Relating teacher professional development and development of students' mathematical understanding

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Introduction

Teachers' have been engaged in inservice teacher professional development program with the aim of creating a reflective approach towards classroom teaching and help teachers in trying out new and innovative ideas for teaching. Often, the professional development opportunities are provided through workshops and follow up in the classroom is not done. In contrast, Connected learning initiative designed and implemented a continuous professional development opportunity for in-service teachers. In this paper, we discuss a classroom experience of a teacher (second author- Amarjyoti Sinha) of engaging in this program and how she utilised the ideas in classroom teaching which she had become familiar with while engaging in the continuous professional development program. The studies on professional development efforts rarely report from the perspective of the teacher who are engaged in these opportunities.

About Connected Learning Initiative design for teacher professional development

CLIx is a large scale ICT in education intervention which is trying to demonstrate scalability and sustainability by taking a systems approach for adoption. The National Curriculum Framework (2005) advocated the use of ICT resources to provide opportunities for students and teachers to be 'producers' rather than 'consumers' of information. This can be possible only when students get opportunities to get hands-on time with computers to learn digital skills as well as develop deeper understanding of the subject matter. Only when students are able to use digital media to express their ideas, will they be prepared to participate equally in this digital age. It is with this vision of using ICT as a platform to groom students as producers of knowledge that the Tata Institute of Social Sciences (TISS) in collaboration with MIT, Boston, Eklavya, HBCSE (Homi Bhabha Centre for Science Education), a number of other strategic national partners and state governments of Rajasthan, Chattisgarh, Mizoram and Telangana, developed the design for CLIx. CLIx changes the technology for technology's sake approach that schools currently have and brings the focus back to using technology as a tool to improve learning.

The failure of the cascade model in bringing about any meaningful change in classroom over the past decades has established the need for a continuous model of in-service professional development that directly connects with teachers' practice in the classroom. Recognizing this gap, CLIx is trying to demonstrate a model of in-service education which sees TPD (Teacher Professional Development) on a continuum wherein teachers begin by developing their digital skills but go on to complete courses in chosen subjects to enhance their pedagogical content knowledge. This puts teachers on par with other professionals who engage in their own professional development by taking different courses. They earn credits for completing the course and for implementing student modules in their school and get rewarded with a certificate from TISS, Mumbai. There are three sites for teacher learning in CLIx - the face to face workshops, the community of practice supported via a social media app, Telegram, and a learning

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platform, TISSx, which is modelled on the lines of Open edX platform (an OER). To increase accessibility, the course is also made available on smartphones.

The teaching of fraction naming and comparison

The teacher, Amarjyoti Sinha, came across a problem shared in mobile based chat groups which serves as a community for teachers and facilitators to exchange and share new ideas, questions and discuss student responses. The problem was

> Anshul and Gulshan have 3 and 5 rotis. When they were just sitting to have a lunch, a man came who was very hungry. They decided to share the rotis equally among themselves. The man gave 8 coins as a gift for sharing their food. Now the friends had a disagreement about how the coins shoud be distributed amongst them. Anshul felt that the coins should be divided equally but Gulshan felt that he deserved more. They went to a judge who said that Anshul should get 1 coin while Gulshan should get 7 coins. Do you think justice was done? Why or why not?

The teacher engaged in discussion and shared her solution on the group. She got to see solutions from other group members which used ideas different from hers. Thereafter, she used the same problem in the classroom to discuss with the ninth grade students. While discussing the problem she realised that students are facing problems in being able to depict the share of one person in the problem. She had used the proportional reasoning module developed by CLIx with her students in the computer lab. The unit 1 of the module addresses the concept of fractions by engaging students in problem solving by sharing food in form of cakes or parathas. Students divide the virtual cakes into equal pieces using a cutting tool in the activity and distribute the shares equally to all the members in a group. One of the problem was to divide 5 cakes among 4 students for which the student had arrived at the answer 5/4. At this point in the lesson, when students were having difficulty in depicting one person's share- she asked students to recall what they had done in the problem of 5 cakes shared among 4 people. Understanding that not all students would have understood why the share of one person is 5/4, she decided to ask students if they think answer is correct or it should ⅘. She observed that many of the students seem confused and were not confident that answer is 5/4. She then engaged the class in discussing the situation of comparing ¾ and ⅜ as she was aware from the discussion in the course designed by CLIx for teachers that students often find this confusing since they look at denominator and consider the bigger denominator depicting the bigger fraction. These two problems of the share 5/4 and comparison of ¾ and ⅜ were taken up by the teacher to develop the prerequisite concept of fraction naming and comparison and to solve the problem which was posed.

The solution of the posed problem was then developed in the classroom. Students were able to say that when 8 rotis were divided among three people the share of each person would be 8/3. They then subtracted 8/3 from 3 to find the share that Anshul gave to the man and 8/3 from 5 to find the share that Gulshan gave to the man. The students were thus able to find that the man got ⅓ roti from Anshul and 7/3 roti from Gulshan and therefore the distribution of 1 coin to Anshul and 7 to Gulshan would be fair.

Conclusion

Teacher felt that the discussion of the problem afforded to make the mathematics relevant to daily life for the students. Engaging with digital modules created interest among the students which helped them in understanding the basic ideas necessary for understanding fractions. She found that students who used to

consider maths as a difficult subject were also engaging with the module with interest. But she was aware that only engaging with the module in the lab and getting the correct answer of the problem is not necessarily an indication of understanding, therefore she took discussion of those problems again in the classroom and connected with other concepts that they were learning. She felt that as a teacher engaging with ICT resources like the proportional reasoning module, the engagement in the discussion on mobile based chats in communities and engaging in the online course for teachers not only made here aware of the different ideas for teaching mathematics but also allowed opportunities to learn from other teachers and their experiences.