Teachers' sentiments to Bikol MTB-MLE: Using sentiment analysis and text mining techniques

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Abstract

Mother Tongue Based – Multilingual Education (MTB-MLE) is one of the quality programs of the K to 12 Law (RA 10533) that raises the country's standard of education. The research study specifically looks into the sentiments of the teacher participants in the *Bikol* MTB-MLE from Grades 1, 2 and 3 public elementary schools by classifying their opinions using sentiment analysis and text mining techniques. Set of validated researchers made semi-structured survey questionnaire were gathered from the responses of 1,365 respondents from the province of Albay. Manual cleaning and R software package were employed in classifying both negative and positive responses and also facilitated the data manipulation and graphical representation. The information was tested using Naïve Bayes algorithm and obtained 88% accuracy. The results indicated success; however, it encourages similar researches possibly involving other mother tongue languages.

Keywords: Bikol MTB-MLE; mother tongue; K-12; sentiment analysis; text-mining techniques

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1. Introduction

The Department of Education (DepEd) implemented the utilization of mother tongue as a medium of instruction in the Philippines which started in June of school year 2012-2013 (DepEd order No. 74, series of 2009). Having implemented for seven years (2012 to 2019) limited research has been observed for Bicol Region using sentiment analysis and text mining technique on the implementation of *Bikol* Mother Tongue-Based-Multilingual Education (MTB-MLE) subject. Conducting study concerning whether teachers and other stakeholders acknowledge its educational worth, does not only provide answers to the lacunae but highlighted the need to conduct sentiment analysis that can validate the assumption *that the sentiments of the teachers in teaching Bikol MTB-MLE will be very encouraging*.

Williams, Metila, Pradilla, and Digo (2014) on their ACTRC phase 1 progress report confirmed that the Mother Tongue-Based of Multilingual Education (MTB-MLE) approach in the country includes usage of native languages as the dialect of direction in Kindergarten to Grade 3. After Grade 3, the national language Filipino and official language English were conferred as the language of instruction. Then, Dekker and Dumatog (2003) presents the adoption of MTB-MLE as motivated by the desire for achieving higher level of education at par with international standards as encouraged by international studies of small-scale MTB-MLE programs in the Philippines, as well as in other countries.

This study is more of discovering teachers' positive and negative sentiments that could lead in determining its problems, challenges and successes in the implementation of *Bikol* MTB-MLE subject. Sentiment analysis method and text mining techniques were used to classify the sentiments of the teachers from Grade 1 to 3. Specifically, it answered the following research questions: (1) What are the sentiments of the teachers in teaching *Bikol* MTB-MLE?; (2) What are the strategies utilized by the teachers, as they experienced difficulties in the implementation of *Bikol* MTB-MLE?; and (3) What sentiment analysis and text mining techniques may be used in classifying teacher's sentiments in teaching *Bikol* MTB-MLE?

2. Methodology

Semi-structured, open-ended researchers' made questionnaires were validated by research professors, guidance counselors, and experts in natural language processing for sentiment analysis and distributed to all the grades 1 to 3 teacher-participants. Respondents were taken within the Province of Albay since *Bikol* MTB-MLE textbooks were written in Albay-based mother tongue by local *Albayano* authors. Sentiment analysis and text mining methodology covers the sequential steps of data gathering (for text documents), data cleaning (structured representation), data classification (patterns and relations in the text), and data result (visualized patterns).

Based from Figure 1, the data gathered were taken from 1,395 respondents' responses that were encoded manually in a text file segregating positive and negative words that were reflective of teachers' judgment about the implementation of *Bikol* MTB-MLE. Data cleaning was realized programmatically through pre-processing of text file. In this step, the algorithm performed removal of spaces, commonly used words, stop words and punctuations. Data classification involved data mining technique. This is important in identifying patterns that were visualized through word-cloud and presented the top ten most frequently used words with bar graph. Data result was expressed in pie graph showing value percentage of positive and negative responses. Naïve Bayes algorithm was then employed solely for determining classifications' accuracy (positive and negative responses) and to establish credibility of earlier finding obtained manually.
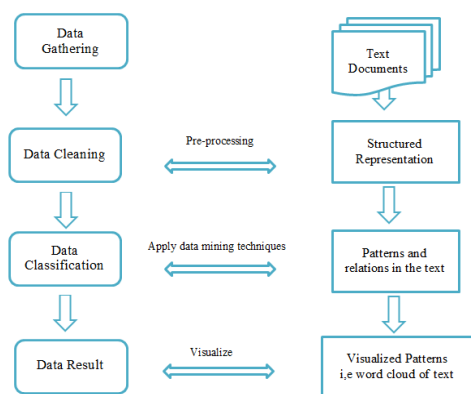
Figure 1. Sentiment Analysis and Text Mining Methodology

3. Results and Discussion

Empirical studies show that teachers have usually negative implications towards MTB-MLE for various reasons. On the contrary, Paulson Stone (2010) asserted that for effective implementation of MTB-MLE, teachers should act as a support, instead of a barrier.

3.1 Sentiments of the Teachers in Teaching Bikol MTB-MLE

From 1,395 answered survey forms, responses were manually annotated by classifying the positive and negative sentiments of the teachers. From a total of 900 cleaned responses, 513 or 57 percent responses were classified positive sentiments and 387 or 43 percent responses were classified negative sentiments. Table 1 shows the percentage of responses with manual cleaning.

Table 1

Manual cleaning of positive and negative sentiments (N=900)

Responses		Percentage	Indicator
513		57	Positive response
387		43	Negative response
	Total	100	

3.2 Bikol MTB-MLE strategies

Based from the manually classified positive and negative sentiments of this study, Table 2 and 3 shows the four major dimensions (Malone, 2010), teachers' sentiments and strategies for *Bikol* MTB-MLE. The dimensions presented were underpinning from the phase 1 strategies and challenges progress report of MTB-MLE implementation (Williams, Metila, Pradilla, & Digo, 2014).

3.3 Techniques in classifying teacher's sentiments in teaching Bikol MTB-MLE

R package (Rahlf, 2017) was used as a tool to classify the information and has been used to facilitate for data manipulation, calculation and graphical representation. There are several studies are carried out on the implementation of MTB-MLE, however none has been conducted a study using sentiment analysis and text mining techniques to classify the sentiments of the teachers in teaching *Bikol* MTB-MLE. From 1,395 answered survey questionnaires, data were cleansed, removed stopwords; ordinarily used words and additional white spaces. As shown in Figure 2, this resulted to 672 responses that represent as data sets and subjected for sentiment analysis and text mining. Only two (2) annotations were used, positive and negative sentiments. The collected data identified 408 or 61% responses as positive, and 264 or 39% as negative responses. Naïve Bayes algorithm was also used to determine the accuracy of training sets against test set of machine learning. The

accuracy of the data tested obtained 88%, which support the two (2) annotations for teachers' sentiments on *Bikol* MTB-MLE implementations.

Table 2

Dimensions, positive sentiments and strategies

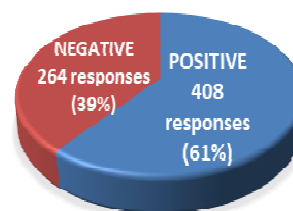| 4 Major Dimensions	Showing some Positive Sentiments	Strategies
Language	Good for children to express their opinions and ideas without such difficulty.	Have full oral proficiency and able to communicate absolutely and freely with their students. Use on-site demonstration for Bikol MTB-MLE subjects.
Materials	At some aspects on MTB implementation, the use of MTB instructional materials is indeed a good way of teaching pupils especially for those who have mostly just begun their learning experience.	Learning materials must be used to promote important improvement in writing and reading skills. If has no or limited school instructional resources, teachers may utilize their personal materials.
Instruction	Students were active in the discussion since most of them are using Bikol dialect when conveying in school and at home. Majority of the pupils understand the lesson better when being translated in mother tongue.	Teach the children a language that's at home with them. Used the Bikol MTB-MLE as medium of instruction.
Program	Its effective because half of the class are participating during class discussion. They understand the dialect they are using in their place.	Teacher's training improves their Bikol MTB-MLE teaching methods. Explain the underlying principles and structure of Bikol MTB-MLE.

Table 3

Dimensions, negative sentiments and strategies

4 Major Dimensions	Showing some Negative Sentiments	Strategies
Language	During their math class, they have difficulties in understanding mother tongue terms.	Reading materials must be written in the *Bikol* dialect. Upgrade the teacher's vocabularies, putting together a basic dictionary of common words in *Bikol* language.
Materials	There are words in the MTB-MLE book that even the teachers don't know the meaning of it. Bikol-Naga is used in MTB-MLE books; it is entirely different to the dialects of Albay province.	Identify and standardize the instructional materials for *Bikol* MTB-MLE, considering the different dialects of every town or municipality of Bicol Region, Use illustrations that are familiar to the student's reality and culture to assist build their reading skills.
Instruction	Somehow it is not good for students because mother tongue cannot be used to communicate in other places.	Attend seminar-workshop which will enhance the abilities in providing sensible instruction to students in a way to read and write their language properly. Program supervisors may prepare instructional dictionaries of key terms that teachers must understand so as to show *Bikol* MTB-MLE effectively.
Program	The implementation of MTB-MLE education is difficult for them because it is more important to learn English or Tagalog rather than mother tongue	School leaders and teachers must interact with parents so that they will perceive and support *Bikol* MTB-MLE implementation. Education officers may conduct another study on implementing MTB-MLE in higher grade levels (e.g. grade 4-6), then have a comparative study on the effectiveness of *Bikol* MTB-MLE between grade 1-3 and higher-grade levels.

The obtained output is the structured representation of teacher's sentiments on *Bikol* MTB-MLE implementation. R package tool was also used to perform sentiment analysis and text mining to come up with the bag of words or word cloud representation of sentiments, including the top 10 most frequent words. Figures 3

and 4 showed the word cloud and bar graph results. The font size of each term in the word cloud shows the number of mentions of that term in the sentiments, indicating its importance and positive effects to the *Bikol* MTB-MLE implementation.

Figure 2. Sentiment analysis result using R package and Naïve Bayes algorithm
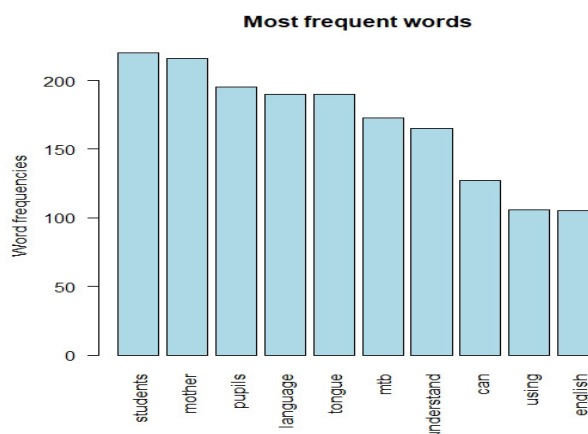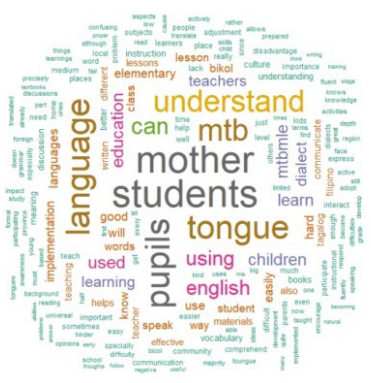

Figure 3. Word Cloud of Teacher's Sentiments   *Figure 4.* Bar Graph of top 10 most frequent words

4. Conclusion

It is capable to collect, pre-process, apply sentiment analysis and text mining techniques, and visualize the teacher's sentiments on the implementation of *Bikol* MTB-MLE. The implications of the sentiment analysis revealed bigger rate of positive opinions (61 percent positive with 39 percent negative). It suggests that educators can viably actualize the use of *Bikol* MTB-MLE in helping their students get the fundamental knowledge and learning. This research study was conjointly conducted to provide additional information and inputs on the implementation of *Bikol* MTB-MLE program. Proper monitoring mechanism, followed by applicable measures to deal with gaps and different requirements, must be incorporated into the *Bikol* MTB-MLE program structure for better outcomes. An essential viewpoint for future work can be the building of internet-based framework and monitoring system, as sentiments or opinions are ever-changing after some time. For better classroom exchanges, it's in addition also profitable to utilize a different method in sentiment analysis and text mining to cluster progressively the inclusion of teachers and students in their *Bikol* MTB-MLE subjects.

Note: Part of this paper was also presented in the *3rd Lumina Research Congress* held in Kuala Lumpur, Malaysia on February 23 to 24, 2019.

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