Investigating Professional Development and Teaching Efficacy among the Master of Science Graduates in Mathematics’ Curriculum

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ABSTRACT

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| This study aimed to determine the level of professional development (PD) and teaching efficacy (TE) and examine their relationship among Master of Science in Teaching (MST), major in Mathematics graduates of Davao Oriental State University. Addressing the need for evidence-based evaluation of teacher preparation programs, the research was grounded in Social Cognitive Theory, which emphasizes the interplay between personal, behavioral, and environmental influences and explored how ongoing training and development activities influence teaching confidence and classroom effectiveness. Utilizing a quantitative approach through a descriptive-correlational design, the study collected data through a survey questionnaire answered by 25 Master of Science Teaching Mathematics graduates. Results showed a generally high level of PD ($\overbar{x}=4.33$,$s=0.41$) and TE ($\overbar{x}=4.46 $,$s=0.42$) among respondents. The findings also revealed a moderate positive correlation ($r = 0.35$, $P= 0.09$) between PD and TE, indicates that teachers who engage more in relevant training tend to feel more effective in their teaching roles. Further analysis showed no significant differences in PD and TE when respondents were grouped by age and years of teaching experience. However, there was a significant difference in PD when respondents are categorized based on gender but not in TE. These results reflect that ongoing professional development contributes to teachers’ confidence and effectiveness in the classroom, while factors such as gender may influence the extent of professional development engagement. |

*Keywords: master of science teaching mathematics, professional development, teaching*

 *Efficacy, classroom effectiveness*

1. INTRODUCTION

Mathematics education continues to pose challenges globally, with international assessments such as the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) consistently showing low levels of student proficiency in mathematics (OECD, 2019). In the Philippines, this concern is more critical. Filipino students have ranked among the lowest in mathematics literacy, reflecting systemic issues including outdated pedagogical approaches, inadequate teacher preparation, and limited access to quality instructional resources (Acido & Caballes, 2024; Cabural, 2024; Trinidad, 2020). These findings underscore the urgent need to improve how mathematics is taught and how teachers are supported in developing their professional competencies.

At the heart of improving mathematics education are teachers, whose knowledge, confidence, and classroom strategies significantly shape student learning outcomes (López-Martín et al., 2023). Professional development (PD) plays a pivotal role in enhancing these capacities by offering structured opportunities for educators to deepen subject mastery, reflect on their practice, and collaborate with peers (Ng et al., 2019; Babu & Venkatesan, 2023). Equally important is teaching efficacy (TE)—teachers' belief in their ability to promote student learning—which has been positively linked to classroom management, instructional delivery, and learner engagement (Na & Isa, 2024; Zeb et al., 2024). When teachers perceive themselves as capable, they are more likely to adopt effective instructional strategies and persist in the face of challenges.

While the connection between PD and TE is well-established in international literature (Liu & Liao, 2019), little is known about how this relationship unfolds in local contexts. In particular, there is a noticeable gap in studies examining how these factors interact among graduates of specific teacher education programs in the Philippines. For institutions like Davao Oriental State University (DOrSU), understanding this relationship is essential for assessing the effectiveness of their teacher preparation programs and making data-driven improvements.

This study addresses that gap by evaluating the Master of Science Teaching (MST) Mathematics program at DOrSU. It aims to assess the level of professional development and teaching efficacy among its graduates, and examine how these dimensions relate to one another. By exploring how well the program equips future educators for the demands of classroom practice, the study provides insights into how teacher education can be strengthened to better meet both national education standards and the specific learning needs of the students.

2. OBJECTIVES

This paper focused on investigating the contribution of the Master of Science Teaching (MST) major in Mathematics program of Davao Oriental State University (DOrSU) in the efforts of its graduates currently teaching Mathematics in high school. Such teachers' professional development, strategies of teaching, and efficacy in the teaching of mathematics high school level students are under scrutiny. In this regard, it sought to address the following objectives:

1. To determine the level of professional development and teaching efficacy among MSTM graduates;
2. To assess if there is significant relationship of professional development and teaching efficacy;
3. To analyze if there is any significant difference of professional development when respondents are grouped according age, gender and teaching experience; and
4. To examine if there is any significant difference of teaching efficacy when respondents are grouped according age, gender and teaching experience.

**3. REVIEW OF RELATED LITERATURE**

Teacher professional development and teaching efficacy are vital for effective mathematics education in today’s rapidly changing academic environment. Professional development equips teachers with up-to-date skills and reflective practices, while teaching efficacy—the belief in one’s ability to facilitate learning—shapes instructional decisions and student engagement. The strong connection between these two factors is well documented, yet there is limited research on this relationship among graduates of specialized programs like the Master of Science Teaching (MST) in Mathematics. This study aims to fill that gap by examining the levels of professional development and teaching efficacy among MST Mathematics graduates and exploring how demographic factors may influence these areas.

**3.1. Level of Professional Development and Teaching Efficacy of MST Mathematics Graduates**

Professional development (PD) is essential in equipping teachers with current skills to address evolving educational demands and improve student outcomes (Ho et al., 2023). Studies emphasize the alignment of PD with authentic classroom practices, especially in mathematics education, where innovative strategies such as problem-based learning are vital (Juma, 2024; Mustafa & Paçariz, 2021; Gradini et al., 2024). Reflection and continuous professional growth are identified as key factors in teacher development, although challenges in institutional support persist (Alnijres, 2024; Zakaria, 2020; Machost & Stains, 2023). Collaboration and peer learning further enhance instructional practices; however, their effectiveness can be limited by time constraints and insufficient support (Wagner et al., 2019; Pannell et al., 2019). The sustainability and impact of PD require ongoing support and well-established implementation frameworks (Sandholtz et al., 2023; Lee et al., 2024; Qazi, 2017).

 Teaching efficacy, defined as teachers’ belief in their capability to facilitate student learning, is closely associated with effective classroom management, instructional strategies, and student engagement (Küçükalioğlu & Tuluk, 2021). Effective classroom management contributes to improved learning outcomes by minimizing disruptions and maintaining student focus (Paulines & Tantiado, 2024; Varszegi, 2022; Shah, 2023; Yadav, 2021). Teachers with high efficacy are more likely to implement innovative instructional methods such as inquiry-based and collaborative learning, which are particularly beneficial in mathematics education (Jagnandan et al., 2024; Lee & Paul, 2023; Hettinger et al., 2022; Bachtiar, 2024). Additionally, teacher self-efficacy fosters student motivation and engagement through interactive and student-centered approaches (Zimu, 2024; Hidayatullah et al., 2024). Formative assessment practices, integral to effective teaching, enable adjustments to instruction that better address student needs (Tashiro et al., 2021; Lumpkin, 2022; Oliveira & Henriques, 2021; Gallavan, 2020). Despite graduates’ confidence in addressing diverse learners, resource limitations and the complexity of inclusive teaching remain ongoing challenges (Ranbir & Education, 2024; Meng, 2024; Devi, 2023).

**3.2. The Synergistic Relationship Between Professional Development and Teaching Efficacy**

 The interaction between professional development and teaching efficacy is deeply synergistic. Darling-Hammond et al. (2020) assert that effective PD not only improves instructional competencies but also enhances teacher confidence and job satisfaction. Liu and Liao (2019) note that while PD equips teachers with technical strategies, efficacy determines how effectively these strategies are integrated into classroom practice. Walters (2023) adds that meaningful PD programs must be practical, collaborative, and sustained, as these qualities enhance both learning transfer and teacher motivation.

 In mathematics education, where conceptual understanding and problem-solving are central, the need for aligned PD is even more pressing. Cevik et al. (2021) found that mathematics teachers who engaged in PD workshops on technology integration and problem-solving techniques not only improved their skills but also felt more empowered to apply them in class. Wang (2023) affirms that teaching efficacy acts as the psychological foundation that enables the successful application of newly acquired knowledge. Teachers with higher self-efficacy are more likely to persist in challenging situations and adopt innovative teaching practices (Yang, 2019; Perera & John, 2020).

 Collaborative PD models that include peer mentoring and reflective practice further enhance this relationship. Boukhari (2021) and Juma (2024) both emphasize that shared learning environments foster a sense of community and collective responsibility, reinforcing individual efficacy and professional growth. Despite growing international research in this area, localized studies remain limited, especially within the context of institutions like Davao Oriental State University (DOrSU). This research thus seeks to fill that gap by examining the link between PD and teaching efficacy among MSTM graduates.

**3.3. Demographic Influences on Professional Development and Teaching Efficacy**

 While demographic factors such as age, gender, and teaching experience are commonly analyzed in relation to PD and teaching efficacy, their influence remains debated. Yoon and Kim (2022) suggest that while demographics provide context, they are not definitive predictors of teacher development or efficacy. Some studies, like Figland et al. (2019), argue that professional needs vary by career stage. However, Coppe et al. (2024) and Kim et al. (2023) contend that instructional challenges are generally universal, and effective PD should address these broadly rather than segmenting based on age or experience.

 Teaching efficacy appears to be shaped more by mastery experiences and supportive environments than by demographic characteristics. Kleppang et al. (2023) and Yoo (2016) maintain that ongoing professional learning and systemic support play a more crucial role than tenure or age in shaping efficacy beliefs. Clark and Newberry (2018), referencing Bandura’s theory, further argue that efficacy is more influenced by environmental and experiential factors than by demographic ones.

 Gender-related findings are more nuanced. Mitton-Kukner (2020) and Godara (2024) suggest that gender roles and societal expectations can impact access to PD opportunities and influence confidence levels. Conversely, studies like Lysinge (2019) and Haverback (2022) report no significant gender-based differences in efficacy levels, reinforcing Bandura’s assertion that self-efficacy stems from universally accessible experiences such as modeling, feedback, and personal mastery.

 Although demographic variables may offer useful insights, Law (2023) and Brien et al. (2023) emphasize that they are not the strongest determinants of professional development or teaching efficacy. Instead, access to reflective, collaborative, and sustained learning environments plays a more significant role (Marshall et al., 2022). Given this, the present study investigates not only the level and relationship of professional development and teaching efficacy but also whether significant differences exist across demographic subgroups among MSTM graduates.

**4.MATERIALS AND METHODS**

This section outlines the research design, instruments, participants, and procedures used to examine the relationship between professional development and teaching efficacy among Master of Science in Teaching Mathematics graduates of Davao Oriental State University. A structured and ethical approach was applied to ensure the reliability and validity of the data collected and analyzed.

* 1. **Research Design**

This study used a descriptive-correlational design aimed at understanding the characteristics of variables and exploring the relationships between them (Panniamogan & Dioso, 2024). The primary focus was to determine the significant relationship between professional development and teaching efficacy of Master of Science Teaching Mathematics graduates of Davao Oriental State University. Data collection involved descriptive surveys, using questionnaires to assess graduates’ professional development and their teaching efficacy.

* 1. **Research Instrument**

Two sets of questionnaires were used in this study. The questionnaire for professional development was based on five indicators—relevance to teaching practice, improvement in teaching skills, reflection and growth, collaboration and peer learning, and support and implementation—and was adapted from Mallilin and Laurel (2022). The questionnaire for teaching efficacy was also anchored on five indicators—classroom management efficacy, instructional strategies efficacy, student engagement efficacy, efficacy in assessing student understanding, and efficacy in meeting diverse student needs—and was adapted from Mohammad et al. (2011). In both questionnaires, respondents were asked to place a check mark in the box corresponding to their degree of agreement, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

* 1. **Respondents of the Study**

There are 65 graduates of the Master of Science in Teaching Mathematics (MSTM) program at Davao Oriental State University (DOrSU) from 2003 to 2024. However, only 25 graduates were successfully reached and agreed to participate in the study. This deviation from the total population is acceptable in cases involving small population sizes (Saunders, Lewis, & Thornhill, 2019).

* 1. **Data Gathering**

This study employed a systematic procedure to ensure the accurate collection and analysis of data. The process began with securing clearance from the Research Ethics Board, which reviewed and validated the ethical considerations of the survey instrument. Following this, a formal letter of request was prepared and submitted to obtain permission to conduct the study. This letter, requiring an official signature, signified authorization to proceed and ensured that participants were adequately informed and protected throughout the research process.

Upon receiving approval, the survey questionnaires were distributed to identified graduates of the Master of Science in Teaching (MST) program majoring in Mathematics. The data collected from the completed questionnaires underwent thorough analysis, utilizing appropriate statistical and analytical methods. The researcher systematically described and summarized the data to ensure clarity, accuracy, and comprehensiveness.

Findings were presented objectively, without manipulation, and organized in a manner that promotes transparency and ease of interpretation. This rigorous and ethical approach to data collection and analysis reinforces the integrity of the research process and supports the reliability of its results.

5. results and discussion

This chapter presents the findings of the study based on the data gathered from the MSTM graduates of Davao Oriental State University. The results are organized according to the research objectives, highlighting the levels of professional development and teaching efficacy, the relationship between these variables, and the influence of demographic factors such as age, gender, and teaching experience.

**5.1. RESULTS**

This section presents the analyzed data collected from MSTM graduates of Davao Oriental State University. The results are systematically arranged according to the study’s objectives, detailing the levels of professional development and teaching efficacy, the correlation between the two variables, and the differences observed across demographic groups. Descriptive and inferential statistics are used to summarize and interpret the findings.

**5.1.1. Level of Professional Development**

 Table 1 presents the summary of the professional development of MST Mathematics graduates based on the survey conducted by the researcher. The table includes five indicators: relevance to teaching practice; improvement in teaching skills; reflection and growth; collaboration and peer learning; and support and implementation. Frequencies and percentages per response category were also considered to provide a more detailed view of participants’ responses.

The findings reveal that the overall level of professional development among MST Mathematics graduates is very high ($\overbar{x}= 4.33$,$s=0.41$), indicating that the measures described in the items were manifested at all times. This result is consistent with Ho et al. (2023), who emphasized the importance of equipping teachers with up-to-date skills to meet evolving educational demands and improve student outcomes.

Results revealed that relevance to teaching practice ($\overbar{x} = 4.41$, $s=0 .50$) and improvement in teaching skills ($\overbar{x} = 4.40$, $s = 0.52$) were rated very high, indicating that the professional development (PD) activities were timely and aligned with instructional needs. This supports the findings of Juma (2024) and Mustafa & Paçariz (2021), who emphasized the importance of aligning PD with classroom realities, particularly in mathematics education, where innovative strategies like problem-based learning are essential (Gradini et al., 2024).

 Reflection and growth received the highest rating ($\overbar{x} = 4.44$, $s= 0.43$), highlighting the graduates’ strong commitment to continuous improvement. This is consistent with Alnijres (2024) and Zakaria (2020), who identified reflection as a key factor in teacher development, though challenges in institutional support persist (Machost & Stains, 2023).

 Collaboration and peer learning also scored high ($\overbar{x} = 4.35$, $s = 0.44$), affirming the value of professional dialogue in enhancing teaching practices (Wagner et al., 2019). However, institutional constraints like time and support can limit its effectiveness (Pannell et al., 2019).

 Support and implementation received the lowest, though still high, rating ($\overbar{x}= 4.04$, $s = 0.78$), indicating a gap in sustained follow-up. This aligns with Sandholtz et al. (2023), who stressed that without continuous support, the impact of PD often diminishes. Strengthening implementation structures remains essential (Lee et al., 2024; Qazi, 2017).

Table 1. Level of the Professional Development based on various indicators (n = 25)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Factors of Professional Development** | **Mean****(**$\overbar{x}$**)** | **Std. Deviation (**$s$**)** | **f(5)** | **%(5)** | **f(4)** | **%(4)** | **f(3)** | **%(3)** | **Level of** **Manifestation** |
| A. Relevance to Teaching Practice | 4.41 | 0.50 | 13 | 52% | 11 | 44% | 1 | 4% | Very High |
| B. Improvement in Teaching Skills | 4.40 | 0.52 | 13 | 52% | 11 | 44% | 1 | 4% | Very High |
| C. Reflection and Growth | 4.44 | 0.43 | 9 | 36% | 15 | 60% | 1 | 4% | Very High |
| D. Collaboration and Peer Learning | 4.35 | 0.44 | 10 | 40 | 15 | 60% | 0 | 0 | Very High |
| E. Support and Implementation | 4.04 | 0.78 | 7 | 28% | 12 | 48% | 6 | 24% | High |
| **Overall Professional Development** | **4.33** | **0.41** | **--** | **--** | **--** | **--** | **--** | **--** | **Very High** |

*Note:* *No respondents selected scale points 2 (Disagree) or 1 (Strongly Disagree), hence these are not shown.*

**5.1.2. The Level of Teaching Efficacy**

 Table 2 illustrates the summary of the teaching efficacy. It also has five indicators specifically classroom management, instructional strategies, student engagement, assessing student understanding and meeting diverse student needs. The results were presented using descriptive statistics—mean and standard deviation—alongside frequency and percentage distributions for the response categories 5 (Strongly Agree), 4 (Agree), and 3 (Neutral). No responses were recorded for categories 2 (Disagree) and 1 (Strongly Disagree).

The results indicate that the overall teaching efficacy of MST Mathematics graduates is very high ($ \overbar{x}= 4.46$, $s = .42$), with all indicators scoring high to very high levels of manifestation. This suggests that the graduates possess strong self-beliefs in their ability to effectively teach and support student learning—an essential factor in academic achievement, especially in mathematics (Küçükalioğlu & Tuluk, 2021).

 Classroom management was rated very high ($\overbar{x} = 4.49, s = .52$), aligning with studies that link effective classroom control to improved student engagement and learning outcomes (Paulines & Tantiado, 2024; Varszegi, 2022). High classroom management skills also reflect stronger teacher efficacy, which helps minimize disruptions and maintain focus, especially in mathematics classes (Shah, 2023; Yadav, 2021).

 Instructional strategies also received a very high rating ($\overbar{x} = 4.52, s = .45$), supporting findings that confident teachers tend to use innovative methods such as inquiry-based and collaborative learning (Jagnandan et al., 2024; Lee & Paul, 2023). These strategies are particularly valuable in mathematics, where engaging tools and differentiation enhance understanding (Hettinger et al., 2022; Bachtiar, 2024).

 Student engagement scored very high ($\overbar{x} = 4.45, s = .54$), consistent with evidence that teacher self-efficacy drives student motivation and participation (Zimu, 2024). Highly efficacious teachers often adopt interactive, student-centered approaches that boost interest and retention in math (Hidayatullah et al., 2024).

 Assessing student understanding was also rated very high ($\overbar{x} = 4.37, s = .55$), reinforcing the importance of formative assessments and authentic evaluation practices (Tashiro et al., 2021; Lumpkin, 2022). When used effectively, these tools help teachers adjust instruction to meet learners’ needs (Oliveira & Henriques, 2021; Gallavan, 2020).

 Efficacy in meeting diverse student needs scored very high ($\overbar{x} = 4.47, s = .54$), indicating graduates’ confidence in handling varied learners. However, this area remains challenging due to resource constraints and the complexity of inclusive teaching (Ranbir & Education, 2024; Meng, 2024). Addressing diverse needs requires differentiated strategies and systemic support (Devi, 2023).

Table 2. Level of Teaching Efficacy based on various indicators (n = 25)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Indicator** | **Mean****(**$\overbar{x}$**)** | **Std. Deviation****(**$s$**)** | **f(5)** | **%(5)** | **f(4)** | **%(4)** | **f(3)** | **%(3)** | **Level of Manifestation** |
| A. Classroom Management | 4.49 | .52 | 15 | 60% | 9 | 36% | 1 | 4% | Very High |
| B. Instructional Strategies | 4.52 | .45 | 12 | 48% | 12 | 48% | 1 | 4% | Very High |
| C. Student Engagement | 4.45 | .54 | 16 | 64% | 8 | 32% | 1 | 4% | Very High |
| D. Assessing Student Understanding | 4.37 | .55 | 10 | 40% | 12 | 48% | 3 | 12% | Very High |
| E. Meeting Diverse Student Needs | 4.47 | .54 | 13 | 52% | 11 | 44% | 1 | 4% | Very High |
| **Overall Teaching Efficacy** | **4.46** | **.42** | **--** | **--** | **--** | **--** | **--** | **--** | **Very High** |

*Note:* *No respondents selected scale points 2 (Disagree) or 1 (Strongly Disagree), hence these are not shown in the table.*

**5.1.3. The Relationship Between Professional Development and Teaching Efficacy**

 Table 3 shows the relationship between professional development indicators and teaching efficacy indicators among MST Mathematics graduates using Pearson's r correlation coefficients. The findings revealed that professional development (PD) has varying degrees of correlation with different dimensions of teaching efficacy. Notably, the highest correlation was observed between support and implementation and both student engagement ($r = 0.47, P = 0.02$) and teaching efficacy as a whole ($r = 0.37, P = 0.07$), both of which were interpreted as moderate relationships. These findings support the assertion by Walters (2023) that effective PD must be practical and continuous, addressing the actual challenges teachers face. The result implies that when PD initiatives are well-supported and implemented, they significantly enhance teachers’ ability to engage students and apply teaching strategies more confidently and effectively.

 Additionally, improvement in teaching skills showed moderate correlations with instructional strategies ($r = 0.36$), student engagement ($r = 0.33$), and teaching efficacy ($r = 0.37$), albeit not all were statistically significant. This aligns with Darling-Hammond et al. (2020) and Cevik et al. (2021), who argue that PD programs that improve instructional skills positively influence efficacy, particularly in complex content areas like mathematics. These skills appear to bolster confidence in applying instructional methods, a key tenet of Bandura's Social Cognitive Theory, as internal beliefs influence how new knowledge is integrated into practice.

 The results also suggest that relevance to teaching practice was moderately correlated with efficacy in meeting diverse student needs ($r = 0.42, P = 0.04$). This supports Copur-Gencturk (2019), who emphasized the value of aligning PD with actual classroom needs to boost efficacy. When PD content is clearly connected to teaching realities, teachers are more likely to apply it effectively, especially in differentiated instruction.

 In contrast, the reflection and growth dimension of PD showed no correlation or weak correlation with all dimensions of teaching efficacy. This finding diverges from studies by Wang (2023), which found that reflective practices enhance efficacy. This may indicate that reflective components of PD in the local context may be underdeveloped or not meaningfully integrated into daily teaching, thus having minimal impact.

 Furthermore, collaboration and peer learning were weakly correlated with all aspects of teaching efficacy (highest $r = 0.25$). While collaboration is known to foster a supportive teaching community (Juma, 2024), the weak relationship here may reflect a lack of structured or impactful collaborative PD efforts at DOrSU. This emphasizes the need for more intentional peer mentoring or team-based learning in professional development models.

 Overall, the results show a moderate positive correlation ($r = 0.35$) between professional development and teaching efficacy, though not statistically significant ($P= 0.09$). This implies a tendency for greater professional development to be linked with higher teaching efficacy, though not conclusively in this sample. Still, the finding is consistent with research highlighting that reflective and collaborative PD can boost instructional skills and confidence (Darling-Hammond et al., 2020; Walters, 2023). Teachers with stronger self-efficacy are also more likely to apply new strategies effectively (Wang, 2023; Yang, 2019), suggesting that professional development remains a potentially valuable contributor to teaching efficacy.

Table 3. The Relationship Between Professional Development and Teaching Efficacy

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables** | **Classroom Mgt.** | **Instruc’l Strategies** | **Student Engagement** | **Assessing Student Understanding** | **Meeting Diverse Student Needs** | **Teaching Efficacy** |
| **Relevance to Teaching Practice** | Pearson Correlation | 0.11 | 0.11 | 0.23 | 0.04 | 0.42 | 0.23 |
| Sig. (2-tailed) | 0.61 | 0.58 | 0.26 | 0.86 | 0.04 | 0.27 |
| Interpretation | Weak | Weak | Weak | Negligible | Moderate | Weak |
| **Improvement in Teaching Skills** | Pearson Correlation | 0.20 | 0.36 | 0.33 | 0.30 | 0.33 | 0.37 |
| Sig. (2-tailed) | 0.34 | 0.08 | 0.10 | 0.14 | 0.10 | 0.07 |
| Interpretation | Weak | Moderate | Moderate | Moderate | Moderate | Moderate |
| **Reflection and Growth** | Pearson Correlation | 0 | 0.16 | 0.80 | 0.12 | 0.10 | 0.11 |
| Sig. (2-tailed) | 0.99 | 0.46 | 0.70 | 0.57 | 0.64 | 0.60 |
| Interpretation | No Correlation | Weak | Negligible | Weak | Weak | Weak |
| **Collaboration and Peer Learning** | Pearson Correlation | 0.15 | 0.10 | 0.07 | -0.04 | 0.25 | 0.13 |
| Sig. (2-tailed) | 0.46 | 0.62 | 0.74 | 0.84 | 0.23 | 0.53 |
| Interpretation | Weak | Weak | Negligible | Negligible | Weak | Weak |
| **Support and Implementation** | Pearson Correlation | .05 | .27 | .47 | .22 | .48 | .37 |
| Sig. (2-tailed) | .80 | .20 | .02 | .28 | .02 | .07 |
| Interpretation | Negligible | Weak | Moderate | Weak | Moderate | Moderate |
| **Professional Development** | Pearson Correlation | .13 | .28 | .36 | .19 | .45 | .35 |
| Sig. (2-tailed) | .53 | .18 | .08 | .37 | .03 | .09 |
| Interpretation | Weak | Weak | Moderate | Weak | Moderate | Moderate |

*Table 3. Correlation Matrix between Professional Development and Teaching Efficacy Indicators. Note: This table presents Pearson correlation coefficients (r) and their significance values (P).*

**5.1.4. Differences on Professional Development**

 Table 4 presents the demographic profile of the respondents in terms of age and teaching experience. Most of the respondents are aged 31–40 years (40%), followed by those aged 21–30 (32%) and 41–50 (28%). Regarding teaching experience, the majority have taught for 6–10 years (36%), while the least have over 16 years of experience (16%). This distribution suggests that most MST Mathematics graduates are in the early to mid-stages of their teaching careers, where ongoing professional development may have significant influence. Gender-wise, a majority of the respondents were female (60%), while males comprised 40%. This distribution reflects the gender makeup of the MST Mathematics alumni who participated in the study.

Table 5 shows the ANOVA result of a professional development when grouped according to age and years of teaching experience. The results presented in Table 4 indicate that there are no significant differences in professional development scores when grouped by age ($F(2, 22) = 0.148, P = .863$) or years of teaching experience ($F(3, 21) = 0.13, P = .941$). This suggests that professional development perceptions or engagement levels among MST Mathematics graduates are consistent regardless of their age or the length of their teaching careers Chit & Ye (2017). Such findings support the argument that professional development needs tend to be broadly similar across different career stages and age groups. This aligns with Kim et al. (2023), who noted that effective professional development should be inclusive and address universal instructional challenges rather than be limited by demographic factors such as age or experience.

Table 4. Distribution of Respondents by Age, Teaching Experience, and Gender

|  |  |  |  |
| --- | --- | --- | --- |
| **Profile Variable** | **Category** | **Frequency (f)** | **Percentage (%)** |
| **Age** | 21–30 years old | 8 | 32% |
|  | 31–40 years old | 10 | 40% |
|  | 41–50 years old | 7 | 28% |
| **Total** |  | 25 | 100% |
| **Years of Teaching Experience** | 1–5 years | 6 | 24% |
|  | 6–10 years | 9 | 36% |
|  | 11–15 years | 6 | 24% |
|  | 16 years and above | 4 | 16% |
| **Total** |  | **25** | **100%** |
| **Gender** | Male | 10 | 40% |
|  | Female | 15 | 60% |
| **Total** |  | 25 | 100% |

Table 5. Professional Development Scores According to Age and Years of Teaching Experience

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Profile Variable** | **Test** | **df (Between, Within Groups)** | ***F*-value** | ***P*-value** |
| Age | ANOVA | (2, 22) | .148 | .863 |
| Years of Teaching Experience | ANOVA | (3, 21) | .131 | .941 |

 Table 6 shows a statistically significant difference in professional development scores based on gender ($t(23) = -2.85, P = .009$). Among the 25 participants, 10 (40%) were male and 15 (60%) were female. This indicates that male and female teachers perceive or engage with professional development differently, with the mean difference suggesting that male scores lower on professional development measures than female. This finding is consistent with research by Mitton-Kukner (2020), who emphasized that gender roles and societal expectations can influence participation in professional learning activities. It suggests that professional development programs may need to consider gender-specific factors to ensure equitable access and engagement.

Table 6. Professional development Scores According to Gender

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Profile Variable** | **Test** | **df** | ***t*-value** | ***P*-value** | **Mean Difference** | **Std. Error** | **95% Confidence Interval** |
| Gender | *t*-test | 23 | -2.848 | .009 | -.406 | -.14 | [-.70, -.11] |

**5.1.5. Differences on Teaching Efficacy**

Table 7 indicates the results of teaching efficacy based on age and years of teaching experience. Among the 25 respondents, 8 (32%) were aged 25-30 years, 10 (40%) were aged 31-35 years, and 7 (28%) were aged 36 years and above. Regarding teaching experience, 6 (24%) had 1-3 years, 8 (32%) had 4-6 years, 7 (28%) had 7-9 years, and 4 (16%) had 10 years or more of teaching experience.

The results show that there are no statistically significant differences in teaching efficacy when grouped by either age ($F(2, 22) = 1.55, P = .236$) or years of teaching experience ($F(3, 21) = 0.83, P = .49$). This means that, on average, teachers across different age groups and experience levels feel similarly confident in their teaching abilities, classroom strategies, and ability to engage students.

These findings support the idea that teaching efficacy may be shaped more by ongoing professional development and support systems rather than just age or experience (Yoo, 2016). According to Clark and Newberry (2018), teaching efficacy is strongly influenced by mastery experiences, feedback, and contextual support — which are not always tied to how long someone has been teaching.

Table 7. Teaching Efficacy Scores According to Age and Years of Teaching Experience

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Profile Variable** | **Test** | **Df (Between, Withing Groups)** | ***F*-value** | ***P*-value** |
| Age | ANOVA | (2, 22) | 1.55 | .236 |
| Years of Teaching Experience | ANOVA | (3, 21) | .83 | .49 |

 Table 8 illustrates the findings of teaching efficacy according to gender. Of the 25 respondents, 14 (56%) were female and 11 (44%) were male. The t-test result for teaching efficacy based on gender shows no significant difference between male and female teachers ($t(23) = -0.81, P = .425$). This means that, on average, both genders report similar levels of confidence in their teaching strategies, classroom management, and student engagement.

 Multiple studies found no significant differences between male and female teachers' efficacy scores (Lysinge, 2019). As Haverback (2022) emphasized through the lens of Social Cognitive Theory, self-efficacy develops from mastery experiences, vicarious learning, and feedback, which are accessible to teachers regardless of gender.

Table 8. Teaching Efficacy Scores According to Gender

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Profile Variable** |  | **Test** | **df** | ***t*-value** | ***P*-value** | **Mean Difference** | **Std. Error** | **95% Confidence Interval** |
| Gender |  | *t*-test | 23 | -.81 | .425 | -.138 | .17 | [-.11, .21] |

6. Conclusion

This study examined the professional development and teaching efficacy of graduates of the Master of Science in Teaching (MST) major in Mathematics program at Davao Oriental State University, guided by Albert Bandura’s Social Cognitive Theory. The study was grounded in the principle that personal, behavioral, and environmental factors interact to shape professional growth and efficacy in teaching. Specifically, it aimed to determine the graduates' levels of professional development and teaching efficacy, the relationship between these two variables, and whether significant differences exist in their perceptions based on demographic factors such as age, gender, and teaching experience.

 Findings showed that graduates reported a high level of professional development, particularly in areas supporting teaching relevance, reflection, and collaboration. However, slightly lower ratings in support and implementation point to the need for stronger institutional backing to fully realize the benefits of professional learning. Similarly, graduates demonstrated high level of teaching efficacy, suggesting that the MST program effectively prepares educators for classroom instruction and student engagement.

 The study further established a moderately positive correlation between professional development and teaching efficacy. This finding confirms that relevant, well-supported, and skill-oriented professional learning contributes significantly to teachers’ sense of competence and effectiveness. Nonetheless, the variation in correlation strength across specific dimensions suggests that the influence of professional development is complex, and not all aspects translate equally into teaching efficacy. This highlights the importance of designing development activities that are closely aligned with the actual demands of classroom practice.

 Demographic analysis showed no significant differences in the level of professional development across age groups and years of teaching experience, indicating that professional learning engagement is relatively uniform among MST graduates regardless of their career stage. However, a significant difference emerged based on gender, suggesting that male and female teachers may experience or perceive professional development differently, possibly due to societal expectations or access-related factors. In contrast, teaching efficacy did not significantly differ by age, gender, or teaching experience, implying that efficacy is shaped more by internal beliefs, professional training, and contextual support rather than demographic variables.

In conclusion, the MST Mathematics program appears to provide its graduates with strong foundations for both professional growth and effective teaching. The study reinforces the importance of continuous, relevant, and well-supported professional development in enhancing teaching efficacy. It also underscores the role of institutional support, gender sensitivity in professional learning, and the need for practical alignment of development activities with classroom realities. These insights can guide curriculum developers, educational leaders, and policymakers in strengthening teacher preparation and support systems, ultimately contributing to improved teaching outcomes and student learning.

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ETHICAL APPROVAL

Before collecting data, the necessary permits to conduct the study were secured from the appropriate offices and authorities. Once approval was obtained, the researchers proceeded with the distribution of questionnaires.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

The authors declare that generative AI technology, specifically GPT-4 developed by OpenAI, was solely utilized to enhance grammar, clarity, and the overall structure of sentences and paragraphs in this manuscript.

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