TEACHERS' PERCEIVED PROBLEMS AND PROVIDED SUGGESTIONS REGARDING PROFESSIONAL DEVELOPMENT BY ONLINE COURSES

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Abstract

This research investigated teachers' awareness, perceived problems, and motivating strategies for their professional development through online courses. Teacher professional development (TPD) played an important role to empower teachers' professional competency and increase students' learning results. the conventional TPD approaches, however, had time, space, and selectivity limitations, but innovated by information and communication technology (ICT), massive open online courses (MOOCs) might provide an alternative choice for TPD since MOOCs do not have time and space limitations with hundreds of courses. The results include: First, the TPD by MOOCs introduction course had improved teachers' awareness of TPD by MOOCs significantly. Second, some teachers' experienced learning problems have revealed. Third, teachers still regarded that face-to-face TPD activities are more efficient than TPD by MOOCs. Fourth, teachers suggested motivating strategies for MOOCs learning have analyzed. Finally, the researcher concludes some suggestions for educational policy makers, practitioners, and researchers.

Keywords: teacher, professional development, online learning

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教師透過線上課程進行專業發展所覺察的問題及提出的建議

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摘要

本研究探討教師透過線上課程進行專業發展所面臨的問題及提出的建議。教師專業發展在強化教師專業能力與增進學生學習成效上扮演著重要角色。傳統的教師專業發展方式有時間、空間與課程選擇性的限制；但是，在資訊與通訊科技的革新下，大規模開放性線上課程(磨課師)可以提供教師專業發展的另一種選擇，因為磨課師沒有時空的限制且具有幾百門課程可選擇。研究發現四項結果。第一，透過磨課師進行教師專業發展的介紹性課程可明顯提升教師對透過磨課師進行專業發展的覺知。第二，研究揭露教師察覺到的一些學習問題。第三，教師依然覺得面對面的教師專業發展活動比磨課師有效。第四，研究分析教師所提出之鼓勵透過磨課師學習的建議。最後，研究者歸結幾項建議給教育政策制定者、實務工作者及研究者。

關鍵字： 教師、專業發展、線上學習

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1. Introduction

This action research explored teachers' awareness, experienced problems, perceived effectiveness, and expected supporting measures of teacher professional development (TPD) through massive open online courses (MOOCs).

TPD was an important issue in education, teachers have had more and more opportunities to conduct the TPD, and TPD has become a global trend (Bautista & Ortega-Ruiz, 2015; Borko, Jacobs, & Koellner, 2010; Fordtran, Grimes, Riggs, & Evans, 2020). Ministry of Education (2014a) stated that "Teachers are professionals who must continue their professional development to support students' learning" (p. 50). TPD played as a crucial means for teachers to improve their teaching quality (Darling-Hammond, Hyler, & Gardner, 2017) and had the significant impact on student's learning (Villegas-Reimers, 2003). The proclaimed achievements of TPD, however, might have a huge gap between TPD demonstrated achievements and TPD in real life (Hill, 2009). The problems of TPD should be explored in advance to have an effective implementing TPD in school (Darling-Hammond, Hyler, & Gardner, 2017). For example, teachers with different backgrounds or working in different districts needed different TPD approaches (Avalos, 2011). The conventional onsite TPD might be insufficient for diverse needs of teachers (Kleiman, Wolf, & Frye, 2013). An innovated MOOCs TPD approach may fill this gap to satisfy diverse teachers' needs (Lambert, 2020).

Taiwan is an information advanced country. For example, Taiwan Semiconductor Manufacturing Company (TSMC) has been a leading giant in its field, has boomed to be the top 10 company in the world, and has produced more than a half of world semiconductor chips for diverse information technological gadgets (Wu, 2020). Under the trend of technological innovation, information and communication technology (ICT) has brought huge influence on many levels of society (Mansell, 1999). The information technologies have applied in many aspects—business performance, data analysis, communication, enterprise internationalization, and education (Kudyba & Diwan, 2002; Lecerf & Omrani, 2020; Targamadzė & Petrauskienė, 2010). In education, online learning has flourished in various levels of schooling (Ayu, 2020), and the latest approach of online learning—MOOCs have become one of the most popular online learning approaches worldwide (Suresh & Srinivasan, 2020), especially under the threat of Covid-19

pandemic that causes worldwide lockdown of schools (Rapanta, Botturi, Goodyear, Guàrdia, & Koole, 2020). MOOCs might provide an innovative but Covid-19 pandemic-free condition for teachers to teach as well as to do their TPD activities.

The instructor's students who are the in-service teachers in master program, however, did not aware this trend; 14 of 21 (66.66%) of them have never heard about their professional development could be facilitated by MOOCs; and 17 of 21 (80.95%) of them have not tried this approach yet (IRN, 20200720). To understand this problem and empower these teachers' basic competency of TPD by MOOCs, the instructor designed an action research to explore the following problems: What is teacher's awareness of TPD by MOOCs? What are teacher's experienced problems of TPD by MOOCs? What is teacher's perceived effectiveness of TPD by MOOCs comparing to face-to-face TPD activities? What are the ways to motivate teachers to conduct TPD by MOOCs? To implement this action research, four goals were planned: analyzing teachers' awareness of TPD by MOOCs, understanding teachers' experienced problems of TPD by MOOCs, examining teacher's perceived effectiveness of TPD by MOOCs comparing to face-to-face TPD activities, and exploring the ways to motivate teachers to have TPD by MOOCs.

2. Literature Review

Three aspects of literature were explored—TPD, MOOCs, and TPD by MOOCs.

2.1 Teacher professional development (TPD)

Villegas-Reimers (2003) defined professional development as "the development of a person in his or her professional role" (p. 11), and OECD (2009) regarded teacher's professional development as "Professional development is defined as activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher" (p. 49). This definition was a broad TPD definition and included dimensions of cognition, affection, and skills. Under this broad TPD concept, the effective elements of TPD could include content focused, active learning strategies, collaboration, models, coaching, reflection, and sustained duration (Darling-Hammond, Hyler, & Gardner, 2017). In these broad TPD approaches, Taiwan's Ministry of Education (2014a) has suggested the relevant TPD activities including lesson study, workshop, seminar, onsite visits, action

research, and online learning. They included both conventional on campus and new trend of online TPD activities (Darling-Hammond et al., 2017).

Among the diverse TPD activities, the traditional TPD focused on school-based lesson study, on-site workshops, or local district TPD activities, but Hill (2009) has argued that the local-based TPD activities were lack of diversity course selectivity and the assistance from limited expertise and the few choice of TPD could not satisfy the various needs of teachers. TPD should response to teacher's needs (Darling-Hammond, Hyler, & Gardner, 2017), personal needs, professional interests, the stage of professional development, and enforcing teacher's professional role in the educational system (Villegas-Reimers, 2003). Moreover, the conventional onsite TPD was not fit the diverse schedules of teachers because teachers have heavy teaching loading at school and house works at home that limited teachers' TPD schedule (FGB, 20200817; IVE, 20200824).

To release the quality concerns (Hill, 2009) and to provide a flexible TPD schedule, MOOCs come from top universities worldwide without the spatial-temporal limitation may provide the qualified TPD and flexible schedule for all teachers.

2.2 Massive open online courses (MOOCs)

MOOCs are the university level's online courses built by the faculties of universities such as Stanford and Harvard or the experts of research institutions such as Google and Microsoft (Ahn, Yoon, & Cha, 2015). A single MOOC could serve hundreds of thousands of learners without the limitation of enrollment (Watson, Watson, Yu, Alamri, & Mueller, 2017). Everyone with the access of the Internet could learn from MOOCs (Lu, Liu, & Zhang, 2020). MOOCs' characteristics of high-quality courses from top tier universities and open for all would support MOOCs being a popular online learning approach nowadays.

Some successful MOOC examples are as follows: In Stanford University, Sebastian Thrun's "*Introduction to Artificial Intelligence*" online course that has hit the record high 160,000 registered learners in 2011 (Moe, 2016), Michael Sandel's "*Justice*" from Harvard has attracted millions views from Web sites for free accessing Harvard's popular general education (Friedman, 2013), and Andrew Ng's "*Machine Learning*" has hosted more than 100,000 worldwide participants learning online in a course session (Flynn,

2013). These astonished achievements surpassed the conventional online learning approach, not to mention the campus teaching which served about fifty students usually.

The MOOCs began from north America, spread to Asia, Europe, and Australia, and become a new online learning trend worldwide in the last decade (Baggaley, 2013). Coursera, edX, and FutureLearn are the top three MOOCs platforms where thousands of courses are provided free or with low cost without learning threshold for all global learners (Gulati, 2s013; Suresh & Srinivasan, 2020).

In Taiwan, ewant, ShareCourse, and TaiwanMOOC have provided hundreds Mandarin-based courses and become the most popular MOOCs learning platforms for Taiwanese learners (Hsieh, 2016). The other Asia-based MOOCs platform, XuetangX (Zhang & Yuan, 2016), is the biggest Mandarin MOOCs platform with more than two thousand courses that will be an alternative choice for learners who are lack of English competency to learn English MOOCs directly.

MOOCs with diverse courses have supported various needs that include career advance, certificates, degree, and lifelong learning. TPD by online approach has become an emerging approach for teachers (Dede, Jass Ketelhut, Whitehouse, Breit, & McCloskey, 2009); TPD by MOOCs might be a good attempt.

2.3 TPD by MOOCs

Since technology and distance learning could support TPD (Borko, Jacobs, & Koellner, 2010; Villegas-Reimers, 2003), teachers could make a good use of it to enjoy a convenient and innovative approach to engage TPD through MOOCs (Phan & Zhu, 2020).

Hill (2009) has found some traditional TPD problems that did not reach the supply, demand, information, and efficiency requirements of TPD because these local based TPD approaches lacked qualified contents, without clear courses' information for teachers and districts, was low in efficiency, and could not satisfy teachers' TPD demands. Through MOOCs, thousands of qualified courses were supplied (Cisel, 2019), could fit the varied teachers' needs, and provided clear information, based on online courses open feedback and evaluations, for teachers and school districts to pick up the relevant TPD courses they need (Sezgin, 2020).

MOOCs have also provided profound TPD related courses that include the pedagogical knowledge such as *Teaching Character and Creating Positive Classrooms*

and *Teacher and Social Emotional Learning* from Coursera, subject knowledge such as *Exploring English: Shakespeare* and *Computer Programming for Everyone* from FutureLearn, and subject teaching knowledge such as *Teaching Historical Inquiry with Objects* and *Effective Teaching Strategies for Biology* from edX.

Homeroom teachers, subject teachers, school administrators can also find TPD courses from MOOCs to fit their professional needs: *Effective Education* and *Life Education* from ewant for homeroom teachers, *Introduction to Calculus* and *Reading Studies for Schools* from ShareCourse for subject teachers, and *Ethical Leadership* and *Systematic Thinking and Problem Solving* from TaiwanMOOC for school administrator. Moreover, the MOOCs learning schedule will be flexible to follow teachers' personal available time such as the self-pace MOOC where learners can learn anytime they like (Moreno-Marcos, Munoz-Merino, Maldonado-Mahauad, Perez-Sanagustin, Alario-Hoyos, & Kloos, 2020). To sum up, the conventional TPD limitations of time, space, selectivity might be released through disruptive pedagogy of MOOCs that are powered by ICT innovation.

3. Research Method

The research method section discussed the research design, participants, instruments, data collection, and data analysis as follows.

3.1 Research Design

To solve instructor's pedagogical problems—to empower in-service teacher's competency of TPD by MOOCs, this study applied an action research because action research is a common approach and widely be used in many aspects of educational research (Avison, Lau, Myers, & Nielsen, 1999; Elliot, 1991; Rowe, 2020).

Action research is a method for practitioners to solve their practice problems in field through a scientific process (Reski, 2020). In education, teacher could conduct an action research to solve their practical problems in school because the action research will not only improve instructional quality but also increase teacher's professional ability (Sugiyama, Sajiki, & Horiuchi, 2020). A scientific based action research could help teachers to identify the right problems they faced and assist teachers to design a corresponding means to reach the intended aim efficiently. Through a scientific problem-

solving strategy, action research helped teachers to release practice obstacles and improved their problem-solving competency as well (Meesuk, Sramoon, & Wongrugsa, 2020).

In this research, the instructor intended to empower in-service teacher's competency of TPD by MOOCs since most of these teachers lack ideas, skills, and motivation to conduct TPD by online courses. Thus, the researcher as their *Teacher Professional Development* course instructor designed a introduction unit and homework of TPD by MOOCs to guide these teachers to understand the basic ideas and to conduct a practice of TPD by MOOCs. Through this instruction, in-service teachers' basic competency of TPD by MOOCs was enforced, their experienced problems were revealed, their perceived effectiveness and suggested motivation strategies of TPD by MOOCs were explored.

3.2 Participants

The participants were 20 female in-service teachers—16 in elementary school, 3 in high school, and 1 in hospital. They are the second-grade master students in a university. These participants are subject teachers, homeroom teachers, part-time administrators, and a hospital clinical teacher. These in-service teachers have about 7 years teaching experiences in average (2 years to 35 years). Twenty participants have assigned research informed consent to allow researcher using their learning and research related data anonymously.

3.3 Instruments

Several self-designed instruments were employed. First, the awareness of TPD by MOOCs questionnaire includes 3 items on teachers' awareness for pre- and post-test, 6 items on teachers' perceived effectiveness of face-to-face TPD activities and MOOCs-based TPD, and one item on teachers' motivation to conduct TPD by MOOCs for pre- and post-test. The questionnaire was a Likert's 7-point scale (1-Very disagree, 2-disagree, 3-somewhat disagree, 4-neutral, 5-somewhat agree, 6-agree, and 7-very disagree). The pre- and post-test were a repeated measures design to evaluate whether there is difference between pre- and post- test of in-service teachers' awareness of TPD by MOOCs.

Second, the TPD by MOOCs learners' opinion questionnaire included two open questions to investigate teachers' experienced problems of TPD by MOOCs and teachers'

suggestions of motivating TPD by MOOCs. Third, the study applied eight interviews with eight in-service teachers and twenty-five minutes each. Fourth, we conducted two focus groups (one hour for each) to explore the effectiveness and motivation of TPD by MOOCs. Fifth, the instructor has kept the reflective notes to record the significant events, meaningful insight, and instructor's reflection on the teacher, students' learning, and teacher-student interaction.

3.4 Data Collection

The awareness of TPD by MOOCs questionnaire and the TPD by MOOCs learners' opinion questionnaire were built by google form online. The awareness questionnaire was applied before and after students having the assigned MOOCs homework; twenty participants have fulfilled this questionnaire. The open question was conducted before the last week of semester; all responses were collected through online google forms directly. The interviews were conducted at the end of semester, the researcher kept the shorthand, and the shorthand was verified by interviewee after interview immediately. The individual interview data was coded as (IVD, 20200824) for student D having interview on August 24, 2020. Two focus groups were conducted in the mid and at the end of semester; the records were kept through shorthand and were verified by focus group members directly after meeting. The focus group data were coded as (FGE, 20200817) for students E having focus group on August 17, 2020. The instructors' reflective notes were kept during the whole semester and were coded as (IRN, 20200721) for instructor's note on July 21, 2020.

3.5 Data Analysis

The Likert 7-point scale of pre- and post-scores were analyzed through paired samples *t* test with IBM SPSS Statistics 24 to verify whether there is statistical difference between the pre- and post-test results. The data of open questions, interview, and focus group were read, extracted, and categorized by the author based on the research conceptual framework.

4. Research Results

The research results were reported according four research goals: teachers' awareness, teachers' experienced problems, teachers' perceived effectiveness, and teachers' suggested motivating strategies of TPD by MOOCs.

4.1 Teacher's Awareness of TPD by MOOCs

A paired samples *t* test (N=20) was conducted to compare teachers' awareness of TPD by MOOCs in pre-test (before the MOOCs homework) and post-test (after the MOOCs homework). There was a significant difference in the scores for pre-test (M=3.066, SD=1.632) and post-test (M=5.9, SD=0.542) conditions; t (19) =-8.173, p< .001. Further, Cohen's effect size value (d = -2.331) suggested a high practical significance (see Table 1).

There are three sub-items under the dimension of teacher's awareness of TPD by MOOCs—Sub 1, I know what are MOOCs; Sub 2, I know what is TPD by MOOCs; and Sub 3, I know how to TPD by MOOCs. Three sub-dimensions were all significant difference in scores for pre- and post-test conditions (see Table 1).

Table 1. Teachers' Awareness of TPD by MOOCs (N=20)

Variable	Pre-test M(SD)	Post-test M(SD)	fd	*t* value	p	Cohen's *d*
Teacher's Awareness of TPD by MOOCs	3.066(1.632)	5.9(0.542)	19	-8.173	.000	-2.331
Sub 1. Know what are MOOCs	3.25(1.743)	6(0.649)	19	-7.6	.000	-2.091
Sub 2. Know what is TPD by MOOCs	3.15(1.694)	5.85(0.587)	19	-7.285	.000	-2.13
Sub 3. Know how to TPD by MOOCs	2.8(1.609)	5.85(0.587)	19	-8.677	.000	-2.518

Note. Teacher's awareness of TPD by MOOCs was the average of the sum of sub1, sub2, and sub3 score.

4.2 What are teacher's experienced problems of TPD by MOOCs?

The answers to the open questions were read, extracted, and classified into four categories: MOOCs platform problems, course design problems, teaching and learning problems, and learners' personal problems.

4.2.1 MOOCs platform problems

Under this category, three types of problems were identified that included available courses, interface, and catalog. Eight participants have mentioned about they cannot find the courses they want because there are limited courses, such as few elementary TPD related courses and few courses fit their needs. Three participants have mentioned that the catalog system is not clear, and one has mentioned the courses under the catalog do

not match the catalog. One participant has complained that the interface of platform is not user-friendly.

4.2.2 Course Design problems

Nine participants have mentioned that they cannot reach the course because courses have time limitation of enrollment, such as courses started time and ended time. Two participants have mentioned that the courses have enrolling status limitation such as only for invited participants (FGB, 20200824). One has mentioned the learning session is too long. Two participants have complained the low quality of online lectures, such as without subtitle, unclear video sound, no voice tuner, unclear instructional demonstration, and "some functions are disabled such as discuss forum" (FGE, 20200824).

4.2.3 Teaching and learning problems

Two participants have mentioned that there is no teacher guide by side and cannot get the instance answer from instructor. Other feedback from participants include "the course has mandatory requirement to finish all the course components, but I do not have interest or I do understand on certain components; thus, I cannot pass the course requirement" (FGD, 20200824); "I suggest the course mush force participants to finish all course requirements; otherwise, I will jump to parts I like only easily" (FGD, 20200824).

4.2.4 Learners' personal problems

Several reasons have mentioned about learners' personal problems: "The learning time will be extended when I am busy", "Learning one unit after the other will let me feel tired", "Lack of intrinsic learning motivation, it is hard for me to learn actively", and " I am distracted easily". Moreover, the feedback from focus groups include "without instructor's monitor, learner was easy to distract and could not finish the course on the schedule" (FGC, 20200824) and "I will jump to see the lecture video I like, I might lost some important topics" (FGD, 20200824).

4.3 Teachers' Perceived Effectiveness of TPD

The teachers' perceived effectiveness of TPD by face-to-face activities reached 5.783 on mean score that indicates nearly agree to the effectiveness of TPD by face-to-face approach. The teachers' perceived the effectiveness of TPD by MOOCs reached

5.167 on mean score that indicates teachers are somewhat agree the effectiveness of TPD by MOOCs. (see Table 2)

A paired samples *t* test (N=20) was conducted to compare teachers' perceived effectiveness of TPD in face-to-face TPD activities (conventional TPD activities in classroom) and TPD by MOOCs. There was a significant difference in the scores for face-to-face TPD activities (M=5.783, SD=0.533) and TPD by MOOCs (M=5.167, SD=0.745) conditions; t (19) =4.975, p< .001. Further, Cohen's effect size value (d = 0.951) suggested a high practical significance. (see Table 2)

There are three sub-items under the dimension of teacher's perceived effectiveness of TPD—Sub 1, face-to-face activities improve my TPD more than MOOCs do; Sub 2, face-to-face activities improve my TPD competency more than MOOCs do; and Sub 3, face-to-face activities are more efficient TPD means than MOOCs are. These was a significant difference in score for face-to-face and MOOCs conditions in these three sub-items respectively (see Table 2).

Table 2. Teachers' Perceived Effectiveness of TPD by MOOCs (N=20)

Variable	By face-to-face M(SD)	By MOOCs M(SD)	Fd	*t* value	p	Cohen's *d*
Teacher's perceived effectiveness of TPD by face-to-face to by MOOCs	5.783(0.533)	5.167(0.745)	19	4.975	.000	0.951
Sub 1. Face-to-face activities improve my TPD more than MOOCs do	5.8(0.768)	5.45(0.826)	19	2.333	.031	0.439
Sub 2. Face-to-face activities improve my TPD competency more than MOOCs do	5.8(0.696)	5.3(0.865)	19	2.939	.008	0.637
Sub 3. Face-to-face activities are more efficient TPD means than MOOCs are	5.7(0.923)	4.75(1.118)	19	3.329	.004	0.927

Note. Teacher's perceived effectiveness of TPD by face-to-face activities comparing to by MOOCs was the average of combining score of sub1, sub2, and sub3 score.

4.4 What are the ways to motivate teacher to have TPD by MOOCs?

Participants' opinions of the ways to motivate teachers to have TPD by MOOCs were categorized into three aspects as follows.

First, sufficient courses: There were nine suggestions on providing more courses in MOOCs platform. These suggestions included "increasing teacher's practice courses such

as Math teaching," "multiple courses," "providing profound courses for different learning domains," and "more courses for high school teachers."

Second, supporting measures: Participants have suggested fourteen supporting measures on motivating teacher conducting TPD by MOOCs. There suggestions included "more introducing activities," "increasing extrinsic motivation," "planning rewarding regulation," "reducing teaching hours," "having free certificate," "verifying as TPD hours," and "replacing part of school-based TPD activities." Eleven of fourteen suggestions were related to extrinsic motivations such as giving reward and reducing teaching hours.

Third, teaching design and learning strategy: Two participants have suggestions on teaching design and learning strategy; these suggestions included "various learning contents such as example videos and animation" and "pick up the MOCO that fits your interest."

Fourth, would like to do TPD by MOOCs: At the end, there was a question on "would you like to do TPD by MOOCs" before and after MOOCs homework. A paired samples *t* test (N=20) was conducted to compare would teachers like to do TPD by MOOCs in pre-test (before the MOOCs homework) and post-test (after the MOOCs homework). There was a significant difference in the scores for pre-test (M=4.2, SD=1.281) and post-test (M=5.35, SD=0.813) conditions; t (19) =-4.524, p< .001. Further, Cohen's effect size value (d = -1.072) suggested a high practical significance. (see Table 3)

Table 3. Motivation of TPD (N=20)

Variable	Pre-test M(SD)	Post-test M(SD)	fd	*t* value	p	Cohen's *d*
I would like to do TPD by MOOCs	4.2(1.281)	5.35(0.813)	19	-4.524	.000	-1.072

5. Discussion

Several aspects of TPD by MOOCs are discussed as following.

5.1 Teacher's awareness of TPD by MOOCs

The participants' awareness of TPD by MOOCs is significant difference before and after MOOCs homework. The after homework score is significant higher than before the

homework score; the MOOCs homework has improved participants' awareness of "what are MOOCs," "what is TPD by MOOCs," and "how to do TPD by MOOCs" significantly. Before this MOOCs homework, participants' awareness of TPD by MOOCs is only 3.066 in the Likert 7-point scale that is somewhat disagree on "know how to conduct TPD by MOOCs." After conducting a MOOCs homework, participants' awareness score is 5.9 that is nearly agree on "know how to conduct TPD by MOOCs." These results suggest that the homework really has a significant effect on improving in-service teachers' awareness of TPD by MOOCs. Specifically, our results suggest that when in-service teachers received the relevant guidance, their awareness of TPD by MOOCs is enforced.

Therefore, it is not difficulty to cultivate teachers to know how to conduct TPD by MOOCs as case showed. A brief introduction to the ideas of MOOCs, to MOOCs platforms (Coursera, edX, ewant, ShareCourse, etc.), and to a practice of TPD from a MOOC will be good enough to equip teachers the minimum MOOCs learning competency, and then teachers can explore their own TPD by MOOCs journey. However, if we do not provide this brief introduction, teachers will rare have chance to aware this innovative means to conduct TPD.

5.2 Teacher's Experienced Problems of TPD by MOOCs

During the TPD by MOOCs practice, participants have encountered different problems, and the most important problem is that participants cannot get the courses they want, which includes nine responses on cannot reach the courses because limitation of course available time and eight responses on cannot find the courses they want from MOOCs platform. Total 17 responses or 50% of responses are the related issues of "cannot get the course they want" (Table 4).

Why teachers' majority experienced problem is that they cannot find the course they want though the published papers have mentioned that MOOCs have thousands of courses? (Cisel, 2019) There are two reasons to explain this question. First, although there are thousands of courses such as Coursera (4757 courses until 26 August 2020) and edX (2935 courses until 26 August 2020), most of them are English-based courses (Baturay, 2015). Most Taiwanese teachers' English competencies are limited, and they need the Mandarin-based courses for TPD (FGB, 20200824; IVD, 20200824). Second, there are

some TPD courses list one Mandarin-based MOOCs platforms, but most of them are either "course is over" or "course has not yet started." (IVE, 20200824; IRN, 20200810)

Many teachers have encountered the frustration on their first step of TPD by MOOCs for lack of course selectivity. It is the essential requirement that teachers need to have the course they want; otherwise, they will be locked outside of MOOCs platform before they can get any benefit from MOOCs for TPD. The government should solve this problem through either creating more Mandarin MOOCs or improving teachers' English competency, but "How many courses are enough for teachers to conduct TPD" and "how many years are enough for improving teachers' English competency" are both interesting issues for further studies.

Table 4. The frequency of teachers' experienced problems of TPD by MOOCs

Main problem catalog	Sub-catalog	Sub-catalog times	Main catalog times	%
Course design problems	1. Cannot reach the courses because limitation of course available time	9	14	41.176
	2. Courses have register limitation	2		
	3. Low quality of course design, such as without subtitle, unclear sound, etc.	2		
	4. Course learning session is too long	1		
Platform problems	1. Cannot find the courses teachers want	8	13	38.235
	2. Course catalog system is unclear	3		
	3. Courses do not match to the catalog	1		
	4. MOOCs platform interface is not user-friendly	1		
Learners' personal problems	1. Weak of time management	3	5	14.706
	2. Lack of background knowledge	2		
Teaching and learning problems	1. Without teacher guide by side	1	2	5.882
	2. Without instructor answer question instance	1		
		Total	34	100

5.3 Teacher's Perceived Effectiveness of TPD by MOOCs

The participants have positive perceived effectiveness on both conventional face-to-face TPD activities and TPD by MOOCs, but the mean of the former (5.783) is higher than the mean of the latter (5.167). Teachers regard that face-to-face TPD activities are more effective means than TPD by MOOCs are. The reasons include that "teachers can get assistant immediately in face-to-face activities" (IVD, 20200824), "We can ask the part we do not know immediately in face-to-face TPD activities" (FGF, 20200817), "In

face-to-face condition, there are many classmates learn together, while in MOOCs, I might fall into sleep sometimes" (FGC, 20200824), and "When I watch the video on MOOC, I am zoned out sometimes, but no one can remind me" (FGD, 20200824).

Face-to-face learning can bring the felling of presence, while MOOCs learning lack of the sense of presence (Foroughi, 2016). Moreover, teachers are still not family with MOOCs since two third of participants have never heard the ideas and practices of TPD by MOOCs before the class (IRN, 20200720).

Although teachers get the basic competency of TPD by MOOCs from this short introduction course, they do not develop the sufficiency skills to conduct a self-direct MOOCs learning approach. Thus, the face-to-face TPD approach is still a more effective means for teachers. Whether teachers will regard TPD by MOOCs a more effective means after taking more MOOCs learning training? It will be a good further exploring question.

5.4 Ways to Motivate Teacher to Conduct TPD by MOOCs

There are two main ways that participants suggested to motivate teachers to conduct TPD by MOOCs. First, increase the courses in MOOCs till teachers can get the courses they want. Teachers from different levels (K-12) and with varied professional (mathematics, music, English, history, etc.) need profound courses to fit their huge different needs. When teachers cannot find the courses they want, they turn away from MOOCs. If teachers find the courses they need easily, they will keep trying TPD by MOOCs. Thus, the first step is to increase the numbers of course in MOOCs.

Second, provide many incentive measures to motivate teachers to do TPD by MOOCs. These suggested incentive measures include money, award, certificate, a day off, and reducing working hours, and these extrinsic rewards are very concrete with the immediate utility. There is one participant has suggested that teachers should select the course they have interest that will help teachers learn actively (Bautista & Ortega-Ruiz, 2015). This is only one intrinsic motivation suggestion because TPD by MOOCs is not the main concern of participated teachers. The daily heavy teaching, administrative workloads, and the mater thesis have occupied most of energy of teachers (FGC, 20200817; FGB, 20200824; IVD, 20200824); TPD by MOOCs might be another burden right now (FGE, 20200817), and they need extrinsic reward to motivate them.

The other participant has suggested to increase the quality of TPD MOOC content, such as clear lecture video, clear sound, with subtitle, animation, quizzes, and various learning activities. This is a critical suggestion because when teachers learn in MOOC authentically, they will encounter these problems that will disturb their learning. Eventually, increase the course numbers could help teachers find the courses they like and incubate teachers' intrinsic motivation of MOOC learning gradually; otherwise, teachers will complain that "There is no MOOC to fit I need; thus, I am lack of intrinsic motivation to learn it" (FGG, 20200824).

5.5 Research Limitations

Since an action research focuses on solve instructor's practice problems, this study has some limitations. First, the participants are twenty female in-service teachers, and their characteristics might quite be different with the majority in-service teachers in the whole country. At least, there is no male teacher participated in this study; thus, the study results have limited inference power to other conditions. Second, the course contents are only including a brief introduction of MOOCs for TPD, a MOOC homework, and MOOC homework guidance and discussion in class. The participants have only learned the basic ideas and practices of TPD by MOOCs; therefore, their learning consequences on this issue might stay on surface level. A further study could design a semester course of TPD by MOOCs that may expand the effect of TPD by MOOCs.

6. Suggestions

Through this research, I infer several suggestions for educational policy makers, teachers, and researchers as following.

6.1 Building a MOOCs Platform with All the Courses Teachers Need

Most teachers would like to conduct TPD by MOOCs (M=5.35, Table 3), but teachers expect to get the course they want immediately when they visit a MOOCs platform because teachers are busy and expect an easier way to get what they need. Teachers are disappointed to find out no course they want.

Although Coursera and edX have thousands of courses and Ewant, ShareCourse, and TaiwanMOOC have hundreds of courses, they are either English-based MOOCs or not

available at that time. The available courses are very limited and cannot satisfy teachers' various needs.

Teachers, therefore, expect there is a MOOCs platform where teachers can get all the courses they want. That will save thousands or tens of thousands of teachers' time and energy to get the TPD courses they need. In status quo, it is a frustrated MOOCs journey for many teachers who try to find the TPD courses they want from MOOCs platforms, especial for the MOOCs beginner.

Building a MOOCs platform with all the courses teachers need might be a huge engineer project, but this platform could facilitate tens of thousands of teachers' needs of TPD to improve teachers' professional competency as well as increasing students' learning quality. It will be a well worth project to complete.

6.2 Equipping Teachers' Basic Competency of TPD by MOOCs

Most in-service teachers do not know how to conduct TPD by MOOCs, but through a short introduction course with a MOOC learning homework, most teachers will equip a basic competency to conduct TPD through MOOCs.

A short introduction course can include a brief MOOCs developing history, the introduction of main international and domestic MOOCs platforms, a demonstrating learning through a MOOC where learning interface, course components, common problems, and related learning tools such as google translation are demonstrated, and a student's practice with instructor's guide by side. This short introduction course can be transferred into a workshop with similar contents to empower teachers the competency of TPD by MOOCs in a short time. That will be an efficient strategy to enhance teachers' TPD capacity. After equipping teachers' MOOCs learning basic competency, teachers can open another window of TPD and conduct the flexible MOOCs learning where teachers can learn without time and space limitations.

6.3 Creating Extrinsic and Intrinsic Supporting Measures

If teachers cannot find the courses they like on the MOOCs platforms or they are lack of TPD by MOOCs motivation, some incentive measures may encourage these teachers to conduct TPD by MOOCs. These incentive measures could be money, award, certificate, a day off, and reducing working hours, or credit for teacher training hours.

Providing a certificate and regarding MOOCs as credit for teacher training hours will be the easiest way and without budget concern.

For a long run, how to cultivate teachers' intrinsic TPD by MOOCs motivation will be a critical issue. Since the 12-year basic education curriculum guideline intends to cultivate students' lifelong learning competency, teachers should demonstrate their lifelong TPD motivation and competency and be an example for students.

The way to cultivate teachers with lifelong TPD competency should focus on connecting teachers' personal interest and professional interest together. Teachers' school subject teaching and administrative work arrangement had better fulfill teachers' interest and professional, and then teachers could conduct TPD activities corresponding to their interest and professional topic at the same time. Moreover, there should be sufficient TPD courses on MOOCs to satisfy teachers' various needs, and then teachers could conduct and enjoy their TPD by MOOC one after the other. These joyful TPD experiences will repeatedly enforce teachers' TPD by MOOCs habit, and eventually cultivate teachers' lifelong TPD by MOOCs competency.

6.4 Suggestion for Further Study

Through this research, I have found several crucial issues well worth for further study as follows: First, how to build a MOOCs platform with all the courses teachers need will be the most important issue for implementing the policy of TPD by MOOCs. Second, how to enforce teachers' intrinsic motivation for TPD by MOOCs, either case study or a survey research, is a critical issue. Third, reporting teachers' TPD by MOOCs successful cases will be a meaningful and useful studies for demonstrating good examples to other teachers.

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