JOURNAL OF MECHANICS OF CONTINUA AND MATHEMATICAL SCIENCES
www.journalimcms.org

ISSN (Online) : 2454 -7190 Vol.-14, No.-3, May-June (2019) pp 94-111 ISSN (Print) 0973-8975

# Lexical Approach: Overcoming Vague Skills Procedure and Early Mathematical Terminology based on the Prosodic Semantic Theory

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https://doi.org/10.26782/jmcms.2019.06.00008

## Abstract

*This study aims to identify and examine early mathematical concepts based on mathematical terminology and early mathematical skills among children and teachers of the PERMATA Anak Negara Centres. This study also investigates the pedagogical practices by the teachers on how to overcome vague terminology and children skills procedure in the teaching and learning of early mathematics. The study focuses on the teaching and learning of early Mathematics topics such as match, gather, separate and compare. Eight teacher participants are involved in 4 selected PERMATA Anak Negara Centres: Bercham, Besout 1, Teluk Intan and Sg. Siput. The findings have revealed that the children are given the opportunities to explain, defend, conclude, predict and suit their ways of understanding the mathematical concepts related to the chosen topics: match, gather, separate and compare. The children are also encouraged to show their understanding through various different ways including the critical thinking skills. As a result, this study has produced the Lexical Kit based on the Prosodic Semantic Theory for the learning and early Mathematics facilitation for pre-schools in Malaysia thus help teachers to make*

*children understand the terminology concepts and early mathematical procedures clearly.*

**Keywords :** Children, lexical approach, mathematics terminology, procedure skills, PERMATA Anak Negara Centre, Prosodic Semantic

## I. Introduction

Mathematics is not only about logic and mantic, but also the knowledge most needed in human lives. Everything a human does needs mathematics even in a very simple mathematical process such as counting from number 1 to 3. Mathematics has a special philosophy which is not in other field, including science. Basic concepts of mathematics such as shape, relationship, category, zero, similar and differences need the understanding of the philosophy to understand such concepts in detailed. Learning mathematics is very important because the knowledge is the 'connection' between metaphysics and other knowledge of science (Abdul Latif Samian, 1997). Among some reasons of the importance of learning mathematics is because it emphasizes on the problem solving skills including understanding problems, planning strategies, implementing plans and checking solutions (Azizi Hj. Yahaya & Elanggovan, 2010). According to Smith (1953), the use of symbols for the quantity marking in the ancient Maya calendar has been used since 3000 BC. Since then, during the Playo and Aristotle era in year 400 till 350 BC, mathematics has been developed into a research field.

According to Kilpatrick (1992), there are two disciplines which have the most influence on mathematics education: mathematics and psychology. The maths experts are very interested on the teaching and learning of mathematics. The inability of some university graduates who are enrolled in mathematics program for low and average levels successfully, has encouraged the maths experts to investigate in detailed what is going on at school levels.

Each maths field develops its collective intuition by its collective practitioners. Based on this fact, this study seeks to investigate the collective pratitioners' views about the maths concepts which are translated into teaching, in particular teaching through the medium of language. In this context, the language used in the teaching of Mathematics helps the emerging of maths concepts and terminology. As far as this study is concern, maths concept refers to the operation or formula of mathematics, whereas terminology refers to the descriptions or explanation related to the operation or formula of mathematics itself. Maths area is focused on early maths taught to children up till the age of 4 year old.

Early maths learning needs to be conducted in a meaningful context. According to Bryant and Nunes (2002), in order to develop children's logical thinking, the teaching of maths needs to be conducted through the conventional counting system and meaningful contexts. These need to be supported with the learning of mathematical principles related to numbers, the ability to compare, classify and to understand correspondence and doubt between each other. The ability to compare objects and the ability in numerical reasoning are the most important basics (Sophian, 1998),

while the ability to classify is the basis for element of mathematics reasoning in general.

*Primary understanding of amounts* appears since 2 years ago when children start to show their understanding on how some words are different to some different objects; however the total number of words acquired is limited. At the acustics level, children at the age of 3 years old have started counting the numbers but it is not in the correct order. Next at the *asynchronic* level, at the age of 4 year old, they have started using correct command words showing to the objects but incoherent. In the following 6 months, at the syncronics level, they can read the numbers spelled in words and can say the counted numbers correctly, showing or moving the objects. The level of decision calculation happens at the age of 5 when children can say numbers starting from 1. At the shorten counting stage, at the age of 5 and a half, they have started recognizing number 5 and can count beyond number 5. Therefore, the ability of early children to operate the sequence of the numbers for the whole numbers and use the numbers to solve problems have developed significantly.

In order to stimulate the development of the skills, the strategies to teach maths for early children need to be improved by adding the teaching aids which are conventional and multi-contexts. In Finland, primary school children are taught the adding and minus operational using the strategies based on counting and memory devices (examples: ciub and fingers) (Fuson, 1982, Barrouillet & Fayol, 1998, Geary, Hamson, & Hoard, 2000, Siegler, & Shrager, 1984). Early counting skills are very relevant to the learning of basic arithmatics. There are many studies which support that the calculation skills have showed the achievement of basic arithmatics such as Godfrey, 2006, Aubrey, & Godfrey, 2003; Kavkler et al., 2003, Aunola et al., 2004, Desoete, Stock, Schepense, Baeyens, & Roeyers, 2009, Jordan, Kaplan, Locuniak, & Ramineni, 2007, Koponen, Aunola, Ahonen, & Nurmi, 2007. The researchers have also shown that the development of maths among children starts early in which it usually starts at the age of 2 to 7 years old. Although this study focuses on children at the age of 7 years old, what needs to be emphasize is, the development of maths skills, in particular the knowledge of early counting and basic arithmatics needs to be developed carefully based on the effective teaching strategies.

## II. Methodology

This study has employed a mixed-method approach, using the qualitative and quantitative design. Eight teacher participants are involved in 4 selected PERMATA Anak Negara Centres: Bercham, Besout 1, Teluk Intan and Sg. Siput. Since this study aims to identify the understanding of the procedural skills and the early mathematical terminology among the pre-schools children, it focuses only on the teaching and learning of early mathematics topics such as match, gather, separate and compare. Classroom observation checklist and questionnaires are used for data collection. There are 5 phases involved in the data analysis: teachers' pedagogical observation, the analysis of the observation through classroom observation checklist and the distribution and the analysis of the questionnaires.

## III. Results and Discussion

The findings reveal that in the teaching and learning, the teachers play the roles as facilitators and always provide the opportunities to explain, defend, conclude, predict and suit their ways of understanding the mathematical concepts related to the chosen topics: match, gather, separate and compare. For example, in the teaching of concept of matching, teachers use the same search words, the same choose words, same design, same as, and pull. Further, the concept of gather used the counting lexical such as follow the same and take all. For the concept of separate, the lexical used is count, try counting, take, put in, search and where. Whereas for the concept of compare, children are taught to pronounce the lexical of difference and which one. In every lesson in teaching of the concepts, teachers provide the opportunities for students to organize their creativity towards the teachers' instructions regarding the topics learned. The operational, terminology and context approaches are used by the teachers in the explanation of the concepts related to match, gather, separate and compare. The operational approach refers to how teachers apply the terms listed in PERMATA curriculum specifications related to the concept of early mathematics. Further, the terminology approach is applied by the teachers when they conclude the ideas of the concepts with their own understanding or facts. The context approach, on the other hand, refers to the situation when the teachers make the children understand the concepts through reinforcement activities such as outdoor activities and online worksheet activities using smartboard and papers. The findings also reveal that the teachers alo use materials such as cube and other relevant objects to explain the concepts. Based on the analysis, the teachers have used all the three approaches equally in the teaching of the relevant early mathematics topics. For the purpose of reinforcement and improvement of the variety of the lexical in the teaching and learning of early mathematics, the researchers have analysed the corpus data and conducted collocation analysis. The researchers have discovered some lexical behaviours for the concept of match such as and, more, suitable, clear, accurate, follow, enough, suppose, using, the same, obvious, follow, same level, designing, choose whether and replacing which indicate the emerging of the concept of match. As for the concept of gather, the lexical behavior indicates the distribution of lexical such as total, results, combination, many, all dan collection. As for the concept of separate, the lexical observed is separating, identifying, inserting, stretching, distance and setting aside. Finally for the concept of compare, the lexical identified is contrasting and comparing. Through the analysis of Semantic Prosodic which is through the units of meaning, consistence aura, attached meaning and tranffered meaning, the explanation related to lexical behavior in the corpus has helped to explain the vague procedural skills and the terminology of early mathematics among the children of PERMATA negara. The findings have resulted in the development of the Lexical Kit which benefits the teaching and learning at the four selected location of the Anak PERMATA Negara centres.

## IV. Lexical Kit

According to 'Kamus Dewan' Fourth Edition (2007), kit refers to portions ready to be assembled. As far as this study is concerned, kit refers to the teaching

aids developed to assist students to understand the concepts of basic mathematics. On the other hand, lexical, according to 'Kamus Dewan' Fourth edition (2007), is a term related to words or vocabulary of a certain language. The meaning of lexical refers to the meaning of the words themselves without considering how they are used in sentences. The Lexical Kits refers to the teaching aids in a form of interactive word cards which are multi-context related to the learning of early mathematics. The word lexical is originally from Greece 'lexico', which means adjective from lexis 'speech' or 'the way of talking' or 'said'. According to Puteri Roslina Abdul Wahid (2015), lexical from a dictionary meaning, indicates how terms are used in language community. The intention is to inform someone the acceptable meaning so that the definition can be used in the real context of sentences. The definition of lexical is descriptive in nature and it means the real use of certain language and changes according to the use of words or terms which are different from the description attached to the 'correct' version though there are changes in the meaning and too vague for many purposes. The main intention is to inform language users of the acceptable meaning in certain language community (Puteri Salina Abdul Wahid, 2005). According to Maslow (1970), the meaning of lexical refers to certain specific content of words as the difference of certain numbers of other words. He further differentiates the meaning of lexical, for example, the word 'big' is divided into three components (a) the relationship with detonation (something which has a positive value such as gift which is defined as compliment), (b) the relationship with logical category (referring to the dictionary or literal meaning) and (c) the relationship with the conceptual meaning (certain meaning is according to cetain concept, for example, 'big-headed' means stubborn). According to Asmah Hj. Omar (1986), the verb lexical carries the meaning of lexical which has the meaning out of the grammatical meaning. The verb lexical is also referred to main verb. Based on the collocation of the word match, matching, gather, separate and separating, the researchers have discovered that the teaching of early mathematical concepts must be clear and accurate. This is to ensure that children can understand the operational and terminology concepts clearly. In other words, the teaching of early mathematics needs to be based on the bulding of the concepts and must be conprehensive in its nature.

The following are the sample materials in the Lexical Kit:

Match Lexical Kit

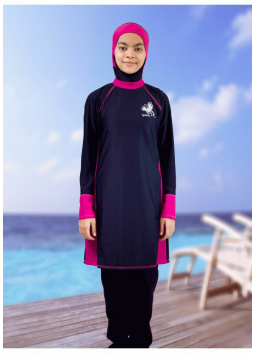
Match 'with'


Match ‘combination’


Match ‘once’ (match complete set)

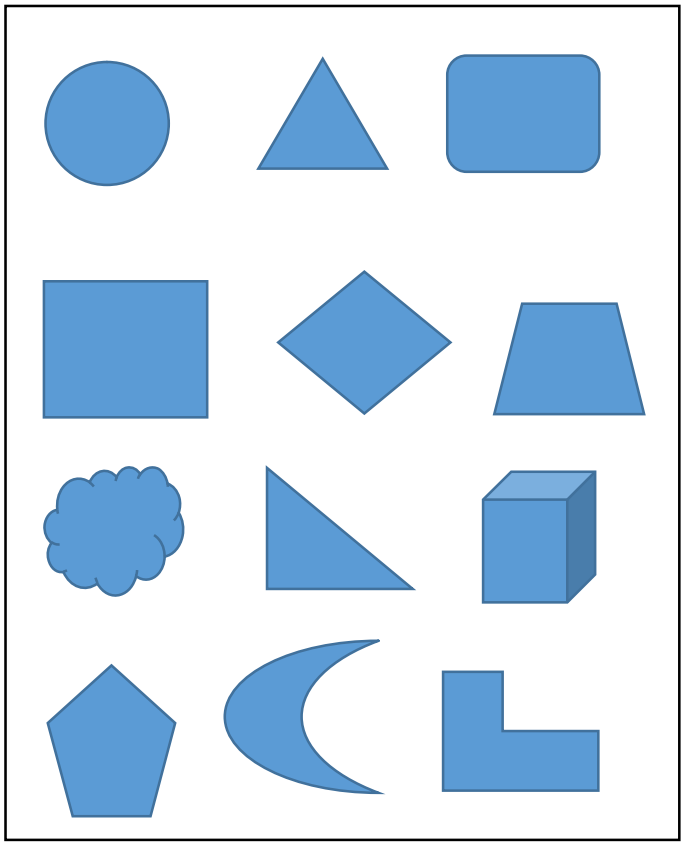

Match ‘compatibility’ (referring to compatibility of same level/quality/potential)


Match ‘with’ (object pair)



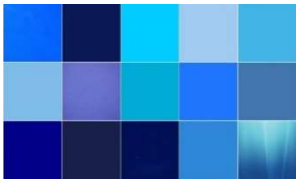
Matching Lexical Kit

Matching ‘accurately’ (matching structure accurately)



Matching ‘suitability’ (matching accurate use)


Matching ‘similarity’ (shape, colour, types of the same category)




Matching ‘colour base’ (based on same colours)


Matching ‘but’ (matching similar but different)


Matching ‘alphabets’ (matching shapes of alphabets)

Matching ‘usability’ (matching tools and their use)

Matching ‘clothes’ (matching clothes to their contexts)

Matching ‘clarity’ (matching objects with clear visibility)

Gather Lexical Kit

Gather ‘money’ (adding numbers of value)


Gather ‘total’ (adding numbers of object)


Gather ‘all’ (adding numbers in containers)


Gather ‘combination’ (adding numbers of various objects)


Gather ‘one shape’ (adding numbers based on shapes)


Gather ‘enough’ (adding required numbers based on measurement)

Gather ‘property’ (adding number of property)


Gather ‘people’ (adding numbers of people)


Gather ‘school expenses’



Gather ‘power and names’ (adding ranks)

Gather ‘energy’ (adding power/energy)

Gather ‘information’ (adding knowledge/information)

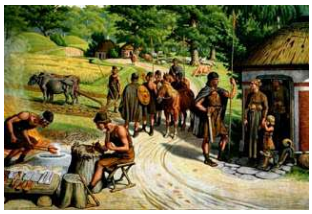
Gather ‘goods’ (adding numbers of collection)

COMPARE LEXICAL KIT

Compare ‘years’ (differentiate years)

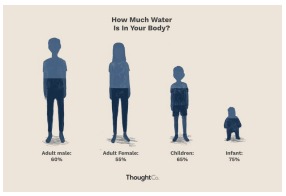

Compare ‘value’ (differentiate value)

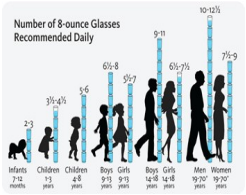

Compare ‘at this age’ (differentiate age)

Compare ‘percentage’ (differentiate value)


Compare ‘self’ (differentiate self-development)

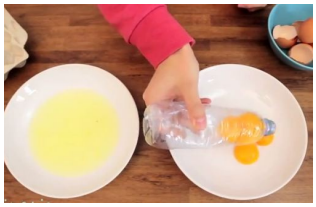





Compare ‘faith’ (differentiate status)


Separating Lexical Kit

Separating ‘two things’ (classify two ingredients from one ingredients)

Separating ‘foreign object’ (classify various ingredients and categories)


Separating ‘self’ (avoiding relationship)


Separating ‘students according to race’ (classify people and types)


Separating ‘with’ (differentiate pairs according to same functions)


Separating ‘rubbish’ (classify materials and types)

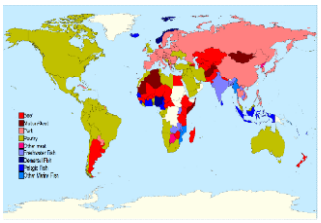
Separating ‘and’ (classify same materials)

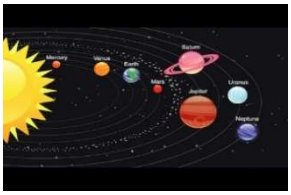
8. Separating ‘students accordingly’ (classify according to level)

9. Separating ‘truth from false’ (separating quality)



10. Separating ‘accordingly’ (classify groups with same features)





11. Separating ‘certain things’ (classify things)


12. Separating 'from' (classify position)


13. Separating 'cars and motorbikes' (classify shapes, quality and functions of transportations)



## V. Conclusion

The use of language in the teaching and facilitation of early mathematics will be clear if it is accompanied by efficient theory or language model in order to overcome the ambiguity in understanding concepts according to procedural skills and the early mathematical terminology rationally. The constraints in the language skills used by the pre-school teachers in the teaching and learning of early mathematics is translated through their failure of using accurate terms in describing the procedural skills and the terminology in the field. This conflict among the pre-school teachers has resulted in the understanding of certain maths concepts which covers the procedural skills and terminology taught needs to be more complex. This is because students work on meanings from terms and construct in operational maths, which involves meaningful teaching strategy through variety of activity contexts which is manifested through the teaching based on lexis. The Theory Prosody Semantic based Lexical Kit generated through this study can be used for the learning and facilitating of early maths in all pre-schools in Malaysia, in particular at Anak PERMATA Negara Centres. It is observed that the

knowledge of early maths in the teaching and learning of pre-schools is still unsatisfactory. This is due to one of the factors which is less lexical understanding used by the teachers. As a result, the children cannot master the early maths until they go to their year one in a primary school. It is hoped that this study can help the pre-schools authority to ensure that their teachers master their teaching strategies to be more interesting and effective.

## VI. Acknowledgement

The authors would like to thank the Sultan Idris Education University under the university research grant (2017-0228-107-01) for financial support.

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