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Teacher Epistemic Shift and Scaling Up: The Change towards Inquiry Based Learning Practices in Singapore Classrooms

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Abstract: Unlike the medical field where scaling and translating research into practice adopts a linear staged process (Woolf, 2009), the educational sciences is more complicated with overlapping social dimensions and evolving teaching and learning contexts. In this paper, we discuss issues on scaling inquiry practices, and we argue that scaling is not a mere roll out of resources related to any particular new pedagogy, nor is it adequate to provide professional development for teachers; rather it requires conviction on the part of teachers and the resilience for change afforded by epistemic learning. In this sense, scaling is less a mechanistic roll out of resources but more a capacity development and mindset shift.

Keywords: Teacher Change, Scaling Up, Epistemic Shift

1. Introduction

Scaling is increasingly important because policy makers (such as the Ministry of Education) aspire to transfer and repeat successful innovations, albeit not necessarily in identical ways, but in cheaper and more efficient ways to benefit the entire education system (Abu-Alhija, 2007). Policy makers perceive investments in school-based interventions as opportunities to maximize research and development efforts on a system wide level. To a certain extent, their understandings are built from a mechanistic viewpoint – when something is successful in one context, assumptions are made to transfer and generalize to other contexts (Sternberg et al., 2006). Most understandings about translation and scaling are seen from a linear, "multiply the benefits" point of view, such as in the medical sciences.

2. The scaling challenge & the beliefs of teachers

We found that getting the teacher prepared in doing these interventions, facilitating for the school principal to support, and to find the resources to do the 'out of the ordinary' endeavor for this period of time is very key. We found that without school support, very few teachers can actually engage in this endeavor. It is giving time off for the teacher to do this 'something new' thing, for this learning to take place. Providing a peer support group in enacting the interventions is necessary. In other words, how can leadership support enable these curricular adaptations as there is a need to change the assumptions of the curricula to enact this new scheme of work. How do we create the support group for the teacher in the classroom to learn together with other peers; and how would this process change the teacher's way of thinking. These are issues that are very critical for us.

To illustrate, these are some voices of principals:

> Teachers need to change the ways they teach and yet meet the curricular objectives. So if we have the end in mind, how do we work backwards although not taking the same road as in the past? It's not a simple substitution or replacement exercise to develop 21st century skills; there is a need to go back to the goals. We need to create a sustaining culture where teachers are comfortable, otherwise it won't work. We need professional development that builds not just the competencies but the culture in doing it.

Another enlightened principal said:

> Why not we open up these classrooms so that the next layer of teachers who want to do this intervention can start observing first. Why don't we open up classrooms – then I told her, we should, yeah let's open it up! So if you come from the principle [of what we intend to do], we know that there's hope, you see.

Teachers in Singapore schools generally would not use technology in their classroom practices if they do not see the need for using it. If in the co-design and re-design of lessons, they can rationally recognize how the affordances (for example, freezing time and motion in simulations and helping students to observe phenomena by slowing it down) enable learning, they would be willing to do it. Structuring for teachers to work together and to reflect on their practices, including recognizing them for these efforts are critical. When teachers witness their students understanding concepts better as afforded by these technologies, they usually are willing to undergo the change-process. They begin to realize that engaging learners from a non-didactic perspective really works better even in the milieu of high stakes performance needs.

3. Changing teacher's epistemic thinking: Peer Apprenticeship Learning

The issue of scaling is thus an issue of shifting the epistemic thinking of teachers - epistemology being the way you view knowledge. It is an epistemic change of thinking, and we refer to it as epistemic learning.

When teachers actually experience the struggling process where their beliefs are challenged; when they initially think they should be able to do a particular intervention (on the surface it looks simple enough), but when the undergo the journey, it is much more difficult than initially expected. And this is followed up by repeated failure. When this occurs, and when teachers have no choice but to persevere because a commitment – which has social implications – has been made, some of these teachers might be willing to suspend their own present beliefs.

At this juncture, providing the support structure of other teachers who have already undergone the change-process journey to mentor these struggling teachers is crucial for the epistemic change to occur. A peer apprenticeship process follows (Hung, 1999). It is an apprenticeship to enculturate the struggling teachers towards the inquiry based learning epistemology.

A local primary school mentor teacher once shared with us her experience on how to guide mentee teachers in the process of co-teaching in school settings.

> A more experienced teacher ("mentor") and a less experienced teacher ("apprentice") will take turns in co-teaching a class. An apprentice teacher may not feel comfortable to say "I do not know" to students in class. As a mentor, I will demonstrate how is done. I will teach the class and the apprentice teacher will be shadowed and observe how it goes. And in next lesson, she will teach and I will follow up to give feedback. And as we are attached in the same class, we will go through the whole year curriculum. It's like a "just in-time" training. Slowly, the apprentice teacher got the gist of how the lesson can be delivered in a self-directed way.

The shift from "I know" to "I do not know" exemplifies an epistemic change from a teacher-centered pedagogy to a student-centered orientation. In this case where epistemic change has occurred, one will find that the significant role of the teacher has changed, because the teacher now begins to teach the discipline and not just the subject. The teacher begins to scaffold students' ways of thinking according to the disciplinary genre. So when the students try to articulate something, the teacher would say: "this is very interesting. What do you mean by this? Can you talk out what you're thinking?". And then the teacher uses the genre of the scientific way of thinking for instance, the teacher is observed to rephrase the students' voices: "Are you saying this? ⋯ Are you saying this is your theory? Is this what you meant? Why did you think this way? " And the teacher tries to infuse into the student's original thinking augmented with that disciplinary way of thinking.

Peer apprenticeship learning is actually a process of ownership development and empowerment. Local adaptation to achieve sense of ownership is crucial for apprentice teachers to learn. There is judgment made by the mentor teacher as to what pedagogical approaches to fit the goals

and differentiated ability levels of apprentice teachers. The more the apprentice teacher is empowered to understand the rationale of implementing certain intervention and adapting to their needs and circumstances, the better they will learn from the actualization and experience changes in the epistemic way.

4. Conclusion

Designing for scaling and maximizing educational innovations is multifaceted because multiple dimensions seem to affect this process. Complexity can include the ease of articulating design principles, and this affects the level of support needed to diffuse and maximize educational innovations. Proximity of support at the appropriate scale is important. Thus, innovations implemented by teachers, schools, and systems may be better supported by appropriate structures at their respective scale.

We need to grow the capacity of teachers with respect to epistemic learning in Singapore, if we want to still make schools in Singapore work with respect to inquiry based learning. Teachers need to understand why something would work because if they do not understand why, adaptations might go lethal. We also need to create the social-infrastructure that enables teachers to undergo the epistemic change process.

Along these lines, how can we create networks of learning across schools and within schools, in order for this conviction and change of practice in disciplinary ways of thinking and help teachers go through this journey, which can only be learned by going through the actual embodied learning process. Scaling up of inquiry based learning, which we have concomitantly argued as a teacher change in epistemology, cannot be overly hastened. It takes a cultural change. The journey toward inquiry-based learning is a change in the larger ecosystem -- the challenge is not just teachers but also the larger ecology -- the expectations of parents and other stakeholders.

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