Table 1:

Researcher(s)/Methodology /Sample	Year	Main Findings
<ul style="list-style-type: none"> • Abdullah, Z. & Ghani, M.F.A. • Quantitative study • Samples: 676 respondents (including principals, school second line leaders and teachers) from 50 secondary schools in Malaysia. 	2014	<ul style="list-style-type: none"> • Schools in which PLCs were successful had principals who were effective as instructional leaders. • Schools were controlled by a centralized system. Hence, found it quite difficult to implement PLCs as directed by the ministry. Principals were challenged to make changes in order to implement PLCs according to their own contexts. They also played an important role in bridging these differences between schools and the ministry.
<ul style="list-style-type: none"> • Khairiah, A. • Mixed methods study • Samples: 218 respondents for questionnaire and 43 respondents (teachers and 	2016	<ul style="list-style-type: none"> • Identified the level of existence and importance of PLCs to be very high in all 6 residential secondary schools. • Teacher collaboration was influenced by principal leadership

teacher leader) from 6 residential secondary schools.

style particularly inspiring a shared vision, encouraging the heart, challenging the process, enabling others.

- Principals followed through the commitment and promises they made by developing and supporting teacher collaboration and teachers' decisions. However, principals had weak rapport with teachers while teachers also reported poor recognition from principals and that they were not appropriately awarded.

• Ismail, S. N. et al. 2018
 • Mixed methods study
 • Samples:
 50 respondents (Language teachers) from 42 schools in Selangor, Malaysia.

- PLCs practiced by Language teachers were found to be in high level. This indicated the teachers were active participants of their PLCs. Collaborative culture was identified as the catalyst for their PLCs.

• Chua, W. C. et al. 2020
 • Qualitative study
 • Samples:
 6 participants (including middle leaders and teachers) from a secondary school in Malaysia.

- Peer coaching was practiced
- between the senior and junior teachers.
- Daily interactions between teachers of same subjects and this indicated the sharing of their personal practices as a way of their professional learning.
- External expertise was engaged as one of their way of enhancing their professional learning.

• Khan, M. H., Razak, A. Z. A., & Kenayathulla, H. B. 2021
 • Quantitative study
 • Samples:
 72 respondents (teachers) from secondary schools in 4 states in Malaysia.

- PLC practices were related to trustful culture in the schools and good professional development among the teachers.

• Tiong, N. D. 2022
 • Qualitative study
 • Samples: 16 participants from 2 secondary schools.

- Teachers learned through collaborative discourse in the Malaysian context
- A variation to the practice of explicit reasoning
- Teachers used small stories and

- replays in their discourse,
- Discourses about external expectations may contribute to the epistemic order of teacher conversations
 - Teacher learning was in more unstructured collaborative settings.

In other Malaysian literature, researchers who conducted their studies on PLCs share the same urgency as their findings have documented that teachers who have engaged themselves in PLC process grow professionally from their experiences (Zuraidah & Muhammad Faizal, 2014; Aziah et al., 2014; Abdul Hafidz, 2015; Fazlina, 2015; Norashdimah, 2015; Siti Khadijah, 2015; Zuliana, 2015; Khairiah, 2016; Mohd Faiz & Jamal, 2016; Mohd Radzi, 2016). However, while there are evidences of PLC being implemented in Malaysian schools, the term PLC is viewed differently and subjected to different interpretations of the school stakeholders (Zuraidah & Muhammad Faizal, 2014; Aziah et al., 2014; Abdul Hafidz, 2015; Zuliana, 2015). The most common cause for this is poor understanding or limited knowledge of the PLC concept as reported by school leaders and teachers (Abdul Hafidz, 2015; Fazlina, 2015; Norashdimah, 2015; Siti Khadijah, 2015; Zuliana, 2015; Zabidi, Abdullah, & Sumintono, 2020).

Methodology

The aforementioned knowledge gaps on Malaysia PLC have been the basis for this study and this offers an opportunity to learn and develop more understanding on the area of focus. Hence, this study was conducted to bolster the understanding of how teachers' participation in PLC resulted in improved teacher practice and increased student learning outcomes. A qualitative approach was chosen as it is seen to be the most fitting approach to address this knowledge gap.

Context of the study

Three high performing secondary schools (fully residential) in Malaysia were purposively chosen as the context for this study as they were among the highly performing secondary schools (fully residential) based on the national public examination (Sijil Pelajaran Malaysia) conducted by the Malaysia Ministry of Education. This study was a small, exploratory empirical study with the purpose to explore the process and activities of teacher collaboration in improving student learning outcomes in the subject of Mathematics.

Sample and data collection

This study design was crucial as it created opportunities for the researchers to collect rich and in-depth data from multiple sources to better appreciate and understand the respondents' social processes and their experiences (Yin, 2014, p.5). The methods to collect data were a) in-depth interview with Head of Mathematics Unit; b) focus group discussion with the teachers; c) focus group discussion with the students. In-depth interviews and focus group discussions were conducted before the COVID-19

pandemic. Samples for this study (refer Table 2) were carefully determined through purposive sampling and theoretical sampling to ensure that data obtained were of optimal quality and sufficient to ensure efficient saturation of categories (Morse et al, 2002; Morse, 2010; Charmaz, 2006; Charmaz, 2008; Urquhart, 2019). Samples consisted of three Heads of Unit, ten teachers and seventeen students were selected based on the criteria: i) Head of Unit must have more than 3 years of experience heading the unit; ii) teachers must have more than 10 years of experience teaching Mathematics; and iii) students must be the students of the selected Mathematics teachers. This is to ensure coherence, transparency, impact and trustworthiness of the data collected (Robinson, 2014, p.1).

Table 2: Descriptive statistics of participants' demographics

Demographics	HoU in-depth interview	Teacher focus group	Student focus group
<i>Number of participants</i>	3	10	17
<i>Gender</i>			
Male	1	2	6
Female	2	8	11
<i>Age</i>			
16-17 years	-	-	17
36-45 years	1	8	-
46-60 years	2	2	-
<i>Tenure as teacher</i>			
12-20 years	-	8	-
21-33 years	-	2	-

Data analysis

The interviews and focus group discussions were transcribed and the data from the transcripts were analysed systematically with the use of ATLAS.ti 8. Data were collected and analyzed concurrently and constant comparative method was used as iterative process to explicate categories. Codes were assigned to fragments of data and sorted into categories. The coding quality used in this study from that identified by researchers. The codes were further developed that was assessed by three experts (raters) using the multi rater analysis with the Many Facet Rasch Model (MFRM) approach with inter rater reliability showed that there was not a big gap between observed or exact agreement (64.6%) and its expected value based on model (70%) (Mohd Zabidi, Sumintono, & Abdulah, 2022). This suggested a good level of agreement (Linacre, 2004; Boone, Staver, & Yale, 2014; Bond & Fox, 2015; Lunz & Stahl, 2017; Van Zile-Tamsen, 2017).

Furthermore, the iterative process of constant comparative analyses had generated 43 core categories. These core categories were aligned with the research questions and then clustered under the construct of practice, impact, support and contributing factors.

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3 These constructs were derived from the keywords in this study's research questions.
4 The repetitive process of coding explored what lies beneath the responses of the
5 participants and looked for their relationships among categories. In reflecting, more
6 contextual clarity was looked for to make sense of the interpretation of data and to
7 become more confident in following what emerges. The repetitive use of constant
8 comparison method was very instrumental in constructing detailed core categories and
9 facilitating in synthesizing description into conceptualization. The extensive coding
10 phases resulted in the emergence of seven major conceptual categories namely 1)
11 teacher collaboration, 2) responding to learning of individual student, 3) instructional
12 activities, 4) improved teacher collective efficacy, 5) improved student outcomes, 6)
13 key players in sustaining PLC, and 7) enabling factors.
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16 17 *Strategies to ensure rigor*

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19 Multiple strategies were used to increase the credibility and trustworthiness of this
20 qualitative study, as there is no one standard that is universally accepted to evaluate
21 qualitative research due to their diversity (Guba & Lincoln, 2005; O'Reilly & Parker,
22 2013; Noble & Smith, 2015). In attaining and maintaining its rigor, methodological
23 coherence was considered prior to data collection phase to ensure the most appropriate
24 methods to elicit response from participants. This was because methods chosen must
25 be congruent with the research questions as this qualitative study was not linear and
26 thus methods must be able to appropriately quantify the phenomenon under study
27 (Morse et al, 2002; Kolb, 2012).
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31 To further enhance the transparency of this study, the suggestion of parallel criteria of
32 trustworthiness (Lincoln and Guba, 1986) was used as guidelines to scrutinize the
33 trustworthiness of this study. The criteria are 1) credibility, 2) dependability, 3)
34 conformability, 4) transferability, and 5) authenticity (Lincoln & Guba, 1986; Guba &
35 Lincoln, 1994). In this study, credibility was established through triangulation of data
36 by using different sources and methods, member checks and development of audit
37 trails. That is to say, the researcher's constructivist knowledge on the studied
38 phenomenon was constituted from multiple perspectives from different target groups
39 studied in this study. The participants' perspectives were from the Heads of
40 Mathematics Unit, Additional Mathematics teachers and Additional Mathematics
41 students and further corroborated by document analysis. In this study, documents
42 served as guidance to understand context and conditions within the context and source
43 of evidences to past events. In addition, data from documents provided the
44 supplementary information that was used to generate more questions to the participants
45 in order to probe deeper into the participants' experiences. It was also important to note
46 that to improve relevance only official and most current documents were analyzed.
47 Besides that, selected transcripts were also returned to participants to check for
48 accuracy with their interviews.
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53 Moreover, the study's findings were shared with the selected participants of the study
54 and they were shown the PLC model built and this afforded them with the opportunity
55 to engage with the interpreted data. To a certain extent, this was used to demonstrate
56 confirmability and authenticity that the interpreted data and conclusions were
57 established based on their responses and coconstructed by the researcher. This
58 innovative member checking technique is referred to as Synthesized Member Checking
59 (Birt et al, 2016). This technique was also mentioned by Charmaz (2006) as a way not
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3 only to confirm findings but also to elaborate on categories. Lastly, dependability and
4 transferability of this study were demonstrated by providing criteria of the participants
5 and their sample size should similar inquiry to check for constancy of the findings is
6 intended in the future. For transferability, the findings were shared with teaching
7 professionals who were not involved in this study if they could associate their
8 experiences with the findings of this study.
9

10 11 **Findings**

12
13 In this particular study, the Double Loop Learning Theory (Agyris, 1976) and
14 Transformative Learning Theory (Mezirow,1978) were used as the underpinning
15 theoretical framework and the findings from this study have identified the features of
16 the structured professional learning as practised by the Mathematics teachers in
17 improving their student outcomes.
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21 Figure 1 shows a proposed model that is developed around the collected data to
22 represent the researchers' beliefs about how the Mathematics teachers' collaboration
23 during their professional learning would lead to their student positive outcomes. This
24 model conceptualizes increased student learning outcomes as a process that results from
25 improved teacher practice through their participation in PLCs. The fundamental activity
26 in teachers' PLCs is the reflective dialogues that they have which lead to their
27 variability in carrying out instruction to suit their strategy for interventions. From this
28 perspective, teachers have a responsibility to ensure that all their students learn and they
29 carry out timely intervention as an embedded instructional process. Teachers achieve
30 this through strategies of responding to individual student needs and varying their
31 instructional activities that occur during or outside class. In addition, there is
32 considerable significant roles that other adults within the school context play in
33 achieving the school's goals. The middle managers for instance, play fundamental role
34 in facilitating the teachers' PLCs as they are partly the departmental team and top
35 management team. They filter the demands of the top management while representing
36 the departmental needs. They see to the needs of the teachers and students in ensuring
37 the culture of teaching and learning is supported while they manage the curriculum and
38 monitoring of the teachers. This includes providing collaborative time for teachers to
39 sit together to implement their PLCs.
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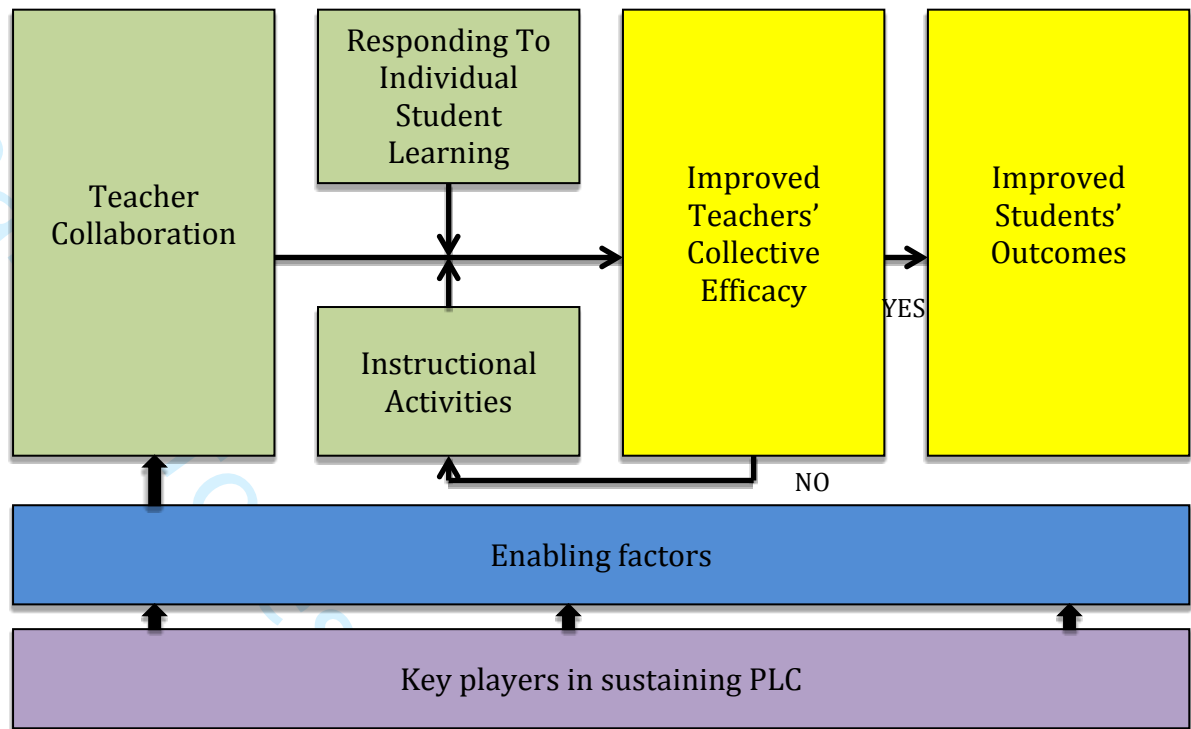


Figure 1: The Proposed Model of Professional Learning for Teachers of Mathematics for Improved Student Outcomes in High Performing Secondary Schools in Malaysia

Revealing the Malaysia PLC black box

Teacher collaboration

Data had identified the process of teachers collaborating among themselves in most of their instructional activities. Prominent activities such as sharing resources, disseminating knowledge, teacher learning, collaborating with external experts, teachers' assigned tasks, collectively identifying student learning focus, collectively administering student intervention strategies, and collectively measuring intervention were aplenty and highly noticeable among teachers in the data across all three schools.

One participant told, "*We even share lesson scheme among us for each topic so that everybody is at the same par. When we did this, we could actually identify which questions that most students could not answer. We would sit together and think about what are the mistakes in our instructions. .. From there teachers will share their teaching strategies.*" (Head of Unit 2)

Responding to individual student learning

It is revealed that students with different capacities struggled in different areas in Mathematics. Hence, teachers engaged in multiple strategies to deal with a range of students from highly performing students to low performing students. In-class and outside class intervention, progress tracking system, varying performance target, and

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3 varying frequency and duration of intervention were some of the multiple strategies in
4 overcoming the different needs of the students.
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7 *“In each class we divide the students into three groups. The highly performing students,*
8 *the average performing students and lastly the underperforming or weak students...we*
9 *recorded their exam score (diagnostic tests) and examined their basic knowledge.*
10 *Usually they went through UPSSI, UPSS 2, mid year exam etc. We used the raw data*
11 *from these tests to identify them. We can really keep track of their ongoing progress*
12 *through the intervention program.” (Head of Unit 1)*
13

14 15 *Instructional activities*

16
17 The teacher participants attested that they learned to become better at what they do
18 through their discourse about their instructional routines and that the activities were
19 purposely embedded into their instructions to ensure students achieve meaningful
20 learning. The activities were integrating marking scheme in teaching and learning,
21 applying differentiated instructions, communicating with struggling students,
22 monitoring student progress, checking prior knowledge, checking for understanding,
23 peer mentoring, and building student independence through these instructional
24 activities.
25

26
27 *“The methods may differ from a teacher to another teacher because it depends on the*
28 *performance of the students. For example, most students in my class perform on the*
29 *average for Maths, so my class teacher taught us methods that are the most easy for*
30 *most of us to understand. Unlike my friend here, most of her classmates excel at Maths.*
31 *So her teacher taught them different methods that are appropriate to their ability.*
32 *Teacher follows the pace of the students in the class.” (Student 1)*
33

34
35 *“We would work with them to the basics. We divided them into groups and then we*
36 *would give them questions based on the area of their problem and then we would ask*
37 *them to present their work and solutions to the whole class. From there we can see*
38 *what is their real area of problem. We would correct them on the spot so all students*
39 *could learn as well.” (Teacher 3)*
40

41 42 *Improved teachers' collective efficacy*

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44 The marked effects when teachers work collaboratively were teachers increased their
45 content knowledge, increased their pedagogical content knowledge, showed
46 willingness to learn, unlearn and relearn, reflected on their instruction process,
47 employed better instructional strategies, designed timely treatment more creatively,
48 manifested high confidence in delivering instructions, showed very high commitment
49 to making goals achievable, and improved teacher agency.
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52 *“... from a psychological point of view, when teachers work collaboratively as a*
53 *professional community, we can see teachers become more confident in teaching.*
54 *Before there was PLC, we always questioned ourselves if we were doing it right.”*
55 *(Teacher 5)*
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Improved students' outcomes

Findings show that, consequentially, improved teachers' collective efficacy affected their students' outcomes. Notable findings showed that students experienced increased content knowledge, positive disposition, took ownership of their own learning, made the expected grades, were confident in reflecting classroom instruction, and improved student agency.

"It is not so much to force the student to learn Maths but rather to develop braveness in students to approach the teachers. Soon after frequent meetings, the students feel comfortable learning with the teacher. It is more of a psychology thing. As a result, they became more willing to ask questions on their own and they take control of their own learning." (Teacher 3)

"...when I'm working on a question on my own and I am able to solve it, I feel very very happy because I outdo myself and beat my own expectation without copying my friend's work." (Student 6)

Enabling factors

The process of PLC in this study was facilitated or inhibited by several key enabling factors that contribute to the impact and sustainability of professional learning of teachers. Shared vision among school stakeholders, affective commitment, shared and extended leadership practice, collaborative time for teachers, empathetic environment, and positive reinforcement became the enabling factors when supported by the key players in the system.

"PLC activities had afforded us with a means to reflect deeply on our own practices as it became more systematic and more structured and hence more meaningful in supporting students' learning." (Teacher 6)

"...teachers trust students to participate as student mentors. And to me that is very effective." (Student 3)

Key players in sustaining PLC

Teacher participants reported that for students to be academically proficient, it is essential for the school to build a strong support for the teacher and the student instructional activities. Their PLCs were enabled or inhibited depending on the support they received from their Head of Unit, school top management, parents and alumni of the schools.

"Our Head of Unit is an effective liaison who facilitates a highly functional working relationship between the teachers and the school top management. His high level of understanding and empathy makes it easier for us to deliver our roles as teachers." (Teacher 7)

"...the alumni of the school also help fund the school's instructional activities. An instance would be them funding an educational retreat for low performing students." (Head of Unit 3)

Discussion and conclusion

Through this study, it was found that classroom for mathematics teaching must feature students' opportunity to learn by engaging struggling students and giving explicit attention to building procedural fluency from conceptual understanding (Hiebert & Grouws, 2007; National Council of Teachers of Mathematics, 2014; Herrelko, 2016). Moreover, opportunity to learn for all students must include considerations of students' entry knowledge that eventually resulted in differentiated instructions for different kinds of learning (Hiebert & Grouws, 2007). It was the teachers who played a pivotal role in the classrooms. Teachers came into class with full knowledge of their students' individual ability and therefore responded to the students' needs through tiered and various instructional activities. It was found that student participants who reported that they were willing to contribute, felt motivated, able to regulate and reflect on their own learning, were mostly high performing students. They displayed dispositions that enabled them to become students with agency. This aligns with research that noted "students who have agency in their learning are more motivated, experience greater satisfaction in their learning, and, consequently, are more likely to achieve academic success" (Lin-Siegler, Dweck, & Cohen 2016, p. 297).

Based on student participants' responses, we assessed that the strategies allowed teachers to give more attention to the low performing students in the class by providing them with more personalised learning experience, giving them immediate feedbacks while at the same time encouraged them to take ownership of their own learning. They also reported progress and improved self-confidence when personalised learning was made available to them. Buffum, Mattos, and Weber believed that schools could expect desirable outcomes when deliberate and timely supplemental support is afforded to students. Moreover, the articles of Deunk, Doolaard, Smalle-Jacobse, & Bosker (2015) and Slavin (1987) argued that both homogeneous and heterogeneous grouping within a class can have positive effects when teachers adapt their instructions and instructional materials to the needs of the grouping arrangements.

These specific instructional strategies required careful planning and deliberate actions. For the teacher participants in this study, time was of the essence because they believed that an effective response to intervention would be when struggling students received timely and appropriate treatment that would address their learning difficulty (Valiandes, 2015; Subban, 2006; Dixon et al., 2014). In addition, the process of planning and executing these instructional activities in classroom or outside of classrooms required a 'vehicle' that would nurture a dynamic learning context for the team members to work collaboratively. In return, this 'vehicle' demanded disciplined measures from the team for it to produce positive results. In fact, the vehicle was actually the central phenomenon of this study that many renowned educational scholars would define as professional learning community (Hord, 2015; Harris & Jones, 2017; DuFour & Reeves, 2016; Sharratt & Planche, 2016; Bill & Melinda Gates Foundation, 2014). Adding to this statement is Donohoo's (2018) argument that teacher collaboration is crucial for deeper implementation of school improvement strategies. Her study showed that teachers with high collective efficacy exhibited greater risk taking and more receptive to innovative improvement ideas. This shows their affective commitment to improve their students' outcomes through improving the quality of their own instructions. Findings in this study showed that when teachers brought their student data to their round table discussion and they unpacked and scrutinized the data

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3 through their animated discourse, it would give rise to two things; engagement and
4 empowerment.
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7 Our findings show that when teachers were collaboratively engaged in their learning,
8 their ability to produce their desired outcomes was more pronounced. This affirmed
9 that when teachers analyzed students' data and discussed interventions for struggling
10 students, teacher efficacy was fostered (Voelkel and Chrispeels, 2017; Herrelko, 2016)
11 as their interest and attention increased in a collaborative setting that promoted
12 professional discourse among teachers (Zuraidah & Muhammad Faizal, 2013;
13 Mugendawala & Muijs, 2020; Fullan, 2019; Hairon & Tan, 2017; Hargreaves & Fullan,
14 2012; Harris, Jones, & Huffman, 2017; Zhang & Pang, 2016). Thus, it certainly could
15 be said that teachers who discussed about what occurred inside their classrooms could
16 learn more on what could be done better to improve their instructions so as to support
17 their students' learning (Zuraidah & Muhammad Faizal, 2013; Mugendawala & Muijs,
18 2020; Fullan, 2019; Hairon & Tan, 2017; Hargreaves & Fullan, 2012; Harris, Jones, &
19 Huffman, 2017; Zhang & Pang, 2016). Therefore, it can be said that the teachers do
20 love teaching but more importantly, they facilitated their student learning.
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24 While this study disclosed that it was vital for teachers to have high sense of efficacy
25 to keep them motivated in producing meaningful learning in their students, it also
26 suggested that other school stakeholders had their own role to play in ensuring that the
27 learning of the teachers was sustained. A sophisticated form of networking that is well
28 designed and well supported by the school stakeholders must be in place for teacher
29 collaboration to produce positive changes in instructional practices that support student
30 learning and more importantly to further sustain this culture (Dogan & Adams, 2018;
31 Harris & Jones, 2017; Hord, 2015; Zuraidah & Muhammad Faizal, 2014; Bolam et al.,
32 2005). It was found that responsiveness to the enabling factors enhanced the growth in
33 the teachers' professionalism and increased the likelihood of meaningful learning in
34 students.
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37
38 Leithwood and Sun (2018) suggested that the time has come to move away from
39 describing the characteristics of successful leaders to illuminating how their roles create
40 impact to those around them. In 2019, Leithwood, Harris and Hopkins reaffirmed that
41 school leadership has positive influence on the quality of teaching and learning of a
42 school. In general, the findings from all three schools confirmed that when the
43 educational leaders shared the school vision with other school stakeholders, efforts that
44 were aligned with school vision were more likely to be supported by the school
45 community. It was evident that the school community had strong awareness in the value
46 of togetherness in embracing the school vision. This was manifested in the actions of
47 the school senior management when they not only supported instructional activities that
48 were planned and carried out by teachers, but they also, to a certain extent, relinquished
49 their control over making decisions on issues that were related to instructions. This was
50 a testament to shared leadership practices that was integral in sustaining effective PLC
51 and a healthy school climate. Head of Mathematics Unit participants and teacher
52 participants in this study attested to these efforts and recognized the strength that this
53 network had in creating a strong community that helped the school to grow and succeed
54 (Schaap and Bruijn; 2018; Leithwood, Harris and Hopkins, 2019). However, as a
55 qualitative study, there is a limitation of the findings, such as small sample and its
56 characteristics. The study findings are also indicative not definitive which trying to
57 illuminate the features of PLCs in Malaysia residential secondary schools context.
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Exploring teacher collaboration: What's inside the Malaysian PLC black box?

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Abstract

Purpose – The purpose of this study was to explore Mathematics teachers' collaboration within their professional learning communities (PLCs), and to gain insight on how the teachers developed their collective efficacy through it to focus on improving student learning.

Design/methodology/approach – Using a qualitative approach, data were collected from three high-performing secondary schools, mainly through semi-structured in-depth interviews with the Heads of Mathematics Unit. For explication and triangulation purposes, focus group interviews with the Mathematics teachers and students, and document analysis were also conducted.

Findings – The findings indicate that PLCs were the vessel through which a culture of disciplined teacher collaboration was fostered. More importantly, this culture encouraged teachers to participate in reflective dialogues that became a driver for their learning, and eventually led to their changed professional practice for improved student learning. The collaborative setting within the PLCs allowed teachers to pool their resources, knowledge, and individual expertise to identify their student learning focus, and administer and measure their student intervention strategies. This collaborative professional learning reduced professional isolation, and as a result, improved teachers' collective pursuit of professional growth to impact student outcomes.

Research limitations/implications – The aim of this qualitative study was to provide a detailed description of the teachers' collaboration within their PLCs based on the researchers' interpretation of how the participants make sense of their PLC practices and experiences. Hence, findings are indicative, and not definitive. In addition, the Heads of the Mathematics Unit, and the Mathematics teacher participants in this study illustrated salient aspects of subject subcultures, where their beliefs, norms, and practices were non-generic, or specific only to their subject context. Therefore, the implications to practice were built from commonalities shared only among the Mathematics Units.

Originality/value – This is a study in a Malaysian context that provides empirical evidences that are concerned primarily with the process of teachers developing their collective efficacy through the disciplined collaboration within their PLCs.

Keywords Professional learning communities; Malaysia; Teacher collaboration; Teachers' collective efficacy; Improved student outcomes

Paper type Research paper

Introduction

Continuous teacher development is seen as vital in improving the quality of instruction as teachers need to stay current and relevant with the times (Boeskens *et al.*, 2020). Recent studies have demonstrated that when teachers are consistently developing themselves, they tend to possess higher efficacy that can subsequently positively impact student achievement (Jensen and Bennett, 2016; Barrera-Pedemonte, 2016; Ainly and Carstens, 2018; Donohoo, 2018; Darling-Hammond *et al.*, 2017; Zuliana, 2021). Teachers must be prepared to keep current on their pedagogical knowledge to align with the changes and demands of present and future educational needs (Darling-Hammond and Oakes, 2021), and understand that “professional development is about teachers learning, learning how to learn, and transforming their knowledge into practice for the benefit of their students’ growth” (Avalos, 2011, p.10).

As schools struggle to improve student achievement, school leaders and teachers are continuously exploring ways to develop quality instruction. While traditional approaches to professional development, such as workshops and conferences, seem to enrich the teachers to a certain extent, the evidence for their effectiveness is often weak (Tan *et al.*, 2015). Nevertheless, research on reform efforts in education are demonstrating evidence that the focus of teacher professional development has shifted towards job-embedded professional development, namely, teacher collaborative learning within the school context (Hargreaves and O'Connor, 2017; Timperly *et al.*, 2007; Barber and Mourshed, 2007; Harris and Jones, 2017).

Literature review

Collaboration matters

Studies on teacher collaboration are not new. Rosenholtz (1985) studied the working conditions and practices of teachers in effective and less effective urban schools, and highlighted the differing patterns of staff norms. She identified that principals in effective schools played a pivotal role in orienting teachers to a unitary mission of achieving the clearly defined school goals. The teachers’ work setting also promoted collaborative activities that encouraged frequent task-focused interaction. She argued that, in effective schools, “teaching is a collective rather than an individual undertaking” (Rosenholtz, 1985, p.365). These findings led to teacher collaboration being increasingly recognized as an important attribute in the norms of continuous improvement. Even in Malaysia, a study by Ismail, Kanesan and Muhammad (2018) found that, compared to only having strategic school leaders, strong collaboration among teachers increases teaching quality.

However, collaboration alone is not enough to promote the growth and skills of the teachers. According to Vangrieken *et al.* (2015), the focus and depth of the collaboration can impact the teachers’ learning opportunities differently. This is also in line with Little’s (1990) suggestion that there is an array of teacher collaboration levels that goes from weak to strong, and as it moves through the continuum, demands increasing collective autonomy, and teacher-to-teacher initiatives. The underlying factor of this continuum is, the more time teachers spend to reflect and talk about their instructions, the more they will complement each other’s content and pedagogical knowledge. Research also suggested that teachers’ collaborative learning was more effective when it was embedded into their daily routines, and took place in their schools rather than one-shot workshops (DuFour, 2004; Fred *et al.*, 2020). Therefore, for

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3 teacher collaboration to be impactful, teachers must be frequently engaged in
4 professional discourse for them to build upon their unique content, pedagogical and
5 experiential knowledge to improve instruction (Goddard *et al.*, 2007), so much so that
6 the right environment for these practices to establish and grow has to be created within
7 the school context.
8
9

10 ***Authentic Professional Learning Communities (PLCs)***

11
12 Rosenholtz believed that “effective teachers are ‘made’ rather than ‘born’” (1985,
13 p.380). In addition, DuFour and Mattos (2013) proclaimed that the teacher collaborative
14 culture, and collective responsibility is the most powerful strategy for improving
15 instruction when fostered in a vessel known as the professional learning community
16 (PLC). Furthermore, the revelation in contemporary literature of an empirical link
17 between teacher collaboration within their PLCs, and overall school improvement
18 seems to validate these strong claims.
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21 However, there is no one definition of PLC that is agreed upon by all. DuFour
22 *et al.* (2016) defined PLC as “an ongoing process in which educators work
23 collaboratively in recurring cycles of collective inquiry and action research to achieve
24 better results for the students they serve” (p.10). As for Hord (2015), PLC is an
25 intentional way for educators to work together toward a shared purpose of improving
26 student learning. Similarly, Stoll *et al.* (2006) defined PLC as “an inclusive group of
27 people, motivated by a shared learning vision, who support and work with each other
28 to inquire on their practice, and together, learn new and better approaches to enhance
29 student learning” (p.230). Harris and Jones (2017) defined PLC as a disciplined
30 professional collaboration that deliberately ensures impact for improving student
31 learning outcomes.
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34 Conversely, putting forth a different view of PLCs, Fullan termed it as a
35 structure “to change the culture of school systems” that will eventually “change practice
36 on a large scale” (2007, p.11). Meanwhile, in the Malaysian context, there are evidences
37 of PLC being implemented in schools. However, the term PLC is viewed differently,
38 and subjected to the different interpretations of the school stakeholders (Zuraidah and
39 Muhammad Faizal, 2014; Abdul Hafidz, 2015). As reported by school leaders and
40 teachers, the most common cause for this is a poor understanding, or limited knowledge
41 of the concept (Abdul Hafidz, 2015; Fazlina, 2015; Norashdimah, 2015; Siti Khadijah,
42 2015; Zabidi, Abdullah, and Sumintono, 2020).
43

44
45 In principle, when a collaborative culture is clearly established, and the
46 foundation for productive discussion and debate is laid, it should give rise to new or
47 improved practices. Yet, many school systems have seen unsuccessful change, and
48 contemporary educational researchers are showing concerns about how the concept of
49 PLC is defined and operationalized (Dufour and Reeves, 2016; Hord, 1997). DuFour
50 (2007) argued that these groups of teachers failed as PLCs as they were doing random
51 actions that did not align with the concept. Poorly understood and implemented, many
52 PLCs turned out to be merely social groups that gave periodic advice, or an extra
53 activity (Harris and Jones, 2010) while others were really department meetings that
54 were supposedly “PLCs” (Dufour and Reeves, 2016).
55

56
57 Implicit in these shortcomings is the tenets of an effective PLC. The real
58 potential of PLCs in improving teachers’ classroom instruction rests on the premise that
59 the members need to demonstrate the discipline to focus on the right work that improves
60 student learning (Stoll *et al.*, 2006; DuFour *et al.*, 2016; Barber and Mourshed, 2007;
Pirtle and Tobia, 2014; Harris and Jones, 2017). Brodie (2021) argued that, for PLCs

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2
3 to be successful, members have to be engaged in long-term, systematic and rigorous
4 inquiry.

5 While evidence has shown this to be true, the PLC is not a one-size-fits-all
6 approach of professional development as it changes with the context. At this juncture,
7 many experts have offered some kind of structured approach that can be used as a guide
8 by teachers to turn their PLC into an authentic and powerful infrastructure that can
9 transform their teaching practices to become more impactful. At its best, a PLC must
10 feature a purposeful collaboration, a collective focus on improving learner outcomes, a
11 leader that creates the conditions for effective learning among PLC members, the use
12 of data as a basis for inquiry into the teachers' classroom instruction, and effective
13 interventions that are adaptable to classroom instruction as a means to improve student
14 learning outcomes (DuFour and Eaker, 1998; Hord, 2015; DuFour and Reeves, 2016;
15 Harris and Jones, 2017; Vangrieken *et al.*, 2015; Zuliana, 2021).
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19 ***The development of Professional Learning Communities (PLCs) in Malaysia***

20
21 Since Barber and Mourshed (2007) brought into the spotlight that, in ensuring high
22 quality teaching, developing teachers is equally as important as recruiting and retaining
23 high quality teachers, many education systems in countries like Singapore, China, Hong
24 Kong, and Malaysia have started to heed the call. However, the concept of PLC has
25 only recently touched the Malaysian shore. It started in 2011 when the Teacher Training
26 Division of the Ministry of Education took the initiative to implement PLCs in 289 low-
27 performing schools across the country, consisting of 274 secondary schools, and 15
28 primary schools, involving 14 State Education Departments, and 99 District Education
29 Offices (Ministry of Education, *KIT PLC*, 2019).
30
31

32 In tandem with this, the Ministry of Education introduced a PLC module named
33 *Modul Komuniti Pembelajaran Profesional* with the aim of assisting school leaders and
34 teachers in implementing effective PLCs in their schools (Ministry of Education, *Modul*
35 *Komuniti Pembelajaran Profesional*, 2011). Based on the content of the module, it was
36 largely developed based on the PLC ideas of DuFour *et al.* (2006), and Kruse, Louis,
37 and Bryk (1995). The module translates the Ministry's aspiration of achieving the goals
38 of the Malaysia Education Development Plan (2013-2025) faster and more effectively.
39 Several provisional initiatives that are focused on the creation of a peer-led culture of
40 professional excellence in schools were planned for, and executed to transform the
41 Malaysian education system. In addition, more emphasis is suggested to be given to
42 school-based training as it is believed to be more effective, being more grounded in
43 classroom instructional practices (Ministry of Education, Malaysia Education Blueprint
44 2013-2025).
45
46

47 The literature was screened to find evidence that showed collaborativeness
48 through PLCs was present in Malaysian schools. In a survey on 676 respondents,
49 including principals, school second-line leaders, and teachers from 50 secondary
50 schools in Malaysia, Zuraidah and Muhammad Faizal (2014) found that schools in
51 which PLCs were successful had principals who were effective as instructional leaders.
52 These principals were found to anchor the collaborative works of their teachers, and
53 played an important role in bridging the differences between the needs of the school,
54 and the directives of the ministry. A mixed-methods study by Khairiah (2016) identified
55 the level of existence and importance of PLCs as very high in six residential secondary
56 schools. She argued that teacher collaboration was influenced by the principals'
57 leadership styles, particularly in inspiring a shared vision, encouraging the heart,
58 challenging the process, and enabling others. In addition, the principals followed
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3 through on the commitment and promises they made by developing and supporting
4 teacher collaboration, and their decisions. However, it was noted that principals had a
5 weak rapport with the teachers while teachers also reported that they were neither
6 appropriately recognized nor awarded by the principals.
7

8 Another mixed-methods study by Ismail *et al.* (2018) on 50 language teacher
9 respondents from 42 schools in a state in Malaysia indicated that teachers were active
10 participants of their PLCs, with the collaborative culture identified as the catalyst for
11 this. Besides that, in 2020, a qualitative study with six middle leader and teacher
12 participants from a secondary school in Malaysia by Chua *et al.* (2020) found that peer
13 coaching was practiced between the senior and junior teachers, and there were daily
14 interactions among teachers of the same subjects. They argued that these practices
15 indicated some of the ways for teachers' professional learning. They also affirmed that
16 external expertise was engaged to enhance the teachers' professional learning.
17

18 A more recent qualitative study by Tiong (2022) found that teacher learning in
19 PLCs was more in unstructured collaborative settings. 16 teacher participants from two
20 secondary schools reported that they learned through collaborative discourse, and
21 mostly through small stories, and replays. Further examination on findings from other
22 Malaysian researchers on PLCs have found that teachers who engaged themselves in
23 PLC collaborative activities reported that their experience resulted in professional
24 growth (Zuraidah and Muhammad Faizal, 2014; Abdul Hafidz, 2015; Fazlina, 2015;
25 Norashdimah, 2015; Siti Khadijah, 2015; Zuliana, 2015; Khairiah, 2016).
26
27

28 ***Outcome of collaborative culture within Professional Learning Community for*** 29 ***teachers and students*** 30 31

32 Vescio *et al.* (2008) reviewed 11 studies on the impact of PLCs on teaching practice
33 and student learning, and highlighted that eight of the studies noted that student learning
34 had improved. Brown *et al.* (2018) suggested that "positive school reform occurs when
35 teachers participate in authentic PLCs, with improved student achievement as a by-
36 product" (p.53). Schaap and Bruijn (2018) also argued that when teachers work
37 together, they develop collective ownership. They also believed that committed and
38 motivated teachers in PLCs display strong positive attitudes, and align their behaviors
39 towards achieving PLC goals. Other research demonstrated that when teachers
40 willingly learned to connect, engage, and inquire about their teaching practices in order
41 to serve a common purpose, their collective efficacy was elevated (DuFour *et al.*, 2016;
42 Donohoo, 2018; Harris and Jones, 2017).
43
44

45 Similar findings by Herrelko (2016), and Voelkel and Chrispeels (2017)
46 affirmed that teacher collective efficacy was fostered when teachers analyzed students'
47 data, and discussed interventions for struggling students. Furthermore, Donohoo (2018)
48 argued that teacher collaboration is crucial for a deeper implementation of school
49 improvement strategies. Her study showed that teachers with high collective efficacy
50 exhibited greater risk taking, and were more receptive to innovative improvement ideas.
51 This shows their affective commitment to improve their students' outcomes through
52 improving the quality of their own instruction.
53

54 In more advanced and sustained PLCs, school leaders entrusted teachers to
55 make instructional decisions, and when the teachers were enlisted into the leadership
56 of the school, they developed "the capacity to act purposefully and constructively to
57 direct their professional growth and contribute to the growth of their colleagues"
58 Calvert, 2016, p.52). This is when teachers who are active in professional learning
59 achieve the state known as teacher agency.
60

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3 A strong link between school leadership and the teacher learning environment
4 was determined in a study with 495 experienced teachers in 48 Flemish (Belgian)
5 primary schools, which suggested that the facilitating role of school leaders cannot be
6 underestimated (Vanblaere and Devos, 2016). Moreover, the strong influence school
7 leaders have in setting the directions of the school, and developing people to support
8 its goals is imperative in fostering a school climate in which PLCs thrive as effective
9 and sustainable (Leithwood *et al.*, 2019; Dogan and Adams, 2018; Harris and Jones,
10 2017; Hord, 2015).
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12

13 **Methodology**

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16 The move by the Malaysian Ministry of Education to cultivate a peer-led culture of
17 professional excellence sends a strong message that there is increasing importance of
18 PLCs in the education system. This is also signified by the growing number of PLC
19 research in Malaysian literature. The impetus for this study came after examining
20 findings from a study by Khairiah (2016) on PLCs in high-performing secondary
21 schools. Her study revealed that PLCs were seemingly evident in the six high-
22 performing fully residential schools, and that the level of collaborative learning among
23 the teachers was very high.
24

25 Despite these promising evidences, detailed and specific information on the
26 practices of the teachers who participated in the PLCs were not provided, resulting in a
27 'black box' on the PLC process. There was no unpacking of the process that explained
28 how it unfolded from teacher collaboration in the PLCs to their outcomes. There was
29 also no explanation on how the PLCs succeeded from the point of view of the students,
30 or other school stakeholders as the study did not take their perspectives on its
31 implementation into account. Besides that, the study was limited only to the roles of
32 the teachers and principals at surface level, and data were collected only through open-
33 ended surveys. A discussion focusing on the impact of PLC on the teachers, or student
34 achievement was also absent from the study.
35

36 Hence, with the PLC black box in mind, this study was undertaken to explore
37 and address the questions on the characteristics of PLCs in the schools, the key factors
38 that enable or inhibit the sustaining of the PLCs, and how teachers' participation in
39 PLCs resulted in improved teacher practice, and student learning outcomes. A
40 qualitative approach was chosen as it is seen to be the most fitting approach to address
41 this knowledge gap.
42
43

44 **Context of the study**

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46 Three secondary schools in Malaysia were purposively chosen as the context for this
47 study as they were among the top-performing fully residential schools based on the
48 national public examination (Sijil Pelajaran Malaysia) conducted by the Malaysian
49 Ministry of Education. This study was a small, exploratory empirical study with the
50 purpose of exploring the impact of the process and activities of teacher collaboration
51 within PLCs on improving student learning outcomes, particularly in the subject of
52 Mathematics.
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Sample and data collection

The qualitative approach was crucial as it created opportunities for the researchers to collect rich and in-depth data from multiple sources to better appreciate and understand the respondents' social processes, and their experiences (Yin, 2014). The methods of collecting the data were a) in-depth interviews with the Heads of the Mathematics Unit; b) focus group discussions with the teachers; and c) focus group discussions with the students. The in-depth interviews, and focus group discussions were conducted before the COVID-19 pandemic. Samples for this study (refer Table 1) were carefully determined through purposive sampling, and theoretical sampling to ensure that data obtained were of optimal quality, and sufficient to ensure efficient saturation of the categories (Morse *et al.*, 2002; Morse, 2010; Charmaz, 2006; Charmaz, 2008; Urquhart, 2019). The samples, consisting of three Heads of Unit, 10 teachers, and 17 students, were selected based on the following criteria: i) the Head of Unit must have more than three years of experience heading the unit; ii) teachers must have more than 10 years of experience teaching Mathematics; and iii) students must be the students of the selected Mathematics teachers. This is to ensure the coherence, transparency, impact, and trustworthiness of the data collected (Robinson, 2014).

Table 1: Descriptive statistics of participants' demographics

Demographics	HoU in-depth interview	Teacher focus group	Student focus group
<i>Number of participants</i>	3	10	17
<i>Gender</i>			
Male	1	2	6
Female	2	8	11
<i>Age</i>			
16-17 years	-	-	17
36-45 years	1	8	-
46-60 years	2	2	-
<i>Tenure as teacher</i>			
12-20 years	-	8	-
21-33 years	-	2	-

Data analysis

The interviews and focus group discussions were transcribed, and the data from the transcripts were analyzed systematically with the use of ATLAS.ti 8. Data were collected and analyzed concurrently, and the constant comparative method was used as an iterative process to explicate categories. Codes were assigned to fragments of data, and sorted into categories. The coding quality used in this study was identified by the researchers. The codes were further developed, and subsequently assessed by three experts (raters) using multi-rater analysis with the Many Facet Rasch Model (MFRM) approach, with inter-rater reliability showing that there was not a big gap between

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2
3 observed or exact agreement (64.6%), and its expected value based on the model (70%)
4 (Mohd Zabidi, Sumintono, and Abdulah, 2022). This suggested a good level of
5 agreement (Linacre, 2004; Boone, Staver, and Yale, 2014; Bond and Fox, 2015; Lunz
6 and Stahl, 2017; Van Zile-Tamsen, 2017).

7
8 Furthermore, the iterative process of constant comparative analyses had
9 generated 43 core categories. These core categories were aligned with the research
10 questions, and then clustered under the constructs of practice, impact, support, and
11 contributing factors. These constructs were derived from the keywords in this study's
12 research questions. The repetitive process of coding explored what lay beneath the
13 responses of the participants, and looked for their relationships among categories. In
14 reflecting, more contextual clarity was sought to make sense of the interpretation of the
15 data, and to gain confidence in following what emerged. The repetition of the constant
16 comparison method was instrumental in constructing detailed core categories, and
17 facilitating synthesizing the descriptions into conceptualization. The extensive coding
18 phases resulted in the emergence of seven major conceptual categories, namely 1)
19 teacher collaboration, 2) responding to learning of individual student, 3) instructional
20 activities, 4) improved collective teacher efficacy, 5) improved student outcomes, 6)
21 enabling and inhibiting factors, and 7) key players in sustaining PLC.
22
23

24 25 *Strategies to ensure rigor*

26
27 Multiple strategies were used to increase the credibility and trustworthiness of this
28 qualitative study, as there is no one standard that is universally accepted to evaluate
29 qualitative research due to their diversity (Guba and Lincoln, 2005; O'Reilly and
30 Parker, 2013; Noble and Smith, 2015). In attaining and maintaining its rigor,
31 methodological coherence was considered prior to the data collection phase to ensure
32 the most appropriate methods were used to elicit responses from the participants. This
33 was because the methods chosen must be congruent with the research questions as this
34 qualitative study was not linear, and thus, methods must be able to appropriately
35 quantify the phenomenon under study (Morse *et al.*, 2002; Kolb, 2012).
36
37

38 To further enhance the transparency of this study, the suggestion of parallel
39 criteria of trustworthiness (Lincoln and Guba, 1986) was used as a guideline for this
40 study. The criteria were: 1) credibility, 2) dependability, 3) confirmability, 4)
41 transferability, and 5) authenticity (Lincoln and Guba, 1986; Guba and Lincoln, 1994).
42 In this study, credibility was established through triangulation of data by using different
43 sources and methods, member checks, and development of audit trails. That is to say,
44 the researchers' constructivist knowledge on the studied phenomenon was constituted
45 from multiple perspectives from the different target groups in this study. These
46 perspectives were from the Heads of Mathematics Unit, Additional Mathematics
47 teachers, and Additional Mathematics students, which were further corroborated by
48 document analysis.
49

50
51 In this study, the documents served as a guide to understand the context, and
52 the conditions within that context, and were also a source of evidence of past events. In
53 addition, the data from documents provided supplementary information that was used
54 to generate more questions for the participants in order to probe deeper into their
55 experiences. It was also important to note that, because of their relevance, only the most
56 current official documents were analyzed. Besides that, selected interview transcripts
57 were also returned to participants to check for accuracy.
58

59 Moreover, the study's findings were shared with selected participants of the
60 study, where they were shown the PLC model built, and this afforded them with the

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3 opportunity to engage with the interpreted data. To a certain extent, this was done for
4 confirmability and authenticity, with the interpreted data and conclusions that were co-
5 constructed by the researcher established based on the participants' responses. This
6 innovative technique is referred to as Synthesized Member Checking (Birt *et al.*, 2016).
7 This technique was also mentioned by Charmaz (2006) as a way to not only confirm
8 findings, but also to elaborate on the categories. Lastly, the dependability and
9 transferability of this study were demonstrated by providing the criteria of the
10 participants, and their sample size to ensure constancy of the findings for future similar
11 inquiries. For transferability, the findings were shared with teaching professionals who
12 were not involved in this study to determine if they could associate their experiences
13 with the study's findings.
14
15

16 Findings

17 *Revealing the Malaysia PLC black box*

18
19
20 Seven essential categories of effective PLC were derived from the data analysis phase.
21 All categories were crucial to the understanding of the process, and outcomes of the
22 PLCs of the Mathematics teachers in the schools visited. The categories are as follows:
23
24
25

- 26 1) teacher collaboration;
- 27 2) responding to individual student learning;
- 28 3) instructional activities;
- 29 4) improved collective teacher efficacy;
- 30 5) improved student outcomes;
- 31 6) enabling and inhibiting factors; and
- 32 7) key players in sustaining PLC.
33
34

35 *Teacher collaboration*

36
37 Across three schools, the teacher collaboration within their PLCs was viewed as the
38 process of learning and working together. In one of the schools, the PLC was mandated
39 while in the other two schools, it was voluntary. Despite this, the teachers participated
40 actively by choice, and were guided by reciprocal commitment. Activities such as
41 sharing of resources, and reflective dialogues were clearly and repeatedly mentioned in
42 their accounts. This strong form of collaboration entailed joint works among the
43 teachers. Together, they identified their student learning focus, discussed interventions,
44 and assigned relevant tasks. They also deliberately administered and measured their
45 student intervention strategies.
46
47
48

49 One participant told, "*We even share lesson scheme among us for each topic so that*
50 *everybody is at the same par. When we did this, we could actually identify which*
51 *questions that most students could not answer. We would sit together and think about*
52 *what are the mistakes in our instructions... From there, teachers will share their*
53 *teaching strategies.*" (Head of Unit 2)
54
55

56 In addition, they also collaborated with external expert teachers from other schools in
57 the district or state, thus expanding their learning opportunities through these
58 educational networks.
59
60

Responding to individual student learning

Findings revealed that the teachers were effective as they were capable of intervening early based on the individual student's response to learning. As students with different capacities struggle in different areas of Mathematics, in the classrooms, the teachers paid attention to the signs of struggling students, and increased one-on-one interaction with them. Teachers engaged in multiple strategies to deal with a range of students, from high-performing students to low performing ones. They consistently tracked their students' progress, and designed in-class and outside-class interventions to meet the different needs of the students. Using student data, teachers applied differentiated instruction that were varied in terms of the performance target, and the frequency and duration of intervention.

“In each class we divide the students into three groups. The highly-performing students, the average-performing students, and lastly the underperforming or weak students...we recorded their exam score (diagnostic tests), and examined their basic knowledge. Usually they went through UPSS 1, UPSS 2, mid-year exam, etc. We used the raw data from these tests to identify them. We can really keep track of their ongoing progress through the intervention program.” (Head of Unit 1)

Instructional activities

The teachers reported that, as much as possible, they tailored their instructions to meet student needs, and discussed these instructional needs during their professional discourse. They attested to the fact that, in a mixed-ability classroom, process differentiation, or student grouping helped them to ensure that all students achieved meaningful learning as the instructional activities became more focused. These instructional activities in the classrooms included applying differentiated instruction, communicating with struggling students, checking students' prior knowledge and understanding, monitoring student progress, encouraging peer mentoring between student groups, and building student independence in learning.

“The methods may differ from a teacher to another teacher because it depends on the performance of the students. For example, most students in my class perform on the average for Maths, so my class teacher taught us methods that are the most easy for most of us to understand. Unlike my friend here, most of her classmates excel at Maths. So her teacher taught them different methods that are appropriate to their ability. Teacher follows the pace of the students in the class.” (Student 1)

“We would work with them on the basics. We divided them into groups, and then we would give them questions based on the area of their problem, and then we would ask them to present their work and solutions to the whole class. From there, we can see what is their real area of problem. We would correct them on the spot so all students could learn as well.” (Teacher 3)

Improved collective teacher efficacy

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3 Another finding in this study indicated how teachers working collaboratively within
4 their PLCs improved their collective efficacy. Teachers reported that they were more
5 receptive to reflective dialogue in the PLCs when they saw the potential value of their
6 community learning. This value induced their willingness to learn, unlearn, and relearn,
7 and be more open during these reflections. Many teachers also noticed that, as they
8 reflected on their instruction, they were able to design better strategies, and timely
9 treatments for their students. In doing so, they experienced increased content
10 knowledge, and pedagogical content knowledge. Most of them also claimed that they
11 were more confident in delivering their instruction, and that their commitment to
12 achieving their goals increased.
13
14

15
16 *“...from a psychological point of view, when teachers work collaboratively as a*
17 *professional community, we can see teachers become more confident in teaching.*
18 *Before there was PLC, we always questioned ourselves if we were doing it right.”*
19 (Teacher 5)
20

21 Some teachers even expressed that they have control of their own learning, and became
22 more reflexive about their instruction. They also determined their own learning and
23 teaching strategies beyond what was required by the school leaders.
24
25

26 *Improved student outcomes*

27

28 In this study, it was found that the teachers, who reflected on their practices and were
29 critical of them, encouraged full participation of their students in classrooms. They also
30 showed greater effort and persistence, which resulted in the high expectations of their
31 students.
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33

34 *“It is not so much to force the student to learn Maths, but rather to develop braveness*
35 *in students to approach the teachers. Soon after frequent meetings, the students feel*
36 *comfortable learning with the teacher. It is more of a psychology thing. As a result,*
37 *they became more willing to ask question on their own, and they take control of their*
38 *own learning.”* (Teacher 3)
39
40

41 Notably, consistent with these findings was the students' self-report of improved
42 outcomes. Student participants reported that, when their teachers were persistent, they
43 became more academically engaged, and developed positive learning dispositions.
44 Students reported that they were given opportunities to be more responsible for their
45 own learning, and in turn, improved their content knowledge in Mathematics. They
46 added that the communicative instructional activities between them and the teachers
47 have had a substantial impact on their learning outcomes. Many said that they became
48 more confident in reflecting upon the classroom instruction, and eventually made the
49 expected grades. A student recounted this sense of achievement:
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51

52
53 *“...when I'm working on question on my own, and I am able to solve it, I feel very very*
54 *happy because I outdo myself, and beat my own expectation without copying my*
55 *friend's work.”* (Student 6)
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Enabling and inhibiting factors

Having competent teachers alone would not make for effective PLCs in schools. In this study, teachers reported that, for their PLCs to be developed and sustained, there should be inter-connecting strands that underpinned their PLCs. They explained that, while a clear school vision was important, the school leaders must include all the stakeholders, and internalize the vision collectively because a shared vision was the catalyst for the growth of the school. They also expressed the need for shared and extended leadership practice especially in being entrusted with the power to make instructional decisions. In one of the schools, the teachers said:

“...the principal had empowered key personnel to discharge certain principal’s tasks while he was on leave” (Teacher 10), and also *“...we were able to conduct a meeting on school’s goals even without the attendance of the principal.”* (Teacher 8)

Fostering meaningful teacher collaboration required the principals to designate a weekly common time for teachers to sit together, and be engaged in their PLCs. Except for teachers in the school where PLC was mandated, the others lamented on the lack of allocated collaborative time for them to have their PLC. These different approaches were decided on by the school administration. Teachers who were provided with a scheduled time described their collaborative learning to be less stressful as they were more prepared with data, and less distracted by other tasks. Meanwhile, teachers from the other two schools reported that they struggled to find a common time among them as they were pressured to meet other work demands. One teacher expressed her dismay over this issue when she said:

“...late last year, the management sat together to schedule all the school programs for this year. We did ask for allocated time for teachers to sit together to discuss their teaching and learning, but somehow they did not manage to find time for that among the packed activities.” (Head of Unit 1)

Nonetheless, their reciprocal sense of responsibility urged them to find time to sit together, and hold their professional discourse. In fact, their affective commitment was so evident as one teacher, and one student participant explained:

“...there is an official intervention program for all students fixed by the management, and there is stream-based intervention initiated by our own department. We would have intervention sessions in the afternoon, or even at night. Even on weekends.” (Teacher 5)

“...teachers came to teach night classes to help students to prepare for their examination.”(Student 16)

Positive reinforcement may act as a powerful strategy to promote the necessary behavior to improve teacher and student learning. In all three schools, high-performing students were given extrinsic rewards. Their achievement was recognized, and they were elected as Mathematics student mentors to their friends. These students felt honored by this appointment though, in order to be appointed and remain as a mentor, they had to consistently maintain their outstanding performance in Mathematics.

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3 Nevertheless, they were also happy to assist their friends, and even learned together.
4 The student participants explained:

5
6
7 *"I am a Guru Muda [student mentor]. For me, when I teach other students, I can*
8 *actually understand better what is being shared. So I think this appointment not only*
9 *benefit other students, but more importantly improve myself. The results show our*
10 *improvement."* (Student 2)

11
12
13 *"...teachers trust students to participate as student mentors. And to me, that is very*
14 *effective."* (Student 3)

15
16 Another example of reinforcement was monetary reward as motivation, and recognition
17 of the effort that the students had invested in improving themselves.

18
19 *"...we even awarded these students monetarily when they showed progress from time*
20 *to time."* (Teacher 2)

21
22
23 One teacher explicitly stated his frustration with teachers not being reinforced
24 accordingly by the school administration due to, particularly, the principal's poor usage
25 of reinforcement. He explained:

26
27 *"...she went to compete using her self-initiated raised fund... her winnings were*
28 *highlighted by the school. I personally think that teacher should be given some benefits*
29 *if not in monetary form."* (Teacher 4)

30
31
32 Together, these findings add further emphasis on the need for schools to build an
33 empathetic environment for students and teachers alike. One student participant
34 explained that the teacher would praise students who were brave enough to ask
35 questions during class. According to her, this had prompted the students to actively ask
36 questions when they did not understand. She said:

37
38
39 *"...it acts like a catalyst for them... it encourages us to learn more rather than*
40 *demotivating us for not knowing", and added that "...the teacher did not demotivate or*
41 *pick on these students [low-performing students who attended intervention sessions*
42 *outside class] when we were in class. Or even overly praised the excellent students."*
43 (Student 1)

44 45 46 *Key players in sustaining PLCs*

47
48 Teacher participants reported that for the students to be academically proficient, it is
49 essential for the school to build strong support for teachers, and student instructional
50 activities. Their PLCs were enabled or inhibited depending on the support they received
51 from the Head of Unit, top management, parents, and alumni.

52
53
54 *"Our Head of Unit is an effective liaison who facilitates a highly functional working*
55 *relationship between the teachers and the school top management. His high level of*
56 *understanding and empathy makes it easier for us to deliver our roles as teachers."*
57 (Teacher 7)

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3 “...the alumni of the school also help funded the school’s instructional activities. An
4 instance would be them funding an educational retreat for low-performing students.”
5 (Head of Unit 3)
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9 **Discussion and conclusion**

10
11 Findings from this study have presented the big picture of the collaboration of
12 Mathematics teachers within their PLCs. More specifically, the findings provide
13 invaluable data that help PLC researchers to figure out what happens, at least, in a
14 Malaysian context. The findings in each category are vital as they help researchers to
15 piece together the practices in PLCs that lead to the outcomes. All things considered,
16 findings from this study indicate that there is strong teacher collaborativeness within
17 the respective PLCs in the three high-performing fully residential secondary schools in
18 Malaysia.
19

20
21 It is implicitly known, through the interactions with the teachers, that most of
22 them acquired their knowledge and skill sets from the learning opportunities that occur
23 within their PLCs. Their reflective dialogues revolve around what occurs inside their
24 classrooms, and what can be done differently to improve their instruction. Using student
25 data, they unpack and scrutinize the data before they discuss approaches to teaching. In
26 doing so, the teachers learn from each other on how to work with students, and to design
27 timely interventions, in particular, for low-performing students. As they continually
28 learn from each other, they not only deepen their knowledge, but also keep perfecting
29 their practices. These collaborative learning activities build their capacity collectively,
30 and this is imperative as their ability to produce their desired outcomes is more
31 pronounced (Voelkel and Chrispeels, 2017). In addition, when they inquire into their
32 own practices, and evaluate their school improvement strategies, they are showing
33 greater risk taking. This is an indicator of teachers with high collective efficacy
34 (Donohoo, 2018).
35

36
37 The opportunity for students to learn must include considerations of their entry
38 knowledge (Hiebert and Grouws, 2007), and these teachers clearly considered this in
39 the planning and delivery of their instruction. The complexity of having mixed-ability
40 students in one class surely requires a teacher with high capability and efficacy. Hodges
41 (2018) states that, “Engaged students are 2.5 times more likely to say that they get
42 excellent grades and do well in school, and they are 4.5 times more likely to be hopeful
43 about the future than their actively disengaged peers.” Therefore, effective use of such
44 strategies was seen in their instructional activities to boost students’ engagement during
45 instruction. The teachers always started their lesson with assessing students’ prior
46 knowledge on the topic, and checking for their understanding from time to time
47 throughout the lesson. The immediacy of the teacher’s response was also a deciding
48 factor for student attentiveness. In this study, there were many evidences that showed
49 that the teachers were aware of the importance of student engagement in class, and
50 promoted it. This could be seen when teachers embedded interactions into the lesson,
51 or communicated with struggling students, or even when they applied differentiated
52 instructions to actively engage with all students.
53

54
55 The appointment of high-performing students as subject mentors also promoted
56 connectedness among students. As a result, these high-performing students had a
57 positive outlook on the school when their excellence in the subject is recognized. It
58 encouraged them to willingly contribute to peer mentoring, and enabled them to
59 regulate their own learning. This aligns with Lin-Siegler *et al.*’s research that notes that
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3 “students who have agency in their learning are more motivated, experience greater
4 satisfaction in their learning, and consequently, are more likely to achieve academic
5 success” (2016, p.297). Student engagement impacts more than just their academic
6 behavior. Good student-teacher relations create a positive culture in students as well
7 (Willms, 2003). Accounts from low-performing students affirmed that they benefited
8 from differentiated instruction, and the interactions with their teachers. Personalized
9 learning encouraged them to slowly take ownership of their own learning, and it
10 consequently improved their self-confidence when they eventually made the grades.

11
12 This study revealed the significant roles played by other school stakeholders,
13 particularly school leaders, in making the educational reform efforts successful. The
14 decision making and communication of the school leaders had implications for the
15 teachers’ motivation, and effective learning environment. Skilled school leaders
16 envision the school’s desired outcomes, and communicate them to others in the school
17 community to implement. School leaders must also secure the resources that are
18 important to the teaching and learning in the schools, and this includes providing
19 collaborative time for teachers to engage themselves in their community learning.
20 Rincón-Gallardo and Fullan (2016) argue that, “Resources that matter are those that
21 create the conditions for effective collaboration, such as time for network actors to
22 collaborate” (p.17).

23
24 Besides that, the teachers in each of the schools viewed the ability to make
25 instructional decisions as a critical component when effective teaching is expected.
26 However, the positional hierarchy in the Malaysian school system can make this
27 challenging. Despite that, in one of the schools, evidence showed that, when teachers
28 are empowered with making instructional decisions, they are more confident in taking
29 greater risks with their instructional strategies. On the other hand, teachers who are only
30 following directives made solely by top management feel that they should be given
31 more autonomy to decide whether or not to implement an instructional strategy because
32 they are the experts in their classrooms, and they would know better if the strategy
33 would be effective or ineffective on their students. Donohoo *et al.* (2020) conclude that
34 “when leaders empower teacher teams by providing them decision-making power on
35 important issues related to school improvement, not only is professional capital built,
36 but also efficacy becomes enhanced” (pp.159-160).

37
38 With a lot of evidence accumulating around the importance of teacher
39 collaboration within effective PLCs, in Figure 1, a PLC model, grounded in the findings
40 of this study, is proposed that aims to support Malaysian teachers in their effort to
41 reform education in their local context. Common features between this model and other
42 PLC models in Western literature can still be identified despite cultural and context
43 differences. First, teachers’ inquiry into their own instruction is the key to building
44 collective teacher efficacy in improving student outcomes. Second, teachers’
45 collaborative learning must be focused and data driven. Third, teachers’ high efficacy
46 supports student learning through various instructional activities and strategies. Fourth,
47 an effective PLC rests on a well-supported school structure that fosters collective
48 teacher efficacy. Last but not least, school leaders, and other stakeholders in the school
49 community have significant roles in facilitating the building of collective teacher
50 efficacy.

51
52 There is considerable variation in PLCs among different countries, but common
53 features emerge in the Disciplined Collaboration (DC) model in Australia (Harris and
54 Jones, 2017), the Singapore PLC model, the Chinese PLC model in Shanghai (Hairon
55 and Tan, 2017), or even the US PLC model (Hord, 2015). As building effective PLCs
56 is not merely bringing teachers together and asking them to collaborate, these common
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features are guidelines to help structure PLCs across any context to build a capacity for change, and foster school improvement. Understanding why these features are tenets of PLCs will help school leaders and teachers to create authentic PLCs that place improved student learning at the heart of this teacher collaborative learning.

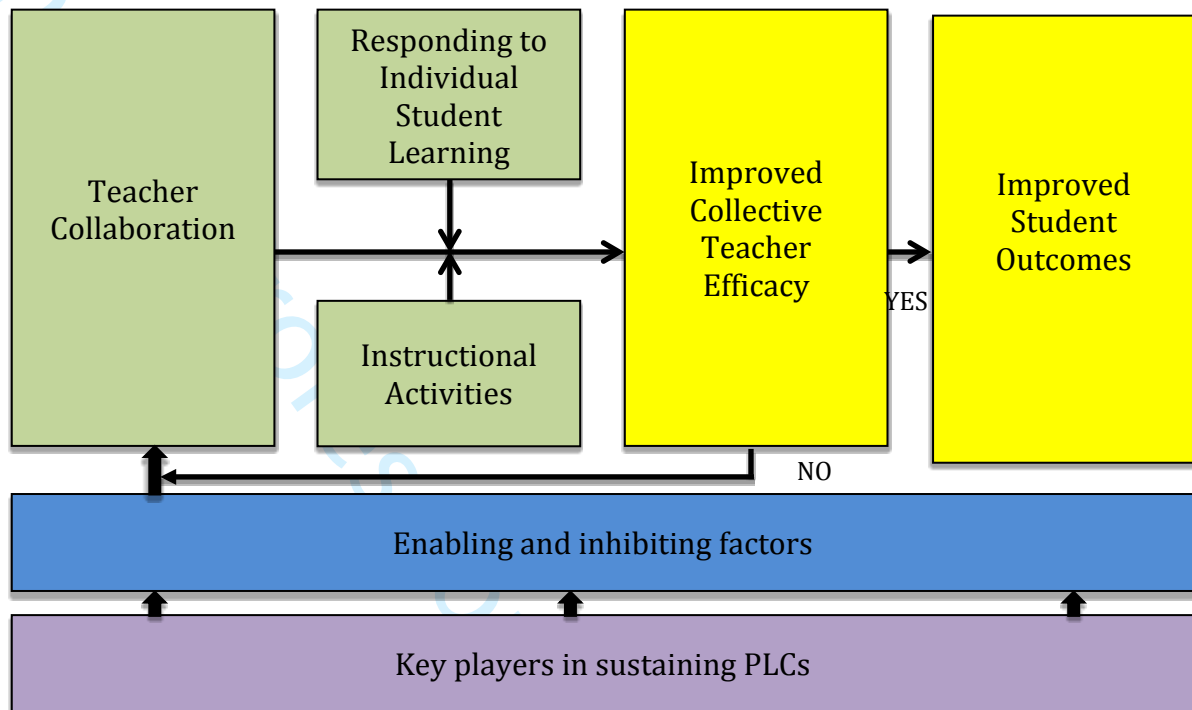


Figure 1: Proposed model of professional learning for Mathematics teachers for improved student outcomes in high-performing secondary schools in Malaysia

Limitations of this study

Findings obtained from this study have to be seen in light of some limitations. First and foremost, the interpretations and meaning attribution of the participants' realities and experiences have been filtered through the researchers' personal lens. Second, the teachers in the schools visited belonged to what Grossman and Stodolsky (1995) would refer to as groups with distinctive subject subcultures, and this was due to the subject-specific context, which was, in this case, Mathematics. This means, their beliefs, norms, and practices are not generic, and may differ from teachers of other subjects in the schools. The implications to practice are built from commonalities shared among the Mathematics Unit of the three schools. As such, any intention on using these findings as guidelines across departments would require more careful consideration.

Suggestions for future research

Future studies on Malaysian PLCs may want to consider, as their participants or respondents, teachers from non-residential secondary schools, or those teaching other subjects. Another gap to consider may be incorporating school administrators into PLCs as members as this would offer a valued perspective in the context of school as a learning organization.

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Exploring teacher collaboration: What's inside the Malaysian PLC black box?

Abstract

Purpose – The purpose of this study was to explore Mathematics teachers' collaboration within their professional learning communities (PLCs), and to gain insight on how the teachers developed their collective efficacy through it to focus on improving student learning.

Design/methodology/approach – Using a qualitative approach, data were collected from three high-performing secondary schools, mainly through semi-structured in-depth interviews with the Heads of Mathematics Unit. For explication and triangulation purposes, focus group interviews with the Mathematics teachers and students, and document analysis were also conducted.

Findings – The findings indicate that PLCs were the vessel through which a culture of disciplined teacher collaboration was fostered. More importantly, this culture encouraged teachers to participate in reflective dialogues that became a driver for their learning, and eventually led to their changed professional practice for improved student learning. The collaborative setting within the PLCs allowed teachers to pool their resources, knowledge, and individual expertise to identify their student learning focus, and administer and measure their student intervention strategies. This collaborative professional learning reduced professional isolation, and as a result, improved teachers' collective pursuit of professional growth to impact student outcomes.

Research limitations/implications – The aim of this qualitative study was to provide a detailed description of the teachers' collaboration within their PLCs based on the researchers' interpretation of how the participants make sense of their PLC practices and experiences. Hence, findings are indicative, and not definitive. In addition, the Heads of the Mathematics Unit, and the Mathematics teacher participants in this study illustrated salient aspects of subject subcultures, where their beliefs, norms, and practices were non-generic, or specific only to their subject context. Therefore, the implications to practice were built from commonalities shared only among the Mathematics Units.

Originality/value – This is a study in a Malaysian context that provides empirical evidences that are concerned primarily with the process of teachers developing their collective efficacy through disciplined collaboration within their PLCs.

Keywords Professional learning communities; Malaysia; Teacher collaboration; Teachers' collective efficacy; Improved student outcomes

Paper type Research paper

Introduction

Continuous teacher development is seen as vital in improving the quality of instruction as teachers need to stay current and relevant with the times (Boeskens *et al.*, 2020). Recent studies have demonstrated that when teachers are consistently developing themselves, they tend to possess higher efficacy that can subsequently positively impact student achievement (Jensen and Bennett, 2016; Barrera-Pedemonte, 2016; Ainly and Carstens, 2018; Donohoo, 2018; Darling-Hammond *et al.*, 2017; Zuliana, 2021).

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3 Teachers must be prepared to keep current on their pedagogical knowledge to align
4 with the changes and demands of present and future educational needs (Darling-
5 Hammond and Oakes, 2021), and understand that “professional development is about
6 teachers learning, learning how to learn, and transforming their knowledge into practice
7 for the benefit of their students’ growth” (Avalos, 2011, p.10).

8
9 As schools struggle to improve student achievement, school leaders and
10 teachers are continuously exploring ways to develop quality instruction. While
11 traditional approaches to professional development, such as workshops and
12 conferences, seem to enrich the teachers to a certain extent, the evidence for their
13 effectiveness is often weak (Tan *et al.*, 2015). Nevertheless, research on reform efforts
14 in education are demonstrating evidence that the focus of teacher professional
15 development has shifted towards job-embedded professional development, namely,
16 teacher collaborative learning within the school context (Hargreaves and O’Connor,
17 2017; Timperly *et al.*, 2007; Barber and Mourshed, 2007; Harris and Jones, 2017).

18
19 With all the evidence demonstrating the importance of integrating professional
20 learning in everyday work, many educational policy makers around the globe are
21 tempted to indiscriminately implement the concept in their schools. Even the Malaysian
22 Ministry of Education is tempted to emulate what appears to have succeeded in other
23 educational systems such as Ontario and Finland, to name a few. However, this policy
24 borrowing in Malaysia may falter as “one-size-fits-all policy orientation is ill-suited to
25 such a diverse country, and that a more customised approach may be necessary to
26 achieve reform objectives”(Bush *et al.*, 2021, p.1). Hence, unpacking what teacher
27 collaborative learning really means in Malaysian context and what factors have thus far
28 facilitated its implementation and sustainability will enable school leaders and teachers
29 to enact this policy initiative more smoothly. Taking this into account, a more nuanced
30 approach to implement teacher collaborative learning in Malaysian schools is needed
31 for it to have the intended impact.

32
33 This article aims to convey an approach to teacher collaborative learning that is
34 grounded in Malaysian secondary schools context. The major findings have the
35 potential to be instructive and could subsequently be applied to improve practice at
36 school level that leads to measurable improvements in student performance.

37 38 39 40 41 **Literature review**

42 43 ***Collaboration matters***

44
45 Studies on teacher collaboration are not new. Rosenholtz (1985) studied the working
46 conditions and practices of teachers in effective and less effective urban schools, and
47 highlighted the differing patterns of staff norms. She identified that principals in
48 effective schools played a pivotal role in orienting teachers to a unitary mission of
49 achieving the clearly defined school goals. The teachers’ work setting also promoted
50 collaborative activities that encouraged frequent task-focused interaction. She argued
51 that, in effective schools, “teaching is a collective rather than an individual
52 undertaking” (Rosenholtz, 1985, p.365). These findings led to teacher collaboration
53 being increasingly recognized as an important attribute in the norms of continuous
54 improvement. Even in Malaysia, a study by Ismail, Kanesan and Muhammad (2018)
55 found that, compared to only having strategic school leaders, strong collaboration
56 among teachers increases teaching quality.

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However, collaboration alone is not enough to promote the growth and skills of the teachers. According to Vangrieken *et al.* (2015), the focus and depth of the collaboration can impact the teachers' learning opportunities differently. This is also in line with Little's (1990) suggestion that there is an array of teacher collaboration levels that goes from weak to strong, and as it moves through the continuum, demands increasing collective autonomy, and teacher-to-teacher initiatives. The underlying factor of this continuum is, the more time teachers spend to reflect and talk about their instructions, the more they will complement each other's content and pedagogical knowledge. Research also suggested that teachers' collaborative learning was more effective when it was embedded into their daily routines, and took place in their schools rather than one-shot workshops (DuFour, 2004; Fred *et al.*, 2020). Therefore, for teacher collaboration to be impactful, teachers must be frequently engaged in professional discourse for them to build upon their unique content, pedagogical and experiential knowledge to improve instruction (Goddard *et al.*, 2007), so much so that the right environment for these practices to establish and grow has to be created within the school context.

Authentic Professional Learning Communities (PLCs)

Rosenholtz believed that "effective teachers are 'made' rather than 'born'" (1985, p.380). In addition, DuFour and Mattos (2013) proclaimed that the teacher collaborative culture, and collective responsibility is the most powerful strategy for improving instruction when fostered in a vessel known as the professional learning community (PLC). Furthermore, the revelation in contemporary literature of an empirical link between teacher collaboration within their PLCs, and overall school improvement seems to validate these strong claims.

However, there is no one definition of PLC that is agreed upon by all. DuFour *et al.* (2016) defined PLC as "an ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p.10). As for Hord (2015), PLC is an intentional way for educators to work together toward a shared purpose of improving student learning. Similarly, Stoll *et al.* (2006) defined PLC as "an inclusive group of people, motivated by a shared learning vision, who support and work with each other to inquire on their practice, and together, learn new and better approaches to enhance student learning" (p.230). Harris and Jones (2017) defined PLC as a disciplined professional collaboration that deliberately ensures impact for improving student learning outcomes.

Conversely, putting forth a different view of PLCs, Fullan termed it as a structure "to change the culture of school systems" that will eventually "change practice on a large scale" (2007, p.11). Meanwhile, in the Malaysian context, there are evidences of PLC being implemented in schools. However, the term PLC is viewed differently, and subjected to the different interpretations of the school stakeholders (Zuraidah and Muhammad Faizal, 2014; Abdul Hafidz, 2015). As reported by school leaders and teachers, the most common cause for this is a poor understanding, or limited knowledge of the concept (Abdul Hafidz, 2015; Fazlina, 2015; Norashdimah, 2015; Siti Khadijah, 2015; Zabidi, Abdullah, and Sumintono, 2020).

In principle, when a collaborative culture is clearly established, and the foundation for productive discussion and debate is laid, it should give rise to new or improved practices. Yet, many school systems have seen unsuccessful change, and contemporary educational researchers are showing concerns about how the concept of

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3 PLC is defined and operationalized (Dufour and Reeves, 2016; Hord, 1997). DuFour
4 (2007) argued that these groups of teachers failed as PLCs as they were doing random
5 actions that did not align with the concept. Poorly understood and implemented, many
6 PLCs turned out to be merely social groups that gave periodic advice, or an extra
7 activity (Harris and Jones, 2010) while others were really department meetings that
8 were supposedly “PLCs” (Dufour and Reeves, 2016).
9

10 Implicit in these shortcomings is the tenets of an effective PLC. The real
11 potential of PLCs in improving teachers’ classroom instruction rests on the premise that
12 the members need to demonstrate the discipline to focus on the right work that improves
13 student learning (Stoll *et al.*, 2006; DuFour *et al.*, 2016; Barber and Mourshed, 2007;
14 Pirtle and Tobia, 2014; Harris and Jones, 2017). Brodie (2021) argued that, for PLCs
15 to be successful, members have to be engaged in long-term, systematic and rigorous
16 inquiry.
17

18 While evidence has shown this to be true, the PLC is not a one-size-fits-all
19 approach of professional development as it changes with the context. At this juncture,
20 many experts have offered some kind of structured approach that can be used as a guide
21 by teachers to turn their PLC into an authentic and powerful infrastructure that can
22 transform their teaching practices to become more impactful. At its best, a PLC must
23 feature a purposeful collaboration, a collective focus on improving learner outcomes, a
24 leader that creates the conditions for effective learning among PLC members, the use
25 of data as a basis for inquiry into the teachers’ classroom instruction, and effective
26 interventions that are adaptable to classroom instruction as a means to improve student
27 learning outcomes (DuFour and Eaker, 1998; Hord, 2015; DuFour and Reeves, 2016;
28 Harris and Jones, 2017; Vangrieken *et al.*, 2015; Zuliana, 2021).
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31 ***The development of Professional Learning Communities (PLCs) in Malaysia***

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33 Since Barber and Mourshed (2007) brought into the spotlight that, in ensuring high
34 quality teaching, developing teachers is equally as important as recruiting and retaining
35 high quality teachers, many education systems in countries like Singapore, China, Hong
36 Kong, and Malaysia have started to heed the call. However, the concept of PLC has
37 only recently touched the Malaysian shore. It started in 2011 when the Teacher Training
38 Division of the Ministry of Education took the initiative to implement PLCs in 289 low-
39 performing schools across the country, consisting of 274 secondary schools, and 15
40 primary schools, involving 14 State Education Departments, and 99 District Education
41 Offices (Ministry of Education, *KIT PLC*, 2019).
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44 In tandem with this, the Ministry of Education introduced a PLC module named
45 *Modul Komuniti Pembelajaran Profesional* with the aim of assisting school leaders and
46 teachers in implementing effective PLCs in their schools (Ministry of Education, *Modul*
47 *Komuniti Pembelajaran Profesional*, 2011). Based on the content of the module, it was
48 largely developed based on the PLC ideas of DuFour *et al.* (2006), and Kruse, Louis,
49 and Bryk (1995). The module translates the Ministry’s aspiration of achieving the goals
50 of the Malaysia Education Development Plan (2013-2025) faster and more effectively.
51 Several provisional initiatives that are focused on the creation of a peer-led culture of
52 professional excellence in schools were planned for, and executed to transform the
53 Malaysian education system. In addition, more emphasis is suggested to be given to
54 school-based training as it is believed to be more effective, being more grounded in
55 classroom instructional practices (Ministry of Education, Malaysia Education Blueprint
56 2013-2025).
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3 The literature was screened to find evidence that showed collaborativeness
4 through PLCs was present in Malaysian schools. In a survey on 676 respondents,
5 including principals, school second-line leaders, and teachers from 50 secondary
6 schools in Malaysia, Zuraidah and Muhammad Faizal (2014) found that schools in
7 which PLCs were successful had principals who were effective as instructional leaders.
8 These principals were found to anchor the collaborative works of their teachers, and
9 played an important role in bridging the differences between the needs of the school,
10 and the directives of the ministry. A mixed-methods study by Khairiah (2016) identified
11 the level of existence and importance of PLCs as very high in six residential secondary
12 schools. She argued that teacher collaboration was influenced by the principals'
13 leadership styles, particularly in inspiring a shared vision, encouraging the heart,
14 challenging the process, and enabling others. In addition, the principals followed
15 through on the commitment and promises they made by developing and supporting
16 teacher collaboration, and their decisions. However, it was noted that principals had a
17 weak rapport with the teachers while teachers also reported that they were neither
18 appropriately recognized nor awarded by the principals.
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22 Another mixed-methods study by Ismail *et al.* (2018) on 50 language teacher
23 respondents from 42 schools in a state in Malaysia indicated that teachers were active
24 participants of their PLCs, with the collaborative culture identified as the catalyst for
25 this. Besides that, in 2020, a qualitative study with six middle leader and teacher
26 participants from a secondary school in Malaysia by Chua *et al.* (2020) found that peer
27 coaching was practiced between the senior and junior teachers, and there were daily
28 interactions among teachers of the same subjects. They argued that these practices
29 indicated some of the ways for teachers' professional learning. They also affirmed that
30 external expertise was engaged to enhance the teachers' professional learning.
31

32 A more recent qualitative study by Tiong (2022) found that teacher learning in
33 PLCs was more in unstructured collaborative settings. 16 teacher participants from two
34 secondary schools reported that they learned through collaborative discourse, and
35 mostly through small stories, and replays. Further examination on findings from other
36 Malaysian researchers on PLCs have found that teachers who engaged themselves in
37 PLC collaborative activities reported that their experience resulted in professional
38 growth (Zuraidah and Muhammad Faizal, 2014; Abdul Hafidz, 2015; Fazlina, 2015;
39 Norashdimah, 2015; Siti Khadijah, 2015; Zuliana, 2015; Khairiah, 2016).
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42 ***Outcome of collaborative culture within Professional Learning Community for*** 43 ***teachers and students*** 44

45
46 Vescio *et al.* (2008) reviewed 11 studies on the impact of PLCs on teaching practice
47 and student learning, and highlighted that eight of the studies noted that student learning
48 had improved. Brown *et al.* (2018) suggested that "positive school reform occurs when
49 teachers participate in authentic PLCs, with improved student achievement as a by-
50 product" (p.53). Schaap and Bruijn (2018) also argued that when teachers work
51 together, they develop collective ownership. They also believed that committed and
52 motivated teachers in PLCs display strong positive attitudes, and align their behaviors
53 towards achieving PLC goals. Other research demonstrated that when teachers
54 willingly learned to connect, engage, and inquire about their teaching practices in order
55 to serve a common purpose, their collective efficacy was elevated (DuFour *et al.*, 2016;
56 Donohoo, 2018; Harris and Jones, 2017).
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58 Similar findings by Herrelko (2016), and Voelkel and Chrispeels (2017)
59 affirmed that teacher collective efficacy was fostered when teachers analyzed students'
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3 data, and discussed interventions for struggling students. Furthermore, Donohoo (2018)
4 argued that teacher collaboration is crucial for a deeper implementation of school
5 improvement strategies. Her study showed that teachers with high collective efficacy
6 exhibited greater risk taking, and were more receptive to innovative improvement ideas.
7 This shows their affective commitment to improve their students' outcomes through
8 improving the quality of their own instruction.
9

10 In more advanced and sustained PLCs, school leaders entrusted teachers to
11 make instructional decisions, and when the teachers were enlisted into the leadership
12 of the school, they developed "the capacity to act purposefully and constructively to
13 direct their professional growth and contribute to the growth of their colleagues"
14 Calvert, 2016, p.52). This is when teachers who are active in professional learning
15 achieve the state known as teacher agency.
16

17 A strong link between school leadership and the teacher learning environment
18 was determined in a study with 495 experienced teachers in 48 Flemish (Belgian)
19 primary schools, which suggested that the facilitating role of school leaders cannot be
20 underestimated (Vanblaere and Devos, 2016). Moreover, the strong influence school
21 leaders have in setting the directions of the school, and developing people to support
22 its goals is imperative in fostering a school climate in which PLCs thrive as effective
23 and sustainable (Leithwood *et al.*, 2019; Dogan and Adams, 2018; Harris and Jones,
24 2017; Hord, 2015).
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27 **Methodology**

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29 The move by the Malaysian Ministry of Education to cultivate a peer-led culture of
30 professional excellence sends a strong message that there is increasing importance of
31 PLCs in the education system. This is also signified by the growing number of PLC
32 research in Malaysian literature. The impetus for this study came after examining
33 findings from a study by Khairiah (2016) on PLCs in high-performing secondary
34 schools. Her study revealed that PLCs were seemingly evident in the six high-
35 performing fully residential schools, and that the level of collaborative learning among
36 the teachers was very high.
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39 Despite these promising evidences, detailed and specific information on the
40 practices of the teachers who participated in the PLCs were not provided, resulting in a
41 'black box' on the PLC process. There was no unpacking of the process that explained
42 how it unfolded from teacher collaboration in the PLCs to their outcomes. There was
43 also no explanation on how the PLCs succeeded from the point of view of the students,
44 or other school stakeholders as the study did not take their perspectives on its
45 implementation into account. Besides that, the study was limited only to the roles of
46 the teachers and principals at surface level, and data were collected only through open-
47 ended surveys. A discussion focusing on the impact of PLC on the teachers, or student
48 achievement was also absent from the study.
49

50 Hence, with the PLC black box in mind, this study was undertaken to explore
51 and address the questions on the characteristics of PLCs in the schools, the key factors
52 that enable or inhibit the sustaining of the PLCs, and how teachers' participation in
53 PLCs resulted in improved teacher practice, and student learning outcomes. A
54 qualitative approach was chosen as it is seen to be the most fitting approach to address
55 this knowledge gap.
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58 **Context of the study**

Three secondary schools in Malaysia were purposively chosen as the context for this study as they were among the top-performing fully residential schools based on the national public examination (Sijil Pelajaran Malaysia) conducted by the Malaysian Ministry of Education. This study was a small, exploratory empirical study with the purpose of exploring the impact of the process and activities of teacher collaboration within PLCs on improving student learning outcomes, particularly in the subject of Mathematics.

Sample and data collection

The qualitative approach was crucial as it created opportunities for the researchers to collect rich and in-depth data from multiple sources to better appreciate and understand the respondents' social processes, and their experiences (Yin, 2014). The methods of collecting the data were a) in-depth interviews with the Heads of the Mathematics Unit; b) focus group discussions with the teachers; and c) focus group discussions with the students. The in-depth interviews, and focus group discussions were conducted before the COVID-19 pandemic. Samples for this study (refer Table 1) were carefully determined through purposive sampling, and theoretical sampling to ensure that data obtained were of optimal quality, and sufficient to ensure efficient saturation of the categories (Morse *et al.*, 2002; Morse, 2010; Charmaz, 2006; Charmaz, 2008; Urquhart, 2019). The samples, consisting of three Heads of Unit, 10 teachers, and 17 students, were selected based on the following criteria: i) the Head of Unit must have more than three years of experience heading the unit; ii) teachers must have more than 10 years of experience teaching Mathematics; and iii) students must be the students of the selected Mathematics teachers. This is to ensure the coherence, transparency, impact, and trustworthiness of the data collected (Robinson, 2014).

Table 1: Descriptive statistics of participants' demographics

Demographics	HoU in-depth interview	Teacher focus group	Student focus group
<i>Number of participants</i>	3	10	17
<i>Gender</i>			
Male	1	2	6
Female	2	8	11
<i>Age</i>			
16-17 years	-	-	17
36-45 years	1	8	-
46-60 years	2	2	-
<i>Tenure as teacher</i>			
12-20 years	-	8	-
21-33 years	-	2	-

Data analysis

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3 The interviews and focus group discussions were transcribed, and the data from the
4 transcripts were analyzed systematically with the use of ATLAS.ti 8. Data were
5 collected and analyzed concurrently, and the constant comparative method was used as
6 an iterative process to explicate categories. Codes were assigned to fragments of data,
7 and sorted into categories. The coding quality used in this study was identified by the
8 researchers. The codes were further developed, and subsequently assessed by three
9 experts (raters) using multi-rater analysis with the Many Facet Rasch Model (MFRM)
10 approach, with inter-rater reliability showing that there was not a big gap between
11 observed or exact agreement (64.6%), and its expected value based on the model (70%)
12 (Mohd Zabidi, Sumintono, and Abdullah, 2022). This suggested a good level of
13 agreement (Linacre, 2004; Boone, Staver, and Yale, 2014; Bond and Fox, 2015; Lunz
14 and Stahl, 2017; Van Zile-Tamsen, 2017).

15
16 Furthermore, the iterative process of constant comparative analyses had
17 generated 43 core categories. These core categories were aligned with the research
18 questions, and then clustered under the constructs of practice, impact, support, and
19 contributing factors. These constructs were derived from the keywords in this study's
20 research questions. The repetitive process of coding explored what lay beneath the
21 responses of the participants, and looked for their relationships among categories. In
22 reflecting, more contextual clarity was sought to make sense of the interpretation of the
23 data, and to gain confidence in following what emerged. The repetition of the constant
24 comparison method was instrumental in constructing detailed core categories, and
25 facilitating synthesizing the descriptions into conceptualization. The extensive coding
26 phases resulted in the emergence of seven major conceptual categories, namely 1)
27 teacher collaboration, 2) responding to learning of individual student, 3) instructional
28 activities, 4) improved collective teacher efficacy, 5) improved student outcomes, 6)
29 enabling and inhibiting factors, and 7) key players in sustaining PLC.

30 31 32 33 34 ***Strategies to ensure rigor***

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36 Multiple strategies were used to increase the credibility and trustworthiness of this
37 qualitative study, as there is no one standard that is universally accepted to evaluate
38 qualitative research due to their diversity (Guba and Lincoln, 2005; O'Reilly and
39 Parker, 2013; Noble and Smith, 2015). In attaining and maintaining its rigor,
40 methodological coherence was considered prior to the data collection phase to ensure
41 the most appropriate methods were used to elicit responses from the participants. This
42 was because the methods chosen must be congruent with the research questions as this
43 qualitative study was not linear, and thus, methods must be able to appropriately
44 quantify the phenomenon under study (Morse *et al.*, 2002; Kolb, 2012).

45
46 To further enhance the transparency of this study, the suggestion of parallel
47 criteria of trustworthiness (Lincoln and Guba, 1986) was used as a guideline for this
48 study. The criteria were: 1) credibility, 2) dependability, 3) confirmability, 4)
49 transferability, and 5) authenticity (Lincoln and Guba, 1986; Guba and Lincoln, 1994).
50 In this study, credibility was established through triangulation of data by using different
51 sources and methods, member checks, and development of audit trails. That is to say,
52 the researchers' constructivist knowledge on the studied phenomenon was constituted
53 from multiple perspectives from the different target groups in this study. These
54 perspectives were from the Heads of Mathematics Unit, Mathematics teachers, and
55 Mathematics students, which were further corroborated by document analysis.

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57 In this study, the documents served as a guide to understand the context, and
58 the conditions within that context, and were also a source of evidence of past events. In
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addition, the data from documents provided supplementary information that was used to generate more questions for the participants in order to probe deeper into their experiences. It was also important to note that, because of their relevance, only the most current official documents were analyzed. Besides that, selected interview transcripts were also returned to participants to check for accuracy.

Moreover, the study's findings were shared with selected participants of the study, where they were shown the PLC model built, and this afforded them with the opportunity to engage with the interpreted data. To a certain extent, this was done for confirmability and authenticity, with the interpreted data and conclusions that were co-constructed by the researcher established based on the participants' responses. This innovative technique is referred to as Synthesized Member Checking (Birt *et al.*, 2016). This technique was also mentioned by Charmaz (2006) as a way to not only confirm findings, but also to elaborate on the categories. Lastly, the dependability and transferability of this study were demonstrated by providing the criteria of the participants, and their sample size to ensure constancy of the findings for future similar inquiries. For transferability, the findings were shared with teaching professionals who were not involved in this study to determine if they could associate their experiences with the study's findings.

Findings

Revealing the Malaysia PLC black box

Seven essential categories of effective PLC were derived from the data analysis phase. All categories were crucial to the understanding of the process, and outcomes of the PLCs of the Mathematics teachers in the schools visited. The categories are as follows:

- 1) teacher collaboration;
- 2) responding to individual student learning;
- 3) instructional activities;
- 4) improved collective teacher efficacy;
- 5) improved student outcomes;
- 6) enabling and inhibiting factors; and
- 7) key players in sustaining PLC.

Teacher collaboration

Across three schools, the teacher collaboration within their PLCs was viewed as the process of learning and working together. In one of the schools, the PLC was mandated while in the other two schools, it was voluntary. Despite this, the teachers participated actively by choice, and were guided by reciprocal commitment. Activities such as sharing of resources, and reflective dialogues were clearly and repeatedly mentioned in their accounts. This strong form of collaboration entailed joint works among the teachers. Together, they identified their student learning focus, discussed interventions, and assigned relevant tasks. They also deliberately administered and measured their student intervention strategies.

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3 One participant told, *“We even share lesson scheme among us for each topic so that*
4 *everybody is at the same par. When we did this, we could actually identify which*
5 *questions that most students could not answer. We would sit together and think about*
6 *what are the mistakes in our instructions... From there, teachers will share their*
7 *teaching strategies.”* (Head of Unit 2)
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10 In addition, they also collaborated with external expert teachers from other schools in
11 the district or state, thus expanding their learning opportunities through these
12 educational networks.
13

14 *Responding to individual student learning*

15
16 Findings revealed that the teachers were effective as they were capable of intervening
17 early based on the individual student’s response to learning. As students with different
18 capacities struggle in different areas of Mathematics, in the classrooms, the teachers
19 paid attention to the signs of struggling students, and increased one-on-one interaction
20 with them. Teachers engaged in multiple strategies to deal with a range of students,
21 from high-performing students to low performing ones. They consistently tracked their
22 students’ progress, and designed in-class and outside-class interventions to meet the
23 different needs of the students. Using student data, teachers applied differentiated
24 instruction that were varied in terms of the performance target, and the frequency and
25 duration of intervention.
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30 *“In each class we divide the students into three groups. The highly-performing students,*
31 *the average-performing students, and lastly the underperforming or weak students...we*
32 *recorded their exam score (diagnostic tests), and examined their basic knowledge.*
33 *Usually they went through UPSS 1, UPSS 2, mid-year exam, etc. We used the raw data*
34 *from these tests to identify them. We can really keep track of their ongoing progress*
35 *through the intervention program.”* (Head of Unit 1)
36
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38 *Instructional activities*

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40 The teachers reported that, as much as possible, they tailored their instructions to meet
41 student needs, and discussed these instructional needs during their professional
42 discourse. They attested to the fact that, in a mixed-ability classroom, process
43 differentiation, or student grouping helped them to ensure that all students achieved
44 meaningful learning as the instructional activities became more focused. These
45 instructional activities in the classrooms included applying differentiated instruction,
46 communicating with struggling students, checking students’ prior knowledge and
47 understanding, monitoring student progress, encouraging peer mentoring between
48 student groups, and building student independence in learning.
49
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51 *“The methods may differ from a teacher to another teacher because it depends on the*
52 *performance of the students. For example, most students in my class perform on the*
53 *average for Maths, so my class teacher taught us methods that are the most easy for*
54 *most of us to understand. Unlike my friend here, most of her classmates excel at Maths.*
55 *So her teacher taught them different methods that are appropriate to their ability.*
56 *Teacher follows the pace of the students in the class.”* (Student 1)
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3 “We would work with them on the basics. We divided them into groups, and then we
4 would give them questions based on the area of their problem, and then we would ask
5 them to present their work and solutions to the whole class. From there, we can see
6 what is their real area of problem. We would correct them on the spot so all students
7 could learn as well.” (Teacher 3)
8
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10 *Improved collective teacher efficacy*

11

12 Another finding in this study indicated how teachers working collaboratively within
13 their PLCs improved their collective efficacy. Teachers reported that they were more
14 receptive to reflective dialogue in the PLCs when they saw the potential value of their
15 community learning. This value induced their willingness to learn, unlearn, and relearn,
16 and be more open during these reflections. Many teachers also noticed that, as they
17 reflected on their instruction, they were able to design better strategies, and timely
18 treatments for their students. In doing so, they experienced increased content
19 knowledge, and pedagogical content knowledge. Most of them also claimed that they
20 were more confident in delivering their instruction, and that their commitment to
21 achieving their goals increased.
22
23

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25 “...from a psychological point of view, when teachers work collaboratively as a
26 professional community, we can see teachers become more confident in teaching.
27 Before there was PLC, we always questioned ourselves if we were doing it right.”
28 (Teacher 5)
29

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31 Some teachers even expressed that they have control of their own learning, and became
32 more reflexive about their instruction. They also determined their own learning and
33 teaching strategies beyond what was required by the school leaders.
34

35 *Improved student outcomes*

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37 In this study, it was found that the teachers, who reflected on their practices and were
38 critical of them, encouraged full participation of their students in classrooms. They also
39 showed greater effort and persistence, which resulted in the high expectations of their
40 students.
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43 “It is not so much to force the student to learn Maths, but rather to develop braveness
44 in students to approach the teachers. Soon after frequent meetings, the students feel
45 comfortable learning with the teacher. It is more of a psychology thing. As a result,
46 they became more willing to ask question on their own, and they take control of their
47 own learning.” (Teacher 3)
48
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50 Notably, consistent with these findings was the students’ self-report of improved
51 outcomes. Student participants reported that, when their teachers were persistent, they
52 became more academically engaged, and developed positive learning dispositions.
53 Students reported that they were given opportunities to be more responsible for their
54 own learning, and in turn, improved their content knowledge in Mathematics. They
55 added that the communicative instructional activities between them and the teachers
56 have had a substantial impact on their learning outcomes. Many said that they became
57 more confident in reflecting upon the classroom instruction, and eventually made the
58 expected grades. A student recounted this sense of achievement:
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4 *“...when I'm working on question on my own, and I am able to solve it, I feel very very*
5 *happy because I outdo myself, and beat my own expectation without copying my*
6 *friend's work.” (Student 6)*
7

8
9 *Enabling and inhibiting factors*
10

11 Having competent teachers alone would not make for effective PLCs in schools. In this
12 study, teachers reported that, for their PLCs to be developed and sustained, there should
13 be inter-connecting strands that underpinned their PLCs. They explained that, while a
14 clear school vision was important, the school leaders must include all the stakeholders,
15 and internalize the vision collectively because a shared vision was the catalyst for the
16 growth of the school. They also expressed the need for shared and extended leadership
17 practice especially in being entrusted with the power to make instructional decisions.
18 In one of the schools, the teachers said:
19

20
21 *“...the principal had empowered key personnel to discharge certain principal's tasks*
22 *while he was on leave” (Teacher 10), and also “...we were able to conduct a meeting*
23 *on school's goals even without the attendance of the principal.” (Teacher 8)*
24
25

26 Fostering meaningful teacher collaboration required the principals to designate a
27 weekly common time for teachers to sit together, and be engaged in their PLCs. Except
28 for teachers in the school where PLC was mandated, the others lamented on the lack of
29 allocated collaborative time for them to have their PLC. These different approaches
30 were decided on by the school administration. Teachers who were provided with a
31 scheduled time described their collaborative learning to be less stressful as they were
32 more prepared with data, and less distracted by other tasks. Meanwhile, teachers from
33 the other two schools reported that they struggled to find a common time among them
34 as they were pressured to meet other work demands. One teacher expressed her dismay
35 over this issue when she said:
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39 *“...late last year, the management sat together to schedule all the school programs for*
40 *this year. We did ask for allocated time for teachers to sit together to discuss their*
41 *teaching and learning, but somehow they did not manage to find time for that among*
42 *the packed activities.” (Head of Unit 1)*
43
44

45 Nonetheless, their reciprocal sense of responsibility urged them to find time to sit
46 together, and hold their professional discourse. In fact, their affective commitment was
47 so evident as one teacher, and one student participant explained:
48

49 *“...there is an official intervention program for all students fixed by the management,*
50 *and there is stream-based intervention initiated by our own department. We would have*
51 *intervention sessions in the afternoon, or even at night. Even on weekends.” (Teacher*
52 *5)*
53

54 *“...teachers came to teach night classes to help students to prepare for their*
55 *examination.”(Student 16)*
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58 Positive reinforcement may act as a powerful strategy to promote the necessary
59 behavior to improve teacher and student learning. In all three schools, high-performing
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3 students were given extrinsic rewards. Their achievement was recognized, and they
4 were elected as Mathematics student mentors to their friends. These students felt
5 honored by this appointment though, in order to be appointed and remain as a mentor,
6 they had to consistently maintain their outstanding performance in Mathematics.
7 Nevertheless, they were also happy to assist their friends, and even learned together.
8 The student participants explained:
9

10
11 *“I am a Guru Muda [student mentor]. For me, when I teach other students, I can*
12 *actually understand better what is being shared. So I think this appointment not only*
13 *benefit other students, but more importantly improve myself. The results show our*
14 *improvement.”* (Student 2)
15

16
17 *“...teachers trust students to participate as student mentors. And to me, that is very*
18 *effective.”* (Student 3)
19

20
21 Another example of reinforcement was monetary reward as motivation, and recognition
22 of the effort that the students had invested in improving themselves.

23
24 *“...we even awarded these students monetarily when they showed progress from time*
25 *to time.”* (Teacher 2)
26

27
28 One teacher explicitly stated his frustration with teachers not being reinforced
29 accordingly by the school administration due to, particularly, the principal’s poor usage
30 of reinforcement. He explained:
31

32
33 *“...she went to compete using her self-initiated raised fund... her winnings were*
34 *highlighted by the school. I personally think that teacher should be given some benefits*
35 *if not in monetary form.”* (Teacher 4)
36

37
38 Together, these findings add further emphasis on the need for schools to build an
39 empathetic environment for students and teachers alike. One student participant
40 explained that the teacher would praise students who were brave enough to ask
41 questions during class. According to her, this had prompted the students to actively ask
42 questions when they did not understand. She said:
43

44
45 *“...it acts like a catalyst for them... it encourages us to learn more rather than*
46 *demotivating us for not knowing”, and added that “...the teacher did not demotivate or*
47 *pick on these students [low-performing students who attended intervention sessions*
48 *outside class] when we were in class. Or even overly praised the excellent students.”*
49 (Student 1)
50

51 *Key players in sustaining PLCs*

52
53 Teacher participants reported that for the students to be academically proficient, it is
54 essential for the school to build strong support for teachers, and student instructional
55 activities. Their PLCs were enabled or inhibited depending on the support they received
56 from the Head of Unit, top management, parents, and alumni.
57

58
59 *“Our Head of Unit is an effective liaison who facilitates a highly functional working*
60 *relationship between the teachers and the school top management. His high level of*

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3 *understanding and empathy makes it easier for us to deliver our roles as teachers.”*
4 (Teacher 7)
5

6
7 *“...the alumni of the school also help funded the school’s instructional activities. An*
8 *instance would be them funding an educational retreat for low-performing students.”*
9 (Head of Unit 3)
10

11 12 **Discussion**

13
14 Findings from this study have presented the big picture of the collaboration of
15 Mathematics teachers within their PLCs. More specifically, the findings provide
16 invaluable data that help PLC researchers to figure out what happens, at least, in a
17 Malaysian context. The findings in each category are vital as they help researchers to
18 piece together the practices in PLCs that lead to the outcomes. All things considered,
19 findings from this study indicate that there is strong teacher collaborativeness within
20 the respective PLCs in the three high-performing fully residential secondary schools in
21 Malaysia.
22

23
24 It is implicitly known, through the interactions with the teachers, that most of
25 them acquired their knowledge and skill sets from the learning opportunities that occur
26 within their PLCs. Their reflective dialogues revolve around what occurs inside their
27 classrooms, and what can be done differently to improve their instruction. Using student
28 data, they unpack and scrutinize the data before they discuss approaches to teaching. In
29 doing so, the teachers learn from each other on how to work with students, and to design
30 timely interventions, in particular, for low-performing students. As they continually
31 learn from each other, they not only deepen their knowledge, but also keep perfecting
32 their practices. These collaborative learning activities build their capacity collectively,
33 and this is imperative as their ability to produce their desired outcomes is more
34 pronounced (Voelkel and Chrispeels, 2017). In addition, when they inquire into their
35 own practices, and evaluate their school improvement strategies, they are showing
36 greater risk taking. This is an indicator of teachers with high collective efficacy
37 (Donohoo, 2018).
38

39
40 The opportunity for students to learn must include considerations of their entry
41 knowledge (Hiebert and Grouws, 2007), and these teachers clearly considered this in
42 the planning and delivery of their instruction. The complexity of having mixed-ability
43 students in one class surely requires a teacher with high capability and efficacy. Hodges
44 (2018) states that, “Engaged students are 2.5 times more likely to say that they get
45 excellent grades and do well in school, and they are 4.5 times more likely to be hopeful
46 about the future than their actively disengaged peers.” Therefore, effective use of such
47 strategies was seen in their instructional activities to boost students’ engagement during
48 instruction. The teachers always started their lesson with assessing students’ prior
49 knowledge on the topic, and checking for their understanding from time to time
50 throughout the lesson. The immediacy of the teacher’s response was also a deciding
51 factor for student attentiveness. In this study, there were many evidences that showed
52 that the teachers were aware of the importance of student engagement in class, and
53 promoted it. This could be seen when teachers embedded interactions into the lesson,
54 or communicated with struggling students, or even when they applied differentiated
55 instructions to actively engage with all students.
56

57
58 The appointment of high-performing students as subject mentors also promoted
59 connectedness among students. As a result, these high-performing students had a
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3 positive outlook on the school when their excellence in the subject is recognized. It
4 encouraged them to willingly contribute to peer mentoring, and enabled them to
5 regulate their own learning. This aligns with Lin-Siegler *et al.*'s research that notes that
6 "students who have agency in their learning are more motivated, experience greater
7 satisfaction in their learning, and consequently, are more likely to achieve academic
8 success" (2016, p.297). Student engagement impacts more than just their academic
9 behavior. Good student-teacher relations create a positive culture in students as well
10 (Willms, 2003). Accounts from low-performing students affirmed that they benefited
11 from differentiated instruction, and the interactions with their teachers. Personalized
12 learning encouraged them to slowly take ownership of their own learning, and it
13 consequently improved their self-confidence when they eventually made the grades.

14
15
16 This study revealed the significant roles played by other school stakeholders,
17 particularly school leaders, in making the educational reform efforts successful. The
18 decision making and communication of the school leaders had implications for the
19 teachers' motivation, and effective learning environment. Skilled school leaders
20 envision the school's desired outcomes, and communicate them to others in the school
21 community to implement. School leaders must also secure the resources that are
22 important to the teaching and learning in the schools, and this includes providing
23 collaborative time for teachers to engage themselves in their community learning.
24 Rincón-Gallardo and Fullan (2016) argue that, "Resources that matter are those that
25 create the conditions for effective collaboration, such as time for network actors to
26 collaborate" (p.17).

27
28
29 Besides that, the teachers in each of the schools viewed the ability to make
30 instructional decisions as a critical component when effective teaching is expected.
31 However, the positional hierarchy in the Malaysian school system can make this
32 challenging. Despite that, in one of the schools, evidence showed that, when teachers
33 are empowered with making instructional decisions, they are more confident in taking
34 greater risks with their instructional strategies. On the other hand, teachers who are only
35 following directives made solely by top management feel that they should be given
36 more autonomy to decide whether or not to implement an instructional strategy because
37 they are the experts in their classrooms, and they would know better if the strategy
38 would be effective or ineffective on their students. Donohoo *et al.* (2020) conclude that
39 "when leaders empower teacher teams by providing them decision-making power on
40 important issues related to school improvement, not only is professional capital built,
41 but also efficacy becomes enhanced" (pp.159-160).

42
43
44 With a lot of evidence accumulating around the importance of teacher
45 collaboration within effective PLCs, in Figure 1, a PLC model, grounded in the findings
46 of this study, is proposed that aims to support Malaysian teachers in their effort to
47 reform education in their local context. Common features between this model and other
48 PLC models in Western literature can still be identified despite cultural and context
49 differences. First, teachers' inquiry into their own instruction is the key to building
50 collective teacher efficacy in improving student outcomes. Second, teachers'
51 collaborative learning must be focused and data driven. Third, teachers' high efficacy
52 supports student learning through various instructional activities and strategies. Fourth,
53 an effective PLC rests on a well-supported school structure that fosters collective
54 teacher efficacy. Last but not least, school leaders, and other stakeholders in the school
55 community have significant roles in facilitating the building of collective teacher
56 efficacy.

57
58
59 There is considerable variation in PLCs among different countries, but common
60 features emerge in the Disciplined Collaboration (DC) model in Australia (Harris and

Jones, 2017), the Singapore PLC model, the Chinese PLC model in Shanghai (Hairon and Tan, 2017), or even the US PLC model (Hord, 2015). As building effective PLCs is not merely bringing teachers together and asking them to collaborate, these common features are guidelines to help structure PLCs across any context to build a capacity for change, and foster school improvement. Understanding why these features are tenets of PLCs will help school leaders and teachers to create authentic PLCs that place improved student learning at the heart of this teacher collaborative learning.

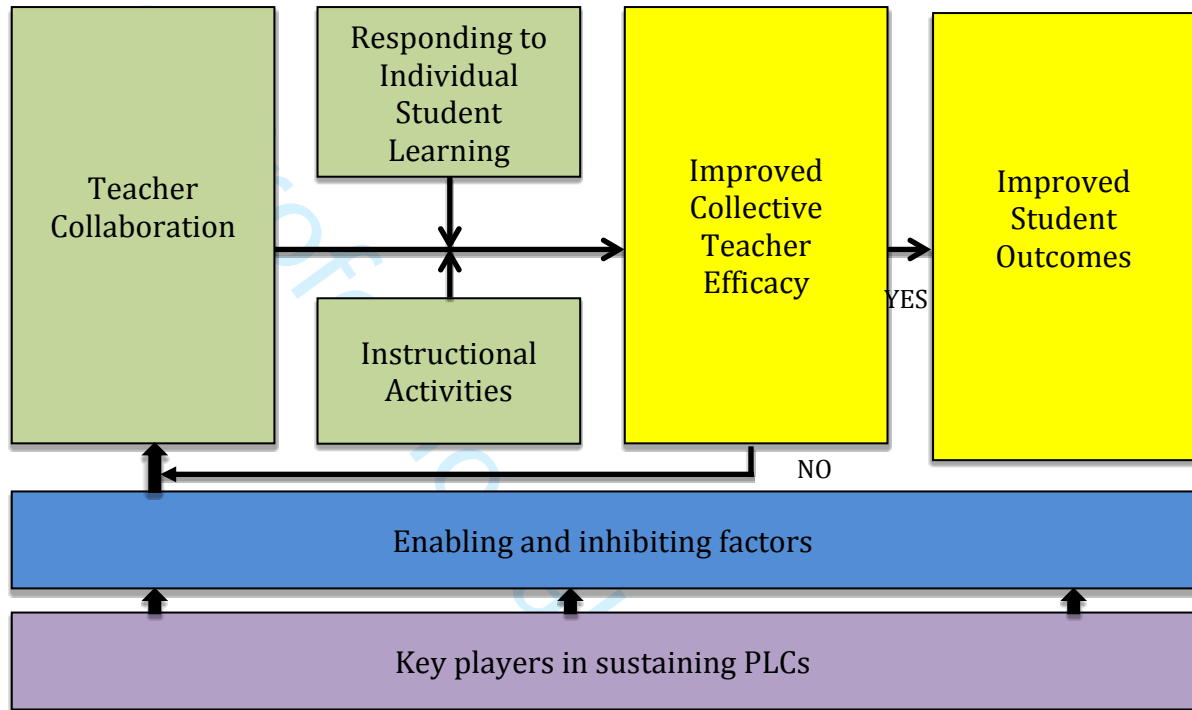


Figure 1: Proposed model of professional learning for Mathematics teachers for improved student outcomes in high-performing secondary schools in Malaysia

Conclusion

School leaders are facing pressures to reform their schools to be more effective and responsive to the new challenges. However, making changes in educational practice is a complex and slow process because it is driven by a number of interrelated factors that function differently in different contexts. Understanding how the factors enable or inhibit the effort of building school capacity would help the school to be successful in providing effective education to the students. Findings from this study demonstrated the beliefs teachers hold about strong collective efficacy and how it is positively associated with student achievement. Teachers responded positively to PLC when trust and support from school leaders and community are applied appropriately in context. The evidence of effective PLCs from Malaysian high performing secondary schools context brings hope to Malaysian education system to narrow the disparity in academic achievement between different student social groups in public schools.

Having said that, there is still much room for further in-depth and focused investigation on effective PLC in Malaysian schools. Findings obtained from this study have to be seen in light of some limitations. First and foremost, the interpretations and meaning attribution of the participants' realities and experiences have been filtered

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3 through the researchers' personal lens. Second, the teachers in the schools visited
4 belonged to what Grossman and Stodolsky (1995) would refer to as groups with
5 distinctive subject subcultures, and this was due to the subject-specific context, which
6 was, in this case, Mathematics. This means, their beliefs, norms, and practices are not
7 generic, and may differ from teachers of other subjects in the schools. The implications
8 to practice are built from commonalities shared among the Mathematics Unit of the
9 three schools. As such, any intention on using these findings as guidelines across
10 departments would require more careful consideration. Future studies on Malaysian
11 PLCs may want to consider, as their participants or respondents, teachers from non-
12 residential secondary schools, or those teaching other subjects. Another gap to consider
13 may be incorporating school administrators into PLCs as members as this would offer
14 a valued perspective in the context of school as a learning organization. More empirical
15 evidence is needed to understand the PLC process in order to advance the local
16 knowledge on teacher professional learning.
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