Architectures for Learning and Successive Processes of Scaling

Pakon Ko, The University of Hong Kong, kopakon@hku.hk
Khe Foon Hew, The University of Hong Kong, kfhew@hku.hk

Abstract: This study examines how school-level learning architectures affect the scalability of an innovation by conceptualizing scalability as successive scaling-up processes from the scale-up of teacher reform capacity to the result of spread. A longitudinal qualitative two-case study was conducted at two different schools, in the context of developing self-directed learning practice. The results showed how components of learning architectures affected successive scaling-up processes. These are components to be monitored at the school level for innovation at scale.

Keywords: architectures for learning, scaling up, self-directed learning, teacher reform capacity

Introduction and background

Previous research studies suggest that scalability is affected by the design of an intervention (Clarke & Dede, 2009) and the construction of teacher community networks (Glennan & Resnick, 2004). Relatively less research has been conducted to examine what and how school contextual factors can significantly hinder scalability when schools have tried to enact reform initiatives.

This study examines the effect of school contextual factors on a school's scale-up progress within the period of project intervention, drawing on the concept of learning architectures (Wenger, 1998, Law, et al., 2015). It is in the context of a three-year government-funded project in Hong Kong to promote self-directed learning (SDL) in science education from 2014-2017. SDL presented an innovative practice as science teachers in Hong Kong have traditionally adopted the teacher-directed lecture approach.

Conceptual framework

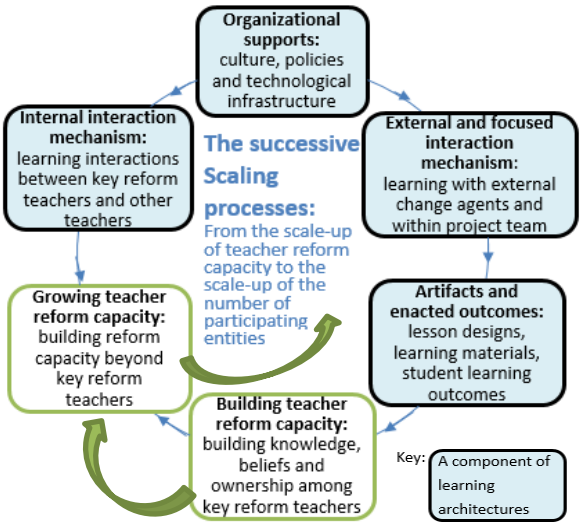

Figure 1. The successive scale-up model

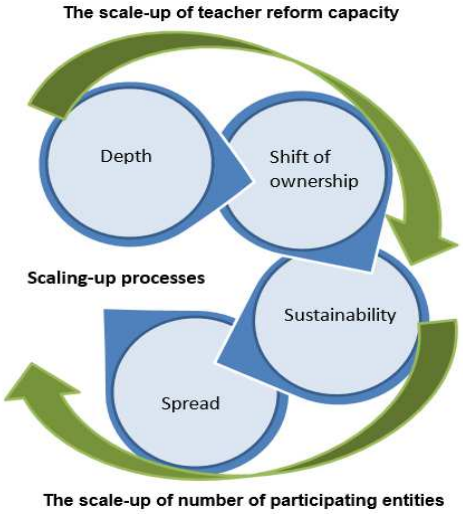

Figure 2. The successive scaling-up processes

This study develops a successive scale-up model (figure 1) to hypothesize the relationship between components of learning architectures at the school level with the scaling-up processes. In the model, scalability of an innovation is conceptualized as successive scaling-up processes (figure 2) from the scale-up of teacher reform capacity to the scale-up of the number of participating entities in the quality reform, building on Coburn's (2003) four dimensions in scalability: *depth*, *shift in reform ownership*, *sustainability* and *spread*. Teacher reform capacity is defined as the abilities of school teachers to accomplish a certain task, such as leading a school-innovation effort (e.g., adopting a SDL approach in primary and secondary school science education as is the case in the present study), embodying depth of reform knowledge, belief and ownership (Bandura, 1977; Gibbons, 2003). Law, et al. (2015) have proposed components for analyzing learning architectures. Building on their work, this study proposes four

major components of learning architectures for school level analysis: (a) organizational supports; (b) external and focused interaction mechanisms among key reform teachers; (c) artifacts and enacted outcomes as a result of teacher learning through external and focused interactions; and (d) internal interaction mechanism for growing teacher capacity beyond the project team.

Methods

A qualitative case study approach was adopted to understand each unit of analysis with an interpretation of data. Two schools A and B were sampled (table 1) because they showed significant differences in the progress of adopting SDL in science even though they joined the project in the same period for two years, working with the same university consultant, who is one of the authors. Data sources in the project included principal and teacher interviews, lesson observations, lesson artifacts, and student focus groups. Information and perspectives provided by different sources were compared. Data analysis was guided by the six components in the conceptual framework (figure 1).

Table 1: Information about the two selected schools

School	**Joined the project at the same year?**	**Worked with the same University consultant?**	**No. of teachers enacting SDL in science**		**The grade-level with SDL in science**	
			1st year	2nd year	1st year	2nd year
A	Yes	Yes	2	1 ↓	Grade 8	Grade 7
B	Yes	Yes	3	5 ↑	Grade 7	Grades 7 and 8 ↑

Findings and conclusion

Compared with school B, project teachers in school A had relatively weak organizational supports and sparse interaction mechanisms. Subsequently insufficient teacher reform capacity was developed and the scaling-up processes in school A broke down. The organizational supports in school B facilitated strong focused internal mechanism among project teachers for creating artifacts to perpetuate ideas. Hence, teacher reform capacity was built. Intense internal mechanism between project teachers and non-project teachers were strategically arranged for growing more reform-capable teachers and spreading SDL to more science classrooms. The two-case analysis with the successive scale-up model attests the impact of components of school-level learning architectures on the scaling-up processes. Schools are suggested to monitor these components for succeeding in building capacity to spread innovative practice.

With limited space, this study does not expand the focus to investigate how leadership affects the strength of components of learning architectures in the model. Principals and teacher leaders might be the architects, contributors and advisors of the school-level learning architectures, while at the same time they are also under the influence of it. Further research is needed to see whether the stronger components in school B is attributed to the involvement of the principal and the two teacher leaders in the team.

References

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191.

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.

Coburn, C. E. (2003). Rethinking scale: Moving beyond numbers to deep and lasting change. *Educational researcher, 32*(6), 3-12.

Gibbons, M. (2003). *The self-directed learning handbook: Challenging adolescent students to excel*. John Wiley & Sons.

Glennan Jr, T. K., & Resnick, L. B. (2004). School districts as learning organizations: A strategy for scaling education reform. *Expanding the reach of educational reforms: Perspectives from leaders in the scale-up of educational interventions, 517-563.*

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*.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity.* Cambridge university press.