

Comparison of Indonesian and Australian Primary Science Education

by

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Introduction

It cannot be denied that every country sees science as a subject, which is important to be taught to children from early time they enter primary school. As one of the core subjects (in Indonesia and Australian primary school curriculum) it now has the same importance, which enables us to communicate about the world where we live, while science assist our standing of the world.

There are some problems in deciding and developing science education curriculum. The problems are in what level the subject will start and how to appropriately teach it in the line with the assumptions and the nature of science itself. The solutions of these problems usually depend upon the educational system and the view of educational experts that belongs to the country. If the system and perception of educational experts are the same might be the learning atmosphere or conditions will also be the same. Conversely, if there is difference in the system and perception of education experts, the learning conditions will also be different. An example, Indonesian primary science education is started in grade 3 primary school (see The new Indonesian curriculum for Primary School, 1994, p.93), while in Australia (Victoria) primary science education is first taught when the students are at the preparatory (prep) class (see Board of Studies, 195, Using the CSF: an introduction, p.3).

In this paper, I would like to briefly describe and compare the differences between science education in Indonesia and Australia education, particularly in primary school level in terms of the way curriculum determined, the way

teachers operate in the classroom, assumption about the nature of the science and children's learning, as well as the implications of these differences for the nature of teacher education.

This paper is developed based on the writer's experience in the school visit to both Indonesian and Australian primary schools. Direct observations of the science teaching-learning process were carried out, and continued with series of interviews with some science coordinators in the schools. Furthermore the reading of some literature (including different primary curricula) in relation to science education in Indonesia and Australia was carried out. The writer's reflections from some lectures for undergraduate and postgraduate have been added.

Curriculum Determination

a) Curriculum in Australia

In Australia, curriculum is determined by teachers' authorization in relation to provide learning experience for students. In this context, the teacher can be seen as a developer as well as evaluator. Consequently in the learning process, their beliefs about nature of learning influence the development of curriculum that they make. In my opinion, Australian teachers view learning as a learning process oriented so that they mostly emphasize children's learning on process.

The Australian Government was concerned about the standard of learning outcomes that was reflected in the quality of academic achievements in school levels. To accomplish more consistency in learning outcomes standard, since 1995 the Curriculum and Standards Framework (CSF) have stated as the sets of the major learning areas to be covered. It describes the learning outcomes, which most students are expected to achieve at particularly levels (see Board of

Studies, 1995, Using the CSF: and introduction p.2). Moreover, the orientation of learning outcomes appears to have become a priority. Recently, the learning Assessment Project (LAP) has strengthened the tendency to be more focused on learning outcomes.

In its execution, the CSF is a framework in which the flexibility to consider appropriate learning experiences still dominates the teachers' planning. By using the CSF as a guide to teaching, the teachers create learning activities around CSF guidelines. In science, the objective of the lessons is to help students developed skills such as predicting and observing. The way they develop the skills is by being involved in activities, rather than being told about them.

The learning activities allow students to find out the "target" concept for themselves (see Board of Studies, 1995, Using the CSF: Science p.18). Therefore, it is hoped that the teachers emphasize students in this way.

b) Curriculum in Indonesia

In 1994, the Indonesian Government developed a new curriculum. The new curriculum replaced an old one that was considered no longer adequate for recent conditions. Looking back to the old curriculum, teachers were viewed as the practitioners rather than the creators of learning activities. Learning outcomes were the center of the students learning. The learning outcomes were described more detail into general learning objectives that were accompanied by learning activities that refereed to achievement objectives. The government provided the teachers with the details of how to conduct teaching in their classes. Moreover, all of the primary schools in every province or city in Indonesia have been using the curriculum. That is to say that curriculum was centralized.

One of big changes from the curriculum with the new curriculum (curriculum 1994) is that the curriculum in 1994 provided teachers with frameworks that consisted of the descriptions of learning outcomes without further details on learning objectives. It seems that the government had changed its views by giving the teachers more freedom to create learning activities for students. In its execution, the curriculum would be used as a framework rather than a rough plan. The difference is that a framework is to be considered as a guide while a rough plan is a to be followed and described in more detail.

Science for Indonesian primary school students, according to curriculum 1994, is constructed to develop students' knowledge, skill, attitude, and scientific values. In turn, it is hoped that students will love and admire the creations of God. One of the aims is to motivate children to investigate things and events around them. In their investigations, they have to be curious, patient, critical, and responsible. (see Depdikbud, 1994, Kurikulum Pendidikan Dasar, p. 93-94). When using the curriculum, it is hoped that teachers will provide children with learning activities that refer to these aims.

The Operation of Curriculum

a. Learning activities in science classroom in Australia.

The view about the way teachers in Australia teaches science was obtained by the writer through some observations made during school visits. Generally, most teachers in Victorian primary schools give the students opportunities to get involved in science activities such as observing, doing experiments, and drawing conclusions. The students are given enough time to observe and to question phenomena. Then, the teacher provides them with hands-on activities in which they can carry out some experiments to examine their hypothesis or their own concept. The teachers work on the "target" concept by facilitating children's learning rather telling them about the concept. In such activities,

textbooks are sometimes used as complementary learning resources. In planning the learning activities sometimes the teachers correlates science with order subject in an integrated curriculum. Integrating science with the order subject will gives student broader learning experiences and an awareness of the values if science in every day life.

b. Learning activities in science classroom in Indonesia.

The following are general view about the way the Indonesian teachers teach science based on observations conducted by the writer in some classrooms. When using the old curriculum most Indonesian teachers relied very much on textbooks. The textbooks contained learning material including the description of the curriculum. In science lesson, the teacher often asked the children to read the textbook individually or one by one in the class. Then the teacher would explain what the textbook was about. Verbalism dominated almost all of the learning activities. To review the lesson the children were asked to answer some questions from the textbook. Sometimes the teacher corrected their work or sometimes he/she would ask them to check their answer by looking at the correct answer given by the teacher.

In the area of the new curriculum, the teacher still seems to use the textbooks. Even though the curriculum has gives the teacher opportunities to create their own learning activities, they still haven't changed their teaching styles. Textbooks are still the integrated science with other subjects. The subject always taught separately. In other words the teachers operate within a fragmented curriculum.

Different assumption about the nature of science and children's learning

Actually, there are no difference assumptions between Australian and Indonesian view about the nature of science as body knowledge, a process of investigation, a set of values and a way of knowing the world. The view of science as body knowledge from centuries of endeavor, and that knowledge consist of facts, concepts, theories, and general understanding of the universe.

Furthermore, one of different views between Australian and Indonesian teachers is the assumption about the nature of children's learning. After some observation, it would appear that most of Australian primary teachers teach science mostly valuing students' ideas, providing hands-on activities, and allowing student to explain their own concepts during the teaching-learning process. This instruction is closely is the related to the constructivist's view about learning. The constructivists believe that student comes to science lessons with their own ideas about phenomena, the meaning of words and explanations of why things behave the way they do. In addition, learning is seen as a conceptual change through constructing rather than absorbing new ideas.

Following the constructivist's view of learning, teacher believe that teaching science is to provide children with learning experiences in order to change their misconception and to strengthen their acceptable conceptions through reconstructing their concepts. Therefore, teachers tend to provide hands-on activities rather than directly teach the concept.

The way most of Indonesian teachers teach science may emphasize on the transmission of knowledge in teaching activities. The children are considered as the empty "vessels" that need to be filled up by teachers. Therefore, the teachers directly tell them the concepts rather than allow them to construct the

concepts by themselves. Actually, some textbooks being used have sections that encourage children's curiosity to investigate phenomena. The books may contain hands-on activities to be completed in class. However, the teachers rarely follow these instructions and mostly teach the new concepts directly to students.

There are many reasons for this approach to teaching. Firstly, the teachers may think that it is not necessary to provide students with hands-on activities. They believe the children need to be encouraged and to be given opportunities to investigate concept. However, they don't have enough time to conduct such activities in a 5 (five) to 6 (six) hours teaching day. Therefore, they tend to tell the student about the learning materials. Thirdly, student evaluations from the government force them to make objectives achievement as a first priority. They considered as failures as teachers if their students fail the examinations. The learning process is becoming unimportant since the learning objectives became the target of achievement.

As a consequence, they tend to neglect some innovation in the teaching and learning process of the government. For example, when the government introduced 'students active learning', and ordered the teachers to implement that kind of learning strategy, the teachers faced a big problem. On the one hand, they had to accomplish the learning target based on a set of learning objectives for the former curriculum. On the other hand, they had to implement that kind of learning strategy. As a result, they reverted to their former styles of teaching.

Implications for the differences in the nature of teacher education.

As mentioned previously, the Indonesian science education expert's view of the nature of science is not far different from the Australians. However, there is a bit difference in their views about learner. It seems that the Indonesian science

educator as the main learning resource for the students. Consequently, the teaching-learning process in the classroom is mostly dominated by a lecturers' knowledge is still considered better than the student's, and students are not eager to express ideas different to the lecturers' idea.

Furthermore, the science curriculum used to teach in primary teacher education (designed by the government and used by IKIP and some faculties of education in private Universities throughout Indonesia) tends to give more emphasize to the content, which can be classified into three categories. The first category concern science materials that are almost cover all science materials (such as energy and force) for senior high school, which are called reinforcement material. These materials are given to "student-teachers" (PGSD students) to enable them to have more understanding about science as their basis for their teaching in primary school. The third concerns the pedagogy – contained in materials dealing with the approaches that are considered as appropriate to the teaching of science in primary school.

In contrast, in Australia the way some lecturers (particularly at Deakin University) operate in their class, based on the writer's view, is very different to the Indonesian lecturers. Their teaching of science is more closely related to the nature of science as well as the learning based on the constructivist's view. They give opportunities to the student to explore their ideas during the teaching learning process. The lecturer very often gives hands-on activities to clarify a concept during the curriculum by using CSF then they practice it in the classroom. In other words, the lecturers give more practical ideas and experiences to the students to which the primary schools teachers usually encounter. In that way, the students are ready to teach science with considerable confidence when they begin to teach.

Conclusion

There are some differences in science education (specially in primary) between Indonesia and Australia. The differences lie in the way the curriculum is determined, and the way the teachers operate in the classroom as well as the implication of these differences for teachers' education. The type of Indonesian primary school curriculum can be classified as a centralized curriculum, which means that all primary school in Indonesia use the same curriculum determined by government. In Australia, in contrast, each school develops its own curriculum by using curriculum and standard Framework (CSF) as guide.

Another difference that is most apparent pertains, to the manner in which teachers view the learners in the teaching learning process. This difference really does how teachers act while teaching science in their classroom.

In Australia, the constructivist's view of learning has a strong influence on the way science teachers teach science in the classroom. As a result, the way they operate in the classroom closely related to the constructivists' view of learning. Generally, most of the teachers give their students opportunities to learn by themselves. In this case, the role of the teachers is more like a facilitator rather than a knowledge transmitter. For example, teachers very often direct experiences to the students some opportunities to explain their opinions rather than talking about certain facts or phenomena, previously mentioned by the teacher.

In contrast, the behaviorist theory significantly influences Indonesian teachers in the way they view learners in the teaching-learning process. Most primary teachers tend to focus their teaching on how to transfer their knowledge directly to the students. Furthermore, the influence of the assessment system, decided by the government, has forced the teachers into this style of teaching. This is due not only to the lack of time allocated for science education, but also,

to the large number of topics that has to be covered in a short time. In this case the role of teachers in the teaching–learning process can be viewed as the knowledge transmitter, i.e. as mentioned already, the teacher has a certain amount of knowledge, which is transmitted into the little “empty vessels”.

To overcome the inadequacies in the teaching-learning process in the area of science in Indonesia, the way the Australian teachers and lecturers teach science to their students need to be taken into account. Considering students as empty vessel in learning is no longer appropriate in Indonesia, because it does not match with the nature of science and the current theory of learning. The constructivists’ view about learning, to be introduced more strength to Indonesian primary teachers and lecturer in Primary Teacher Education, as well as professionals. As a result, it is hoped by having the same assumptions as the constructivist’s the teacher will become aware of the advantages of the active learning process and they will then place more emphasis on actively involving the students in learning rather than telling them about it.

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