Phenomenological reflection on culture in classroom action research:

Primary science teaching approach in Central Java, Indonesia

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Abstract

This paper is about research for primary science teaching that is culturally appropriate to Javanese students in Central Java, Indonesia. Most teaching practices in primary classrooms in Javanese schools are teacher-centred with students copying notes. There is a global paradigm shift in how children learn – a general overview of the nature of learning as personal construction – *constructivism* or *constructivist learning*, which appears to be culturally contradictive to Javanese values that appreciate virtues that contribute to harmonious social integration. Ideal human virtues include obedience to superiors (*manut*), respect to superiors (*aji*), respectful politeness (*sungkan*), shaming (*isin*), as well as avoidance of conflict (*rukun*), generosity, understanding of others, and empathy. In line with the needs of national development which is included in Indonesia's new curriculum called *Kurikulum Tingkat Satuan Pendidikan* (KTSP), active learning is targeted by fostering students' abilities to develop deeper understandings, to think independently and critically, and to solve problems. The methodology of classroom action research is the most appropriate tool to be conducted to improve strategies in science teaching because it allowed for collaboration and reflection. However, there is a serious dearth in collaborative reflection. Researchers and classroom teachers simply maintain reflection on practice. Teachers need to perform phenomenological reflection on culture and on the nature of science teaching. Teachers' experiences in teaching primary science are shaped by Javanese culture which maintains transmission approaches. Javanese culture is central to the implementation of primary science teaching in the schools. Reflection on culture in classroom action research is essential to achieve effective teaching approaches which coincide with the Javanese culture that can contribute to the success of learning science for students.

Background

There are numerous definitions for science. Bybee (2004, p. 2) claims that general characterisation of science is "a way of explaining the natural world". Furthermore, DeBoer (2004, p. 17) indicates that science "… is both a body of richly interconnected observations and interpretations regarding the natural world, and [it is] a set of procedures and logical rules that guide those observations and interpretations" and can help children to identify the present

knowledge they possess from life experiences and apply it to subject matter they are beginning to learn. This knowledge gained from science of how to investigate problems or search for answers is bound to help students have more confidence when learning becomes more challenging for them in another subject. Bybee (2004) also reports that the act of scientific inquiry can be a key to help students unlock doors and drive their own learning in all subjects. Therefore, science is a chance to foster and nurture inquiry.

Recent research has transformed the global understanding of science by highlighting the ways in which culture and values impact upon the development of scientific ideas and practices. In this new intellectual environment, Rodriguez (2001) maintains that science knowledge and the processes of science were to be used to answer questions that people encountered in their everyday lives. Science is to be practical and useful to people and whether it was used to develop students' abilities to solve problems that were personally and socially relevant, for personal intellectual development, or as a motivational device, science teaching should be consistent with the nature of scientific inquiry.

To fulfil science learning experiences meaningfully, teachers must have the freedom and space to think about teaching practices and make these their own. As Fleer (2007b, p. 23) further explains, "knowing the benefits and the limitations of the different approaches to teaching science is important for making decisions about which approach to use with a particular group of children in a particular community or context". Science teaching would focus on science as a social and cultural force, on the relationship between science and technology, and on preparing citizens who could use scientific knowledge and processes to solve problems they met in everyday living. However, only few primary school teachers will spend their time devoted to such an endeavour (Mulholland & Wallace, 2000).

Science Teaching Approaches

For 150 years there have been debates about the purpose, nature and role of science education (DeBoer, 2004; Duschl, 2004; Fleer, 2007a; Gunstone, 1995; Symington & Kirkwood, 1995). Duschl (2004) argues that science has been part of primary school instruction for more than a hundred years, but for most of this time this kind of science was far different in philosophy, structure, and approaches from that described in previous part of this paper. Sund, Trowbridge, Tillery, and Olson (1967) assert that science was taught for many reasons, including: it would help children understand God's design for the world; it would prepare children for the world of work they would soon enter; and it would strengthen their reasoning ability.

Although other approaches have also become known, five dominant approaches have emerged in science education practice and research: transmission approach; process approach; discovery-inquiry-activity-interactive approaches; constructivist approach; and socio-cultural approaches.

Transmission Approach. Symington and Kirkwood (1995) report that until the beginning of the 19th century, the teaching approaches were dominated by an expository approach. Knowledge was transferred intact from the head of the teacher to the heads of students.

Process Approach. The foundation of this view is supported by Thier (1970) which particularly emphasises that the process approach should provide the opportunity for students to develop a clear conception of natural phenomena, something that could not be accomplished through book learning alone. Science is viewed as a particular "scientific method or technique" (Fleer, 2007b, p. 20). Process-centred teaching has been proposed and defined as that teaching by which teachers and children study scientific phenomena with the approach and the spirit of the scientist (Symington & Kirkwood, 1995). To this extent, it is often argued that "this [also so-called] skills-based approach does not guarantee that

children will be given the opportunity to express their understandings or to ask questions about what interests them" (Fleer, 2007b, p. 20). The recognition of the role of the activity of the learner led to the notion of learning by discovery, the desire to give pupils the excitement of finding things out for themselves.

Discovery-Inquiry-Activity-Interactive Approaches. In science the discovery approach, also known as the heuristic method, was widely adopted in the 1960s (Sund et al., 1967; Thier, 1970). Thier (1970) continues to identify that inductive approaches to teaching were also apparent which rationalised that the best way for students to develop an understanding of new concepts was by having them discover the relationships between phenomena on their own and by having teachers relate new concepts to the experiences of the learner.

Fleer and Ridgway (2007, p. 15) point out that "activity" in the field of science becomes "learning activity" if, among others, fundamental notions are constituted, concepts are developed, new views arise, skills are practised, procedures are developed and models are acquired. But in practice, as Bodrova and Leong (2007) later note, it was soon realised that 'activity' of itself is not necessarily accompanied by learning. Similarly, McGuiness, Roth, and Gilmer (2002) affirm that it emphasises observable, external behaviours and, as such, avoids reference to meaning, representation and thought. As Fleer and Ridgway (2007) maintain, 'just doing' is not sufficient. What has been done needs to be put into words. Teachers need to record children's ideas and questions as drawings with written notes so that they can be discussed.

Fleer (2007b, p. 21) further argues that "an interactive approach to science is designed to find out what children think and encourage them to ask questions". Meanings that initially have been constructed individually will be shared and complemented by interaction. Interaction is more than communication; pupils learn to understand each other; they learn to listen, to immerse themselves in the thinking of peers and teacher, to feel for others' efforts and to realise that they

must allow access to their own thoughts. Furthermore, Bodrova and Leong (2007) contend that whether knowledge is considered to be an individual construction or whether it is seen as socially situated has implications for the ways in which learning is conceptualised. In addition, Krueger, Loughran, and Duit (2002) assert that where behaviourism conceived learning as a process of changing or conditioning in manifest behaviour, constructivism takes a more cognitive approach. This subtle difference has profound implications for all aspects of learning theory.

Constructivist Approach. For two decades there has been a major shift away to a constructivist approach. Rodriguez (2001) claims that constructivism is based on the perspective that learners are the constructors of their own knowledge and knowledge resides in individuals. At the heart of the theory is the negotiation of meaning, at a personal level and also at a social level.

Socio-cultural Approaches. Socio-cultural theory provides many conceptual tools for studying the processes of learning science in educational settings. Instead of locating learning within the heads of isolated individuals, Rogoff (2003) argues that learning needs to be viewed as a process of participation in community activities. She conceptualises this process of participation as occurring on at least three levels: personal, interpersonal, and cultural/institutional. She also argues that this process of participation has to include the history and analysis of the institutions (such as schools and scientific communities) that affect and are affected by the developmental trajectories of individuals and their interpersonal relationships. Wells (2003) maintains that these levels never operate alone. In fact, they are inherently interwoven in all human activities (including mental activities).

Socio-cultural approaches explicitly employ students' active role in generating ideas, engaging in scientific argumentation with their peers, and learning how to use persuasive discourse to convince others of the validity of those ideas

(Brooks, 2004). These approaches view science as practice and learning as participation, not acquisition (Robbins, 2005). Thus, science learning occurs as much between people and between people and cultural artefacts as it occurs within individuals. Using these approaches allow young students to be quite capable of high level engagement with appropriate scaffolding from their teachers and peers. Learning much science outside of formal educational settings is emphasised. As a result, changing the culture of the classroom is necessary for improving students' scientific literacy.

Research in Indonesia.

As reported by Mutiara (1987) and Iskandar (1987) (as cited in Wahyudi & Treagust, 2004), many teachers in Indonesia believe that science is a collection of thousands of important facts and comprehensive theories. This understanding of science is a result of the previous generation education, which derives from textbooks crammed with scientific facts and theories and from the rituals of traditional science teaching. According to Mutiara and Iskandar, these textbooks do represent one aspect of science: they are the organised product of science. They are tools that may be used to enrich science teaching to make it more than a ritualistic repetition of narrow, limited facts. Because teachers consider that science can be learned effectively by reading textbooks, Wahyudi and Treagust (2004, p. 455) conclude that the teaching and learning process is always organised in a transmissive approach and "most teaching practices in science classrooms in rural schools were teacher-centred with students copying notes".

In terms of approaches, in Indonesia, the past decade has been one of rapid change in primary education and times of change charge teachers with new responsibility and makes new demands "to keep abreast of the rapid developments in modern science and technology" (Thair & Treagust, 1999, p. 357). The only empirical data showing the effect of new teaching/learning approaches in science is reported by Berg (1983) which indicates that the students who have been taught science with laboratory work have performed

better on practical skills such as using laboratory equipment than the students who have not been taught with laboratory work, but have not performed better on tests of understanding of science concepts, ability to think scientifically (e.g. interpret and evaluate data, solve problem experimentally, etc) and interest and motivation in science.

Kurikulum Tingkat Satuan Pendidikan. There is a worldwide awareness of the need for improvements in the teaching and learning of science, and also a challenge to develop culturally sensitive curricula and teaching methods that embrace science for all. In line with the needs of national development to develop locally and culturally sensitive curricula, Indonesia has recently changed the former curriculum with the new one that is *Kurikulum Tingkat Satuan Pendidikan* (KTSP (Education Unit-Based Curriculum), Ministry of Education, 2006).

The KTSP is an operational curriculum that is composed and implemented by each education unit. In terms of curricular change, this means local district are being encouraged to interpret the nationally mandated competency based curriculum in locally relevant ways. As a result, the expediency of identifying and locating appropriate instructional materials, lesson planning, and assessment are left entirely to individual classroom teachers. School and principal develop the KTSP and syllabi based on framework and standard competencies indicated in the KBK under coordination and supervision of Education Service at the level of district, city, or province.

The instructional activities are student-centred, develop students' creativity, create fun and challenging condition, are contextual, provide various learning experience, and learning by doing. Learning plan is used if possible, as well as traditional lesson plan, which usually contains content and procedures designed to create specific student behaviour and outcomes. Assessment is competency-

oriented and operated through portfolios, products, projects, performance, and paper and pen.

The direction the curriculum is heading in Indonesia can be summarised in two elements. Firstly, it is directed at active learning, fostering students' abilities to develop deep understandings, to think independently and critically, and to solve problems. Secondly, it allows regional diversity within syllabuses, while maintaining national standards and priorities. Transmission science teaching and learning approaches are obviously discouraged in the curriculum documents.

While there is an attempt from local government to improve primary science through small projects, according to Sarkim (2004), education in science and technology is still very weak in many schools. This is in line with Wahyudi and Treagust's argument (2006), which conveys that many teachers were inadequately prepared to initiate effective learning strategies to fully realise the competencies of the new curriculum, and generally teachers continued to use traditional teacher-centred *chalk-and-talk* and lecturing methods in their classrooms.

Theoretical Framework

Given the situated nature of learning, it is important to understand a range of cultural and social elements in the context of children's learning. Javanese values for and of children are particularly pertinent. I propose that Javanese culture strongly contribute to both teaching practices and children's learning styles. Hence, science teaching approaches that are grounded in everyday experiences is a key determinant in promoting students' learning success in science.

Javanese children culture.

Javanese culture values virtues that contribute to harmonious social integration. In this section, the key concepts of Javanese culture which appear to be

psychologically contradictory to active learning will be identified. Ideal human virtues include obedience to superiors (*manut*), respect to superiors (*aji*), respectful politeness (*sungkan*), shaming (*isin*), as well as avoidance of conflict (*rukun*), generosity, understanding of others, and empathy (Koentjaraningrat, 1985; Magnis-Suseno, 1988).

One of the ideal human virtues is *manut* or obedience to superiors (Magnis-Suseno, 1988). A child who is *manut* is widely praised. Magnis-Suseno (1988) maintains that a child is considered good, and will be successful in his/her further career, when s/he is *manut*, because obedience is considered to be a very useful quality. In teaching self-control and respectful behaviour to Javanese children, parents emphasise the concept of *isin* or shaming. In the Javanese culture, to know when to feel *isin* is to know the "basic social properties of self-control and avoidance of disapproval" (Koentjaraningrat, 1985, p. 242).

As the child enters adolescence, the concept of *sungkan* (respectful politeness), is gradually introduced. According to Koentjaraningrat (1985), the concept of *sungkan* is basic for the Javanese "to be able to perform the social minuet with grace" (p. 249). Another concept of Javanese social life is *rukun* (conflict avoidance) which requires all Javanese to avoid open confrontation in every situation possible. Magnis-Suseno (1988) claims that the objective of this concept is the establishment and maintenance of social harmony. The Javanese put a high value on harmonious integration with the group to which they belong.

Notwithstanding these Javanese characteristics, Bettleheim (1975, as cited in Osborne & Brady, 2001, p. 50) argues that "according to one tradition in child psychology we are all, and especially children, constructing meaning in our lives and of our lives". Hence, it is necessary to prepare the children to use scientific knowledge to make decisions that affect their lives. In particular, as argued by Barton and Osborne (2001, p. 17), "it is important to make visible how science is situated within larger social values and global ecosystems", so that "science is

shaped by political, economic, and cultural contexts that reflexively guide observations, theory building, and applications" (Barton & Osborne, 2001, p. 16, citing Haraway, 1997), science teaching therefore cannot be taught without consideration of its social and cultural context.

Socio-cultural Theory.

In recent years the influence of socio-cultural psychology on research in science education has been reflected in a gradual development of interest in studies, not only on individual students' understandings of specific phenomena, but also on how these understandings are developed in the social context of the science classroom (Aikenhead, 2001). From this perspective, Palincsar (2005) supports that it is a natural step in an attempt to understand how social and cultural conditions shape children's activities and therefore affect the way they learn. Social interactions and children's participation in authentic cultural activities are necessary for understanding children's learning (Friedman, 2001), as suggested by Vygotsky (1978, p. 30, as cited in Palincsar, 2005, p. 290): "The social dimension of consciousness is primary in time and in fact. The individual dimension of consciousness is derivative and secondary."

In order to situate social interaction in the learning process, integrated inquiry involves learners in the collaborative social practice of doing science and communicating about their learning. As stated by Lave and Wenger (1991, p. 122), "[a] person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a socio-cultural practice". Fleer, Jane, and Hardy (2007, p. 175) contend that educators should view "learners not as individuals, but as a community of learners, shaping and moulding thinking through interactions with one another".

From socio-cultural perspectives, social and cultural processes foster and shape children's way of learning. Javanese cultural virtues are reflected in teaching and learning processes, which stress avoidance of conflict, obedience and respect to

superiors as important principles in human relations and Javanese society. On the other hand, these values seem in conflict with the nature of young children which has much in common with scientist (e.g. curiosity, exploration). Children by their very nature are active learners. However, Javanese virtues emphasises obedience and conformity which result in students' passiveness in terms of interaction.

Classroom Action Research

Classroom Action Research becomes a strategy that promotes science teaching and learning because it provides classroom teachers with a focused process of investigation and reflection. As a methodology, it has been linked to teachers and education for some time and is seen to be a valuable way for teachers to address issues that arise in their classrooms as they plan, act, observe, and reflect in order to work towards solutions. From my own experience as an educator, classroom action research is what teachers do naturally in their classrooms. Cohen and Manion (1994, p. 192) describe classroom action research as:

> … essentially an on-the-spot procedure designed to deal with a concrete problem located in an immediate situation. This means that ideally, the step-by-step process is constantly monitored over varying periods of time and by a variety of mechanisms (questionnaires, diaries, interviews, and case studies, for example) so that the ensuing feedback may be translated into modifications, adjustments, directional changes, redefinitions, as necessary, so as to bring about lasting benefits to the ongoing process itself …

It is important to note that this definition makes clear that the task is not finished when the project ends. The participants continue to review, evaluate, and improve practice.

Elliot (1991, p. 107-108) states that teacher-based action research has specific characteristics. The problems that are addressed reflect a "practical/moral" nature and reflect the real issues of classroom life. The process of the action is increasingly important as teachers consider "the concept of value" which shapes

their teaching practices. These values are realised in a teacher's interactions with the students. Teacher-based action research is a "reflexive practice" as the teacher evaluates and appraises the quality of their "self" through their actions. Actions "are conceived as moral practices rather than mere expressions of techniques". Theory and practice are integrated through teacher-based action research. An increased understanding of educational theories is demonstrated through consistently improved teaching practice. Dialogue with "professional peers" is important as it helps the teachers "realise professional values in action" as "they are accountable for the outcome to their professional peers".

Terms such as 'teacher research' and 'reflective practice' have become increasingly more common in educational reform (Whitehead, 2000, 1989; Carson, 1997; LaBoskey, 1994; Gore and Zeichner, 1993). Such terms suggest that teachers must play active roles "… in formulating the purposes and ends of their work as well as the means" (Gore & Zeichner, 1993, p. 205). Reflection is a key component of the classroom action research process. As Elliot (1991, p. 54) states, "Classroom action research integrates teaching and teacher development, curriculum development and evaluation, research and philosophical reflection, into a unified conception of a reflective educational practice".

Implications for science teaching in Central Java

One can argue about adopting any science teaching approach, one can argue about the necessary of changing students' behaviour in the classroom to be more active, the pros and cons of classroom or subject-specialised primary teacher, but it is hard 'to argue away' the fact that culture seems to be a key aspect of identities. Javanese culture is strongly reflected on the social interactions. There were problems student was going through with the authorities. Most students were potentially communicative. However, they believed that teacher was the source of authority. For this reason, students and teacher had a low level of communication. Some students show high levels of

intelligence which unfortunately was not always paired with the will to engage themselves.

There was tendency of the teacher to reject strategy that encouraged students' activities because the teacher would face problems in managing the classroom or in being challenged by students. When the teacher once eventually got students to discuss, with a lot of pressure, this usually resulted in worse outcomes, namely students ignored the teacher, did activities other than the topic, and students' achievement was low in the formative assessment by the end of the lesson. On the other hand, the teacher stressed that the positive feature of this class was their obedience, attention, and conformity to the teacher. Summarising, I can say that Javanese culture seems to promote a philosophy of respect for interaction between students and teacher whilst science learning seems to stress the importance of being active to both students and teacher.

Obedience is a concept evident to the students of the class. It is implicitly referred by the teacher which states that the explanation technique is important to primary students to educate them about obedience. Such a level of obedience reflects on the strong authorities that exist between the teacher and the students within the classroom, authorities built up over a period of years. In accordance with the Javanese values and the social conditions, teachers teach this way because children should be taught to acquiesce to authority. For example, not having children's questions during the lesson reflects the value of knowledge as wisdom from those higher in authority (older) and the value of humility (shame). Javanese values are translated into teaching practices and students' learning science. According to Krueger, Loughran and Duit (2002), from constructivist perspectives (e.g. valuing what we have learnt in the world), Javanese teachers could encourage children's questions without totally abandoning their values.

From constructivist perspectives, Javanese teachers could assign children to discuss the lesson topic in a small group as alternative technique. Teachers

could tell them what issue will be addressed and give some questions to discuss. Students get more out of an interactive approach than a passive lecture because they are given time to think. This time allows them to understand a concept, and if not teachers could encourage them to ask questions. This understanding is crucial when concepts build on one another. However, as indicated previously, in Javanese culture, asking question is discouraged because it challenges the higher authority. In this way, Fleer (2007, p. 21) has strongly advocated that "'asking question' is not always appropriate across cultures".

Classroom action research is the most appropriate tool to be conducted to improve strategies in science teaching because it allowed for collaboration and reflection. It assists classroom teachers with the teaching of science. It also negotiates and enables change in a primary school. In dealing with this condition, teachers need to perform phenomenological reflection on culture and on the nature of science teaching as well as reflection on practice.

Concluding comments

The importance of reflection in improving science teaching approaches is obvious. Reflection could enhance teaching and learning of science by involving phenomenological reflection on culture and on the nature of science teaching as well as reflection on practice. The phenomenological reflection on Javanese culture provides insights into the personal experience of teaching that are unobtainable by other methods. These insights highlight the singularity and complexity of factors that influence the teaching approaches, progress, and outcomes. Teachers' experiences in teaching primary science are shaped by Javanese culture which maintains transmission approaches. Javanese culture is central to the implementation of primary science teaching in the schools. Reflection on Javanese culture is essential to achieve effective teaching approaches which coincide with the Javanese culture that can contribute to the success of learning science for students.

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