Multilevel Approach to Professional Development for Teaching During School Closure

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This paper describes how an in-service school-university partnership (SUP) innovation Network in Hong Kong modified its teacher professional development program in order to address the challenges of school closure during COVID-19. The SUP network is a joint-school network with a mission to support scalable STEM pedagogical innovations in schools with self-directed learning as the pedagogy of choice. The school closure disrupted the network's original schedule of monthly workshops, which provides professional learning and networking opportunities. This also threatens the achievement of the targeted network goals. The University support team adopted a layered, multilevel approach that addressed in sequence: challenges faced by teachers in implementing pedagogical sound online teaching and learning (T&L) practices, school-level strategies for building sustainable online T&L capacity, and the design and implementation of interactive online STEM learning activities. Some initial success in re-establishing the learning community through the application of this layered multilevel approach is reported.

Keywords: In-service teachers; professional development; online learning; multilevel approach; school-university partnership; STEM education; self-directed learning.

INTRODUCTION

Until the COVID-19 outbreak, the use of digital technology for learning played only a small role in Hong Kong classrooms (Reichert, et al., 2020). How could the Network sustain the learning community and continue to support teachers when place-based Network meetings, consultation visits and classroom observations were no longer possible?

The SUP Network adopted design-based implementation research (Fishman, Penuel, Allen, Cheng & Sabelli, 2013) as its methodological approach, and the MultiLevel-MultiScale (MLMS) framework (Law, Niederhauser, Christensen, Shear, 2016) as its design principles. The MLMS framework highlights that if a learning innovation is to achieve scalability (Clarke & Dede, 2009), it needs to address learning issues at both classroom and school leadership levels. This can be achieved through the design of an appropriate architecture for learning comprising organizational structures, interaction mechanisms and mediating artifacts (Law, Yuen & Lee, 2015). The MLMS framework underpins the design of the layered multilevel approach in the revised professional learning and support plan.

INNOVATION

Learning at different levels is needed for innovation and change, and the learning is interdependent (Law, et al., 2016). For pervasive online learning implementation to be effective, the multilevel learning needs are as follows:

(a) At the teacher level, knowledge and skills about online learning technologies suited to different pedagogical approaches and designs.
(b) At the school level, strategies to build the capacity (infrastructure and organizational) for online teaching and learning.
(c) At the Network level, building knowledge communities to share experiences about practices and innovations that work.

We aligned these learning needs with long term goals of e-learning and STEM education since the ability of implementing pedagogically sound online teaching and learning (T&L) becomes the fundamental competence for teachers to be able to conduct SDL-STEM lessons online.

Learning conditions for the network communities were facilitated by learning architectures (Law et al., 2015) with online professional development (PD) as interaction mechanisms. Layers of PD were designed at the teacher, school and network levels with interdependent learning focuses (Law, et al., 2016). The design of the three layers was principled by peer learning and agencies of Network members. The first layer was at the teacher level, responding to the imminent learning need of online technology and pedagogy. The second layer was across both school and network levels, facilitating Network pioneering school leaders to share challenges and roadmaps for online learning to inform subsequent strategies. The third layer addressed school-level strategies with a school's successful experience of engaging teachers and students in online learning for sustainable development during the school closure period. When schools and teachers were accustomed to online PD, the fourth layer was designed as a series of STEM workshops, focusing on designing STEM curriculum topics with online activities that foster self-directed learning. At the time of writing, the Network has reached the stage of being ready for setting subsequent implementation.

Reification artifact as a component of learning architecture (Law et al., 2015) was used to facilitate learning in and beyond the network community. Teachers' and school leaders' sharing in online PD has contextual richness, but not the systematic design principles for easy understanding and adoption by others. At the network level, a website (https://elearning.cite.hku.hk) about online learning was designed to abstract the key design ideas underpinning practitioners' sharing. The website facilitates peripheral participation (Wenger, 1999) through asynchronous online learning in the Network.

The above layered multilevel approach is summarized in table 1.

Table 1

Layered multilevel approach to designing learning for Network communities

<table>
<tr><th></th><th>Identify learning needs</th><th colspan="4">Learning conditions with layers of professional development activities at different levels and artifacts</th></tr>
<tr><td>Teacher Level</td><td>knowledge and skills about online learning technologies suited to different pedagogical approaches and designs</td><td>Layer 1
Pedagogically guided online learning and teaching basics</td><td></td><td></td><td>Layer 4
STEM Workshop series—Designing online STEM activities with self-directed learning</td></tr>
<tr><td>School level</td><td>strategies to build the capacity (infrastructure and organizational) for online teaching and learning</td><td></td><td rowspan="2">Layer 2
Sharing of challenges and roadmap for online learning with Network school leaders</td><td>Layer 3
School-level strategies of building sustainable online learning</td><td></td></tr>
<tr><td>Network level</td><td>building knowledge communities to share experiences about practices and innovations that work</td><td></td><td>Artifacts — Website for online learning with good practices</td><td>becoming ready for subsequent implementation of STEM education</td></tr>
</table>

RESULTS

To evaluate schools' engagement in the SUP network, we compared the data on their participation for online STEM workshops with place-based workshops right before COVID-19. We found that schools' engagement, as measured by the percentage of Network schools participating in at least one PD remained constant at 78%. Majority of Network schools were able to engage in our STEM workshops though the number of participating schools were slightly lower than that before school closures. The school closure from late January caused disruptions of original network mechanisms for STEM implementation as well as school routines. These disruptions posed threats of breaking down the learning community in the network. The layered multilevel approach has re-engaged most Network schools' teachers in the learning community for designing STEM education both online and at schools for the long run.

Table 2

School engagement before and after school closure

	Place-based PD		**Online PD during school closures**				
Professional development	STEM Workshop series in Dec	STEM Workshop series in Jan	Layer 1	Layer 2	Layer 3	STEM workshop series I	STEM workshop series II
No. of schools	**31(63%)**	**32 (65%)**	26 (53%)	8 (100%) **by invitation*	20 (41%)	**26 (53%)**	**29 (59%)**
No. of schools joined at least one PD	**38 (78%)**		**38 (78%)**				
Total no. of Network schools			49				

IMPLICATIONS

The social distancing measures have caused challenges not only on the continuity of learning but also the continuity of learning communities for teachers and schools. The design of the PD programs must be learner-centered and community-centered (Bransford, Brown & Cocking, 2000). Guided by the MultiLevel-MultiScale (MLMS) framework, the learning community was able to get-back-together through addressing emerging learning needs at teacher, school leadership and network levels with layered PD. In the process, teachers and school leaders were enabled to have their agencies in the network and peripheral participation was accommodated (Wenger, 1999).

The layered multilevel approach offers a way for rebuilding existing learning communities amid disruptions of accustomed networking mechanisms. The rebuilding process echoes parts of Wenger's (2009) development stages for communities of practice. We conceptualize the rebuilding process in three stages: potential, coalescing and re-activating. The design framework for rebuilding learning communities is illustrated in table 3.

Table 3

Framework for rebuilding learning communities

	Development Stages for re-building learning communities		
	Potential	**re-coalescing**	**re-activating**
Teacher Level	Identify and align emerging needs with long term goals	Create learning mechanisms and artifacts with layers of professional development activities addressing learning needs at different levels	
School level			
Network level			

The rebuilding process might be applicable to other situations with learning communities relying on physical meetings before. We consolidate key strategies in each development stage.

(1) In the potential stage, practitioners at each level work for emerging needs without sharing practices (Wenger, 2009). Making alignment of learning needs at multiple levels with long term developmental goals is needed so that the design of PD is informed by learners' needs (Bransford, et al., 2000) and laden with the value of sustainable development.
(2) In the re-coalescing stage, practitioners are enabled to share their emerging practices. There are three key strategies in this stage: (i) the identification of pioneering teachers and schools as expert members in the community (Wenger, 1999); (ii) the provision of learning mechanisms at multiple levels (Law, et al., 2016); (iii) making use of reification artifacts (Law, et al., 2015) for recognizing members' contributions and facilitating peripheral participation (Wenger, 1999).
(3) In the reactivating stage, network members adapt to change and re-engage in learning and developing good practices in response to the original goal of the network. There are two key strategies: (i) aligning learning interests of online teaching with the provision of interactive online STEM learning experience; (ii) connecting the learning content with the immediate real life issues in relation to the pandemic, in line with the crux of STEM education (Johnson, Peters-Burton,& Moore, 2016).

FUTURE RESEARCH

Apart from the online PD programs, we have been consistently connecting with Network schools via phone calls, WhatsApp, emails and online co-planning meetings. Some teachers have engaged in designing online STEM learning activities for students. We will further investigate the influence of online PD on teachers in designing STEM activities mediated by online means and monitor the subsequent development of the learning community in the school network.

For us, the conceptualization of development stages for re-building learning communities is a hindsight. The design framework (table 3) might be adopted in design-based implementation research for re-building learning communities. We defined a re-activating stage of getting back on track before the maturing stage in Wenger's (2009) model. Further research on the trajectory of rebuilding learning communities is called for.

References

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). Learning: From speculation to science. *How people learn: Brain, mind, experience, and school*, *3*, 30.

Clarke, J., & Dede, C. (2009). Design for scalability: A case study of the River City curriculum. *Journal of Science Education and Technology*, *18*(4), 353-365.

Fishman, B. J., Penuel, W. R., Allen, A. R., Cheng, B. H., & Sabelli, N. H. (2013). Design-based implementation research: An emerging model for transforming the relationship of research and practice. *National Society for the Study of Education Yearbook*, 112(2), 136-156.

Johnson, C., Peters-Burton, E., & Moore, T. (2016). *STEM Road Map*. New York: Routledge.

Law, N., Niederhauser, D. S., Christensen, R., & Shear, L. (2016). A Multilevel System of Quality Technology-Enhanced Learning and Teaching Indicators. *Journal of Educational Technology & Society*, 19(3), 72-83

Law, N. W. Y., Yuen, J. K. L., & Lee, Y. (2015). Precarious school level scalability amid network level resilience: insights from a multilevel multiscale model of scalability. In *Annual Meeting of the American Educational Research Association, AERA 2015*. Chicago, IL.

Reichert, F., Lam, P., Loh, E.K.Y., & Law, N. (2020). *Hong Kong Students' Digital Citizenship Development: Initial Findings.* Hong Kong: The University of Hong Kong.

Wenger, E. (1999). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wenger, E. (2009). Communities of practice: Development stages. Retrieved from http://esflive.archiv.zsi.at/files/CoP_development_stages.pdf