An exploration of professional noticing and PCK (Pedagogical Content Knowledge) among teacher educators from low resource countries

Authors: Anirudh Agarwal; Arushi Bansal; Ruchi Kumar

Affiliation: Tata Institute of Social Sciences, Mumbai

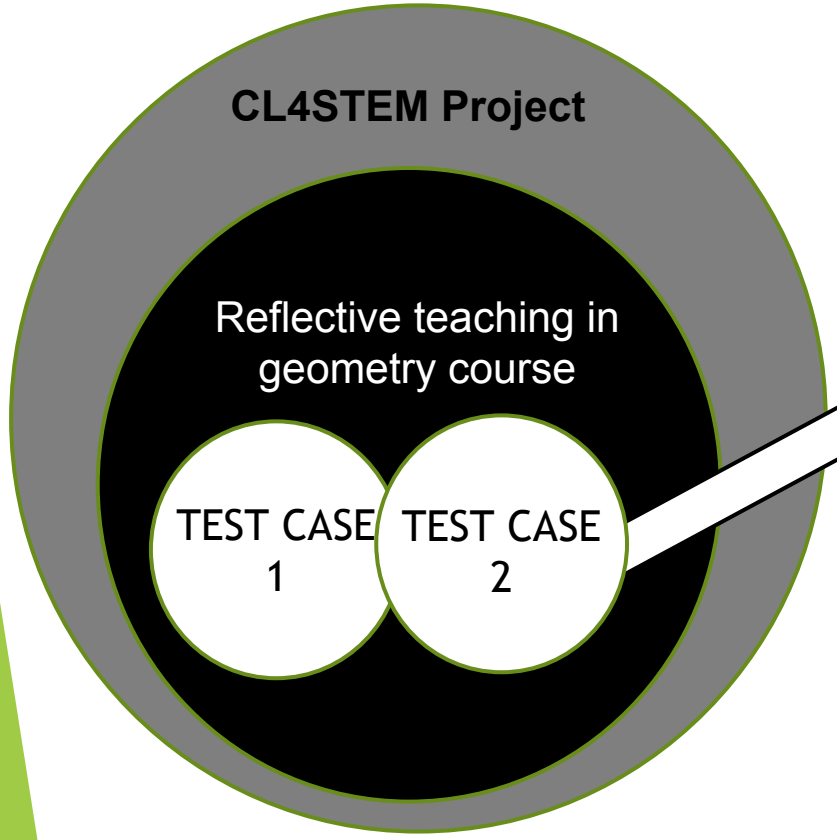
About the project:

- The Connected Learning Initiative project seeks to build capacities of middle and secondary school newly qualified teachers (NQT) in science and mathematics for fostering inclusive higher-order learning in their classrooms.
- Aims to pilot the Connected Learning Initiative (CLIx, https://clix.tiss.edu) innovation, developed and scaled in India, to new contexts through South-South collaboration and research its effectiveness and potential for scaling
- Funded by the IDRC under the Global Partnership for Education Knowledge and Innovation Exchange (GPE-KIX)
- Project comprises of - Knowledge Transfer, Impact Study, and Innovation Diffusion Study.

Theoretical Framework

- PCK as an important part of knowledge required by teachers and hence by teacher educators (Beswick and Chapman, 2012).
- Teachers use mathematical knowledge to address students' difficulties (Shulman, 1986) involving **understanding conceptual and procedural knowledge of students**, **students' alternative conceptions** and **levels of understanding**, **techniques to diagnose and assess** students' learning and misconception.
- **PCK includes explanation, understanding and examining students' work for which different forms of representation is required** (Ball et al., 2005).
- Beswick and Goos (2018) argue that **MTEs need meta PCK.** Veal and MaKinster (1999) describe **general PCK, domain specific PCK and topic specific PCK are intertwined and essential**
- *We propose that along with PCK, MTEs need to be able to have same or higher level of professional awareness (Mason, 2011) by being able to notice and "identify relevant aspect of a teaching situation; use knowledge to interpret the events, and establish connections between specific aspects of teaching and learning situations and more general principles and ideas about teaching and learning" (Llinares, 2013)*

Methodology



Fela loves **making different objects and figures using paper**. Yesterday, he made a swan and an equilateral triangle by **folding paper**. In the mathematics class, he **finds it difficult to understand the meaning of algebraic symbols** and is **not able to solve** any quadratic **equations**. When he gets the question paper, he **selectively attempts those questions that do not involve algebra**

How would you as a teacher of these two students help them in learning mathematics?

Participants: 17 teacher educators from Bhutan, Nigeria, India and Tanzania

- Descriptive response collected and analysis done through "directed content analysis" (Hsieh & Shannon, 2005) using codes derived from the theoretical framework
- Responses analysed by researchers independently on four parameters: **Teacher Educators' beliefs**, **Teacher Educators' knowledge of pedagogy, Teacher Educators' knowledge of student thinking** and **whether the pedagogy lent to addressing the student specific characteristics/difficulties** in the question.
- Consolidated summaries analyzed for evidence on teacher educators' beliefs about learning, their general and subject (math) specific pedagogy and topic (algebra) specific PCK

Results

Response details	Response details	Response details
Teacher beliefs/general pedagogy	**Subject (Math) Specific Pedagogy**	**Topic (Algebra) Specific PCK**
47% recognised student's preferred way of learning and interests	47% believe that hands-on/ experiential learning / authentic learning is important and can be useful.	12% outlined activities for teaching generalization (topic specific PCK)
12% recognise the affective struggles and advocates mitigating them	12% believe that multiple math representations can be useful	12% do not address pitfalls of using completely new set of symbols
6% believe in presence of multiple intelligences among students	12% TE advocate for student agency by allowing them to use their own methods and symbols while doing maths	65% do not outline a topic specific PCK
TEs exhibited positive beliefs regarding student centric teaching learning practices.	Alongwith a positive belief for creating a learner centric classroom environment, the respondents exhibited knowledge about effective subject specific pedagogies.	6% outlined a topic specific PCK misaligned with subject specific pedagogy whereas 24% outlined non clarity on how it will help student learning
Some TEs also recognised that students might be scared or anxious about learning mathematics, and advocated for methods that will help mitigate these affective struggles.	Results outline the evidence of use of TLMs and experiential learning and using multiple representations for student learning.	TEs did not exhibit specific strategies.TEs who outlined a pedagogy specific to algebra, but did not outline how it may help in the particular instance.

Discussion and implications

- All the four countries have undergone curriculum reform in recent years, the MTE's response indicates awareness and alignment towards student-centered teaching approaches.
- Skill of noticing student characteristics and their difficulties, and suggest pedagogic strategies in alignment was challenging.
- Differences lie in the attention to the details and knowing topic specific representations and pedagogic strategies.

Limitations of the study

- The TEs have not been observed in practice, and thus there is a chance that the TE practice is different from their responses
- Since the study used a specific topic and a small sample, it is possible that the TEs do have topic specific PCK for other topics
- It is possible that the participants provided socially acceptable answers in context of the question
- The sample is small and thus non representative and skewed towards males. The participants were not selected randomly, but instead by the virtue of being partners of the study.

References

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