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ABSTRACT

In the realization of the teaching and learning process, the Language of Instruction plays a crucial and vital role. Thus, determining what language to use remains a debate among scholars, and a concern among educators. Along this line, it is worth to note that teachers' cognition towards a language used for instruction is an important aspect to consider, because cognition influences behavior. Hence, this study investigated the perceptions of teachers towards the use of Mother Tongue as medium of instruction in the teaching of Mathematics. The study employed a quantitative research design utilizing an adapted research tool administered to a total of 102 elementary-grade mathematics teachers. Interesting results are discussed herein.

Keywords: Mathematics, Perceptions, Teacher Cognition, Mother Tongue, Multilingual Contexts

INTRODUCTION

The field of cognition weaved with Mother Tongue as Medium of Instruction is an area in research that necessitates some more investigation. Cognition per se is defined as the aspect of both the conscious and unconscious mind (Eisner, 2002; Tavin, 2010). It is a term associated with complexity, in-depth investigation, and transdisciplinary integration that addresses practices, processes, beliefs, and actions (McClam & Flores-Scott, 2011). Borg (2003) explained that cognition pertains to the dimension relating to one's thoughts, knowledge, and beliefs which has an impact on one's actions. More specifically, the author explicated that teacher's cognition is the cognitive domain that is beyond observation among teachers involving what they think, believe, and know. It was further demonstrated that the teachers' cognition emerges as a powerful influence on what they practice. Previous studies have examined the construct of cognition alongside mother tongue education with pre-service teachers as the respondents (Alieto, 2019; Go Silk et al., 2020) and alongside art education with artist teachers informing the investigation (Heaton, 2021).

When children learn the literacy fundamentals in their mother tongue together with teachers' appropriate and rigorous training, books and instructional materials of good quality, age appropriateness, and sufficient time allocation to master the basics, they can transfer learning with ease into a second/international language (Baker, 2006; Edwards & Ngwaru, 2014; Kraft, 2003; Kruger, 2009; Mirici, 2020). Cummins (2000) argued that the use of the learners' linguistic and cultural knowledge asserts their identities and thereby promotes their achievement in their academics. Substantial instruction delivered via the learner's primary language hones the child's resources, specifically in their intellect and academics (Malone, 2003).

Moreover, education in the primary language or mother tongue is a linguistic right (Kosonen, 2005), and Mohanty (2010) argued that mother tongue based education is a way to combat institutionalized discrimination in the domain of language. Also, voluminous research has been carried out from across the globe tremendously showing that best learning is optimally obtained via the learners first languages (Young, 2002), and research has likewise shown that failing to use the mother tongue as a medium for instruction at least in the educational formative years has a long-lasting effect on the learner's cerebral competence (Dutcher, 2004). In a more specific sense, Alimi et al. (2020) demonstrated that there was a significant difference in the achievement when pupils were taught mathematics in their mother tongue, and Bernmahnn (2018) reported that teaching Haitian students in their native language had an effect on their mathematics academic achievement.

On the diametrically opposing side of the spectrum, mother tongue based education has not emerged devoid of criticisms. Eslit (2014) challenged the mother tongue based education in the Philippines pertinent to its implementation particularly with its alignment in the mother-tongue approach. Similarly, Lartec in 2014 called out the Department of Education for a mechanism initiation where assessment, monitoring, and evaluation of the teachers' innovative strategies and problems are done. In fact, Wa-Mbaleka (2014) executed a survey among 476 Filipino teachers of the English language and the results reported that the participants had a negative

perception towards the mother tongue based education in the Philippines. Mahboob and Cruz in 2013 showed similar results among non-teaching professionals. Premised on this current situation about the Mother Tongue-based education in the Philippines, a scholarly scrutiny with it as a variable is most indubitably going to be contributory to the current discussion relative to mother tongue based education.

Another construct that necessitates scholarly examination in this current paper is education in the discipline of mathematics which is often regarded as difficult and which subsequently poses enormous challenges in the teachers' pedagogy (Žilinskiene and Demirbilek, 2014), but is a consequential tool aiding people to make sense of what the world has to offer (Furman, 2017). It is key in the obtaining of stronger logical thinking skills and better leverage in the province of academic competition (Lucas & Fugitt, 2010). It is reported to be believed as useful and important (Brez & Allen, 2016) and that most adults believed mathematics is of importance and reported using it on a daily basis (Lucas and Fugitt, 2010). Contrarily, the importance of math is believed to decline among students approaching their final year (Watt, 2004). With all the accounted importance of mathematics and a great deal more, the teachers' perspectives, experiences, or attitudes in mathematics education are undeniably of immense significance. Though that is the case, teachers' input has not been at the fore and thus underrepresented in educational reform and education per se (Cohen & Mehta, 2017; Priestly et al., 2017). Thus, the exploratory tradition has to carry on in the lens of the teachers. Up until this point, mother tongue as the medium of instruction (MI) in mathematics education remains a fertile ground for research to be carried out. With that in mind, this current research seeks to determine the Cognition of the respondents towards the use of Mother Tongue as language of instruction in teaching Mathematics. Moreover, the study also aimed to determine whether gender is a factor influencing significant difference, and whether age is a variable significantly associated with Cognition.

METHODOLOGY

Research Design

This study employed a descriptive-quantitative-correlational research design. The current investigation is acknowledged as quantitative for two reasons. One is that it intended to quantify the Cognition of the respondents towards the use of Mother Tongue as language of instruction in the delivery of instruction for the subject Mathematics. Second is that the investigation utilized inferential statistics to analyze the data to answer developed hypotheses of the study. Moreover, the research is noted to be descriptive because it characterizes the respondents' cognition through the gathering, collection and analysis of data through the use of simple statistics such as mean, standard deviation and percentage (Calderon, 2006 cited in Rillo & Alieto, 2018; Johnson, 2010). Further, the empirical study aimed to determine whether a significant association could be determined between studied variables in the study; hence, the research is identified to be correlational (Kendra, 2020 in De La Rama et al., 2020). Additionally, the study is acknowledged as non-experimental as there was no establishment of controlled and experiment groups (Torres & Alieto, 2019a; Torres & Alieto, 2019b)

Participants of the study

This research is directed towards elementary teachers teaching mathematics, specifically those in the grades 1 to 3. As such, the study is determined to be a population-based type of research (Buslon & Alieto, 2019). In connection to this, one hundred two elementary-grade teachers assigned to teach mathematics in the Mother Tongue were enlisted to serve as participant in the study. Females dominate the total number of participants, constituting 59.8% of the sample size. In terms of age, the youngest is 25 while the oldest is 63 with mean age equals 37.97 (Standard Deviation – 11.64). From this data, it could be inferred that the respondents are dispersed in terms of age distribution, suggesting that sampling was wide in range.

Data Collection tool

The research employed classic technique of using research tools to quantify Cognition as the latent variable in this study. This approach is widely accepted and commonly practiced in quantitative studies (Creswell, 2012 in Dela Rama et al., 2020). Towards such end, the research instrument utilized in the study of Alieto (2020), which explored the Cognition of teachers towards the use of Mother Tongue as substitute of English in the education of young learners, was adapted and was with declared reliability of 0.94 – excellent reliability. The use of a research tool to gather data was informed by Dillman et al. (2009 in Alieto et al., 2020) to be an efficient approach when a study enlists a large sample.

Essential changes were performed in consideration of the context and objectives of the present study. From the original 15 items, only 8 were considered and used. Seven items were removed as they were deemed inappropriate. In addition, items were modified limited to the inclusion of the terms 'mathematics' – a contextualization of the adapted instrument. The items are answerable with a four-point Likert scale ranging from Strongly Disagree to Strongly Agree. The questionnaire contained positive (4, 5, and 7) items and negative statements (1, 2, 3, 6 and 8); thus, reversed coding was employed for negative statements.

Data Analysis Procedure

The study utilized both descriptive and inferential statistics to analyze the data set. To determine the cognition of the respondents' Cognition towards the use of mother tongue as MoI in the teaching of mathematics, descriptive statistics such as mean and standard deviation were used. In addition, for the determination whether a significant difference in the Cognition exists among respondents when data is grouped across gender, the inferential statistics for difference known as T-test for independent sample was used. Finally, to determine whether a significant relationship exists between the variables cognition and gender, the inferential statistics for relationship was employed, the Pearson Product Moment Coefficient test.

RESULTS AND DISCUSSION

Respondents' Cognition towards the use of MT as MOI

For the identification of the respondents' Cognition, the data solicited from the research questionnaires. Moreover, the data set was analyzed utilizing descriptive statistics [i.e. Mean (M), and Standard Deviation (SD)].

Table 1: Respondents' Cognition towards the use of MT as MOI

#	Statements	M	SD	Interpretation
1	Teaching Mathematics in the Mother Tongue adversely affect young students' learning of the subject area.	1.87	0.640	Negative Cognition
2	The use of Mother Tongue as Language of Instruction in the teaching of Mathematics is a sign of regression and not progression	2.35	0.886	Negative Cognition
3	Mathematics is better presented and understood in English than in Mother Tongue	1.64	0.715	Very Negative Cognition
4	The use of Mother Tongue in the teaching of Mathematics is an ideal educational practice.	2.65	0.713	Positive Cognition
5	Teaching Mathematics in the Mother Tongue makes students interested and motivated.	2.21	0.665	Negative Cognition
6	Mother Tongue is linguistically limited, and could not deliver Mathematics concepts which the English language can	2.22	0.852	Negative Cognition
7	The utilization of Mother Tongue as medium of instruction in teaching Mathematics makes teaching effective	2.42	0.724	Negative Cognition
8	Teaching Mathematic in the Mother Tongue degrades the Teaching Profession	3.06	0.701	Positive Cognition
OVERALL		2.30	0.445	Negative Cognition

N- 102

From Table 1, it could be noted that the respondents, in general, hold a 'Negative Cognition' towards the use of MT as MOI in the teaching of mathematics. This means that there is a preponderance of negative beliefs towards using MTs as a substitute for the English Language. This suggests that the teachers remain to favor teaching the subject mathematics in the English language. This specific finding does not echo the finding of Alieto (2018). In the said study conducted among prospective language teachers, it was found that the respondents were 'positive' towards the use of MT as MoI. The seen explanation for this conflict of finding is the difference of context between the respondents of the previous study and this current investigation. The study in Alieto (2018) were those who received training and discussion about the use and importance of MT as language of instruction. However, the respondents of this study are in-service teachers who were already in active service and have been exposed and used to the utilization of English as language of instruction. Thus, the policy requiring the use of MT appears to take teachers away from their comfort zone which is seen as the reason for their negative cognition towards the use of MT as MoI. Additionally, there is another reason perceived to explain the finding. The absence of instructional material and support in the use of MT as MoI. It could be noted that because the shift to the use of MTs was described to be done in haste (Alieto, 2018) which led to having teachers teach despite without receiving needed training. Further, the sudden shift also means the absence of developed instructional materials in the MTs which are needed in the delivery of quality education.

Cognition towards the use of MT as MOI across Gender

To determine whether gender difference exists, the variables gender which was used to mean male and female as used in various studies (e.g. Alieto et al., 2019; Bacang et al., 2019; Buslon et al., 2020; Cabangcala et al., 2021; Devanadera & Alieto, 2019; Eijansantos et al., 2020) was first coded as 1 for male and 2 for female. Afterwards, the data was tested to determine the normal distribution using Sapiro-Wilk test (0.067). Moreover, the parametric test known as T-test for independent sample was used to analyze the data.

Table 2.0: Cognition across gender

Variables		Categories	N	Mean	p-value	Interp.
Dependent	Independent					
Cognition	Gender	Male	41	2.27	0.658	Not Significant
		Female	61	2.31		

Table 2 shows that gender is not a factor influencing significant difference on the Cognition towards the use of MT as MoI in the teaching of Mathematics. It must be noted, however, that the females, in general, are possessing a ‘better’ Cognition as compared to the male counterparts in the study as provided by the higher mean score. Nonetheless, this difference was determined to be not statistically significant.

Both genders possess ‘negative cognition’ towards the use of MT as language of instruction. This implies that respondents, regardless of gender, held a sense of negativity in terms of belief as to whether MT could be used as a language of instruction in the teaching of Mathematics. Most of the respondents believed that MT is linguistically limited to serve as a language of instruction. The majority of the male and female respondents are of the perception that MT could not express sufficiently terms and expressions utilized in the teaching of Mathematics. However, it is worth pointing out that concepts taught and discussed in the early years of education in a mathematics class could be captured and well expressed in any MT, and that MTs being linguistically limited is a myth. In fact, the first language of a child is sufficient to serve as language in teaching mathematics (Moschkovich, 2002 in Perez & Alieto, 2018)

It is supposed that there are two reasons that would explain the negative perceptions towards the use of MT as language of instruction in mathematics class. One is that there are no, utmost limited, success stories documented and published supporting the use of MT as a medium of instruction in Mathematics Teaching. In other words, the prevalence of negative perceptions is due to the absence or scarcity of publications providing empirical support that the use of MT is effective, especially in instruction the young in Mathematics. Another reason relates to the multilingual characteristic of the communities. In this study, the survey was conducted among teachers serving multilingual communities; hence, are attending to groups of students coming from different linguistic backgrounds. Therefore, choosing one language from the many becomes a concern among teachers. It is troubling among educators to instruct students in a local language, but this language is not spoken nor understood by all. Thus, it is believed that nominating a Lingua Franca to serve as the language of instruction is not the ‘true essence’ of mother tongue-based instruction. It would be best to educate children in the language they both speak and understand. Hence, the mother tongue education policy must not simply be an idea of substituting English with a local language.

Correlation: Cognition towards the use of MT as MOI and Age

To determine the significant relationship between the respondents Cognition towards the use of MT and their age, the data was analyzed using the parametric statistics tool known as Pearson Product Moment Coefficient which also goes by the name Pearson r.

Table 3: Correlation: Cognition and Age

Variables		p-value	r-value	Interpretation
Cognition	Age	0.031	-0.214	Significant / Inverse Correlation

The analysis of the data provides that there is a significant association between the respondents’ age and Cognition towards the use of MT as MoI. Further, the relationship is identified to be inverse which means that as respondents increase in age their Cognition becomes negative, suggesting that they do not favor the use of MT as language of instruction in teaching mathematics. Conversely, respondents who are younger, generally, are likely to favor the use of MT in teaching the Mathematics subject.

Two reasons are seen to explain this. One is that seasoned teachers have been so used to using English as MoI in teaching Mathematics. Therefore, teachers are familiar and have gained a sense of expertise in preparing instructional materials, lesson plans and activities in the English language. However, the new policy and emerging practice appears to drive teachers out of their comfort zone. This change in educational policy demands a shift in educational practices, and usually the initial reaction to change is negativity and opposition; thus, teachers who have stayed long in the profession appeared to be more ‘negative’ towards the use of MT as MoI than the new breed of teachers. Another is provided by Alieto (2018) who explained that seasoned teachers were not exposed to discussions and seminars promoting the importance of the use of MT in early education. The younger teachers were educated in educational frameworks that provided essential spaces discussing the importance, benefits and need for early education to be conducted in the MT. The absence of these discussions is perceived to have contributed to the negative perceptions of the seasoned teachers.

CONCLUSION

In the wake of having researched the cognition towards the utilization of Mother Tongue as Medium of Instruction in Teaching Mathematics of in-service educators who were at that point in active service and have been presented and used to the usage of English as language of instruction, it was discovered that they showed negative cognition towards the utilization of MT as MoI in the teaching of mathematics. This proposes that respondents harbor a somewhat less certainty towards the expectations that the makeshift language learning methodology to in any case convey education's core reason to its customer. These backings the findings of Wa-Mbaleka (2014) which uncovered that members had negative discernment towards mother tongue based education in the Philippines.

Additionally, with regards to gender, both male and female gave similar reactions and was really settled to be not statistically significant. In determining the significant relationship between the respondents' cognition towards the utilization of MT and their age, the information showed that there is a significant relationship with inverse correlation. There is a need to develop interest and consistency to all instructors paying little mind to age or long stretches of educating. Instructors should be uncovered into various trainings, courses and workshops on Mother Tongue as vehicle of guidance for them to be more certain and participative in the moving of information to students utilizing mother tongue and for the educators to take on new techniques to work on the abilities of the students on the major activities and to outfit them with the required abilities.

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