COLLABORATIVE COMMUNITIES OF PRACTICE FOR TEACHER LEARNING:
IMPLICATIONS FOR IN-SERVICE ARRANGEMENTS IN TANZANIA'S CONTEXT

Kassimu A. Nihuka
Institute of Continuing Education
The Open University of Tanzania
Dar es Salaam – Tanzania
nihuka2003@yahoo.com

Abstract: One-time workshops and seminars have been criticized for various reasons including lack of effectiveness in helping teachers integrate technologies in education. This study investigated the impact of *collaborative communities of practice for effective teacher learning* regarding technology integration. Specifically the study looked at the conception of communities of practice, different scenarios and routines of communities of practice and things that teachers learn as a result of participation in communities of practice. A systematic review of literatures was used in order to address the characteristics of communities of practice that contribute to effective teacher learning. Findings from literature review have revealed that; in terms of conception, there exists a mixed feeling about the clarity of definition of the concept of communities. On one hand several scholars attempt to define the concept but on the other hand other scholars argue that the definitions lack sound research base. Regarding scenarios and routines, the study has found that communities of practice can be organized, among others, into teacher design teams (or communities of designers) and in-service scenarios. It has been demonstrated that both of these scenarios can have more-or-less related routines which aim at assisting teachers towards innovation adoption in education. As a result of participation in communities of practice, the findings of the study have revealed that teachers learn different things in a community of practice which include; technology integration in teaching processes, pedagogy and instruction designing, and curriculum designing. In terms of characteristic, the study has established that for effective teacher learning, communities of practice need to have the following characteristics; first, communities of practice are characterized by school-based training of teachers about innovation. This way, teachers find easy to relate new pedagogical-content-knowledge they learn in the training to real setting. The second characteristic is that, for school-based trainings to be effective, they need to be blended with workshops or seminars. This ensures teachers with a continuous support from experienced teachers or experts. The third and last characteristic is that members in a community of practice communicate and collaborate with each other through the use of technology or in a traditional way. It is concluded that professional development programs that are organized around communities of practice and are characterized by school-based training, blended with workshops or seminars and allow virtual or physical communication among teachers (members) are very effective at bringing teacher learning in terms of technology integration, improvement of pedagogy and instruction designing, and curriculum designing.

INTRODUCTION

Technology integration in education in Tanzania is an inevitable endeavor which poses great challenge on the existing curriculum and teachers' professional competence. This is because technology integration in education exerts more pressure for curriculum (re)designing at different levels and also improvement of teachers' pedagogical-content-knowledge and skills (PCK & S). In

this case teacher learning through appropriate professional development programs is necessary to make them effective enough to implement technology related innovations in education. It is argued by Voogt, Almekinders, Van den Akker, & Moonen (2005, p.2) that "traditionally teacher learning takes place through workshops and seminars after which teachers return to their institutions". This situation is also true in the context of Tanzania and often the approach seems ineffective because teachers then may or may not use in their real situations what they have learned during the workshop. Such one-time workshops and seminars often lack follow up by coaching, study groups, peer visits and collaborations with colleagues or experts (Joyce & Showers, 1995). It seems also that workshops and seminars are not promising approaches because they do not combine aspects of curriculum (re)designing, innovation (such as technology) integration, teacher learning and the necessary workplace-based support. According to Nieveen, Handelzlts and Van den Akker (2005) and Wentworth and Earle (2004) professional development programs that integrate aspects of collaboration through communities of practice are effective at bringing about teacher learning. These collaborations can be from within a locality (see for example Fairbanks, Freedman & Kahn, 2000; Leander & Osborne, 2000 and Peacock & Rawson, 2001) or virtual through networking (see for example De Moor & Weigand, 2005; Hezemans & Ritzen, 2004; Johnson, 2001; Lieberman, 2000 and Wilson & Stacey, 2003). This paper provides a review of literature to ascertain the potential of collaborative communities of practice for teacher learning towards fostering knowledge and skills in curriculum (re)design to accommodate appropriate technology-related innovations in education.

Relevance of the study

This study has opted to ponder the topic of *collaborative communities of practice for teacher learning* because of its relevance to teacher education and professional development in the context of Tanzania. This means that the study will contribute to the understanding of how to organize effective professional development programs that improve teacher learning in terms of skills on curriculum (re)designing in order to integrate relevant technologies for quality teaching and learning. Effective professional developments programs are quite in demand in Tanzania because of the growing efforts towards technology integration in education. Currently for example, there are efforts guided by the

Tanzania National ICT Policy (URT, 2003) (at http://www.moe.go.tz/ICT4E/ICT4E.html) and specific higher education institutional ICT policies towards integration of ICTs in teacher education colleges and higher education respectively. For teachers to be able to effectively integrate such technologies in education, appropriate in-service programs that harness the advantages of collaboration through communities of practice are important.

Main question for the study

In order to search for relevant literatures that adequately address the aim of this study, the following main question was formulated: *what characteristics of communities of practice contribute to effective teacher professional learning*? The following tree sub-questions were used in addressing the main question:

1. how are communities of practice defined?
2. what are the different scenarios and routines of communities of practice?
3. what do teacher learn as a result of participation in communities of practice?

Search strategies

The study involved searching literatures from education databases including; Eric, piCarta, Scopus, PsychoINFO, UT catalogues, Google, Google scholar, web of science, ScienceDirect and UT repository. The keywords such as design teams, communities of designers, teacher learning, collaborative learning, professional development, in-service, peer collaboration, communities of practice and learning communities were used in searching for literatures. Reference lists of the articles were also used to identify more relevant literatures which could be searched from the search engines to add to the literatures. It was found that the topic is widely researched especially in the areas of professional development and teacher learning, communities of practice and professional learning, and professional development and school development. However, most of the studies are reported from developed countries.

FINDINGS

This section summarizes findings of the study on *collaborative communities of practice for teacher learning.* It is organized into three sub-sections which include; *the concept of communities of practice, scenarios and routines of communities of practice* and *teacher learning in communities of practice.* Towards the end of these sub-sections, a discussion of the implications of the findings for professional development in the context of Tanzania is provided.

The concept of communities of practice

The first question aimed at determining how communities of practice are defined in the existing literature. It was established from literature that the concept of communities of practice has often being used synonymously to other concepts such as professional learning communities and learning communities. Existing literature portray a mixed feelings about the meaning of communities of practice. In one hand West (2007) conceives the concept of communities of practice as being fussy and ill-defined. He argues that the current definitions lack research base. In the other hand numerous other scholars seem to have provided very vigorous definitions for the same concept (see for example Barab & Duffy, 2000; Barab, MaKinster & Swcheckler, 2004; Lave and Wenger, 1991 and Looi, Lim & Chen, 2008). However, this study acknowledges the documented definitions of communities of practice and hereby provides a thorough definition of the concept as related to teacher professional development in education. According to Wenger *et al* (2002), communities are groups of people who share a concern, a set of problems, or passion about a topic, and who deepen their knowledge and expertise in their academic areas by interacting on an ongoing basis. Such communities may have different characteristics depending on whether such communities are educational or non-educational. For example according to Schlager and Fusco (2004), educational communities (which are the focus of this study) are characterized by the mutual engagement by members in a collective practice of helping students to learn. DuFour (2004) argues that the powerful collaboration that characterizes professional learning communities should be a systematic process in which teachers work together to analyze and improve their classroom practice. In a community of practice, teachers work in teams, engaging in an ongoing cycle of questions that promote deep team learning. Another definition is

suggested by Barab *et al* (2004). These scholars conceive a community of practice as a persistent, sustained social network of individuals who share and develop an overlapping knowledge base, set of beliefs, values, history and experiences focused on a common practice and / or mutual enterprise. Looi *et al* (2008) add to the existing definitions that a community of practice is a practice that binds the individuals (education professionals) into a collective whole, rendering a community its character, activities and even its idiosyncrasies. Moreover, Looi *et al* content that members in a community of practice share stories, problematize work-related issues and actively construct knowledge on how to improve their own professional practices. West (2007) provides a comprehensive review of literature on the meaning of communities of learning and their characteristics. He identifies four boundaries to define a community of practice, which include; physical presence, emotional, mental and functional boundaries. First, regarding physical presence, it means that if teachers attend the same professional development program at a particular place then are regarded as a community of practice. However, because of modern technologies researchers have expanded the concept of what it means to be 'present' in a community of practice to include the possibility that someone is present in a virtual and not wholly a physical sense. West argues that (virtual and physical) presence allows members of a community of practice to have access to each other, a common meeting place, transactional distance and quality and quantity time to interact and learn from each other. The second boundary to consider when when defining a community of practice is referred to as emotional boundary. Being engaged in a community of practice requires more than just being present. Several different emotional parameters need to overflow within the community. According to West, these emotional parameters include a feeling of sense of belonging to the community, independence or reliance among members, trust among members and faith in the combined purpose of the community. In this way 'affect' plays a very large role in determining a community of practice. The third aspect is known as mental boundary. According to West, members of a community of practice need to have a shared vision for which the community is about, share the same mission statements and goals and believe they are progressive as a community towards the same end. Evolution of individual member's identity in a community is an indication of the development of a shared vision. Wenger (1998) believed that identity formation is one of the key characteristics of communities of practice arguing that the

formation of a community of practice is a negotiation of identities. Moreover, Wenger associates identity formation with belonging to a community, and that as individual trajectories lead to participate within a community, they redefine their identities in relationship to their roles within the community. The last but not least characteristic of community of practice is referred to as a functional boundary. According to West, in this case the association between members of a community of practice is merely functional and like work or research teams to achieve a particular goal, they hold together as well as the work is held in common. Hakkarainen *et al* (2004) suggest that workers need to develop the capacity of forming collaborative teams or communities of practice to quickly achieve a particular purpose. Based on this review of definitions of communities of practice, it shows that generally communities of practice advocate a whole-person developmental approach in a social environment and situated nature of cognition. Teachers interact with colleagues and support each other continuously to improve their educational practices in the institution.

The need for teacher professional learning through communities of practice

Technology has become part of practices in education in the developed world and quite recently in the developing world as well. Focusing on higher education, Fisser (2001) provides a synthesis of reasons that explain why universities need to integrate technologies. These reasons explain why educational institutions need to consider professional development as an appropriate way to equip teachers with needed knowledge and skills for technology integration in their educational practices. The reasons include; first, government and policy. It is established in a study by Gornitzka and Maassen (2000) cited in Fisser that the role of governments in supporting universities is decreasing. Consequently universities tend to move towards integrating technologies so that they deliver competent service to the market and thus responding to the needs of clients. The second reason for technology integration has to do with the desire by universities to respond to demographic changes of students. It is argues in Collis & Moonen (2001) and Kerr (2001) that demographic changes of students have an influence on both the increasing demand for higher education and on the composition of students population. These make universities to invest in technology so as to make education flexible to a wide range of varied students' characteristics. Third reason is the market forces. According to Meek and Wood

(1998) higher education should be relevant to the labor market and needs of future students. It is argued by Fisser (2001) that students of the near future will be learners that are more mature and can relate their learning to professional and life experiences. Response to the knowledge economy is another factor that influences universities to integrate technologies. This means that since economies depend on the development and application of new knowledge then education and technology are needed to obtain the necessary knowledge. According to Gibbons et al (1994) students should acquire appropriate skills for this context (=knowledge economy context) which need to be reflected in higher education curriculum, in its content, structure, length and mode of delivery. Internationalization of higher education is another reason. This means that education becomes a cross-border activity in which the use of technology then plays an increasing important role. For this reason universities find themselves integrating technologies in their operations including courses delivery. The last but not least reason for integrating technologies in higher education is a response towards lifelong learning (Erichsen, 1998 and Fisser, 2001). To realize lifelong education the use of some form of information and communication technologies is necessary. Based on the highlighted reasons and others specific to realities of particular institution, studies reveal that many universities in the developed world have made a move towards ICT integration in education delivery (see for example De Boer, 2004; De Boer & Collis, 2000 and Fisser, 2001, 2006). Similar initiatives are also reported from some other universities in the developing world (Aguti & Fraser, 2007; Nnafie, 2002; Sife et al, 2007 and Siritongthaworm *et al*, 2006). Across universities and perhaps much so in the developing world, instructors' knowledge and skills on technology use in education has always been a greatest challenge (Hoven, 2000; Paul, 2002; and Smart & Cappel, 2006). It is reported in the literature that instructors in higher education have insufficient knowledge and pedagogical skills for using technology for educational purposes. Specifically, a study by Hoven (2000) in the developing world found that instructors use computers in education for processing of learning results (30% often), development of learning materials (13% often), providing courseware and practise materials (29% often), examining (16% regularly), to deliver education to students on different locations (3% regularly) and for counselling and student support (3% regularly). Two conclusions can be drawn from these findings, first; seldom computers are used for delivery of education to students through e-learning and for

distance counselling and student support, and second is that there are significant uses of the computers for works related to processing of learning results, providing of courseware and practices materials, and to some extent for examining. This implies two things; first one which is also obvious is that instructors' pedagogical knowledge and skills towards technology integration is questionable. Second, instructors' are incompetent at (re)designing their program / course curricular to accommodate appropriate technologies which make universities respond to demands of government and policy, demographic changes of students, market forces, knowledge economy, internationalization of higher education and lifelong learning. This challenge demands for appropriate teacher learning through appropriate professional development programs (PDP) to help them pioneer integration of technology in courses delivery. Specifically, Lave and Wenger (1991) suggest that professional development through communities of practice as being an effective strategy for promoting teacher learning. They argue further that communities of practice provide teachers with a valuable platform for teachers to connect and interact among themselves, to share and support each other on their specific problems, experiences and lessons learned and they do that at their own time and place. However, professional development programs have been dominated by traditional strategies which involve fragmented and intellectually superficial workshops or seminars (Borko, 2004). According to Krecic & Grmek, 2007 and Putnam & Borko, 2000) the effective professional development is that which harnesses the advantages of collaboration through communities of practice. This is because such arrangements contribute to teacher learning and make instructors acquire skills in curriculum (re)designing and technology integration for quality teaching and learning.

Scenarios and routines in a community of practice

The second question seeked to identify the different scenarios and routines in a community of practice. It was found from existing literature that there are several scenarios with distinct but related routines (De Vries & Pieters, 2007; Harvey, 1999; Mishra, Koehler & Zhao, 2007; Nieveen, Handelzalt & Van den Akker, 2005; Thijs & Van den Berg, 2002; and Voogt, Almekinders, van den Akker and Moonen, 2005), namely: (i) in-service scenario (i.e workshops, exemplary materials, and computer-based communication and (ii) scenario of design teams or communities of designers.

In-service scenario

School-based in-service scenarios for professional development of teachers have been reported widely (Thijs & Van den Berg, 2002; Kitta 2004; Mafumiko; and Voogt et al, 2005). These in-service scenarios provide opportunities for collaboration and peer-coaching among teachers. Common to most scenarios is the provision for pedagogical-content-knowledge for teachers on particular innovation. For example considering the in-service scenario reported in Voogt *et al* (2005), it shows that the scenario was an exploration of the potential of technology enhanced teacher networks as a strategy for in-service program. This was an in-service arrangement that was developed to train teachers on how to integrate technology in their teaching. It involved alteration of short workshops with periods in schools during which the participating teachers could communicate with each other and exchange materials. In this scenario internet was used for the communication and exchange during the in-school periods. The activities and routines during this blended approach involved the following; (i) familiarization of the participants with the basic technology skills so that every participant had the same level of technology proficiency and (ii) participants practiced the integration of internet in their classroom and were expected to reflect on the experiences gained. Specifically, teachers carried out an email project and web-based lessons with the help of exemplary lesson materials. At a later stage, it was expected that the networks were self supporting. It is to be noted that these kinds of in-service scenarios are quite different from the traditional professional development programs which have been criticized for being ineffective because they are often organized as fragmented and intellectually superficial workshops or seminars (Borko, 2004). These alternative in-service scenarios have very keen emphasis on teacher learning in real context with collegial collaborations. The approach involves organizing collaborative communities of practice. Recent studies have demonstrated that collaborations in in-service scenarios that harness the advantage of communities of practice have great potential in contributing to teacher learning in education (Nieveen, Handelzalts & Van den Akker, 2005 and Wentworth & Earle, 2004). According to Putnam and Borko (2002), there is meaningful teacher learning when in-service scenarios are organized around communities of practice. A similar conclusion is also shared by McLaughlin and Talbert (1993). It was reported in a study by McLaughlin and Talbert (1993) that collaborations in an

in-service scenario through community of practice are important for instructors to learn successfully about how to implement an innovation. They argue further that instructors need to participate in a professional community that discusses new curriculum materials, strategies and that supports the risk taking and struggle entailed in transforming practices. Central to the idea of communities of practice for professional development is collaboration / peer collaboration (Little cited in Wilson and Berne, 1999; Kitta, 2004), peer coaching (Harvey 1999) and collegiality (Putnam & Borko, 2000 and Clement & Vandenberghe, 1999).

Scenarios of teacher design teams or communities of designers

Teacher design teams (also called communities of designers) are another type of scenario for professional development. Teacher design teams (Nieven *et al* 2005) or communities of designers (Mishra *et al*, 2007) are groups of teachers of adjacent subjects who cooperate in order to renew and redesign the curriculum and develop themselves professionally. Teacher design teams or communities of designers seem promising in helping teachers to integrate curriculum development, teacher development and school development as related to innovation integration in education. Design teams may have a quite varied number of participants. For example in a study by Mishra *et al* (2007), six faculty members were selected to participate in the team, six design teams were then formulated around each of the faculty members. The teams were typically based at faculty level and teachers got opportunity to help each other in their daily practices. According to Mishra *et al* (2007) the design teams included (i) designing of website for teaching and introductory teacher preparation course, (ii) developing strategies for using classroom digital video, (iii) developing a database of lesson plans for science learning, (iv) design of technologies for literacy instruction and evolution in reading, (v) designing of an online course and (vi) developing a web-based interface for sharing of teaching videos. Another design team is reported by Nieveen *et al* (2007). These design teams were organized in order to help teachers integrate technologies more in education. This was also a school-based scenario, characterized by its school-wide approach and evolving nature. There were seven design teams with about three teachers of related subjects. Unlike in community of designers reported by Mishra *et al* (2007), design teams in Nieveen *et al* (2005) had a coach as an expert in pedagogical

content knowledge and curriculum) as facilitator and resource person. The principal and innovation manager were responsible for overall facilitation and coordination in the teams. Leaders of each team could meet regularly in order to exchange ideas, discuss problems and needs and to serve as platform to come to some convergence in the innovation. The major routines of the teams included re-examining the joint domain curriculum and work together to design, test and implement the renewed common curriculum of their domain. It is to be noted that central to in-service scenarios and design teams' scenarios is teacher collaboration. Little (1997) distinguishes four types of collegial collaborations, which include; storytelling, helping each other, sharing of ideas and experiences, and joint working. He argues further that educational institutions that aim at innovation need teachers who work together on innovation and reflect on and learn from their experiences. Collaboration of teachers therefore seems indispensable for educational institutions that are working towards a more relevant and effective curriculum.

Teacher learning in communities of practice

The third question aimed to provide a synthesis of literature that demonstrates *what teachers learn as a result of participation in communities of practice* (i.e. design teams and in-service programs). It was found from existing literature that the common skills and knowledge that teachers learn in a community of practice include technology integration in teaching processes, pedagogy and instruction designing, and curriculum designing (Desimone *et al*, 2002; Garet *et al,* 1999; Jonathan & Herbert, 2000; Mafumiko; Mishra *et al* 2007; Kitta 2004; Tilya; Thijs and Van den Berg 2002 and Voogt *et al* 2005).

In terms of helping teachers to integrate technology in their teaching processes, Voogt *et al* (2005) found that as a result of collaboration in an in-service, teachers learned how and when to integrate technology applications in their teaching. They argue that, teachers in the study no longer avoided the use of technology and they regularly applied technology in their lessons. Additionally, teachers became less anxious towards computers, they developed positive attitude to computer use and used emails for communication purposes. Similar results are also confirmed in a study by Mishra *et al* (2007) who found that as a result of collaborations in teacher design teams, teachers in their teams

produced products that were subsequently used in teacher education programs which are a good indication of technology integration and teacher education.

Collaboration in communities of practice and in-service programs improved teacher learning in terms of pedagogy and instruction designing. It has been demonstrated in Nieveen *et al* (2005) that based on the activities in design teams; teachers got new subject- and pedagogy-related insights. Moreover, Nieveen *et al* found that teachers could make explicit lesson planning and discuss them with colleagues for improvements. This interaction assisted in great extent the reflection on how to improve instructions. In terms of improving instructional strategies among teachers, Jonathan and Herbert (2000) confirmed that the amount of participation in professional development and a community of practice were statistically associated with both greater teacher use of inquiry-based instruction. Specifically they found that on average, teachers with no professional development were predicted to employ inquiry-based instruction four-tenth of a standard deviation less frequently than that of the average teachers in the sample. In fact Jonathan and Herbert had demonstrated that teachers with less than 40 hours of professional development had more traditional instruction (less inquiry oriented) than did the average teachers. Teachers with between 40 – 70 hours of professional development had about average teaching instruction. Same conclusions are shared with Borko (2004); Desimone *et a*l (2002) and Garet *et al* (1999). According to Voogt *et al* (2005) teachers perceive these pedagogical aspects related to the integration of technology as an important learning outcome.

Interactions in communities of practice improve teachers' skills and knowledge on curriculum designing. According to Nieveen *et al* (2005) teachers in design teams made joint efforts to formulate a tentative curriculum based on reflection, exchange and deliberations. Teachers commended the curriculum designing in design teams as great opportunity for learning how to design and improve curriculum. Consequently teachers in design teams became conscious about the parts of curriculum that went well during try-outs and those that needed modifications.

IMPLICATIONS FOR IN-SERVICE ARRANGEMENTS IN TANZANIA'S CONTEXT

Based on the findings of this study and own experiences on the educational settings in Tanzania, the following are the implications of the findings for professional development in Tanzania's context; First, the idea of technology integration in education is inevitable despite existence of numerous challenges including teachers' knowledge and skills on technology use. Educational institutions in Tanzania have got to take the lead towards this endeavor for a quality education. The second implication is that in order to have a significant impact on teacher learning, there is need to abandon the growing interest on one-time workshop and seminar-based professional development programs which are highly criticized for its ineffectiveness. Such arrangements need to be systematically integrated with the idea of communities of practice which have been proven to allow teachers opportunity for collaboration at the level of department, faculty, or institution. Ideas of design teams or communities of designers are such powerful approaches towards effective technology integration in education. Coupled with appropriate technical support for teachers, this approach reduces the inertia for technology adoption among teachers. The other implication is about the importance of organizing professional development programs in a real setting of teachers and education (situated learning). Educational institutions need to invest into professional development programs that involve design teams and communities of designers through a community of practice. This way, teachers assist each other towards adoption of particular innovation. Moreover, this allows meaningful teacher learning and provides the opportunity to relate own experiences and context to the learning process. Consequently, teacher learning in terms of technology integration, pedagogy and instruction designing and curriculum designing get improved

DISCUSSION AND CONCLUSION

This study investigated the concept of *collaborative communities of practice for teacher learning.* Through systematic review of literatures, the study aimed at addressing the question *what characteristics of communities of practice contribute to effective teacher learning?* In this study, the

concept of communities of practice have been used to refer to the groups of teachers who share a concern, a set of problems, or passion about a topic, and who deepen their knowledge and expertise in their academic areas by interacting on an ongoing basis. Such communities may be preceded by relevant workshops or seminar that aim at (i) introducing teachers to the kind of innovation they are expected to integrate in education and (ii) the holistic view of implementation strategies. Members in a community of practice may be either physically or virtually present so as to have easy access to each other. They are also expected to share emotional feelings, mental and functional responsibilities. Communities of practice can be organized into different scenarios including teacher design teams or communities of designers and in-service program arrangements. As discussed earlier, both scenarios are institution-based professional development programs which involve more-or-less related activities. Central to both scenarios is collaboration, peer coaching and team working towards technology integration. Literature has demonstrated that teachers learn different things in a community of practice which include; technology integration in teaching processes, pedagogy and instruction designing, and curriculum designing. The following are some of the characteristics of such communities of practice which contribute to effective teacher learning; first, communities of practice are characterized by school-based training of teachers about an innovation. This way, teachers find easy to relate new pedagogical-content-knowledge they learn in the training to real setting. This kind of situated learning can quite easily transform teachers to new ways of teaching using technologies. The second characteristic is that, for school-based trainings to be effective, they need to be blended with workshops or seminars. In this case, the idea of formulating communities of practice becomes critical. This ensures teachers with a continuous support from an experienced teacher or expert. Additionally, teachers get opportunity to practice what they have learned in an in-service training into real educational settings. The third and last characteristic is that members in a community of practice need to communicate and collaborate with each other through the use of technology or in a traditional way. This allows teachers (members of a community of practice in this case) to share, reflect, and collaborate with colleagues easily regardless of geographical location. It is concluded therefore that professional development programs that are organized around communities of practice and are characterized by school-based training, blended with workshops or seminars and allow virtual or

physical communication among teachers (members) are very effective at bringing teacher learning in terms of technology integration, improvement of pedagogy and instruction designing, and curriculum designing.

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