Teachers' perceived challenges of knowledge building pedagogy

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Abstract: Using the Cultural-historical activity theory (CHAT) as a lens, this paper reports the contradictions that 18 teacher participants identified as they learned about knowledge building pedagogy in a course and reflected on the challenges that they might face in implementing the pedagogy. Among many challenges, two were highlighted in this paper to illustrate the within system and between systems contradictions. Deweyan's transaction theory was used to suggest a possible way forward to overcoming these challenges.

Keywords: Teacher's perception, obstacles, Knowledge building, CSCL

1. Introduction

The advent of the new millennium witnessed the clarion calls by education researchers to respond to the demands of the twenty-first century. While some argued for equipping our young with 21st century skills [1], others suggested a more fundamental change to schools: transforming schools into knowledge building organizations [2]. The argument is that rather than focusing on leadership, administrative and structural changes, the primary function of schools is to work as a knowledge building organization, which focuses on developing students' capacity and disposition to be knowledge workers, constantly improving shared epistemic artifacts that are useful to the learning communities. Even though K-12 students are not expected to produce knowledge new to the world, they are capable of developing the habits of questioning their understanding, and have the capacity to improve their understanding in a collaborative way.

While substantial effort has been invested in improving knowledge building pedagogies in classrooms, Tan [4] argued that there is an urgent need to develop teacher's capacity in facilitating knowledge building. One of the ways is to help teachers to develop their identity as a knowledge builder, which means teachers engaging in collaborative improvement of ideas related to theories and practice of teaching and learning, with the ultimate goal of improving their students' learning outcomes. To this end, Tan [3] has implemented a knowledge building community among the teacher participants in a university program. In this course, the goal was to engage the participants in discussing theoretical professional knowledge, not only to solve problems related to teaching practices, but also to seed ideas for innovation and breakthrough.

The perspective of knowledge building in education, however, is relatively new to many participants. From the perspective of cultural-historical activity theory [4], the introduction of a new idea into a community is likely to trigger some contradictions within the activity system. Rather than treating it as resistance, this could, in fact, be the genesis of a new idea or concept. The purpose of this study is to uncover the challenges perceived by the teacher participants, as they participate in a knowledge building community to

deepen their understanding about knowledge building. The research questions guiding this study are: (1) What are the interacting activity systems involving the teacher participants in the course? (2) What are some contradictions, within and between the activity systems, with regard to the teacher's perception about knowledge building, the Knowledge Forum, and their implementation in schools?

2. Literature Review

This study examines teacher's perception of challenges in implementing knowledge building pedagogies, using the lens of cultural historical activity theory. Below is a review of the key concepts employed in this study.

8.1 Knowledge building

In essence, knowledge building among teachers engages the participants to investigate questions about pedagogical practices and their theoretical foundation, and collaboratively improve their ideas about these practices. For example, participants discussed principles of knowledge building by making meaning of statements of principles found in literature, interpreting and paraphrasing the statements, suggesting observable indicators when the principles are working, and organizing the principles in various ways. In short, there is deepening of understanding of knowledge building principles and higher level of abstraction in terms of how the principles could be organized.

The key strategy for knowledge building is to focus on eliciting and improving students' ideas (epistemic artifacts) about a topic, through collaborative and productive discourse. Scardamalia and Bereiter subscribe to Poppers' ontology [5] of reifying student's ideas as World 3 objects, so that these epistemic artifacts can be improved continuously. This necessitates the use of Knowledge Forum, an online forum, to capture these ideas accessible to a group so that they can be improved collaboratively. Knowledge building pedagogy, complemented with the Knowledge Forum, was employed in this study to engage the teacher participants to deepen their understanding on knowledge building.

8.2 Cultural historical activity theory

Cultural historical activity theory (CHAT) by Engestrom [4] builds on Vygotsky's theory [6] that cultural tools (e.g., resources, language, and technology) mediate the subjects' actions on the object. It extends the lens to examine subjects operating within a larger community (e.g., a group of teachers) with rules or norms, and there is a division of labour where community members work together towards achieving the object. Engestrom held that an activity system is the smallest meaningful unit for analysis. What distinguishes one activity from another is the motive that drives each activity and the object that the activity is oriented to. For example, a group of teachers (subjects) working on understanding pedagogical practices (object) to find out ways to improve classroom practices (motive). Contradictions are the driving force for knowledge creation according to CHAT [4]; the resolution of contradictions leads to formation of new object and consequently transformation of the entire activity system. Resolving contradictions could lead to expansive learning because of its focus on "new expanded object and pattern of activity oriented to the object" (p. 7). The third generation activity theory examines the interactions between at least two activity systems. For example, the teacher participants in a Master's class could belong to at least two different activity systems: the activity system

of a knowledge building community in the class and the activity system of professional teacher community in schools. Contradictions, within and between activity systems, form the main focal point of analysis in this study.

3. Methods

This intervention project adopted an instrumental case study methodology in order to understand the challenges perceived by the teachers with regard to knowledge building pedagogies. The main data source came from the discussion notes in the Knowledge Forum. Content analysis procedure was used to guide the analysis and to identify the main contradictions within and between activity systems.

3.1 Participants and Setting

The participants consisted of 16 Singaporean K-12 teachers and 2 polytechnic lecturers, who enrolled in a graduate course in the MEd (Learning Sciences) program. The participants had read about knowledge building approach and attempted to use Knowledge Forum (an online forum) in a previous course.

The course, entitled "Engaged learning in Knowledge Building Communities", consisted of 13 three-hour weekly sessions. This course was offered by the National Institute of Education, the official teacher education college in Singapore, as part of a Master of Education (Learning Sciences & Technologies) program. The course was conducted in a computer laboratory where there was sufficient space for the participants to form a circular configuration during the cogenerative dialogues sessions.

3.2 Instructional Approach

The instructor aimed to foster a knowledge building community among the participants as an experiential approach to understand knowledge building. The course activities include reading and discussing ideas presented in academic papers, reciprocal teaching by the participants where groups of participants took responsibilities to conduct short lessons on a particular topic, and cogenerative dialogues [7] that lasted from 15-20 minutes that engaged the participants to reflect on what went well in the class and to suggest what could be done in the following lesson for more effective learning. The course aimed to help the participants form a mental image of a knowledge building classroom, to make sense of the various theories and practical issues related to knowledge building, and to apply what they have learnt to a consequential task. This task involved designing a knowledge building curriculum or writing a position paper on a topic related to knowledge building community.

The face-to-face discussion was complemented with discussion on the Knowledge Forum, a computer-supported collaborative learning (CSCL) tool, within and beyond the class contact time. It is a web-based discussion forum that affords the participants a platform to capture and work on their ideas. A *View* in the Knowledge Forum can be created to support discussion on a topic by posting, building on, referencing, and annotating the notes so that the participant's ideas (epistemic artifacts) can be reified, worked on and be improved. This online platform changes the turn-taking structure in a face-to-face setting and reduces the probability of participants who might dominate the discussion [8]. In so doing, it provides a more equitable platform for the participants' voices to be heard. To scaffold the participant's thinking, customizable scaffolds in the form of sentence starting phrases, can be set by the instructor to encourage knowledge

building discourse. For instance, to support better argumentation, these prompts can be provided: “My claim is”, “My claim is supported by”, or “A counter argument is”. These are cognitive cues that model and encourage learners to take part in productive knowledge building discourse, rather than engaging in casual social chat.

4. Findings

4.1 The activity systems

To answer the first research question, the following two interacting activity systems (Figure 1) could be identified through the participants’ discourse.

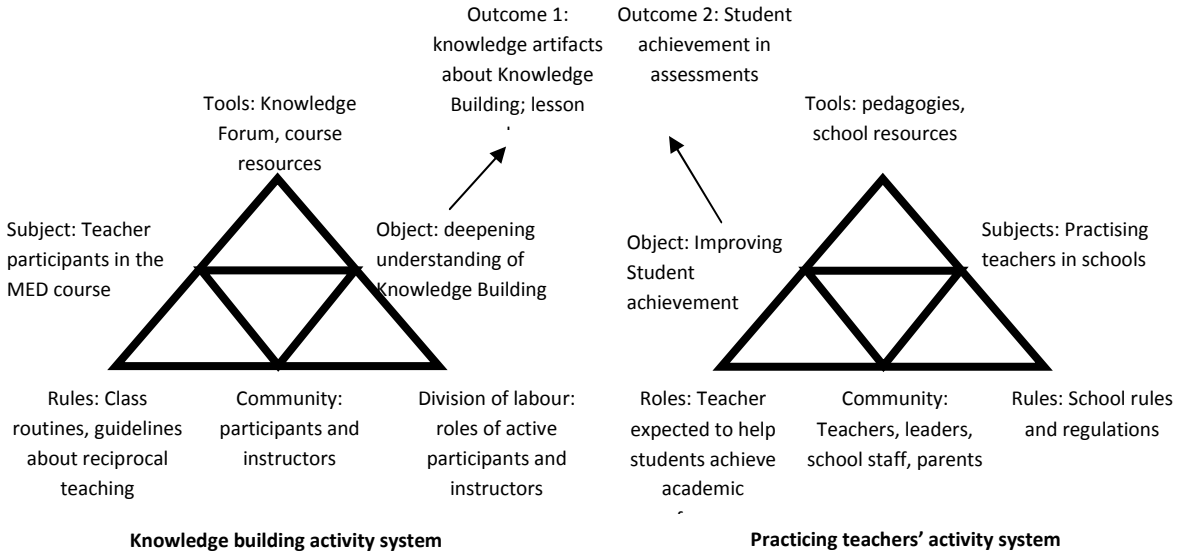

Figure 1. Two interacting activity systems

In the forum discussion, two broad themes were evident: one that focuses on understanding knowledge building and the other that evaluates the feasibility of this pedagogy in school environments. They correspond to two underlying motives. As a graduate student, the participants were engaged in deepening their understanding of knowledge, they attempted to make meaning of the theories, principles and research findings related to knowledge building. On the other hand, the participants are all full-time practicing teachers. They brought with them the lens to evaluate this pedagogy by examining the effectiveness and feasibility of this pedagogy in their respective school context. This is best illustrated in the comment by Jimmy (Pseudonyms are used in all quotations and words in square brackets [ ] are scaffolds provided in the Knowledge Forum):

> *From my understandings and readings, despite the advantages, applying KB principles and KF in class will definitely encounter resistance from the rest of people (students and teachers).*
>
> *[My theory] That is why I BELIEVE that if we can lengthen the transition period (from Normal teachers & students to KB students and teachers), EVERYONE of us can adopt KB.*

Similarly, Sunny agreed that knowledge building is beneficial, but there is no urgency to implement in lower primary schools:

> *… the long road of education for a child is at least 10 years in Singapore, why is there is need to rush them into things that they are not ready for? They should take their time to build their base, probably 9-10 years, before going onto more advance learning and I believe KB pedagogy will help them achieve even more at this level.*

Upon identification of the interacting activity systems, we proceed to analyze the contradictions within each system and the interactions between the two systems. Owing to the word limits, we shall highlight two key themes: (1) contradiction between the actor and the tools in the knowledge building system, and (2) contradictions between the activity systems owing to the differences between the predominant culture in schools and the ideal knowledge building culture.

4.2 Contradiction between the actor and the tool (Knowledge Forum)

The participants were quick to criticize the design of the Knowledge Forum, the CSCL platform supporting knowledge building, during the cogenerative dialogue after the first lesson. They complained about the non-user friendly and unappealing interface design. Walton posted this note in the forum:

> *… After a few months of using KF, I am still lost in its plethora of functions which have been organised in a very cluttered fashion… this software had all its functions squeezed packed without being organised, layered and made optional.*

Most participants felt that the design does not afford an intuitive interface. For example, after composing a note, the user needs to click the button "Close and Contribute" located at the top right hand corner instead of the more familiar "Send" button at the bottom of the screen. To reply to a note, the user needs to click the "Build on" button. Once the note is posted, the user needs to do a screen refresh to see the new note. As Walton pointed out, there are just too many functions (e.g., views, reference, rise above, etc.) that are not intuitive to the users. As a result, a full session (3 hours) was devoted to discussion on technologies supporting knowledge building. The participants suggested alternative platforms – wikispaces, Edmodo and InvisionFree – and compared them against Knowledge Forum.

Much of the participants' frustration with the Knowledge Forum was due to the design principles of knowledge building that were not commonly known. For example, the term "build on" was intentionally chosen to reflect the idea improvement principle of knowledge building. It was interesting to note that as the participants probe deeper into understanding the principles of knowledge building and began to link the features of the Knowledge Forum to these principles, acceptance level of the platform increased correspondingly. Several participants became "Knowledge Forum converts" near the end of the course. Edmund proclaimed that:

> *Personally, I see no flaw in the KF. It does what it needs to do beautifully and the various applets are able to generate visual representations of the heart and links of our KB contributions. ..The issue which surfaced many times was just simply how technology and expectations of interfaces by the mass general public arose through the invention of the table PC as well as formats of current websites and various reputable social media.*

Jimmy took a more moderate view, acknowledge that "KF is definitely more powerful" but the "steep learning curve might turn off the interest/curiosity of the students". There

are, however, participants who were still skeptical about the Knowledge Forum. For example, Sandy lamented that the participants in this class did not have a choice whether to use the Knowledge Forum, and opined that when forced to use the platform for some times, some participants might begin to appreciate the software.

Apparently, the developer of the Knowledge Forum had the intention to present an interface in alignment to the pedagogical principles. This finding reflects a need to understand the predominant user's culture. It highlights the conflict between intended affordance of the software and the perceived (lack of) affordance by the users. Another major contradiction between activity systems could also be attributed to the cultural differences.

4.3 Contradictions between the knowledge building activity system and the practicing teacher's activity system

Even though many participants were convinced of the potential benefits of knowledge building, they were struggling with the feasibility of implementing this pedagogy in schools, primarily due to the predominant culture in schools or even in the larger society. One hotly debated issue is the impact of high-stakes assessment. While recognizing the values of knowledge building, Tom argued that teachers struggle to complete the formal syllabuses because of the high-stakes "O" level examination and the limited curriculum time:

> *… Edwards and Mercer (1987) found that most of what students learning in schools in predetermined by the curriculum and hence, education is merely a process of socialisation into pre-existing epistemological world... teachers are bound by the time allocated for them to complete the SOW so to clear the O level examination. I believe that if the assessment system changes, teachers will surely try to use KB approach.*

This post triggered a series of discussion on the impact of assessment. Some suggested removing formal assessment would help, but Sandy questioned teachers' readiness to facilitate knowledge building:

> *I think even if assessment was to be supportive, many teachers will still not dare to embark on KB. KB requires teachers to be facilitators so does that mean they are supposed to have the knowledge to answer any question that may occur? …The critical issue is whether teachers are ready to be facilitators, and if students are willing to participate in knowledge construction together.*

Beyond teacher readiness, the fundamental roles of schools were discussed. The participants read the paper on "Schools as knowledge building organizations" by Scardamalia and Bereiter [3]. Some lamented that schools are too oriented toward service organization. Nathan questioned:

> *…we are told to treat students as our customers. My Question is can we discipline customers? Many of the schools changes are done so as to make students learning a less painful experience so that we can beat others on admission numbers. We are driven by KPI of non academic outcomes!*

But there are participants who suggested that schools should both be a learning organization and a service organization. Minimally, the schools should do their "national service" by helping to cater to the country's needs. Besides, most "structural and administrative changes are usually based on initiatives that are inclined towards learning."

Such a view implies that it is legitimate to apply organizational management concept in schools, as long as the ultimate goal is to improve students' learning. Beyond schools, the teachers are challenged by the societal culture and expectations on schools. Sam shared about a recent "saga" when his school introduced a new technology, which resulted in a parent's complaint in a public press. He attributed this to parents' prior experience and their expectations:

> *In addition to the many reasons why teachers are resistant to kb, I think parents' beliefs also need to be changed as well. If parents are not supportive, or do not understand the rationale of using kb, it would indirectly affect teachers' use of KB as well… many parents of our generation who were schooled in the traditional ways, still believe in the more traditional methods of instruction where students are passive learners. Their beliefs influence their children, who then bring their parent's beliefs to class.*

This theme of discussion on challenges faced by teachers was prevalent throughout the course, which resurfaced at various online and face-to-face sessions. It suggests a possible dissonance the participants are experiencing. Taking a CHAT perspective, the teachers are at the boundary of two activity systems. On one hand, they are graduate students, attending courses to understand various learning theories and issues. On the other hand, they are constantly wearing the hat of a practicing teacher, weighing the potential strengths and limitations of applying some innovative ideas in schools. It is a struggle between rational thinking with theories versus feedback from embodied experience in schools. Therein presents an essential question: would the participants take up the challenge to implement new ideas in their schools?

We could draw inspiration from Dewey's notion of inquiry [9]. Dewey suggested that inquiry involves several stages: confrontation with a difficulty, recognizing and defining the problem, suggestion of possible solution, reasoning for the viability of the suggestions, observation and experimentation to verify the solution. Dewey's transactional realism does not regard knowledge as a reflection of reality, but knowledge as warranted assertions that verify relationships among (social) events; knowledge has its genesis when a person has experiences with the environment, and knowledge plays a significant role in and for action with real impact, rather than as a separate entity directing the person's action. Dewey's transactional theory removes the mind-matter divide and theory-practice divide. The lens of CHAT is in alignment with Dewey's perspective. In other words, in this course, the contradictions that the teachers are experiencing represent their initial encounter with a difficulty, and the challenges they identified suggests the definition and identification of the problem. Knowledge about knowledge building pedagogies and knowledge about their classroom practices have real applications in developing possible solutions. In this course, another instructional strategy used was to invite a practitioner's community who were engaged in knowledge building to share their real-life experience and challenges with knowledge building. This became another source of knowledge for the participants to identify possible solutions and to reason out the viability of their solutions. Extending beyond the course, it is crucial for the participants to put into practice and experiment with the new pedagogy that they have studied. It is only through this "doing" that they would develop their warranted assertions about how and why the pedagogy could work in their respective classrooms.

5. Concluding Remarks

This study uses the lens of Cultural historical activity theory (CHAT) to examine teacher participants' perception of the possible challenges of implementing knowledge building pedagogy in their classrooms. At the boundary of two activity systems, the teachers were well placed to uncover several contradictions. This paper highlighted two contradictions, one between the actors and the tools within an activity system, where the participants suggested the limitations of Knowledge Forum, the supporting technology. Another is the implementation challenge due to cultural differences between the ideal knowledge building culture and the predominant assessment-driven culture in schools. To overcome the challenges, the participants could put into practice the new ideas that they have learnt so as to have transactive experience with their teaching environment. Arguing from Dewey's theory, it is knowing-by-doing that the teacher participants could eventually form warranted assertions about how and why the pedagogy could work.

Acknowledgements

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