

**Constructive learning and Javanese culture:
*Primary science teaching in Central Java, Indonesia***

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Abstract

This paper is about primary science teaching 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. 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. This study shows that teachers need to be guided by more effective teaching approaches which coincide with the Javanese culture that can contribute to the success of learning science for students.

Review of Literature

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 hundred years ago. 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 change 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.

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. For this study, Javanese values for and of children are particularly pertinent. We 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, Bettelheim (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.

Discussion.

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, Fler (2007, p. 21) has strongly advocated that "‘asking question’ is not always appropriate across cultures”.

In dealing with this condition, teachers must let go of the mindset that they control learning. In a heuristic approach, the lesson would be about constructing a concept rather than just transmitting knowledge/facts, which may be needed in Javanese classroom because students are not eager to express what they know or ask some questions. Teachers need to set up several areas where the students can free explore with some objects and prepare some possible questions to stimulate their thinking and dialogue while the students are exploring with objects. In order to provide students with opportunities to have meaningful learning experiences, the areas should focus on everyday contexts so that it builds understanding of a concept from their daily life basis.

This vignette about a Javanese classroom is the picture of teaching/learning primary science in Central Java, Indonesia and highlights three important issues in the life of the primary science teaching. These issues are: the importance of Javanese virtues to the teacher; the role of teacher in promoting students' understanding; and the importance of Javanese virtues to students.

Despite these profound changes in curricular scheme, the structure and operation of schools have changed very little. There is a serious mismatch between what the curriculum expects students to learn, and what teachers actually do. Primary teachers' less readiness to implement curriculum, teachers' perspective about their role in promoting students' understanding, the Javanese concepts which is a key aspect of students' identity, all contribute to the persistence of teacher-centred instruction with little consideration other approaches, including discovery and inquiry modes of practice.

Concluding Comments

The curriculum is directed at active learning, fostering students' abilities to develop deep understandings, to think independently and critically, and to solve problems. The vignette

about a Javanese classroom highlights the importance of Javanese virtues to the teaching practices. Active learning is in accordance to children's nature. However, Javanese virtues emphasises obedience and conformity which result in students' passiveness in terms of interaction. On the basis of the findings, we advanced a proposition based on key concepts of Javanese culture and the importance of virtues- and socio-cultural-based teaching approaches. Discovery and interactive approaches that are grounded in everyday experiences coincide with the Javanese culture and is a key determinant in promoting students' learning success in science. As a result, we advanced teachers' need to be guided by more effective teaching approaches which coincide with the Javanese culture that can contribute to the success of learning science for students.

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