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Exploring exemplary physics teachers' instructional practices supporting learner access to school physics content

Rammiki, Rorisang Agnes

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Abstract

This study explored exemplary physics teachers' instructional practices which place learners at the centre of activities in terms of their abilities and competencies. It was carried out at two senior secondary schools in Botswana at a period when enrolment of learners had been increased. The increase in learner enrolment brought in new groups of learners whose performance in science subject was generally low as evidenced by national examination results. The low national examination results indicated a need for making school science content more accessible for these learners which is a direct responsibility of teachers (Mullis, Martin, & Foy, 2005; Shulman, 1987). Teachers' instructional practices had been characterised by excessive use of chalkboard and teacher-talk which is considered less effective in making school science content accessible for learners of wide ability range (Botswana, 1993; Prophet, 1990b).

Science education research on instructional practices put emphasis on active participation of learners as a way of improving learner access to school science content (Tiberghein, 2000). Learner participation in instructional practices draws largely from Vygotsky's social constructivist perspective (Vygotsky, 2012) which assumes that knowledge must first appear at the social level between people before it can be constructed at an individual level (Minick, 2005). Ideas presented at a social level must be in a form that can be understood by learners in order to construct them as their own (Driver & Oldham, 1986). The teacher plays an important role in making the subject content accessible for learners especially when they take into account learners' characteristics (Shulman, 1987).

The study used qualitative design to explore exemplary teachers' instructional practices in order to understand how they support learners in making sense of school physics content (Gay & Airasian, 2000). A case study approach was used because of limited information on exemplary instructional practices of physics teachers in Botswana (Merriam, 1998). Purposive sampling was used to select two teachers who were identified by the researcher for their exceptional instructional skills in engaging learners (Merriam, 2009; Patton, 2002). The intention for employing purposive sampling was that the teachers' exceptional practices would provide information on instructional activities that could serve as exemplars for physics teachers' instructional support for learners (Kuhn, 1970). Lesson observation was

used to collect data on at least seven lessons for each teacher; interviews with teachers and their respective learners were also used to substantiate inferences because of their potential for providing information-rich data. Video and audio recorders were used to capture data because it was necessary to capture activities as close to their occurrence in natural settings as possible; also because these could be replayed to develop deep understandings of the interactions for making and validating inferences. Inductive analysis was used to explore instances of teacher's instructional support for learners from transcripts.

The findings included teachers' engagement of learners in new physics concepts which were structured on learners' knowledge from prior instruction and from events in their lives. The teachers created environments which were sensitive to learners' needs and competencies for accessing new physics concepts and skills. They used discussion and written work to provide opportunity for learners to demonstrate their understanding and to give feedback. The teachers' feedback included performance expectations set by Botswana Examination Council as a standard for learners' understanding of concepts and skills. The findings provide a potential basis for instructional practices in school physics in Botswana. These findings have implications for developing teacher's instructional practices in school physics and for initial teacher education.