

LINKING TEACHERS' KNOWLEDGE FOR PROFESSIONAL EMPOWERMENT

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Abstract: This study investigates perceptions of professional knowledge transfer during workshops conducted by the Centre for the Public Awareness of Science for Indonesian and Sri Lankan science teachers. The teachers believed that although teaching science in a culturally meaningful manner is a challenge to implement, it could be achieved through the development of specific professional knowledge bases. This paper discusses the role of science communication when facilitating effective knowledge transfer to professionally empower two culturally dissimilar groups of science teachers.

Objectives

Scientific knowledge, although a means of interpreting universally experienced phenomena, is grounded in social context and varies significantly within dissimilar cultures, with regard to its construction and transmission (Day et al, 1985). Consequently, many science teachers feel challenged when contextualising scientific concepts to suit their classrooms. In order to overcome this challenge, such teachers need to develop specific professional knowledge bases (Barnett & Hodson, 2001).

Science teachers receive a significant proportion of professional development support in the form of in-service programs. For the past eight years, the Centre for the Public Awareness of Science at the Australian National University has been conducting professional development workshops that focus on Constructivist pedagogy and employ simple, inexpensive materials. These workshops aim at professionally empowering science teachers by enabling them to make connections between their personal experiences and science context knowledge. The following study describes the experiences of two groups of science teachers from Sri Lanka and Indonesia, and the outcomes of these two workshops.

The main aim of this study was to investigate how science teachers' professional knowledge could be developed through culturally meaningful and effective knowledge transfer. This was achieved through the following objectives: 1. To investigate how science teachers from two socially and geographically diverse backgrounds would relate to pedagogical approaches that employ commonplace concepts and simple materials to teach science; 2. To conceptualize teachers' professional knowledge and propose possible means by which their professional empowerment could be facilitated; and 3. To examine the possibility of effective science communication strategies to overcome limitations when science is communicated across cultures with different value systems; especially where English is not the primary medium of instruction.

Significance

The professional development outcomes, which the teachers from Sri Lanka and Indonesia achieved through the workshops, underpin the importance of effective and meaningful communication (especially across culturally dissimilar groups), to facilitate transfer of professional knowledge. Effective means of communication are required to develop awareness among teachers of their own knowledge bases, which need to be linked with science content knowledge to facilitate learning experiences that are contextualized within the social framework of the classroom. Literature in education research confirms that students have a better appreciation of science when it relates to familiar social constructs with which they could easily identify (Stocklmayer, 2001 and Haney et al, 2002). Communication is however, strongly dependent on the culture within which it is contextualized (Bakhtin, 1986). Communicating science (as described above), with teachers who are linguistically diverse and belong to knowledge systems that are dissimilar to Western traditions is, therefore, a challenge to facilitate. It is expected that the outcomes of this study could be further applied to other cross-cultural efforts to professionally empower science educators.

Theory

There are two aspects of knowledge that are unique to the social context of each teacher: Personal Practical Knowledge (PPK: ie. that which is the personal professional domain of each teacher; Connelly & Clandinin, 1985) and Pedagogical Content Knowledge (PCK: ie. that which links content and pedagogy in the context of the classroom; Shulman, 1986). PPK and PCK also individually contribute towards teachers' professional development. Teachers who access PPK derive personal control and confidence to teach, while PCK enables teachers to make science content knowledge more accessible to their students. The ability to make connections between these two distinct spheres of knowledge would professionally empower science teachers and thereby allow for good science teaching to be implemented (Barnett & Hodson, 2001).

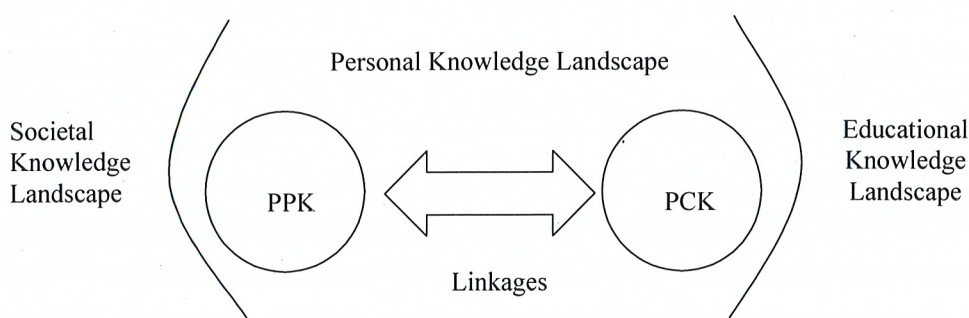


Figure1. A synthesis of teachers' professional knowledge landscape

Employing the *knowledge landscape* metaphor (Connelly & Clandinin, 1995), Figure 1 represents the interactions between the different terrains of knowledge that constitute teachers' professional knowledge landscape. Making connections between PPK and PCK

requires 'linkages' to which teachers could easily relate and use to scaffold new knowledge. Since PPK and PCK are however, culturally dependent, it is more challenging to construct linkages for teachers from dissimilar cultures.

This study examines how effective science communication facilitates transfer of professional knowledge to construct linkages between teachers' professional knowledge bases. It is especially concerned with the transferability of professional knowledge by means of science communication based on Constructivist epistemology (Piaget, 1964) and the Theory of Multiple Intelligences (Gardner, 1983). Cognitive implications (Day et al, 1985) of linking PPK and PCK of socio-culturally dissimilar teacher groups are also investigated in this study.

Design and procedure

This study describes two separate professional development workshops conducted by the Centre for the Public Awareness of Science of the Australian National University, for secondary school science teachers. The first workshop was conducted in Sri Lanka (November 2005) for a group of sixty-two science teachers, while the second was a residential workshop in Australia for nine science teachers from Indonesia (August 2006).

Data for this study was gathered through participant observation records, teachers' feedback in workshop evaluations and through follow-up interviews and focus groups (Gall et al, 1996; Ball, 1997 and Keats, 1997). Interviews and focus groups were based on a series of semi-structured open-ended questions and sometimes mediated in the participants' mother-tongues.

Findings

Both groups of teachers agreed that teaching science through commonplace experiences and simple devices was more engaging and effective than the conventional methods to which they are accustomed. The teachers felt that they would be more likely to adopt this approach in their own classrooms because it is easy to relate to familiar concepts and less intimidating to use simple materials (than conventional laboratory equipment). All workshop participants acknowledged that the workshop was personally rewarding and professionally insightful. One teacher from Indonesia in particular remarked that "*There are many positive things that I can put into place at my school [about] the way science is taught..... The application of material-centred learning [ie. hands-on] in a real-life context (Translation)*".

When further inquiry was made about the transfer of professional knowledge, the participants responded that the workshops had empowered them to teach science creatively. Several of the teachers provided anecdotal evidence of utilising their personal knowledge bases (ie. PPK) to develop scientific learning experiences their students could easily relate to (ie. PCK). One such instance reported by a Sri Lankan science teacher describes how she substituted local household products to achieve similar results that were obtained from some of the workshop activities. It is evident from similar findings

that the workshops didn't merely equip teachers with 'a bag of tricks' but had facilitated a significant level of professional knowledge transfer.

While investigating the communication which allowed for the transfer of professional knowledge, there was concern from the facilitators about the medium of communication. Given that the teachers primarily communicated in their own mother-tongues and that linguistic constructs are socio-culturally entrenched (Bakhtin, 1986), there was speculation whether English language as the medium of communication would have impeded any of the desired outcomes at the workshops. Both groups of teachers however, did not believe that an interpreter would have had an effect on improving the workshops' communication. Instead they alluded to effective communication strategies that were employed during the workshops, which on closer analysis revealed to be underpinned by elements of scientific communication (Stocklmayer, 2001), and to conform to Constructivist epistemology and the Theory of Multiple Intelligences.

This study provides evidence that professional knowledge transfer to empower culturally dissimilar groups of science teachers could be facilitated through science communication that is constructed effectively. In conclusion I would like to include a statement from one of the teachers: "*Some teachers continue to teach what is wrong, even though they know and believe it to be wrong, because they don't feel they have the power to correct it... We were made to feel that is alright to teach differently when we believe so we feel empowered.*"

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