

Generating New Paths for Teacher Professional Development (TPD) through MOOCs

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Abstract

The study investigates the feasibility and means for facilitating teacher professional development (TPD) by massive open online courses (MOOCs). Through a literature review, limitations in conventional TPD approaches due to time, location, capacity, and budget issues were discovered. By exploring recent publications on information and communication technologies (ICT) in online learning and pedagogical innovation, this study has recognized that MOOCs are a feasible path for TPD since MOOCs are free and open for all with few limitations of time, location, and participation. The research has found several means for TPD through MOOCs, such as improving teacher's pedagogical literacy, professional subject knowledge, and professional subject teaching competency by MOOCs. Further, this study provides a critical reflection on the advantages and limitations of TPD through MOOCs and proposes some remedies for these limitations. Finally, the author infers some implications for TPD: using the advantages of MOOCs to facilitate TPD, providing teachers with support measures, facilitating the innovation of MOOCs, and encouraging teachers to be active learners in MOOCs.

Keywords: teacher professional development, MOOCs, online courses, online learning, pedagogical innovation



透過磨課師為教師專業發展創造新途徑

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摘要

本研究探討大規模開放性線上課程（磨課師）促進教師專業發展的可行性與方法。藉由文獻分析發現，因於時間、空間、容量與預算限制，傳統教師專業發展存有局限性。透過探索資訊與通訊科技在線上學習與教學革新的研究發現，磨課師可為教師專業發展之合宜途徑，因為磨課師免費開放給大眾，少有時間、空間、參與的限制。研究找出透過磨課進行教師專業發展的方法：諸如藉由磨課師提升教師之教育專業素養、專業學科知識、以及專業學科教學能力。此外，研究對經由磨課師進行教師專業發展之優缺點提出批判性反思，再對缺點提供修補之道。最後，研究者推論對教師專業發展數項啟示：利用磨課師的優點來促進教師專業發展、提供教師配套措施、支助磨課師的革新、以及鼓勵教師成為磨課師的主動學習者。

關鍵詞：教師專業發展、磨課師、線上課程、線上學習、教學革新



Introduction

Teachers' abilities are crucial for student performance (Harwell, 2003); thus, teachers need to engage regularly in professional development to improve their skills (Downes, 2004). Conventional onsite teacher professional development (TPD) models, however, have some limits on time, space, selection, and budget, whereas massive open online courses (MOOCs) can provide new paths for TPD without these limitations.

Professional working context is a dynamic changing phenomenon of learning and knowing rather than a fixed production process (Tuomi, 2013), so teachers should continuously renew their professional knowledge, skills, and attitude to keep up with social changes. Moreover, working and learning in professional fields are genuinely intertwined (Milligan & Littlejohn, 2014) as Downes (2004) described: "It has been widely observed that learning does not end with graduation, that employment in a profession carries with it an ongoing need for professional development..." (p. 8).

Although TPD is an important mission, conventional TPD models are limited by course time, commuting distance, budget, academic resources, non-personalized presentation, and available learning partners. To overcome these limitations, information and communication technologies (ICT) for online learnings are appropriate for a society oriented to the Internet (Glassman & Burbidge, 2014) and can be a fruitful direction for pedagogical innovation as well as a tool for TPD. At the forefront of this development are MOOCs (Ospina-Delgado & Zorio-Grima, 2016) since MOOCs can be a "potentially useful mechanism for supporting and enabling professional learning, bringing diverse groups of learners together, united by common (or at least complementary and overlapping) learning needs" (Milligan & Littlejohn, 2014, para. 8). In addition, Partnership for 21st Century Skill (2009) suggested to "enable 21st century professional learning communities for teachers" (p. 8). MOOCs can facilitate to form professional learning communities for teachers by clustering a great many participants with similar interests, overcoming spatial and temporal limitations.

MOOCs have been applied in professional development for pharmacists (Wan & Hsu, 2016), librarians (Fredrick, 2014; Spring, 2016; Wilson & Gruzd, 2014), health-care

professionals (Paul et al., 2016), nurses (Skiba, 2013), and teachers (Mirriahi, Alonzo, McLntyre, Kligyte, & Fox, 2015). Stephens and Jones (2014) conclude that MOOCs for librarian's professional development "can provide LIS [library and information science] practitioners with a professional development opportunity in a global classroom of peers" (p. 354). Vivian, Falkner, and Falkner (2014) propose a MOOC for TPD "to address the challenge and support teachers with the implementation of a new computing curriculum" (p. 7). For the human resource profession, Radford et al. (2014) find that "the potential for employers' use of MOOCs is strong... almost three-quarters (73%) viewed MOOC courses positively or very positively when making hiring decisions" (para. 51). Skiba (2013) also suggests using MOOCs to improve nurse's professional development. Radford, Coningham, and Horn (2015) use MOOCs for employees' professional development from the Research Triangle Institution's experiences. Milligan and Littlejohn (2014) conclude that "a professional learning MOOC could support professional learners to reflect on the knowledge gained from the course and how it may be embedded into their work practice before the end of the course" (para. 31). Most of the learners in the HarvardX and MITx MOOCs are teachers (Ho et al., 2015). Learners, including teachers, can easily access MOOCs by a computer or smartphone with internet connection (Chang, Hung, & Lin, 2015). As open and flexible tools to educate many people, MOOCs have enormous potential to meet various needs of learners (Jansen & Schuwer, 2015).

Given the identified limitations of conventional TPD models (e.g. budget, resources, space limitations), the educational innovator will see the solutions possible due to the flexible features of MOOCs. Thus, MOOCs could be new paths for TPD in Taiwan that awards many of the limitations of traditional TPD. To test this hypothesis, this research investigates the feasibility of delivering TPD via MOOCs. After evaluating the proposed new paths for TPD, this study provides some implications for educational policy makers, school leaders, researchers, and teachers. Figure 1 demonstrates a concise research conceptual framework of new paths for teacher professional development through MOOCs.

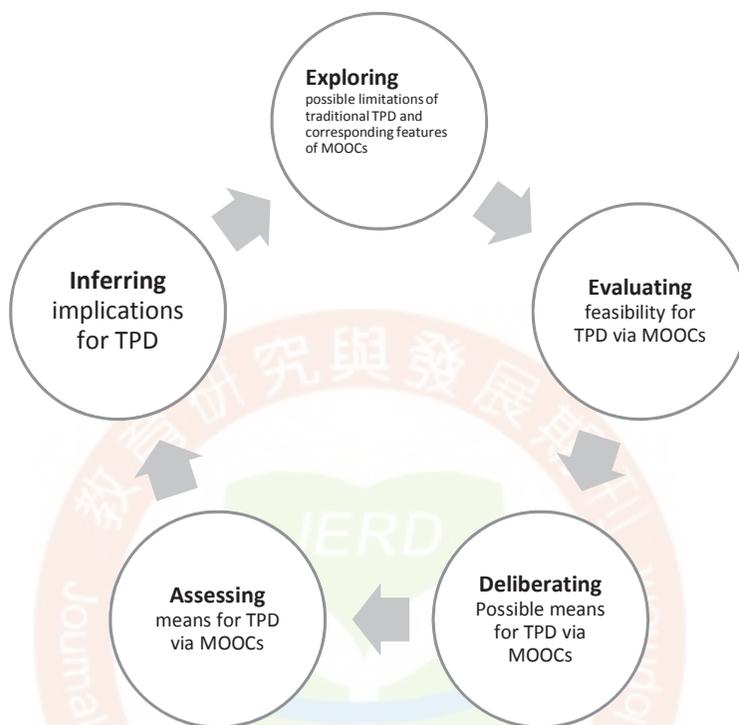


Figure 1. Research framework of new paths for teacher professional development through MOOCs.

Following this research framework, this study begins with a literature review on the concept of TPD, as well as the features and applications of MOOCs. Second, the correspondences between limitations of traditional TPD and the features of MOOCs are evaluated as rationales of the feasibility of generating new paths for TPD via MOOCs. Third, the research deliberates and generalizes some means for TPD through MOOCs. Fourth, the advantages and limitations of means to present TPD through MOOCs are assessed. Finally, these perspectives are appraised and inferred into implications for TPD.

Teacher Professional Development (TPD) and MOOCs

The related concepts are discussed and analyzed in this session as the foundation

for arguing the feasibility of MOOCs for TPD in next session. These analyses include the need for TPD, conventional TPD approaches, limitations of conventional TPD, various web-based learnings and MOOCs as the latest trend, and features of MOOCs.

The Need for TPD

Due to technological innovations, people's lives have changed rapidly in many aspects, including education. Learning is predicted to become more integrated with other components of our lives that will be affected by technologies (Downes, 2004). Digital innovation brings opportunities and challenges for higher education (Ospina-Delgado & Zorio-Grima, 2016), encourages teachers to adopt the flipped classroom technique (Clem & Junco, 2015), and uses mobile devices (Sung, Chang, & Liu, 2016). Technological evolution is creating new ways to connect online learners to educational opportunities (Anderson, 2013).

In the 20th century, scientific knowledge increased exponentially (Price, 1963), and even more so in the current century (Siemens, 2005). Tuomi (2013) has stated that: "Evolution becomes revolution when the established institutional order changes and new social practices and concepts begin to organize everyday activity and discourse" (p. 58). Teachers must incorporate innovations in their pedagogy for the new generation of students whose lives will be changed by advancements in genetics, biotechnology, nanotechnology, artificial intelligence, and robotics (World Economic Forum, 2016).

Educational reform encourages teachers to participate in professional development since educators need up-to-date knowledge and skills (Liu, Jehng, Chen, & Fang, 2014), and TPD can have a significant role in increasing educational quality (Choy, Chen, & Bugarin, 2006; Harwell, 2003). Teachers should be aware of revolutionary changes in education and prepare themselves with current professional knowledge, skills, and attitude; otherwise, the out of date knowledge and skills in education is insufficient for students to survive in 21st century where there are full of creative and innovative challenges. Thus, educators should develop new pedagogical competency to inspire students to effective learning and creative performance.

Conventional TPD Approaches

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) categorized international TPD into three models — organizational partnership model, small group model, and individual model. There are various approaches under these models — professional-development schools, workshops, self-directed development, observation of excellent practice, co-operative or collegial development, case-based study, teachers' participation in new roles, portfolios, action research, teachers' narratives, coaching, and others (Villegas-Reimers, 2003). These models and approaches are used according to the practices of individual schools and varied school teacher to fit conditions, contexts, and needs. However, TPD has traditionally been provided through topic workshops arranged by the school or district without consulting teachers (Choy et al., 2006). This approach may neglect teachers' needs, lack continued support, and be less effective in creating authentic change.

To provide systematic support for TPD and assess its outcomes, Teacher Evaluation for Professional Development (TEPD) has been used for the K-12 TPD model in Taiwan since 2006 (Huang, 2010). The TEPD model for TPD provides a systematic, continued, and evaluative mechanism, but too many evaluations can drain teacher's energy without providing actual pedagogical improvement.

Little (1993) pointed out that TPD should emphasize teachers' collaborative work and learning for improving teaching and student achievement. Directions Governing for the 12-Year Basic Education Curricula (Ministry of Education, 2014) also suggested the use of professional learning groups, collaborative lesson planning, teaching observation and feedback, curriculum development, participatory workshops, topical lectures, online learning, action research, and other means for TPD. However, Liu (2017) found that teacher's lesson study — including collaborative lesson planning, open classroom observation, and discussion — improves teacher's pedagogical competency and increases students' learning consequences, leading to a more effective TPD approach. Lesson study has three main focuses: understanding subject content knowledge, improving teaching strategies, and enhancing students' learning quality. Since technology integration can

improve the results of TPD (Liu, 2013; Liu, Tsai, & Huang, 2015), it is worth exploring how MOOCs can facilitate lesson study for TPD.

Various TPD approaches are used in Taiwan, including the alternative and multiple TPD model (Tseng, 2003), action research TPD approach (Weng & Lin, 2005), empowerment and conversation TPD approach (Chen, 2008), faculty learning community for TPD (Chen, 2014), and others. Since Taiwan has ten thousand schools and hundreds of thousands of teachers with diverse individual conditions and educational contexts (The Taiwan Ministry of Education, 2017), a variety of TPD models are needed. Teachers who cannot access a superior TPD approach by traditional means should have alternative approaches.

Limitations of Conventional TPD

School-based TPD activities are common for K-12 teachers in Taiwan, and teachers usually have one half-day weekly allotted for TPD in their school. For example, one to four p.m. Wednesdays is assigned for elementary school teacher's TPD. Teachers must regularly engage in TPD activities that are scheduled at the beginning of the semester, though there are a few exceptions. The high school policy is to schedule one half-day without classes weekly for teachers who teach the same subject to meet. These teachers can engage in TPD at their school or make other arrangements. However, the limitations on time, space, budget, supporting resources, personalized learning, and learning partners limit the opportunities and results of TPD.

For example, most K-12 teachers teach classes from eight a.m. to four p.m. (elementary school) or to five p.m. (high school), but they must arrive earlier to care for students who have come earlier and to direct students to do morning cleaning. They also stay beyond the end of classes to handle student's afternoon dismissal and finish their classroom duties. Harwell (2003) suggested that there be "time for TPD equaling 25 percent of time during each day for teachers to work together and to collaboratively plan lessons and share information" (p. 9); but in Taiwan there are only weekly half-days for TPD, and these may be preempted by school policy propaganda.

Most teachers can only attend the school-based professional development activities

due to their heavy loads of teaching and other administrative activities. Professional development courses, workshops, or lectures are usually provided by teacher colleges, universities, and in-service education centers, which are located in a few limited areas. Thus, only the relatively few teachers who live or work near these locations can attend site-based TPD.

Although schools have some budget to plan weekly school-based TPD activities, they lack the funds to support TPD that is adequate in quantity, type, or personalization. In addition, schools have insufficient supporting resources, such as books, videos, facilities, or professional staff for TPD. Taiwan had about 300,000 teachers in 2015 (The Taiwan Ministry of Education, 2015), including the outlying islands and remote areas with very limited resources for TPD. Teachers have diverse TPD needs, according to their level of kindergarten, elementary or high school teaching (McNeill & Knight, 2013). Due to limited budget, most of school-based TPD activities are in groups with limited topics, and individualized professional development has been assumed to be the responsibility of teachers themselves. It is difficult to form a TPD learning community in a single school since the number of teachers is small in most schools and teachers have diverse pedagogical interests, or they may be specialized teachers for certain subjects who serve several schools. Time and commuting issues limit teachers from forming a TPD learning community with neighboring schools.

Conventional policies offer few solutions for these limitations, and in order to advance their professional abilities, teachers must either face disruption to facilitate the existing TPD models or be presented with an alternative TPD approach. Through the innovation of ICT in education, ubiquitous and flexible online or web-based learning may shed light for new paths to TPD.

Various Web-based Learnings and MOOCs as the Latest Trend

The technological transformation from ICT has had massive impact on education (Means, Bakia, & Murphy, 2014), one which has become clearer over the past decades with developments in e-learning methodology (Nath & Agarwal, 2014). ICT has changed the learning culture due to two features — the vast amount of online learning resources

and the great number of learners connected online (Thomas & Brown, 2011). Moreover, applying technology into teaching is a global trend (Li & Choi, 2014). Lytras et al. (2015) predicted, "...in less than 20 years informal learning will gain the same importance to formal learning thanks to technologies powered by collaborative learning infrastructures" (p. 561).

Web-based learning, or web learning, and online learning both involve learning through the Internet, where the web is the common interface. Web-based learning, however, is slight different to web-based education since the meaning of web-based education is much broader than web-based learning, whereas learning is only one part of education (Devedzic, 2006). The applications of web-based learning, nonetheless, are diverse and changing rapidly with developments of information technology (Schaller, 1997). People can explore web learning through various websites or platforms, including Khan Academy, JunyiAcademic, Assessment & Learning in Knowledge Spaces (ALEKS), Open Course Ware (OCW), MOOCs, EduTopia, Modular Object-oriented Dynamic Learning Environment (MOODLE), Linda, Ted, and Duolingo. These online learning websites are open for all, without spatial and temporal limitations too; but they differ in fee, depth and breadth of their contents, target learning population, curriculum design, and pedagogical styles.

For example, Khan Academy, a well-known international web learning platform, provides K-12 students free courses for basic educational literacies with limited pedagogical styles. In contrast, MOOCs provide high school and college students with career advancement training and lifelong learning. MOOCs also use many pedagogical innovations, such as online discussion, team projects, peer assessment, hour-long stimulating lectures, online game learning, online learning communities, and others. Edutopia is another web learning platform for K-12 teachers and parents that includes thousands of resources for K-12 teaching and learning strategies: articles, videos, weblinks, discussion forums, Facebook and Twitter links, etc. Though there are many useful K-12 educational ideas and practices in Edutopia, MOOCs comprise an extended virtual university that provides comprehensive courses, certificate programs, and degree courses more flexibly for diverse populations.

Each web learning platform has its own distinct characteristics that may be appropriate for certain aspects of TPD, so it would be challenging to compare the differences among web learning platforms for facilitating TPD. It also requires a series of papers to fully analyze various web learning sites' individual characteristics to explore these distinct applications for TPD.

This paper, however, focuses on MOOCs only because MOOCs are an innovation in education (Holotescu, Grossec, Cretu, & Danciu, 2014), have high level content, provide various flexible features, attract a huge group of teachers, and have been widely discussed in online education (Dodson, Kitburi, & Berge, 2015). The development of MOOCs is very rapid. In the fall of 2011, Stanford Professor Sebastian Thrun and Google's Director of Research, Peter Norvig, opened an online course titled SC221: Introduction to Artificial Intelligence that attracted 160,000 students from 190 countries around the world (Davidson, 2013). The success of this course inspired Thrun to launch the first MOOCs platform, Udacity, in February 2012. Coursera and edX soon followed, FutureLearn was launched in the UK, iversity started in Germany, Open2Study began in Australia, and ewant and ShareCoure opened in Taiwan. In addition to higher education (Hew, 2016), MOOCs are also used in other level of schools and become the latest trend in online learning.

Features of MOOCs

Several features make MOOCs become a new trend for online learning and pedagogical innovation. This study has categorized them into four major features of MOOCs that own potential to facilitate TPD.

First, providing online courses without spatial and temporal limitations: MOOCs build their courses online in virtual space where people could access these courses at any time and any location (Chang et al., 2015).

Second, open availability for all: MOOCs are provided free of charge (Kizilcec, Piech, & Schneider, 2013), and they attract people and institutions, especially those with little professional development budget (Radford et al., 2014).

Third, the diversity and high level of courses: The variety of courses available

through MOOCs can support learners' needs and interests (Chang et al., 2015). For example, the biggest MOOCs platform, Coursera, provides 2,574 courses from 161 universities or institutions across 29 countries, and there were 1,214 found in a keyword search for "professional development" on December 19, 2017. Most of courses have a prominent level of content because they come from top tier universities, such as Stanford University, University of Tokyo, University of Copenhagen, and National Taiwan University.

Fourth, varied curriculum design and flexible pedagogy: MOOCs curriculum designs differ from traditional classrooms courses (Macleod, Haywood, Woodgate, & Alkhatnai, 2015) since they have more components. Traditional classroom courses have a syllabus, lecture, handout, textbook, PowerPoint, quizzes, midterm and final examination, homework or team works, and face-to-face discussion or Q&A. Though MOOCs do not have face-to-face activities, they provide many online open educational resources (OERs) links, instant quiz feedback, lecture scripts, online discussion or Q&A forums, learner's progress records, learning analysis, course review, and online learning games.

Traditional classroom teaching and learning is a linear approach, whereas MOOCs learners can choose a non-linear way to learn, such as reading the handout before watching the lecture video, doing the quizzes before reading the text, participating in a discussion forum before finishing the session's reading or lecture, or writing the final paper before finishing the course materials. The pedagogical innovation of MOOCs supports flexible learning sequences that fit individual learners, such as blending online courses with traditional campus courses (Christensen & Eyring, 2011).

Although there are many conventional online courses or web learning sites with some features of MOOCs such as freedom from location or time limitations and having flexible pedagogy, MOOCs have a number of other features. For example, conventional online courses charge a fee for learners, whereas MOOCs are free with an optional payment for a certificate. Traditional online learning websites provide a limited number of courses from only a few institutes, while MOOCs can accumulate one more thousand courses from one hundred world top-tier universities. Regular online courses attract hundreds or thousands of paying learners for a course, but a single MOOC can service

more than a hundred thousand participants.

With these features, MOOCs may become an excellent option for new paths of TPD or a way to facilitate other TPD models. The paper argues MOOCs' feasibility for TPD in following session.

Feasibility of Providing TPD via MOOCs

This section argues how the features of MOOCs can overcome the limitations of conventional TPD and reveals the feasibility for generating new paths for TPD through MOOCs.

MOOCs for TPD Without Limitations on Location and Time

Except the few hours per week in school for professional development, teachers can also do their professional development at night, on weekends, and during winter break or summer vacation. However, during these available times the courses, lectures, meetings, or workshops for conventional TPD take place in only a few locations, such as teachers colleges or teacher in-service education centers that are inconvenient for most teachers. In contrast, with MOOCs, teachers could do their professional development at whatever time or place is convenient that has internet access. MOOCs can thus provide teachers with a more convenient means for professional development as Harwell (2003) has found in teacher's online professional development.

MOOCs for TPD Are Free and Available for All

Doing TPD on MOOCs has few financial limitations because most MOOCs are free and for all without discrimination based on nationality, sex, or age (Dodson et al., 2015). Although there are some worries about the freemium policy, it is only an additional option to pay for certification or degree. Teachers can get the benefits of most of MOOCs without additional fee beside the cost of Internet access. Teachers fee for official certifications also can be less expensive, such as 49 US dollars for the University of California, Irvine's "Foundations for Virtual Instruction" course from Coursera.

MOOCs for TPD Fit Teachers' Various Needs

The thousands of courses on MOOC platforms offer many options for teachers to choose courses of interest for their professional development. Radford et al. (2014) found that “using MOOCs for professional development had to do with enabling employees of all levels to advance in their careers” (para. 31). Classroom teachers, subject teachers, or school administrators could all benefit from the varied courses in MOOCs, such as “Teaching Character and Creating Positive Classrooms” from Coursera for classroom teachers, “Basic Physics” in Open2Study for subject teachers, or “Leaders of Learning” from edX for school administrators.

MOOCs for TPD May Be Tailored for Personalized Learning

MOOCs are flexible (Porter, 2015) and provide the various course components through an adaptable learning process that enables a teacher's personalized professional development. “Even where courses are formal, the ‘open’ and online format offers a useful approach to professional learning, potentially capitalizing on the inter-relationship between professional practice and learning through allowing each individual to tailor specific learning needs to their work demands” (Milligan & Littlejohn, 2014, para. 3).

Teachers could enjoy their personalized professional development in MOOCs by choosing a self-paced MOOC, learn in a non-linear sequence, choosing their own goals, sharing their pedagogical problems, and answering to others' questions. This can be a much more personalized learning experience than conventional on-campus professional development workshops or courses.

In summation, MOOCs for TPD can overcome limitations due to time, cost, and location while fitting teachers' various needs and supporting personalized learning. Thus, the feasibility of MOOCs as new paths for TPD can be regarded as a positive vision for the future.

Means for TPD via MOOCs

The Organization for Economic Co-operation and Development (OECD, 2009)

defined TPD as: “activities that develop an individual’s skills, knowledge, expertise and other characteristics as a teacher” (p. 49). Directions Governing for the 12-Year Basic Education Curricula (Ministry of Education, 2014) suggested that TPD contents should include professional subject knowledge, pedagogical practical ability, and pedagogical professional attitude. This study considers the main components of TPD suggested from the OECD and Directions Governing for the 12-Year Basic Education Curricula and discusses several ways of delivering TPD through MOOCs.

An Introductory TPD MOOC

Since MOOCs are relative new learning approach for teachers, a course, an introductory TPD MOOC, for teachers to enhance their “MOOCs learning literacy” and “TPD via MOOCs literacy” is essential. Such a MOOC would introduce the use of MOOCs for learning (similar to Open University’s “Get Started with Online Learning” in FutureLearn), suggested ways of learning on MOOCs (such as University of Leeds’ “Learning Online: Learning and Collaborating” in FutureLearn), provided the general ideas of TPD (similar to Commonwealth Education Trust’s “Foundations of Teaching for Learning 7: Being a Professional” in Coursera), recommended related courses for TPD on MOOCs, and discussed how to form an online TPD community. Equipping with a basic literacy for TPD on MOOCs, teachers will have abilities and confidence to explore their professional development through MOOCs.

MOOCs for Pedagogical Knowledge, Skill, and Attitude

An educational professional, including subject teachers, classroom teachers and administrators should have educational professional knowledge, skills, and attitudes; and there are many pedagogical related courses on MOOCs. For example, Relay Graduate School of Education’s “Teaching Character and Creating Positive Classrooms” in Coursera, The University of Texas at Austin’s “Classroom Strategies for Inquiry-Based Learning” in edX, University of Colorado Boulder’s “The Teacher’s Social and Emotional Learning” in Coursera, and National Chiao Tung’s “FM-The Ideas and Practices of Flipped Classroom” in ewant.

MOOCs for Professional Subject Knowledge and Skill

Most teachers tend to become experts in subject areas, such as English, chemistry or music. Thus, subject knowledge and skill are essential for TPD and should be included into TPD courses. Subject-related courses on MOOCs are easy to find because MOOCs originate from university courses on diverse academic disciplines — mathematics, physics, government, psychology, literature, music, art, and others. For example, a Physics or Natural Science teacher could use Swinburne University of Technology’s “Basic Physics” from Australia MOOCs, Open2Study; Art or Music teachers could use Goldsmiths University of London’s “Machine Learning for Musicians and Artists” from kadenze, a professional MOOCs platform brings together educators, artists, and engineers from leading universities; or Social Science teachers could use Chung Yuan Christian University’s “Introduction to Multicultural” from ShareCourse, Taiwan’s MOOCs platform.

MOOCs for Professional Subject Teaching Knowledge and Skill

A good subject expert may not be a good subject teacher, especially for elementary or junior high school because young students need more scaffolding assistances from teachers who have the subject teaching knowledge. Teachers could learn subject teaching knowledge and skill MOOCs from many subject teaching courses. For example, teachers can learn English teaching from Arizona State University’s “Teaching English Now! Foundational Principles” from Coursera; Biology teachers can learn from Trinity College’s “Effective Teaching Strategies for Biology” from edX; and Physical Education teachers can learn from the University of Birmingham’s “Outstanding Physical Education Lessons” from FutureLearn.

MOOCs for Facilitating Lesson Study TPD Model

A lesson study TPD model can help teachers understand subject content knowledge, improve teaching strategies, and enhance students’ learning quality better than other TPD approaches (Liu, 2017). Though this model shares some limitations of the onsite TPD

model, such as time, experienced peers, and resources, MOOCs have the potential to facilitate the lesson study TPD model to improve TPD results through following ways.

First, since not every teacher is familiar with the lesson study TPD model, a Lesson Study MOOC is an efficient and economic gateway to recruit teachers to explore the idea and practice of the lesson study for TPD.

Second, if teachers are not comfortable opening their classrooms for observation, thousands of MOOCs can act as examples that show open classrooms online for observation, thereby making teachers more willing to accept this activity.

Third, during collaborative lesson planning, several team teachers sometimes can only share their own limited ideas, knowledge, skills, and experiences. MOOCs can act as OERs, where thousands of courses syllabi, designs, contents, and related materials are free for teachers to use as references for innovative techniques.

Fourth, when teachers engage with the feedback discussion after classroom observation, thousands of real-time teaching videos on MOOCs can play, forward, backward, and pause for comparison and enrich the discussion.

Fifth, some MOOCs are filmed from real classroom teaching, and lesson study team members can see MOOC students' performance in classes and compare that to their own students' performance. These comparisons may inspire lesson study team members to reflect and innovate their own pedagogy.

MOOCs accumulate good classes online for open classroom observation and welcome all teachers to observe MOOCs classroom teachings. Teachers could take advantage of MOOCs features to enrich their lesson studies as well as benefit students' learning.

Other Ways for TPD via MOOCs

Several other ways for TPD on MOOCs are discussed.

Forming a TPD community with online learners. Forming a professional development community could motivate teachers to engage in sustainable professional development, and online learning can help attain this goal because from a huge MOOCs population it will be easier to find learning partners who can participate in a community.

If teachers intend to pursue corporate learning, they could learn KPMG's "Corporate Digital Learning" from University of Applied Sciences, Germany. If teachers want to connect to other teachers, they could join "Deeper Learning MOOC (DLMOOC)." Teachers could also develop their relationships with students, parents, colleagues, and school leaders, through Commonwealth Education Trust's "Foundations of Teaching for Learning 8: Developing Relationships" from Coursera.

Teacher's lifelong learning through MOOCs. Learning can be lifelong and closely connected with one's vocation (Siemens, 2005). UNESCO suggests four pillars for lifelong learning: learning to know, learning to do, learning to live together, and learning to be (Delors, 1996), "learning to change" was subsequently added (UNESCO Institute for Education [UIE], 2003). Stephens and Jones (2014) suggested: "We would advocate for future partnerships with professional associations, institutions of higher learning, or non-profits to use the model to offer continuing opportunities for lifelong learning" (p. 354). As teachers learn to change their traditional professional development and learn from online learning platforms, MOOCs can provide freely available lifelong learning resources.

Several courses are related to lifelong learning in MOOCs, such as Harvard University's "Leaders of Learning" in edX, University of California, San Diego's "Learning How to Learn" in Coursera, and University of Leeds' "Blended Learning Essentials: Getting Started" in FutureLearn.

Learning pedagogy knowledge and curriculum design skill from participating MOOCs. The most important aspect is that MOOCs can improve teaching and learning. Instructors, staff, and designers on MOOCs have the chance to learn from experimenting with MOOCs, as well as to educate others (McAndrew & Scanion, 2013), and some professors have learned to improve their teaching skills via teaching an experimental course in MOOCs (Hew & Cheung, 2014).

There is a vast quantity of data from MOOCs learners, which can open opportunities for educational research (Breslow et al., 2013). For example, "Educators can use their MOOC experiences to improve their on-campus, blended and mobile teaching by design, and by the continuing provision of resources, share and apply knowledge in their own

networks” (Salmon, Gregory, Dona, & Ross, 2015, p. 553).

Directly obtaining pedagogical ideas and practices from MOOCs. The pedagogical methods and curriculum design in a MOOC provide examples for teachers to learn from. Teachers, therefore, can learn this pedagogical knowledge and skills from any MOOC they use. In a traditional educational culture, there may be few chances for teachers to observe other teachers’ teaching, but MOOCs open thousands of courses where teachers can not only experience but also examine their pedagogical methods closely. MOOCs thus provide great opportunities for teachers to learn from real pedagogical cases.

Examples of Effective Instructional Designs That Support TPD by MOOCs

To provide some practical applications for TPD through MOOCs, three examples of effective instructional designs that support TPD by MOOCs are discussed.

First, TPD on “Leading an Effective Big Class Discussion through Sandel’s Justice” in edX: Leading a classroom discussion is not easy especially in a large class, but a good model can make this mission easier. Michael Sandel’s Justice course through Harvard’s Sanders Theatre to MOOCs platform edX has become a very well-known self-paced course for his outstanding ability to lead a big class discussion. Teachers can learn from Sandel’s classroom discussion by examining and mimicking the details of curriculum design and pedagogical style step by step through online flexible usages to be better able to lead a large class discussion.

Second, TPD Team Study on a MOOC: Several teachers can form a learning community for TPD. They can choose a MOOC as their TPD course, learn from this MOOC together and discuss course content, curriculum design, teaching style, student performance, assessment methods, and course resources. Through team learning, teachers can inspire each other, get supports, and share their various understandings. TPD team study can make TPD as more engaging and productive.

Third, TPD Individual Preference MOOC as a Model: Each teacher has distinct characteristics, specialties, and preferences. If a teacher can encounter a model who

matches these characteristics, this teacher will be inspired to excel. Teachers can search for a suitable teaching model through thousands of courses on MOOC platforms and then analyze the course plan, study the curriculum design, follow its pedagogical style, grasp the teaching skills, and learn the tacit knowledge. Based on an ideal model, a teacher can extend this wisdom to form a personal pedagogical style.

These three examples act as an incentive to activate teachers to offer their important contributions on various effective uses of TPD by MOOCs. If teachers can share diverse effective usages on TPD online community websites, other teachers can benefit and help students with better teaching.

For a concise picture of ways and corresponding resources for TPD via MOOCs, Table 1 lists several example courses for TPD in MOOCs.

Table 1 *Sample Courses for Teacher Professional Development in MOOCs*

Type	Course Title/Institution (Course Website Address)
MOOCs Literacy and Teacher Professional Development	1. Get Start with Online Learning/ The Open University (https://www.futurelearn.com/courses/online-learning)
	2. Learning Online: Learning and Collaborating/ University of Leeds (https://www.futurelearn.com/courses/learning-and-collaborating)
	3. Foundations of Teaching for Learning 7: Being a Professional/ Commonwealth Education Trust (https://www.coursera.org/learn/professional-teacher)
Pedagogical Knowledge, Skill, or Attitude	1. Teaching Character and Creating Positive Classrooms/ Relay Graduate School of Education (https://www.coursera.org/learn/teaching-character)
	2. Classroom Strategies for Inquiry-Based Learning / The University of Texas at Austin (https://www.edx.org/course/classroom-strategies-inquiry-based-utaustinx-ut-ibl-11-01x)
	3. FM-The Ideas and Practices of Flipped Classroom/ National Chiao Tung University (http://www.ewant.org/admin/tool/mooccourse/mnetcourseinfo.php?hostid=7&id=232)
	4. Justice [learn how to lead big classroom discussion]/ edX (https://www.edx.org/course/justice-harvardx-er22-1x-2)

(Continued on the next page)

Table 1 *Sample Courses for Teacher Professional Development in MOOCs (continued)*

Type	Course Title/Institution (Course Website Address)
Professional Subject Knowledge or Skill	1. Basic Physics/ Swinburne University of Technology (https://www.open2study.com/courses/basic-physics)
	2. Machine Learning for Musicians and Artists/ Goldsmiths University of London (https://www.kadenze.com/courses/machine-learning-for-musicians-and-artists/info)
	3. Introduction to Multicultural/ Chung Yuan Christian University (http://www.sharecourse.net/sharecourse/course/view/courseInfo/535)
	4. Stanford Introduction to Food & Health/ Stanford University (https://online.stanford.edu/course/stanford-introduction-food-and-health)
Professional Subject Teaching Knowledge and Skill	1. Teaching English Now! Foundational Principles/ Arizona State University (https://www.coursera.org/learn/english-principles)
	2. Effective Teaching Strategies for Biology/ Trinity College (https://www.edx.org/course/effective-teaching-strategies-biology-trinityx-t003x)
	3. Outstanding Physical Education Lessons/ University of Birmingham (https://www.futurelearn.com/courses/outstanding-physical-education)
	4. Teaching Social Justice Through Secondary Mathematics/ TeachForAmericaX (https://www.edx.org/course/teaching-social-justice-through-teachforamericax-sjsm-tfax)
Forming a Teacher Professional Development Online Community	1. Corporate Digital Learning/ KPMG (https://iversity.org/en/my/courses/corporate-digital-learning/info)
	2. Deeper Learning MOOC/ Barrios, L. et al. (http://dlmooc.deeper-learning.org/index.html)
	3. Foundations of Teaching for Learning 8: Developing Relationships/ Commonwealth Education Trust (https://www.coursera.org/learn/teacher-relationships)
	4. Communication Skills and Teamwork/ FullbridgeX (https://www.edx.org)
Teacher's Lifelong Learning	1. Leaders of Learning/ Harvard University (https://www.edx.org/course/leaders-learning-harvardx-gse2x-0)
	2. Learning How to Learn/ University of California, San Diego (https://www.coursera.org/learn/learning-how-to-learn)
	3. Blended Learning Essentials: Getting Started/University of Leeds (https://www.futurelearn.com/courses/blended-learning-getting-started)
	4. Leading Educational Innovation and Improvement/ University of Michigan (https://www.edx.org/micromasters/michiganx-leading-educational-innovation)

(Continued on the next page)

Table 1 *Sample Courses for Teacher Professional Development in MOOCs (continued)*

Type	Course Title/Institution (Course Website Address)
The General Ideas and Practices of Pedagogy	All MOOCs are applicable, and the recommended MOOCs platforms include Coursera, edX, FutureLearn, Udacity, NovoEd, Kadenze, Open2Study, iversity, ewant, ShareCourse, TaiwanMOOCs, etc.

Note. Data were collected from related MOOC platform websites directly from March 1, 2017 to February 25, 2018.

Discussion and Reflection

Advantages and limitations of TPD via MOOCs are analyzed, and the viable solutions for these limitations are discussed.

Advantages

Five advantages of TPD via MOOCs are examined.

Convenient to use. These free online resources provide unprecedented chances for teaching and learning (Kopcha, Rieber, & Walker, 2016), and it will be convenient for teachers to have TPD through MOOCs because MOOCs have few limitations on time, space, or participants. Teachers can use their spare time to access professional development courses online anywhere with Internet access, especially in regions of high Internet penetration rate, such as the 89.2% Internet access in Taiwan (Taiwan Network Information Center, 2015).

Very low cost. Although it is expensive to create a MOOC, most MOOC platforms open their courses for free. Teachers could use these free resources as their professional development courses or OERs. This can save a considerable amount of money for teachers, schools, or educational institutions. Teachers, therefore, needn't worry about their finances when increasing their professional competencies.

Various choices and usages. The options for TPD are important. As Radford et al. (2015) have suggested: "A key benefit concerned giving employees the ability to engage in their own development, allowing them 'to take what they want,' give them 'goals to

work on,' and help increase their 'self-motivation'" (para. 30). In MOOCs, teachers will have many choices for their topics. No matter the physics teachers or music teachers, they can get their professional courses online, whereas on-site TPD courses have very limited choices, especial in small schools.

Moreover, teachers could learn from MOOCs with their own personal learning styles, such as watching lecture videos, reading e-texts, taking quizzes, or enjoying the discussion forums. In a self-paced MOOC, teachers can do intensive study in a brief period to finish the requirements of course or absorb the content gradually, and there is no semester or class time limit for learners.

A valuable opportunity for disadvantaged teachers. Disadvantaged teachers have few resources for professional development. These people include teachers who serve in remote areas, who have a heavy administrative workload, who are physically limited, who care for a young child, do housework, or care for the elderly after school. MOOCs provide opportunities for these teachers to do professional development at any time or any place when they are available. MOOCs could fit into disadvantaged teachers' individual conditions, whereas conventional professional development activities require that teachers follow fixed schedules.

A disadvantaged teacher self-reported the learning experience in a TPD MOOC: "Living in country areas it is not always easy or affordable to go to PD [professional development] sessions. It [MOOC] has allowed me to network with other teachers who share the same interest and gather valuable resources" (Vivian, Falkner, & Falkner, 2014, pp. 15-16). A working woman who is committed her family obligations finds the convenient and flexible online learning a valuable opportunity to learn (Touati, 2016).

Teachers seem ready for learning in MOOCs. MOOCs learners with a professional background have higher self-regulated learning ability than learners without such a background (Hood, Littlejohn, & Milligan, 2015), and teachers who are well educated with a professional background seem ready for MOOCs learning. MOOCs also help people to learn by feedback on learner's progress to increase learner's self-monitoring and reviewing of learning (Loya, Gopal, Shukla, Jermann, & Tormey, 2015). This kind of feedback can help teachers not only to understand their own learnings in

MOOCs but also to apply this feedback strategy to their own students. In addition, if learners could connect the development of knowledge and expertise in MOOCs with their own workplace context, they will have higher self-regulation for their learning, which is an essential component for MOOCs learning (Littlejohn, Hood, Milligan, & Mustain, 2016). Since the population of MOOCs learners is huge, it will be possible for MOOCs learner to meet an expert they need. MOOCs learners, however, still need facilitation and guidance in their learning (Zhou, 2016), and educational policy makers need to give teachers the support needed to fully develop their potential.

Limitations

Though MOOCs have advantages for TPD, there are some negative aspects noted by researchers (Dodson et al., 2015).

Lack of individual guidance. MOOCs learning is different from guidance provided with traditional learning (Ostashewski & Reid, 2012). Teachers' in-service education focuses on increasing their professional ability to solve practical problems and improve the quality of classroom teaching. For teachers to solve specific pedagogical problems via MOOCs, they need senior educators to help them and discuss their individual conditions. There are few chances for MOOCs learners to discuss their individual school problems with MOOCs instructors because there are thousands or tens of thousands of learners per session though interaction between students and teachers is important for increasing student's learning efficiency and motivation (Moreillon, 2015). If teachers cannot get answers when they have questions, it may be easier for them to drop out from MOOCs learning.

Weak quality assurance. In addition, what a student has actually learned from a MOOCs course is difficult to quantify because the evaluation system is based on a student's honor code, which is violated easily. Quality assurance of MOOCs needs close examination (Hayes, 2015).

The ways to evaluate students in MOOCs are unconventional approaches, such as online quizzes and peer-reviewed essays, whereas the assessments in an on-campus classroom are in-class tests under instructor's monitor and faculty-graded essays. Thus,

people may consider that an online quiz is easier to cheat on, and the quality of peer-graded essays maybe low. There should be more reliable ways to improve MOOCs' quality assurance, but they are difficult to achieve.

Lack of Active learners. Learner's autonomy determines learner's intention to attend in MOOCs (Zhou, 2016). Learner's engagement is also a vital component, but many MOOCs do not yet emphasize it (Meyer, 2014). Thus, how to motivate teachers to actively engage in professional development through MOOCs will be challenging.

In addition, MOOCs provide few opportunities for learner collaboration (Spoelstra, van Rosmalen, Houtmans, & Sloep, 2015), though Camilleri, Busuttil, and Montebello (2014) have suggested that learners could use online social networks to share their knowledge and beliefs with the global community to contribute to collective intelligence.

Finger and Lee (2014) considered that, "educators can reflect and consider how their educational contexts might be explained in terms of their moves toward digital normalization and extent to which they have become networked school communities" (p. 82). To reach these ideal results, teachers should engage with more participation in their online professional development activities. There is, however, a lack of active MOOC learners and few supporting measures and incentive mechanisms.

Remedies for Limitations

Several possible ways to reduce these limitations are analyzed and discussed.

Increased supporting measures. Most in-service teachers may need some supporting measures to help them be active learners and to receive effective professional development from MOOCs when MOOCs are teachers' innovative approach for TPD.

Building a TPD MOOCs gateway can be a very useful strategy for teachers to learn and get help through MOOCs. This MOOCs gateway could include the suggested MOOCs in various categories: teacher pedagogical MOOCs, teacher professional subject MOOCs, and teacher professional subject teaching MOOCs. The gateway should also support teachers to form a professional development online community where teachers could share their teaching experiences and educational wisdom, ask pedagogical questions, answer other's questions, engage in professional development project together,

and create teachers' professional development profiles.

Teachers should actively participate in various interaction opportunities in MOOCs, such as peer assessments, discussion forums, and group works (Nkuyubwatsi, 2013), and these interactions will not only increase learning motivation but also improve learning consequences. Educational policy makers should distribute the proper finance support, and school leaders must create a supporting school culture for TPD on MOOCs. Under a TPD-friendly culture, faculty or peers could support each other, and having support is important for MOOCs learners (Hew & Cheung, 2014).

Improving quality assurance mechanics to secure quality of learning. The quality of MOOCs and their quality assurance mechanisms are still under doubt. Thus, educational policy makers should support universities, institutes, or educational associations to design MOOCs with rich student-to-student, student-to-faculty, and student-to-staff interactions as the main priority. In addition, creating a secure assessment system to evaluate students reliably can obtain reliable information about the learning results of MOOCs learners and understand the effectiveness of TPD via MOOCs. Cooperating with other institutions to form reliable assessment networks is another practical strategy, such as how ewant cooperates with Taiwan Open University to test students in Regional Study Centers of Open University, which are located each of the counties of Taiwan and are convenient for MOOCs learners to take more reliable onsite examination.

Motivating teachers as autonomous MOOC learners. The e-generational society is full of OERs, including MOOCs; autonomous learners will get the most benefits from these resources. Awards encourage a learner's learning motivation (Randall, Harrison, & West, 2013), so providing awards for TPD via MOOCs will increase their commitment. These awards represent the process of TPD and should be the evidence for TPD evaluation. A positive school culture, moreover, will encourage and support teachers in their professional development via MOOCs or other ways. Supporting by a positive school culture, teachers will gradually become autonomous learners and engage TPD actively.

Implications

The researcher infers some implications for teachers, educational administrators, and policy makers to proclaim and implement new paths for TPD through MOOCs.

Using MOOCs to Facilitate TPD

The disruptive innovation of ICT is inspiring pedagogical innovation. MOOCs are a new trend for education and provide a convenient and low-cost way for TPD. Nevertheless, many teachers still lack awareness on how technologies are altering our societies (Siemens, 2006) and have not yet benefitted from educational technologies such as MOOCs to facilitate their TPD.

MOOCs also can facilitate the latest TPD model, Lesson Study, in various ways, such as being a course to recruit teacher into lesson study list, enriching the lesson study process, and supporting teachers in their lesson study through abundant real class teaching materials. This can be a faster way to facilitate teachers' professional growth through cooperating with an existing TPD model.

Educational policy makers, school leaders, and practitioners should take advantage of MOOCs for their professional development because MOOCs are free and have substantial content and flexible usage without spatial-temporal limitations. There are already many teachers enrolling in MOOCs (Rayyan et al., 2016), so it will be easier to extend teacher's professional development in MOOCs if the government encourages teachers to do their professional development via MOOCs and provides related supporting measures, such as including the MOOCs as one of official courses for Teacher Professional Development Evaluation.

Providing the Support Measures

To promulgate a new way for TPD requires support, especially at the beginning. Creating a friendly TPD culture will be a good foundation because this culture will motivate and encourage teachers to actively engage in their professional development on MOOCs. Providing a TPD website as the gateway to assess suitable MOOCs will reduce

obstacles to teachers learning on MOOCs. In this TPD gateway, teachers can easily find the OERs and MOOCs appropriate to their professional interests.

Moreover, designing a user friendly online system for teachers to create the TPD online learning community and personal professional online profiles will help teachers nurture their sustainable TPD learning abilities. It is important to sustain teachers' learning habits since those habits will shape their professional character, build their professional competency, and secure students' learning quality.

Supporting Innovation of MOOCs

The development of MOOCs is still in an early phase (Jacoby, 2014). There are some shortcomings in MOOCs, but stronger relationships between educational research, policy, and practice (Carneiro, Looney, & Vincent-Lancrin, 2015) can help find solutions for these problems. The government could finance educational researchers and practitioners to improve and innovate the TPD MOOCs, such as MOOCs as a tool for facilitating other TPD models. It will be well worth investment since MOOCs can be used for teachers nationwide over a long time.

Policy makers should have effective educational policies to support innovation in MOOCs and encourage teachers to do their professional development in MOOCs. This policy will not only innovate MOOCs but also empower teachers. Eventually, the better qualified teachers will be of benefit to all students.

Encouraging Teacher to Be Active Learners

Under the innovation of information technologies and social media, developing the ability to learn is more important than learning specific things (Lytras et al., 2015). Encouraging teachers to be active learners in their professional development is crucial mission since there are profound TPD resources in MOOCs but not yet many active learners engaging in MOOCs.

Forming a sustainable TPD model by encouraging and culturing teachers to be active learners on MOOCs can provide a solid foundation, especially in a rapidly changing society, where teachers need to continually update their professional knowledge

and skills. There are several means to facilitate this: project-based MOOCs to increase teachers' collaboration, a system of awards to improve teachers' learning motivation, a policy of officially recognized MOOCs for Teacher Evaluation in Professional Development, and using MOOCs learning communities to make TPD in MOOCs attractive to teachers. These facilitating strategies can become effective policies to encourage teachers to be active learners on MOOCs.

Conclusion

Information technology is having a revolutionary impact on working and learning (The Ministry of Education, 2016). Accordingly, teachers can improve their professional ability through new educational tools, such as MOOCs. A bottom-up model to encourage teachers to adopt this learning technology can reduce resistance from teachers. Thus, the government should develop a teacher-friendly environment for TPD, using MOOCs for teachers' professional development.

MOOCs from top-tier universities can have various advantages. Teachers should make good use of MOOCs as a platform and OERs for their professional development or other learning approaches as they see them fit without cost and spatial-temporal considerations. MOOCs provide unprecedented opportunities for teachers' professional development. Teachers should take active roles in MOOCs learning to get the most benefits for their TPD and so they can eventually increase their students' performance.

The application of MOOCs has both positive and negative aspects, so using them to make up limitations of conventional TPD instead of replacing it will be a win-win strategy. Forming a sustainable TPD model is a long-term mission, and the best strategy will be to encourage and support teachers to form a learning community online with support from a TPD-friendly school culture under supportive leadership.

There are several further areas of development for TPD on MOOCs, including building a common gateway for TPD on MOOCs, designing an experimental school-based TPD with MOOCs, forming learning communities online for TPD, and creating the appropriate school culture to support TPD via MOOCs.

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