

# **A META-ANALYSIS: PEDAGOGICAL STRATEGIES FOR TEACHING MATHEMATICS AMONG ABORIGINAL STUDENTS**

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## **INTRODUCTION**

Pedagogy is the study of teaching, especially teaching in the formal education. In other words, it is the science and art of teaching in schools. As a field of extensive research, pedagogy also involves the study of the process of teaching and learning, classroom management, school organization and teacher-student interactions. However, there are some pedagogical strategies that take into considerations language background, low socio-economic status, and of non-dominant or minority cultures need to be proposed and experimented. In the recent years, it has been generally recognized that the conventional approaches in learning and teaching numeracy for aboriginal students have limited effectiveness. However, the aboriginal students' performance in literacy and mathematics has not much improved since then. Efforts to improve the teaching and learning of this minority group should be given serious attention since students who have not mastered basic skills in reading, writing and arithmetic are dropouts and at-risk groups who will face difficulties in meeting the needs of further education and career. Numeracy competence, which is the ability to understand, evaluate, perform and utilize

numeracy in different situations and contexts are very crucial in learning mathematics, but often neglected as Malaysian mathematics educators emphasize mostly on curriculum, calculations, skills and procedures. Understanding of numeracy should be taught to Aboriginal students as early as in preschool (Kementerian Pendidikan Malaysia, 2010; O'Donoghue, 2002) so as to avoid them from being able to do the calculation algorithms without knowing the reason behind the operations (Lucia, 2008; Brown, Askew, Millett, & Rhodes, 2003; Bobies, 2005; Clark, 2004). In primary schools, understanding of numeracy is important because this skill can be used to determine students' mastery at higher levels. Moreover, understanding of numeracy in the classroom is useful in daily life (Westwood, 2008). Noraini Idris (2009) in her study found that numeracy concepts such as the concept of ten, the concept of the collection, the concept of numbers and counting skills play an important role in helping students to build a strong foundation in literacy and numeracy. It has been found that students with the knowledge of numeracy concepts are able to learn mathematical concepts at higher levels.

The concept of numeracy as a life skill (LeFevre et al., 2009) that needs to be connected to authentic activities is currently of considerable interest to educators of young children. As noted by Ginsburg, Lee, and Boyd (2008), children develop strong and deep knowledge of mathematics as part of their early development. The crucial task for educators is to connect informal knowledge to the formal knowledge associated with schooling (Ginsburg, H. P., Lee, J. S., & Boyd, 2008). Broad exposure to a range of numeracy-related activities at home may be one of the ways to facilitate those connections.

At present, there is little systematic research that evaluates the underlying structure and nature of informal numeracy skills and empirically links these skills to the development of later formal mathematics skills (Purpura & Lonigan, 2012). The process of mathematical education should focus on the development of NC

to create a generation of mathematically literate citizens (Kementerian Pendidikan Malaysia, 2010). This goal is in line with national educational philosophy statement. Low achievement in basic skills such as numeracy can significantly contribute to the failure of Aboriginal students to cope with schooling. However, when the curriculum take into considerations the culture, appropriate pedagogical context the diversity of students' backgrounds, and formative assessment for monitoring students' progress, students' achievement can be enhanced (Warren & DeVries, 2009; Frigo & Simpson, 2000; Matthews, Howard, & Perry, 2003; Nicol, R. and Robinson, 2000)

Since the aborigines have their own paradigm of education, there should be special teaching methodologies to attract the students' interest, attention and focus in the subject. In order to achieve these, teacher should build a program by selecting content and the adapting curricula to address students' learning needs, interest and prior knowledge (Alias *et. al.*, 2011). There is another necessary level of relationship that includes the deliberate creation of time and space before any engagement in learning can be affected (Campbell, M., & Christie, 2009), as "good community engagement starts with respect, which is a quality of individuals rather than institutions" (Eady & Woodcock, 2010). Thus, the process of relationship building is integral to learning in these communities. They should guide and facilitate learning with a suitable methodology in the classroom. Furthermore they should develop activity and assessments that promote students' interest and depth of understanding (Tan *et. al.*, 2014).

## **RESEARCH QUESTIONS**

This small-scale meta-analysis aims to answer the following research questions:

What are the Pedagogical Strategies to facilitate the development of numeracy competence among Aboriginal students?

Hence this study will create an evidence-based research which will give a top to bottom seeing on the part of PS and how it could be saddled to encourage the improvement of NC among Aboriginal students.

## **METHODOLOGY**

This meta-analysis only focuses on primary and secondary school thus only published papers that provide original and empirical meta-analysis which focused its application on students were selected. The terms [Pedagogical Strategies], [Numeracy], [Teaching Strategies] and [Mathematic] were used to conduct the search in EBSCOHost, IEEEExplore Digital Library, JSTOR, SAGE Journal, ScienceDirect, Taylor & Francis Online, Web Of Science and Interdisciplinary Journal of Mathematics.

Then again, to reduce the probability of presenting preference at this stage, the electronic review was not narrowed down, and the ensuing emphases were carried out physically. One concern emerges as the participants' age gathering was regularly not or inadequately reflected in titles, decisive words or abstracts. The electronic quest produced 50 papers by utilizing titles as the premise. The vast majority of the writing is determined from outside Malaysia and more to early schooling which is preschool and it shows up a considerable measure of analysis done outside. Preliminary today, the fundamental center of pedagogical methods in the classroom to numeracy for aborigine's student is no more in Malaysia.

The aim of the review reported here, is to consider the research evidence that bears upon the ways in which the approach adopted by teachers during the daily mathematics lesson in delivering the Numeracy Strategy in Malaysia has impact on pupils' confidence and competence in mathematics.

**Table 1 : REVIEW OF STUDY PEDAGOGICAL STRATEGIES FOR NUMERACY/ MATHEMATICS IN SCHOOL**

Author	Strategies/ approach	descriptions	level
(Jorgensen & Lowrie, 2011)	Media technology	Digital games – Guitar Heroes - examining rates regularly in the setting of stamping up costs or growth	secondary
(Meaney & Evans, 2012)	Three-pronged research program	<ol style="list-style-type: none"> <li>1. to discover what reckoning strategies continue to be used or have been used in the past.</li> <li>2. to determine how reckoning practices could be connected to Western calculating;</li> <li>3. to develop strategies for maintaining traditional mathematical practices.</li> </ol>	Primary and secondary
(Matthews et al., 2003)	Innovative Mathematics Programs: Five Exemplars	<ol style="list-style-type: none"> <li>1. Count Me In Too Indigenous: NSW Department of Education and Training Program [2001-3] (CMITI).</li> <li>1. Counting On: NSW Department of Education and Training program [2001-2].</li> <li>2. Mathematics in Indigenous Contexts [K-6]: NSW Board of Studies Project [2001-3].</li> </ol>	primary

			3. Aboriginal Students WII GAAY (Gifted Child) (Mathematics Camp: Armidale CSO Project [2003].	
<b>(Sternberg &amp; McDonnell, 2010)</b>	technology		1. Digital cameras 2. Digital photographs 3. locating a benchmark at the site (chose a fence post) 4. a scavenger hunt where students used the GPS	secondary
<b>Owens, 2014</b>	Project: ways	8	Out of class lessons, the clarify of purpose, the use of narrative and a change in relationships with students	primary
<b>Murcia, K. and McKenzie, S (2009)</b>	technology		Interactive whiteboard	primary
<b>(Higgins &amp; Parsons, 2009)</b>	Numeracy Development Project		1. the number framework 2. the diagnostic interview 3. the strategy teaching model	primary
<b>(Warren, Elizabeth and Baturo, Annette R. and Cooper, 2005)</b>	Investigate or social constructivist		- enables students to actively make sense of new information and ideas, situated in meaningful and real world contexts (Bickmore-Brand, 1990). - The key dimensions of the pedagogy are the use of manipulative material and the construction of knowledge in social settings (often groups) (Schifter, 1998). - Teachers act as guides, listeners and facilitators (Schifter, 1998), and new mathematical knowledge is built upon previous understandings (NCTM, 2000).	Primary and secondary

Obviously, most studies resulted in primary schools. In most cases, technology uses had applied as pedagogies to improve numeracy competence in school. However, many researchers highlight the need for transformed pedagogy for effective integration of technology into the curriculum (McCormark, R & Scrimshaw, 2001). In addition, many countries have introduced programs to enhance understanding of Aboriginal students in mathematics or numeracy.

## **RESULT AND DISCUSSION**

What is it that makes teachers shift their practice? How does authority suggest itself to make teachers more susceptible to new ideas; to attach them to or ignore specific ways of teaching aboriginal students in the classroom?

Nevertheless, it was frequently a test for teachers to exploit unplanned numeracy action which recommends that it might be a test to see numeracy opportunities as they emerge. From the meta-analysis, dialect likewise assumes an imperative part in learning. In embracing the dialect methodology to showing mathematics, it gets to be essential to perceive the particular dialect of mathematics (Zevenbergen, 2011). English is accepted as a global medium of communication and knowledge as the students' capacity to mediate in the use and understanding of English thought form one competencies identified by Power (2006). Therefore, one way to show progress along the lines advanced by (Power, 2006) is to investigate the pedagogical issues that have a direct guide to how students acquire, use, and communicate an understanding of mathematical knowledge in solving problems that might be encountered in daily life (Chinnappan & Pandian, 2009).

The real world problems to be solved require teachers to

formulate solution or other method in teaching to encourage attendance over the day so that the students remain in school (Jorgensen & Lowrie, 2011). Inferred from writing identified with teaching method and numeracy, are mainly centered around students in preschool. Very few studies are accessible to take a look at the issues of students in secondary schools. The literature reveals that culture is indeed an important element of gaining new knowledge and experience and as such must be given significant consideration by educators. However, the findings of (Alias *et al.*, 2011) also suggest that in relation to the aboriginal students in secondary level of schooling and the influence of culture on learning certain subject is less evidence

In time, not only will the school be integrating processes of teaching but also the mathematics content will be more culturally based as teachers and community discuss mathematics in terms of cultural knowledge (Owens, 2014). Most teachers were agreeable with recognizing the scientific information in the lessons and exercises they offered student furthermore communicated a longing to enhance student's dispositions. Initially they utilized just a constrained scope of tool to develop numeracy; however this enhanced over time, particularly in connection to computerized tools, for example, spreadsheets. Teachers perceived the imperativeness of connections as a recognizing gimmick of numeracy furthermore most made advancement in blending numeracy into their lessons (Geiger & Dole, 2012). However, it was frequently a challenge for teachers to see numeracy moments which proposed that it might be a test to see numeracy opportunities as they emerge (Geiger & Dole, 2012). Nonetheless, integrating a selective orientation into learning activities was the most difficult part of numeracy for generally teachers.



## CONCLUSION

Aboriginal children perceived that learning math was difficult , that there was more to learn in discipline than whatever other subject and that they couldn't do a few parts of arithmetic despite the fact that they knew a lot. If Aboriginal kids have negative convictions about mathematics and themselves as learners of mathematics, then correct math projects and showing methods need to be created to help overcome such perspectives (Howard, P., Perry, B., Lowe, K., Ziems, S., & McKnight, 2003). Such mathematics programs, that accentuated the kids' backgrounds and settings, would bring an importance to their learning bringing about expanded inspiration and engagement, because they truly preferred adapting new things in mathematics.

A number of researches have shown that pedagogies are effective in secondary schools, as well as in primary schools. Young children at the concrete operational stage could benefit from pedagogies through problem solving. Meanwhile, students who are supposed to have reached the formal operational stage at the secondary school level not only benefit in those competencies but also in self-esteem, analytical thinking and retention. However, the researchers are more comfortable conducting pedagogical research among older students than younger ones. In summary, the significant role of pedagogical in the development of numeracy competence should be harnessed in both primary and secondary schools. In this twenty first century, the challenge is to nurture students with multiple competencies so that they will be better equipped to face and solve authentic real life problems of today and the future.

There is not a single literature that provides a comprehensive report on the Pedagogical strategies for Malaysian aboriginal students. Therefore not only it is crucial to determine the PS specifically for developing NC among the aboriginal students, the implementation and evaluation need to be investigated. This

research will determine the best practices for our local needs so as to narrow the gap between the educational status of the aborigines and the non-aborigines.

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