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Modelling how to Elicit Learners' Ideas

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Abstract

As teachers participate in Teacher professional development (TPD) programs, one of the greatest concerns is whether they implement what they learn. Teachers are likely to practice what they learn when they find it not only practical but also if they can relate to it. Working as a teacher trainer during the 2016 secondary program INSET by CEMASTEA, I modelled to teachers how they can elicit learners' ideas, I designed an activity where I prompted the teachers to think about and state what they thought was in a bubble in boiling water. Working with teachers as learners, they experienced what it means to elicit learners' ideas as well as the varied responses they gave for what is contained in a bubble of boiling water. This article describes this activity and concludes with a call to teachers to seek to understand learners' ideas, the thinking behind those ideas, and leverage learning based on those ideas.

Keywords

Learners' ideas, Teachers as learners, Teachers' ideas

Introduction

Learners have ideas about concepts they learn in class. Effective teaching should endeavor to build on these ideas to leverage meaningful learning (Taber, 2014). Therefore, teachers' understanding of how to elicit and build on learners' ideas is key. In this article, I describe, the outcome of an activity I used during the 2016 secondary teacher professional development (TPD) in-service education and training (INSET) to help teachers appreciate the variation in thinking among individuals on the granted common phenomenon.

Teachers as Learners

The Unit titled "*Encouraging, Capturing and Using Learners' Ideas*" was included in the 2016 Secondary INSET Module to help the teachers not only understand that learners have ideas about content they teach but also help them to develop strategies for soliciting and using learners' ideas in teaching. As one of the facilitators of the content in this unit, my struggle was on how to enhance participating teachers' understanding of how to elicit ideas that learners have about concepts before the actual teaching in class. After reflecting on this for some time, I decided to position teachers as learners and elicit their understanding of a given phenomenon. This was guided by the understanding that teachers learn and implement what they learn better if they can relate to it (Patton, Parker & Tannehill, 2015). I designed and used an activity that allowed teachers to think about and state what they thought was in a bubble in boiling water. I chose a bubble in boiling water because it is a common phenomenon that is familiar to many people.

1. Activity on a Bubble in Boiling Water

During the session, I projected one of the PowerPoint slides showing a picture of boiling water in a beaker over a Bunsen flame as shown in Figure 1. I then posed the question, "What is in the bubble in the boiling water?"

Figure 1: Boiling Water in a Beaker

While the participants were still thinking, I provided them with blank cards and informed them that I would give them about two minutes to think about their idea and write their responses on the card provided without indicating their names. The idea of not writing their names was meant to allow them to give their responses freely without the fear of being linked to given responses individually. After two minutes, I collected the cards from the teachers.

2. The Teachers' Responses

There were many different responses given by the teachers. The responses included drawings that represented the teachers' ideas as shown in Figure 2. All three drawings in Figure 2 show a bubble conceptualised as being a spherical enclosure containing air. This means that the teachers who drew their ideas as shown in Figure 2 visualised the bubble as a ball-like structure containing air.

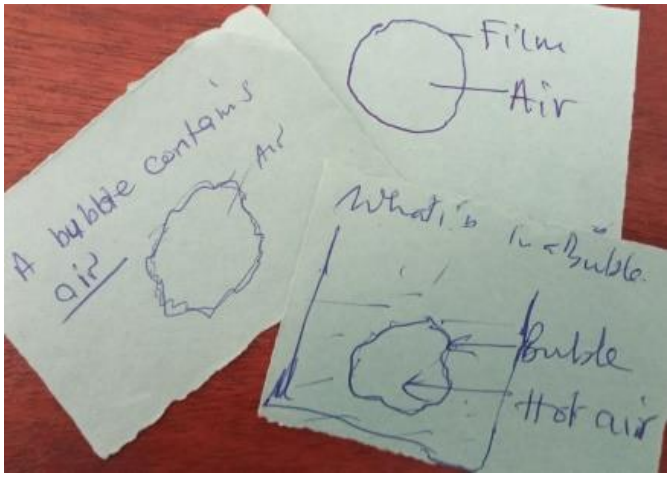

Figure 2: Drawings of "what is in a bubble of boiling water"

From the written responses, I randomly selected and shared a few of the responses. The teachers were surprised to learn that there were as many different ideas of what is contained in the bubble in boiling water as there were participants in the session.

At the end of the session, I took the cards with me for further analysis. I sorted and categorised the responses into two main categories namely matter and non-matter. Examples of responses in the matter category were "air", "steam", and "oxygen". On the other hand, examples of responses in the non-matter category were "pressure" and "energy". I further categorised the responses in the matter category into two sub-categories as follows (1) known gaseous substances (2) unknown gaseous substances. Table 1 shows categories and sub-categories of the teachers' responses as well as the number and percentage of respondents per category and sub-category.

Table 1: Teacher's responses by category and sub-category

Category	Sub-category	Exemplars	Respondents	%
Matter	Known gaseous substances	Air, hot air,	105	60.0
		Water vapour, steam	26	14.9
		Air and water vapour	20	11.4
		Hydrogen and oxygen, Oxygen	3	1.7
	Unknown gaseous substances	Gasses, gas	15	8.6
Non-matter		Vacuum, pressure, heat energy	6	3.4
Total			**175**	**100**

Based on data in Table 1, 96.6% of the teachers thought that a bubble in boiling water contained substances that can be considered to be matter with the majority (i.e., 60% of the total respondents) indicating that the bubble contains air. It is interesting to note that a small percentage (i.e., 3.4%) of the teachers thought that the bubble had no matter in it including the idea that there was completely nothing (i.e., vacuum) in the bubble.

Ideas and the Thinking behind them

This activity is a clear demonstration that people including teachers can have different ideas about even the taken-for-granted phenomena such as a bubble in boiling water. It is for this reason that teachers should give learners opportunities to express their ideas about the content being taught, draw on those ideas and support them to learn. Teachers can use this strategy of presenting a phenomenon to students and asking them to think and give their ideas and understanding about it. It may not be necessary for teachers to carry out a detailed analysis of their learners' ideas as described in this article. However, they need to understand the thinking behind learners' ideas. This can be achieved by selecting some of the responses and probing the students to provide the likely reasoning and thinking behind those responses. This way, the students will have opportunities to not only give their ideas but also reflect on the thinking behind their ideas. As a result, the students become and remain active participants in their learning which is a major expectation of the Competency-Based Curriculum (CBC).

Using the example of the teachers' ideas as shown in Table 1, some possible explanations for their ideas include, (1) water contains dissolved air that is expelled as bubbles during boiling for those who indicated that a bubble contains air; (2) water molecules vibrate faster when boiled and turn into water vapour or steam that rises in the boiling water as bubbles for those who indicated that a bubble contains water vapour or steam; and (3) heat breaks water molecules into its constituent elements (i.e., hydrogen and oxygen) for those who indicated that a bubble contains hydrogen and oxygen or oxygen alone. The scientific accurate thinking, in this case, is the second one. Therefore, making the students' thinking visible helps the teacher to recognise misconceptions in their thinking. Ultimately, this can help the teacher to design further activities to support or challenge students' thinking as they work towards a more acceptable explanation of the phenomenon.

Conclusion

The purpose of TPD is to help teachers improve their teaching methodologies for improved students' learning outcomes. I designed an activity where I prompted the teachers participating in the 2016 Secondary program TPD to think about and state what is in a bubble in boiling water. This was to help them to come to recognise and appreciate that learners' have ideas about the content they learn in class. The activity also sought to help the teachers understand that while some

of the ideas may be closer to the acceptable reasoning behind the content, others are not. This activity showed that even teachers can hold different ideas about the simplest and most common phenomenon such as a bubble in boiling water. Teachers need to determine ideas students have about the content they teach and leverage their learning based on those ideas. The teachers need to be flexible and accept students' responses in whatever format including written text, verbal submissions, and drawings. Drawing is especially important as Ainsworth, Prain, and Russell (2011) argue it is not only a learning strategy but also helps in representing and communicating ideas and enhances engagement.

References

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