Pedagogical Negotiations between Conventional and Innovative Strategies in Teaching KBSR Mathematics: The InSPIRE Project

Fatimah Saleh*, Shafia Abdul Rahman, Salmiza Saleh

School of Educational Studies, Universiti Sains Malaysia

Abstract

Teachers’ pedagogical knowledge applied to mathematics teaching relate strongly to students’ mathematics achievement. However, it is known that from the needs analysis study, underperformance schools in remote areas lack competent and professionally trained mathematics teachers, especially with regards to Pedagogical content knowledge (PCK). With this concern, a research project was carried out with the intention of retooling/retraining the teachers on the PCK of the four main subjects, namely English, Bahasa Malaysia, science and mathematics. Eleven modules on KBSR mathematics were developed. These modules incorporated in the text innovative strategies that teachers could adopt and adapt in their classroom mathematics teaching. The strategies include the mathematics processes such as communication, reasoning, mathematics connections and problem solving. This paper will present findings from the needs analysis study, excerpts of the mathematics teaching implementation sessions using the modules which brought about tensions, receptiveness and willingness in implementing the modules as well as children receptiveness in class interaction.

Keywords: Mathematics teaching; Innovative strategies; Pedagogical content knowledge; Project Inspire modules

1. Introduction

Mathematics achievements in rural schools in Malaysia and in many other countries including the United States has been consistently depressed as compared to the national average (Howley, 2003). Primary schools from remote areas, particularly in Sabah, East Malaysia have been performing very poorly in the UPSR (Primary Schools Assessment). A need analysis study (Abdul Rashid, 2008) on six schools from four different categories in Sabah had shown some preliminary findings on the factors that influence mathematics achievement of primary school pupils. The four categories of schools include remote, foothill, island and riverside. Table 1 shows the UPSR mathematics results for the four categories of schools. The table shows that the performance of these schools fluctuate extensively over the five years. One possible reason for the extensive fluctuation is due to the small enrolment of students in the school.

* Corresponding author.

E-mail address: sfatimah@usm.my
Table 1 UPSR Percentage of Passes

<table>
<thead>
<tr>
<th>School</th>
<th>School 1 (%)</th>
<th>School 2 (%)</th>
<th>School 3 (%)</th>
<th>School 4 (%)</th>
<th>School 5 (%)</th>
<th>School 6 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>57.1</td>
<td>21.7</td>
<td>37.5</td>
<td>71</td>
<td>5.9</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>100</td>
<td>21.2</td>
<td>25</td>
<td>100</td>
<td>14.3</td>
<td>12.5</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>25</td>
<td>11.5</td>
<td>25</td>
<td>86</td>
<td>6.25</td>
<td>35.7</td>
</tr>
</tbody>
</table>

The UPSR comprises of four core subject areas, namely English language, Bahasa Melayu, Mathematics and Science. A student needs to pass all the core areas to be considered a pass in the UPSR assessment.

From the need analysis study carried out in 2007, it was found out that classroom teaching environments, teachers’ professional knowledge, teacher pedagogical practices and teaching resources were among the main factors contributing to the poor performance of pupils in mathematics (Abdul Rashid, 2008). The mismatch of teachers’ subject option during teacher training and the teaching subjects in schools brought about the lack of professional knowledge among mathematics teachers and poor use of the resources to support learning in the rural schools. The common scenario was to replace mathematics teachers with the ‘out of field’ teachers. Some teachers admitted that they do not have ideas about teaching mathematics except to follow whatever in the textbooks provided. They were observed not giving enough attention to the critical role of conceptually focused, robust tasks that can be used to support the development of mathematical thinking and conceptual understanding.

2. Teachers’ Knowledge and Practice

From a range of studies, Romberg (1988) comes to a conclusion saying that the ‘professional knowledge’ of teaching should include at least three distinctly different but related categories:

- **Content knowledge:**
  Knowledge of the subject (mathematics) they are to teach and its relationship to other content areas;

- **Pedagogical knowledge:**
  An understanding of how students learn and how teachers teach, including the process of learning such as information processing, retaining of information and construction of ideas; and how teachers implement the process of instruction, such as instructional techniques, and knowledge about relevant instructional materials;

- **Knowledge about management:**
  How to manage different and complex instructional setting involving a large number of students, a variety of resources and the use technology, and the different management styles by the schools’ administrators.

Hanna (1987) and Brophy and Good (1986) reported that in classroom instruction three modes exist: (a) giving information; (b) soliciting information; and (c) providing feedback. An effective teacher requires an approach which structures the information so that the lessons are coherent and able to relates previous work to new teaching material. To do this well requires clarity of teacher’s classroom presentation and a proper sequencing of information. However, all these requirements were not being addressed in the case of remote schools under study.

Gore (2000) believes that students’ engagement in the learning process would provide classroom environment that support active learning, and this entails students participation and setting high expectations, encouraging students to be self-regulating and independent in their thinking. Student engagement, both its depth and extent, has come under scrutiny as a factor affecting student achievement (Nickerson, 1988; Stigler & Perry, 1988).
3. Impact of Professional Development on Students’ Learning

Wilson (2003) reported that a positive connection had been observed between teachers’ subject matter preparation and higher student achievement in mathematics. However, impact of professional development on students’ learning still remained doubtful (Guskey, 1997), though Ball and Cohen (1999) claimed that there was a weak impact of professional development on student’s learning. Ironically, professional development was perceived as ineffective as it has shown little impact on teachers teaching (Guskey, 2000). The reason being that the conventional approach of professional development was seen as top-down, ‘one-shot’ courses and the contents are too isolated from the classroom realities. It offers little opportunities for teachers to participate actively, thus it may deny any influence on teacher’s teaching.

Darling-Hammond and McLaughlin (1995) outlined some major principles for effective professional development;

- Focus should be on student learning and outcome;
- Opportunities for teachers to develop knowledge and teaching skills;
- Based on collaborative problem solving;
- School based; and
- Ongoing and continuous support

Programme for professional development that are in place for teachers in Malaysia comes in different forms, courses and workshops, conferences, school visits, collaborative research, mentoring and peer observation, informal dialogues, etcetera. According to Teaching and Learning International Survey (TALIS) report (OECD, 2009) the percentage of Malaysian teachers who undertook some professional development in 2007-2008 was 91.7 %. Thirty countries took part in this survey, and more than half of the teachers surveyed reported that they wanted more professional development than what they received in 2007-2008. The extent of unsatisfied demand is sizeable in every country, ranging from 31% in Belgium to over 80% in Brazil, Malaysia and Mexico.

4. Objective

Concern about the poor performance of these remote rural schools, especially in comparison with the national average of mathematics performance of primary schools in Malaysia, this project was carried out with the intention of helping mathematics teachers through the newly developed mathematics teaching resources. This paper reports on the observations made during of the pilot and training sessions on the use of the modules, specifically on teachers’ acceptance with some elements of reluctance in adapting with the new ideas.

5. Methodology

It started with the need analysis study which revealed that among the contributing factors towards the poor mathematics achievement, teacher factor such as teacher’s professional knowledge and poor use of the available resources could be considered to be improved immediately. Other contributing factors such as school environment and infrastructure development might need longer time to improve.

In this project, modules for mathematic teaching were identified to be developed by School of Educational Studies, Universiti Sains Malaysia and a sponsoring body The Yayasan Sabah. Eleven mathematics teaching modules were then developed according to the topics presented in the Ministry’s KBSR mathematics curriculum and its specifications. However, the sequence of a few subtopics was changed as to facilitate pupils’ learning. Those involved in this project include researchers, teacher educators and practising teachers who meet from time to time to brainstorm, suggest and come up with the framework for modules development.

The modules were developed based on mastery learning principles with variations of teaching materials and local resources suggested for the teachers to use in their classroom teaching. The innovative strategies presented emphasized on the conceptual understanding of the fundamentals in mathematics learning. Other aspects include the mathematical processes, such as the communications, connections to real life experience, reasoning, and problem
solving as indicated in the mathematics specifications. Teaching approaches suggested in the modules should take care of pupils’ interaction and the formative assessment. During the pilot study each pupil was provided with a laminated card and a marker for him/her to write short and simple answers asked by the teacher. This would provide an easy, quick and continuous assessment of pupils’ learning. Teachers were given some autonomy in terms of timing of each lesson and additional appropriate exercises for their pupils. The modules served as the frameworks supporting teachers’ effort as they incorporate the approach that underpins the proposed activities. In view of the training implications, we believe it necessary to focus the utmost attention on how these modules are used.

For the training purposes, teachers teaching mathematics in six poor performance schools in a region of Sabah were identified and requested to attend a three-day training sessions in Semporna, Sabah. The training session started with a briefing on the rationale and the emphasis given in the modules given by the project leader and followed by a question and answer session. The participants were required to work in group of four to five persons, discussing and preparing lessons using the modules and the prepared teaching aids provided. Teaching was carried out by a representative from each group doing a simulated teaching their peers. Meanwhile the trainers observed over the whole process and at times joined in the group discussion.

6. Summary of Observation

One of the pertinent and pressing issues that we observed is Pedagogical negotiations, among other issues are equally important, but will not be discussed in this paper. Often we hear complaints that mathematics teachers are not keen on trying out new approaches, such as open problem approach or cooperative learning. Many mathematics teachers tend to restrict themselves to whole class procedural teaching, giving a lot of drills and exercises, opt for ‘teach to test’ rather than ‘teach to learn’. In the pilot study four mathematics teachers from two suburban schools were involved and both schools are below average in UPSR (primary school assessment) performance. Initially the teachers seemed to be a bit reluctant due to the lack of knowledge and training on good mathematics teaching, and they felt insecure as their teachings would be observed and videotaped. Three of them were not trained in mathematics, but became mathematics teachers after going through a conversion course for a period of 14 months. However during the workshops session, they turned to be quite responsive and able to give important feedback on the modules itself. Their receptiveness seemed to surface after a lot of discussions and negotiations.

During the pilot study the pupils seemed to be enjoying their lessons on multiplication and time, very excited on the use of the laminated card where they can write their answers on. There were many other teaching resources such as counters, manipulative, picture and number cards which they can play around. For lessons on ‘time’, they were provided with clock which they can play around with the hour and minute hands.

Seeing the interest with which the children work on the activities in the modules, which are very different from what they did before, the teachers’ ability to reflect on their work is aroused. In their conventional teaching, they did not use any teaching materials due to unavailability or lack of knowledge or ideas on what and how to use them effectively. This initiated a process of change in teachers’ concepts of teaching and learning, on their own performance and what the children are able to do. The use of modules and resources brought about reflection and negotiations on the teachers’ part with regard to classroom activities, which appeared to produce changes in their perceptions.

Having provided the teachers with resources which comprised of modules and teaching materials, some innovative teaching strategies are also embedded in the modules. These strategies were specifically designed to incorporate the mathematical processes of representing, reasoning, connecting, communicating, and problem solving. However, some teachers appeared to revert to their convention style of teaching, although some adapted well to the new ideas. When they were reminded to follow the module closely, they were quite defensive of their teaching approach, probably due to lack of understanding of the rationale put forth in the module.

We believe that the idea of transforming the teaching approaches will not take place effectively unless these ideas are internalized and accepted well by the teachers concerned. The process of transforming practices will only occur after
teachers have overcome their initial resistance and sense of insecurity arising from their lack of knowledge. While
the module training session was intended to train teachers on how to use the module, what emerged was the
teachers' concern over their normal practices which in their views were satisfactory. Thus, negotiations over their
normal pedagogical practices and the rationale and justifications of the strategies and approaches suggested became
necessary.

Moreover, back in schools, the teachers are also required to implement a new program called LINUS, with the aim
of identifying the pupils' competency level in reading literacy and numeracy. This was taken as an excuse for
teachers not to continue with the use of the InSPIRE modules. In fact, what they were not aware of is the
philosophy, aspirations and the complementary nature of the two reform movements. Thus, a lot of persuasions and
negotiations had taken place before the real implementation of using the modules in mathematics teaching.

7. Conclusion

In relation to teachers' interaction during training to use the teaching modules, mainly with the materials used to
organize teaching, there are signs of change in the perceptions and beliefs that underpin teachers' work. This
interaction generates processes of negotiations expressed in innovative practices that will give rise to new
knowledge. The interaction process is actually prepares teachers to assume more complex tasks later on in their
teaching life, such as curricular design and school projects. In fact, by using the modules, teachers are taking
curricular decisions in term of timing the teaching and appropriateness of the task to suit the pupils. While working,
they incorporate contents they consider relevant to their pupils and complement them. They actually resort to their
own store of knowledge, bringing it into play by deciding whether or not to work with them. The process of
negotiations is going to take place continuously within the teachers themselves throughout the teaching life.

Negotiation and acceptance of any innovations in teaching practices is an important factor in determining the
success or failure of any reform movements in education. One of the important barriers is the teachers' inner
resistance to change which need to be overcome successfully by the teachers themselves before pedagogical change
can take place.

Acknowledgement

The authors would like to express gratitude to The Sabah Foundation for their financial support without which this
project would not be possible.

References

Abdul Rashid, M., Sharifah Norhaidah, S.I., Hashim, O., Fatimah, S., Rohizani, Y., Muhamad Kamarul, K., Abdul Ghani, K. A., Nordin, A.R.,
Study InSPIRE Project II. Pulau Pinang: School of Educational Studies.

Schools.

Ball & Cohen (1999). Developing Practice, Developing Practitioners: Toward a Practice-based Theory of Professional Education. In Darling-
Publisher, 3-32.

Brophy, J. E., & Good, T. L. (1986). Teacher Behavior and Student Achievement. In M. C. Wittrock (Ed.), Handbook of Research on Teaching

124 - 134.

76(8), 597-604.

of Mathematics Education, Montreal.


11, 2010


