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Culturally responsive self-efficacy of mathematics teachers: Input for self-efficacy building enhancement

Jennilyn Edilo [1], F. Bustamante National High School, 5JRW+6HH, AH26, Bunawan, Davao City, Davao del Sur, Philippines

Orville Jr Evardo, Ateneo de Davao University, Roxas Ave, Poblacion District, Davao City, 8000 Davao del Sur, Philippines

Roar Callaman, University of Southeastern Philippines, Davao del Sur, Philippines

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Abstract

The Philippines is a multicultural society with diverse cultures and beliefs for each indigenous community. This study was designed to determine the level of culturally responsive teaching self-efficacy (CRTSE) of mathematics teachers and to propose a training design. The study utilized an explanatory sequential research design using a survey and focus-grouped discussion and was participated by 65 in-service mathematics teachers. Based on the result, the mathematics teachers' overall level of teaching efficacy in using culturally responsive pedagogy (CRP) is very high. It was also found that teachers' implementation of CRP that influences teaching self-efficacy includes the use of native language and the use of contextualized and localized examples. It is recommended that mathematics teachers may adopt the use of culturally responsive pedagogies in their respective classes and consider the use of native language and use of contextualized and localized examples to provide a meaningful teaching-learning experience.

Keywords: Culturally responsive teaching; culturally responsive pedagogy; mother tongue instruction; self-efficacy.

* ADDRESS FOR CORRESPONDENCE: Orville Jr Evardo, Ateneo de Davao University, Roxas Ave, Poblacion District, Davao City, 8000 Davao del Sur, Philippines
E-mail address: orvilleevardo@gmail.com

1. Introduction

The Philippines is a multicultural society with diverse cultures and beliefs for each indigenous community. Differences marked by race, gender, religion, and other ethnic particulars have been greatly considered to manifest a peaceful and inclusive environment, particularly in the context of the Philippine Educational System. Despite the implementation of the numerous educational programs on multicultural education (Department of Education Order 62 s. 2011 and Department of Education Order 32 s. 2015) and the enhanced basic education programs, which is one of the salient features of the K-12 program, the maximization of learning by shaping a setting that is safe and productive for both teachers and learners are still not at par (DepEd 2011;2015).

Thriving in increasingly diverse learners with different learning styles, cultural orientations, and socio-economic backgrounds is evident, hence the need for teacher preparation programs and professional development to meet the needs of these diverse students (Román, Arias, Sedlacek & Pérez, 2022; Leo, 2023). However, Li (2013) stated that the majority of pre-and in-service teachers are underprepared to meet the demands of the rapidly growing culturally and linguistically diverse student population. In this context, Abuso (2004) recommends that teacher training institutions prepare in-service teachers to navigate culturally and linguistically diverse classrooms successfully. In order to be culturally responsive, teachers must develop a deep understanding of race, adopt welcoming attitudes toward students from diverse cultural backgrounds, commit themselves to be change agents, and refine their knowledge and skills to address students' sociocultural backgrounds (Villegas & Lucas, 2002; Gentile & Budzilowicz, 2022; Kumi-Yeboah & Amponsah, 2022).

Alarmingly in Australia, cultural responsiveness is not mentioned in the policy documents of the Northern Territory and Queensland State governments, despite those jurisdictions having the highest populations of Aboriginal and Torres Strait Islander peoples (Australian Bureau of Statistics, 2017). Within the North American educational context, there is a progressive movement to adapt traditional curricula to the representative realities of critical pedagogy, critical multiculturalism, and CRP (Ragoonaden et al., 2010; Shariff, 2008). Curricula can be better positioned to reflect diverse ways of teaching by bridging the gap between demographics, experiences, and cultural values (Ball, 2009; Yu et al., 2022).

On the other hand, the educational scenario in the Philippines acknowledges the pressing need to strengthen the Indigenous Peoples Program (IPEd) with 2.5 million learners served. The Department of Education (DepEd) implemented the National IP Education (IPEd) Policy Framework (DepEd Order #62, s., 2011) and IP Education (IPEd) Curriculum Framework (DepEd Order #32, s., 2015) in response to the right of the indigenous learners to a learning experience that is relevant and responsive to their context (Department of Education, 2016). Since then, it has established mechanisms for community engagement and closer collaboration between indigenous elders, schools, and other basic education programs (DepEd, 2013; 2015; 2017). Resulting of the dialogue between DepEd, community elders, and IPEd practitioners, an IPEd Curriculum Framework was formulated to guide the interfacing of the national education system with indigenous learning systems, knowledge systems, and practices (DepEd, 2015).

Locally, the demands for training to enhance the capacity and capability of teachers were reported in the consolidated individual professional development plan during the teacher review performance for public teachers. However, despite its importance, still, several teachers needed to be fully equipped with this culturally responsive teaching. Thus, the need to assess the level of teachers' self-efficacy in culturally responsive teaching is deemed essential. Consequently, the result of this study will serve as the basis for the administrators in crafting culturally responsive self-efficacy building enhancement for teachers' continuous professional development, which will also help teachers address the needs of learner diversity.

1.1. Purpose of study

This study aims to determine the level of culturally responsive teaching self-efficacy (CRTSE) and its influence on Mathematics teachers and to propose a training design. Notably, the study sought to answer the following questions:

1.) What is the level of the CRTSE of the Mathematics teachers?

2.) In what ways does CRTSE influence mathematics teachers?

3.) What recommendations can be derived to help Mathematics teachers with regard to their teaching self-efficacy?

2. Materials and Methods

2.1 Research Design

This study utilized a mixed-method approach, particularly the explanatory sequential research design. In this design, a researcher follows up on a specific quantitative finding and explains it with qualitative data (George, 2022). As a method, it has two distinct interactive phases, the quantitative and qualitative phases. The first phase begins with the collection and analysis of the quantitative data. Then, to expand the quantitative results, the qualitative phase was conducted based on the quantitative findings (Creswell & Clark, 2017).

2.2 Participants

For the quantitative phase, the respondents were selected using a *complete enumeration sampling design. It is a statistical investigation in which the data are collected for every element/unit of the population (Byjus, 2021). This approach is suitable since it offers thorough information that covers a wide range of issues. The respondents of this study were the 65 Mathematics teachers from junior and senior high schools in cluster 4, Division of Davao City. Respondents were included in the study if they met the following criteria: (1) teachers handling mathematics subjects, (2) less than three years of teaching experience in public schools or newly hired teachers, and (3) willing to take part in the study.* Meanwhile, for the qualitative phase, the participants in the focus group discussion (FGD) were eight (8) mathematics teachers who were purposively chosen from the 65 respondents in the quantitative phase.

2.3 Data collection instruments

Since the study utilized an explanatory sequential research design, the study used two (2) data-gathering instruments, i.e., one for each phase. For the quantitative phase, the study adopted the Culturally Responsive Teaching Self-Efficacy Scale (CRTSES) by Siwatu (2006). CRTSES is a 40-item Likert-type tool in which in-service teachers are asked to rate how confident they are in their capacity to use particular culturally sensitive teaching practices by indicating a degree of confidence ranging from 0 (no feelings of self-efficacy) to 10 (high feelings of self-efficacy). Following an expert panel review and pilot testing with 30 non-participant teachers, the instrument's validity and reliability were established. It registered a Cronbach's alpha value of 0.971, which means that the questionnaire has high internal consistency reliability. Table 1 shows the range of means, qualitative description, and interpretation of the data for CRTSES.

Table 1

CRTSES Interpretation

Range of Means	Qualitative Description	Interpretation
8.01-10.00	Very High	This means that the respondents always manifest self-efficacy.
6.01-8.00	High	This means that the respondents frequently manifest self-efficacy.
4.01-6.00	Moderate	This means that the respondents sometimes manifest self-efficacy.
2.01-4.00	Low	This means that the respondents occasionally manifest low self-efficacy.
0.00-2.00	Very Low	This means that the respondents never manifest self-efficacy.

For the qualitative phase, the researcher developed a semi-structured interview guide. To ensure the interview guide's validity in terms of content, experts in the field were consulted. The suggestions and feedback from the experts were incorporated to finalize the research instrument. The interview consists of open-ended questions with prompts to elicit responses from all participants.

2.4 Data Analysis

For the quantitative phase, mean and standard deviation was used to get the level of the culturally responsive teaching self-efficacy of the in-service mathematics teachers in cluster 4 schools. While in the qualitative phase, thematic analysis was conducted to generate emerging themes from the narrative responses of the participants. In this study, Colaizzi's (1978) method of thematic analysis was utilized.

3. Results

3.1 Level of Culturally Responsive Teaching Self-Efficacy

Presented in Table 2 are the descriptive statistics of the variable culturally responsive teaching self-efficacy. It showed an overall mean of 8.30 with a corresponding standard deviation of 1.22. This result had a very high descriptive meaning, meaning that the in-service mathematics teachers always manifest their self-efficacy in using culturally responsive teaching.

Moreover, it can be noted that item statements (23) *I help students to develop positive relationships with their classmates*, (28) *I help students feel like important members of the classroom*, and (8) *I build a sense of trust in my students* registered the highest means, 9.08, 8.95, and 8.91 respectively, which all signifies the very high level of self-efficacy. It implies that mathematics teachers always manifested confidence in dealing with students in the course of utilizing culturally responsive teaching.

Table 2

Level of Culturally Responsive Teaching Self-Efficacy

Statements	Mean	SD	Description
1. I adapt instruction to meet the needs of my students.	8.54	1.31	Very High
2. I obtain information about my student's academic strengths and weaknesses.	8.20	1.54	Very High
3. I determine whether my students like to work alone or in a group.	7.97	1.42	High
4. I identify ways that the school culture (e.g., values, norms, and practices) is different from my students' home culture.	8.09	1.38	Very High
5. I implement strategies to minimize the effects of the mismatch between my students' home culture and the school culture.	8.15	1.23	Very High
6. I assess student learning using various types of assessments.	8.29	1.16	Very High
7. I obtain information about my students' home life.	7.69	1.56	High
8. I build a sense of trust in my students.	8.91	1.17	Very High
9. I establish positive home-school relations.	8.82	1.12	Very High
10. I use a variety of teaching methods such as visual aids.	8.69	1.17	Very High
11. I develop a community of learners when my class consists of students from diverse backgrounds.	8.55	1.26	Very High
12. I use my students' cultural backgrounds to help make learning meaningful.	8.11	1.21	Very High
13. I use my students' prior knowledge of subjects such as science to help them make sense of new information.	8.55	1.12	Very High
14. I identify ways in how students communicate at home may differ from the school norms.	8.18	1.36	Very High
15. I obtain information about my students' cultural background such as their L1 (first language) or mother tongue.	8.43	1.21	Very High
16. I teach students about their cultures' contributions to fields such as science if content and context permit.	7.86	1.37	High
17. I greet mathematics learners with a phrase in their native language if I am able to.	7.95	1.54	High
18. I design a classroom environment using displays that reflect a variety of cultures.	7.88	1.46	High
19. I develop a personal relationship with my students.	8.28	1.38	Very High
20. I identify ways that standardized tests such as the National Achievement (Basic Education Exit Assessment) may be biased toward linguistically diverse students.	7.57	1.57	High
21. I communicate with parents regarding their child's educational progress.	8.80	1.11	Very High

22. I structure parent-teacher conferences so that the meeting is not intimidating for parents.	8.80	1.05	Very High
23. I help students to develop positive relationships with their classmates.	9.08	0.97	Very High
24. I revise instructional material to include a better representation of cultural groups.	8.37	0.94	Very High
25. I critically examine the curriculum to determine whether it reinforces negative cultural stereotypes.	7.94	1.37	High
26. I model classroom tasks to enhance mathematics learners' understanding.	8.23	1.07	Very High
27. I communicate with the parents of mathematics learners regarding their child's achievement.	7.83	1.44	High
28. I help students feel like important members of the classroom.	8.95	0.99	Very High
29. I identify ways that standardized tests such as the NAT/BEEA may be biased toward culturally diverse students.	7.85	1.20	High
30. I use a learning preference inventory to gather data about how my students like to learn (e.g., are they visual, linear, kinesthetic, or auditory learners?).	8.14	1.20	Very High
31. I use examples that are familiar to students from diverse cultural backgrounds.	8.46	0.94	Very High
32. I obtain information regarding my students' academic interests.	8.42	1.07	Very High
33. I use the interests of my students to make learning meaningful for them.	8.75	0.97	Very High
34. I implement cooperative learning activities for those students who like to work in groups.	8.72	1.05	Very High
35. I am mindful when using Philippine cultural metaphors as analogies to teach subject-specific concepts (e.g., scientific or mathematical).	7.62	1.52	High
36. I understand that mathematics learners' cultural beliefs regarding certain subject-specific concepts may differ from my own.	8.06	1.17	Very High
37. I give students the opportunity to improve their proficiency in Math in my class.	8.26	1.20	Very High
38. I am mindful when using illustrations or metaphors from mainstream popular culture (including movies, television, and music) as analogies to teach scientific or mathematical concepts.	8.17	1.14	Very High
39. I repeat content-specific terms and phrases multiple times so that mathematics learners can comprehend them better.	8.37	1.04	Very High
40. I encourage mathematics learners to use their first language to define and understand content specific terms and phrases.	8.31	0.98	Very High
Overall Mean	8.30	1.22	Very High

However, the statements (20) *I identify ways that standardized tests such as the NAT/BEEA may be biased towards linguistically diverse students*, (35) *I am mindful when using Philippine culture metaphors as analogs to teach subject-specific concepts (e.g., math or science)*, and (7) *I obtained information about my students' home life* generated the lowest means among the 40 statements which denote a high level of self-efficacy. Cruz et al. (2020) supported this result and disclosed that the highest mean scores were in areas that involve building trust and personal relationships with students, which are essential features in culturally responsive teaching. The areas that required more specialized cultural understanding, such as being able to validate students in their mother tongue and teaching students about their culture's contributions to Science and Mathematics, had the lowest mean scores.

3.2 Ways in implementing culturally responsive pedagogy

There are various ways to consider in choosing the appropriate pedagogies given a culturally responsive classroom. These include exploring one's culture, learning about other cultures, and learning about students' cultures. Based on the responses of the informants when asked how they implement culturally responsive pedagogy that influenced their self-efficacy, two (2) themes emerged. These include (1) the use of native language and (2) the use of contextualized and localized examples.

3.2.1. Theme 1: Use of Native Language

One of the themes that emerged when the respondents were asked about how they implement CRP that influenced their self-efficacy is using their native language. Using our native language not only allows us to communicate and connect but also to understand and appreciate the history of our ancestors and our upbringing. The Department of Education implemented the mother-tongue-based-multilingual education (MTB-MLE) policy in the teaching context. This paved the way for the use of local dialects as the language of instruction. One informant said that she uses her mother tongue

whenever she teaches:

"I feel confident when I use my mother tongue in teaching Mathematics. Yes, it influenced teaching self-efficacy." (P1)

This claim was not only true for P1 because other informants claimed that the culprit why it made them confident in using culturally responsive pedagogy was the use of native language.

"Whenever I conduct my oral recitation, I let my learners respond using their language so that they can express properly." (P4)

"In teaching, I'm using their own language so that the learners will explain their answers clearly. Yes. It influences the teaching self-efficacy." (P6)

"I'm having board work and let the learners explain using their own language." (P7)

3.2.2. Theme 2: Use of Contextualized/Localized Examples

Using contextualized and localized examples is another experience of mathematics teachers to which they attribute how they implement culturally responsive pedagogy that influenced their self-efficacy. Contextualization and localization are the keys to engaging the students in teaching and learning to which they can relate their situations to their lessons. It makes it meaningful and relevant to the students' lives by relating the context to mathematical content. The participants propounded this theme during the interview. The informants said:

"I used real-life situations in giving math problems. Sometimes yes, if they can relate with the problems and sometimes no if they can't relate to the problems." (P2)

"I always give examples to my students of which they can relate to their context. I also consider their cultural background and their locality for ease understanding." (P5)

4. Discussion

The results support the claim that the non-use of the home language fosters difficulty for learners. Educational systems that need to account for the use of children's home language in their early education expect young schooling children to learn a new language alongside learning content that proves to be too difficult, if not improbable, to fulfill (MacKenzie, 2009). This becomes particularly true in the study of Mathematics taught to English-to-English language learners (ELL) as it was confirmed that so-called language-associated difficulties exist (Lee & Jung, 2004).

Moreover, it is further claimed that mother tongue-based schooling imposes constraints on learners' acquisition of knowledge and learning of skills. This is because understanding the language of instruction becomes a task in itself in cases where the learners are yet to master the medium of instruction. This is essentially true concerning mathematics, as learning the subject is noted to be a two-way process. The first is to understand the math concepts being taught, and the second is to be able to communicate such understanding (Gerber et al., 2005). In both processes pointed, language plays both central and vital roles. Therefore, the language of instruction proves to be very important for learners to relate to happenings during class hours, and there would be no other best way for children to learn other than being taught in their mother tongue (UNESCO, 2011).

In addition, Secada (1992) also argues that language is central to the process of mathematical reasoning and activities such as explaining, making claims, and providing proof. This implies not only that language is essential to fulfill different activities realized inside a mathematics class but also the necessity for students to possess proficiency in the language of instruction to get passing or better grades in mathematics. Therefore, it is not surprising that learners with limited language of instruction proficiency have difficulties learning mathematics and are eventually poor performers.

This result is also evident in several research which provides evidence that instruction can lead students to see themselves as participants of a discourse community and to develop an identity as

mathematics learners (Schleppegrell, 2010). Allexsaht-Snider and Hart (2001) affirm that engagement, belongingness, and confidence impact student achievement and are indicators of students being part of a mathematics classroom community.

Similarly, Turner et al. (2013) show how learners can become competent and confident problem solvers through a teaching approach that engages them in meaningful and cognitively challenging co-construction of mathematical ideas. Principled instruction is needed that creates a classroom culture that values mathematics and provides dialogical and rich mathematical and language interactions (Chval & Khisty, 2009). Turner and Celedón-Pattichis (2010) affirm that teaching practices support studentś mathematical understanding when teachers integrate students' cultural knowledge and experiences by using stories familiar to children and using the native language and relevant contexts to introduce new mathematical concepts.

Indeed, students' comprehension will be more profound and lasting, and mathematics will be regarded as a whole if they can link mathematical ideas (National Council of Teachers of Mathematics, 2000). The conducted research also emphasizes that the idea of using real-life connections in mathematics teaching increases the student's interest and motivations towards mathematics, develops a positive attitude about mathematics, and contributes to students for their preparation for real-life and develop conceptual understanding (Karakoç & Alacacı, 2015; Bingölbali & Çoşkun, 2016; Papadakis et al., 2017).

4.1. Development of Self-Efficacy Building Series

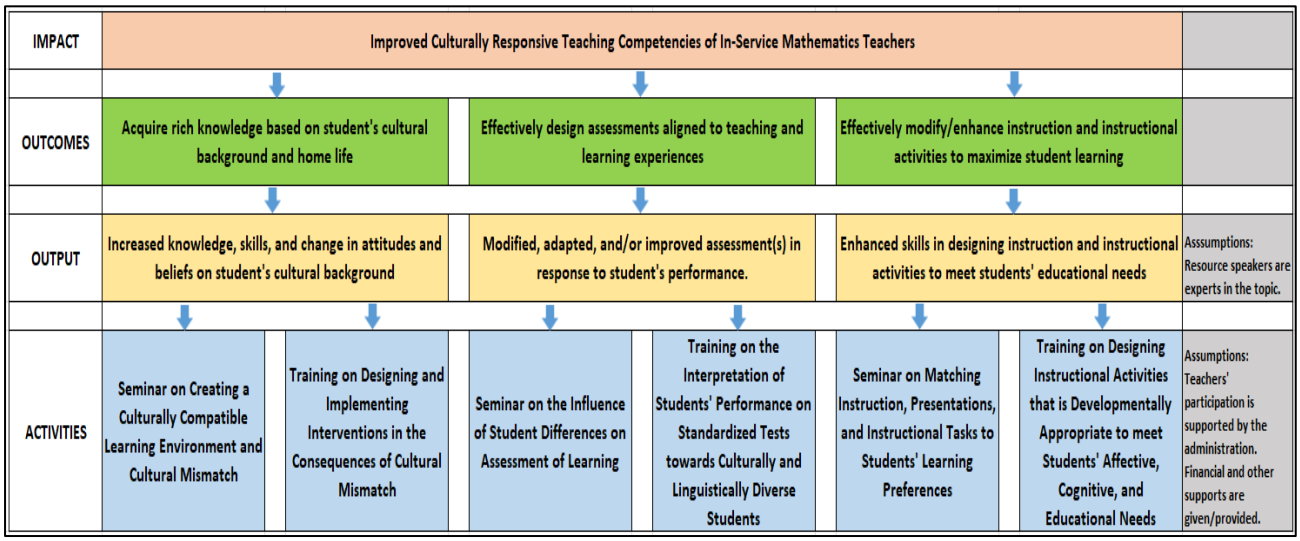
The impact of the intervention training design is to improve culturally responsive teaching competencies of in-service Mathematics teachers. Participants are expected to acquire rich knowledge based on student's cultural background and home life; to effectively design assessments aligned to teaching and learning experiences; and to effectively modify/enhance instruction and instructional activities to maximize student learning. With these outcomes, it will increase knowledge, and skills, and change attitudes and beliefs based on student's cultural background; it will modify, adapt and improve assessment in response to students' performance; and it will enhance skills in designing instruction and instructional activities to meet student's educational needs. We can achieve these outputs with the following activities:

- Seminar on Creating a Culturally Compatible Learning Environment and Cultural Mismatch
- Training on Designing and Implementing Interventions in the Consequences of Cultural Mismatch.
- Seminar on the Influence of Student Differences on Assessment of Learning
- Training on the Interpretation of Students' Performance on Standardized Tests towards Culturally and Linguistically Diverse Students
- Seminar on Matching Instruction, Presentations, and Instructional Tasks to Students' Learning Preferences
- Training on Designing Instructional Activities that is Developmentally Appropriate to meet Students' Affective, Cognitive, and Educational Needs

The above activities are expected to develop the culturally responsive teaching self-efficacy of in-service Mathematics teachers. Illustrated in Figure 1 is the intervention logic frame of the proposed self-efficacy building series.

Figure 1

Intervention Logic Frame on Culturally Responsive Teaching Competencies of In-Service Mathematics Teachers



5. Conclusions

Considering the study's findings, the following conclusions are drawn: (1) it can be inferred that culturally responsive teaching self-efficacy among mathematics teachers is very evident. Teachers vary their teaching approaches and methodologies based on students' cultural contexts and backgrounds, and (2) the use of the native language and the contextualized and localized examples influenced the teaching self-efficacy of mathematics teachers in utilizing culturally responsive pedagogies.

Moreover, based on the conclusions drawn, the following recommendations were suggested: (1) teachers may adopt the use of culturally responsive pedagogies in their respective classes. They may consider the use of native language and use of contextualized and localized examples to provide a meaningful teaching-learning experience; (2) school administrators may implement the designed intervention program to develop the culturally responsive competencies of mathematics teachers. They may consider incorporating the identified activities in their school-based learning action cell; (3) DepEd officials may provide more relevant training relative to the various culturally responsive pedagogies in various cultural groups and multicultural set-up classrooms; and (4) further studies may be conducted to validate the result of the study in other learning areas.

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