

Sources of self-efficacy of science teachers

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ABSTRACT

The purpose of this study was to determine the four sources of self-efficacy (mastery experience, vicarious experience, verbal persuasion and physiological/emotional state) of science teachers of the Division of Cebu City, S.Y. 2018-2019. A descriptive research design was used to find out the sources of self-efficacy of respondents using the self-made, modified questionnaires and the profile of the respondents. The findings of the present study showed that respondents sources of self-efficacy were very high efficacy. More importantly, physiological/emotional state was found to be the main predictor for science teacher's achievement in science teaching. There was no significant relationship between the respondents' profile and their mastery experience, vicarious experience, verbal persuasion and physiological/emotional state. The study concluded that science teacher's self-efficacy in terms of mastery experience, vicarious experience, verbal persuasion and physiological/emotional state influence teachers' performance in the teaching- learning process.

Keywords: Self-efficacy, science teachers, physiological/emotional state.

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INTRODUCTION

Life is full of challenges and adversities that require a high level of self-efficacy in order to help a person deal with difficulties more effectively. Self-efficacy is the feeling of trust that an individual can influence the conditions that affect his life. It is a domain-specific belief in one's competence to successfully perform a task, describing one's own capability to deal with various situations, and playing a role not only in how a person feels about oneself but also in whether or not one successfully achieves goals in life (Pajares, 2003). A teacher's self-efficacy implies a complementary importance to one's well-being, job satisfaction, teaching behavior, and students' learning outcomes, and conforms to the different teaching practices, approaches, and aspects of quality teaching (Scherer, 2016). Within the Division of Cebu City, the crucial role of teachers in improving the quality of the teaching and learning process has been consistently emphasized in conferences and meetings of the program education supervisor in science, where it has been reiterated that good teachers are vital to raising student achievement. Classroom observation records reveal that efficacious or confident teachers demonstrated glamorized lessons, in-depth knowledge of the subject matter, well-prepared

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instructional materials, and a vast variety of differentiated instructions, resulting in meaningful learning experiences as manifested by student engagement. In contrast, less efficacious teachers rendered classroom observations ceremonial in nature, seldom focused on student learning, and relied largely on accomplishing the competency of the lesson, ultimately leading to poor performance in science. These observations underscore the practical urgency of understanding the sources from which science teachers draw their sense of professional confidence, and thus provided the impetus for the present study.

The theoretical foundation of this study rests on the Social Cognitive Theory of Albert Bandura (1987), which holds that social and cognitive factors, as well as behavior, play important roles in learning. Central to this framework is the concept of self-efficacy, defined as the belief that one can master a situation and produce positive outcomes. Bandura identified four main sources through which self-efficacy beliefs are developed and strengthened. Mastery experiences, or past performances, are the most effective means of building a strong sense of self-efficacy, as successful experiences increase the likelihood that a person will repeat or extend a given behavior. Vicarious experiences arise from observing people around oneself, particularly role models, whose sustained effort and success raise an individual's belief in their own capacity to master activities needed for success. Verbal persuasion, linked to influential people in one's life, strengthens the belief that one possesses the capabilities to succeed, making a person more likely to sustain effort when problems arise. The fourth source involves physiological and emotional states, through which individuals learn to interpret their arousal as indicators of personal competence by evaluating their performance under differing conditions. Conforming to this theory, self-efficacy refers to a future-oriented belief about the level of competence a person expects to display in a given situation (Tschannen-Moran, 2001), and these beliefs affect thought patterns, belief systems, and emotional reactions that shape how people pursue goals, persist in the face of obstacles, cope with setbacks, and exercise control over situations that influence their lives.

Rooted in the same social cognitive tradition, Bandura (1986, p. 25) emphasized that individuals are agents proactively engaged in their own development and that what people think, believe, and feel affects how they behave. Although nearly all people can identify goals they wish to accomplish and changes, they would like to make, putting these plans into action is rarely straightforward (Ackerman, 2019). Developing a strong sense of self-efficacy plays an important role in almost every aspect of life, as one's belief in one's abilities can predict levels of motivation, self-regard, and effort invested in achieving goals (Cherry, 2019). An individual's mood can greatly affect judgments of self-efficacy (Velthuis et al., 2015), and people who are low in self-efficacy tend to perceive difficult tasks as threats to be avoided, set fewer goals, demonstrate low commitment, give up quickly when setbacks occur, and are more vulnerable to feelings of failure and depression (Harrison, 2010). High self-efficacy, by contrast, can serve as a proactive factor against anxiety and depression, while low self-efficacy is strongly related to anxiety and neuroticism (Muris, 2002). Supportive messages from trusted others can bolster effort and confidence, particularly when accompanied by conditions and instruction that facilitate success (Hattie and Timperley, 2007), and strong emotional reactions to tasks can either undermine or enhance self-efficacy depending on how they are interpreted.

Complementing Bandura's framework, Alderfer's ERG theory situates human motivation within three core need groups: existence, relatedness, and growth. Existence needs encompass the basic physiological and safety requirements prerequisite to survival, while relatedness needs refer to the desire to maintain important interpersonal relationships including acceptance, belongingness, friendship, shared goals, and recognition from a social network. Positive relationships increase the likelihood that a person will succeed and develop (Stipek, 2006). Growth needs, emanating from internal esteem and self-actualization, impel a person to make creative and productive contributions to themselves and their environment through

personal development, self-fulfillment at work, and professional growth. This framework resonates with research showing that teachers who care about their students, who demonstrate democratic interaction styles, develop expectations in light of individual differences, model a caring attitude toward their own work, and provide constructive feedback, motivate students to learn and achieve (Samillano, 2017). Teacher motivational behavior, in turn, influences students' academic achievements by affecting their emotional state, goal setting, and persistence, which shape students' intrinsic motivation and academic outcomes (You et al., 2015).

Vroom's Expectancy Theory further enriches this theoretical landscape by explaining how individuals choose among alternative courses of action based on what they expect the results of those actions will be. According to this theory, motivation is a product of the individual's expectancy that a certain effort will lead to intended performance, the instrumentality of this performance in achieving a certain result, and the desirability of that result for the individual. The theory assumes that people join organizations with prior expectations shaped by their needs, motivations, and experiences; that behavior is a result of conscious choice; that people want different things from organizations; and that individuals choose alternatives that optimize their personal outcomes. Vroom recognized that employee performance is based on individual factors such as personality, skills, knowledge, experience, and abilities, and he used the variables of expectancy, instrumentality, and valence to account for motivational differences. Experience affirms that no one willingly undertakes a task when expectations of success are very poor, and similarly, nobody begins a task without some anticipation of satisfactory experience during its performance, confirming that motivation is an important indicator of success (Pintrich and Schunk, 1996). Taken together, these three theoretical frameworks converge on a common principle: that beliefs about one's capabilities, the quality of interpersonal relationships, and the anticipated value of outcomes all interact to shape performance and persistence in professional and academic contexts.

The literature across multiple educational contexts consistently affirms the significant consequences of self-efficacy for teaching practice and student outcomes. Teacher efficacy, defined as teachers' belief in their ability to have a positive effect on student learning (Ashton, 1985), has been positively associated with many effective teaching practices, characteristics, and qualities (Schoon and Boone, 1998). Teachers with high self-efficacy are more willing to participate in difficult tasks, persist longer, and work harder (Brunning and Horn, 2000). They tend to perceive themselves as capable of regulating teaching, set challenging personal goals, and hold an expectation rather than merely a longing to succeed in teaching students and managing them effectively, a disposition that affects their interpretation of successes and disappointments, the approaches they engage to cope with challenges, and the standards they set for themselves (Ross, 1992). Importantly, strong self-efficacy beliefs have been associated with less stress and burnout among teachers, increased job satisfaction, and improved instructional practices linked to student achievement (Ross, 1998). High self-efficacy acts as an effective barrier between job stress, job dissatisfaction, and burnout (Schwarzer and Hallum, 2008), and generally, when teachers believe in their ability to effectively instruct students and adapt lessons to individual needs, they demonstrate a greater and higher level of overall self-efficacy related to teaching (Skaalvik and Skaalvik, 2007).

Self-efficacy also interacts closely with motivation, and teachers will tend to perform well when they are motivated and believe in their own potential, a belief considered critical and vital for students' overall performance in class (Egger and Kauchak, 2004). Teachers who reported perceiving themselves as capable of reaching even the most difficult or unmotivated students demonstrated a sense of control over issues that sometimes negatively impact learners

(Tschannen et al., 1998). The implications of teacher self-efficacy are extensive, with evidence of increased productivity, effective teacher behavior, and positive impacts on school culture and organizational effectiveness among teachers with higher efficacy beliefs. Pajares and Schunk (2001) found that a strong sense of self-efficacy enhances human well-being, influencing the amount of stress and anxiety people experience as they engage in activities. Although empirical evidence supports the positive effects of self-efficacy beliefs on well-being, experience, and satisfaction (DeWitz and Walsh, 2002), the motivational mechanisms mediating the self-efficacy and satisfaction relationship remain an area requiring further investigation. Dull et al. (2005) similarly pointed out that self-efficacy plays an ongoing role in the learning process, influencing motivation, goal orientation, and academic performance, and can change in response to circumstances, lending support to the concept of self-efficacy as an important adaptive outcome. Maddux and Meier (1995) further attested that a strong self-efficacy helps individuals approach challenging situations without experiencing incapacitating anxiety and confusion.

Beyond the four sources identified by Bandura, the amount of science content knowledge is recognized as an important predictor for science teaching self-efficacy, particularly for personal science teaching efficacy, with high science knowledge corresponding to high personal self-efficacy scores for teaching science (Rohann et al., 2010). Mastery of subject matter boosts teacher confidence and reflects the quality of instruction delivered. The curricula of science education are considered a vital tool for scientific and technological development, and learners in science are expected to be equipped with 21st century skills and competencies, with STEM education placed at the centerpiece of contemporary schooling. Duffy (2011) found that STEM classes added to students' overall sense of accomplishment and self-confidence as they progressed through college, with the most common student response reflecting certainty in their ability to succeed. Bergen (2013) similarly argued that a major focus of instruction should shift toward improving students' level of self-efficacy by providing them with a more realistic view of their skills, which in turn bolsters their belief in and actual ability to face problems, representing the best life skill to internalize and generalize.

Research on student-level self-efficacy echoes the patterns observed at the teacher level, with consistent evidence that self-efficacy shapes academic motivation, goal orientation, and achievement. Students with high self-efficacy tend to perceive themselves as capable of regulating learning, set challenging personal goals, and make choices based on confidence in their abilities, including selecting rigorous coursework with the confidence to complete challenging material (Pajares and Schunk, 2002). Students with low self-efficacy may perceive tasks as more difficult than they are and give up prematurely (Williams and Williams, 2010). Schunk (1991) noted that students with high self-efficacy recognize the importance of academic goals, embrace new experiences, and diligently work to prove their intelligence, and tend to demonstrate higher optimism, better academic performance, more effective personal judgment, better coping with stress, better health, and higher overall satisfaction and commitment to school (Chemers and Hu, 2001). Students with lower self-efficacy, by contrast, assume that intelligence cannot be improved, feel unable to succeed, and are less likely to target any kind of goal.

Among the four sources of self-efficacy, mastery experience has consistently emerged as the strongest predictor of academic performance. Loo and Choy (2013) found that self-efficacy sources were correlated with mathematics achievement scores and cumulative GPA, with mastery experience identified as the main predictor for academic achievement in mathematics and related engineering modules. Arslan (2012) similarly reported that performance accomplishments were the strongest predictor of students' self-efficacy beliefs for learning and performance, accounting for 36.7% of the variance, while vicarious experiences and verbal persuasion accounted for only 2.1% of the total variance. Gore (2006) found that

academic self-efficacy beliefs could be used to predict college students' academic performance and persistence, and that students need feedback on both social and academic performance before they can realistically assess their ability to achieve academic goals. Zajacova and Espenshade (2004) demonstrated that self-efficacy is related to higher first-year college GPA, more credits earned, and higher retention rates, and that even when students face the stresses of higher education, high self-efficacy acts as a protective factor and motivator.

The role of vicarious experience and social persuasion in shaping self-efficacy has likewise received sustained empirical attention. Ringle and Zimmerman (1981) found that observing a low-persistent but confident model raised children's self-efficacy, while observing a pessimistic model who persisted for a long time lowered it. Walker (1986) demonstrated that exposing low-achieving children to models explaining mathematical division while providing feedback and stressing the importance of ability and effort had a positive effect on self-efficacy. Hibbs (2012) noted that a student's sense of self-efficacy is more positively impacted by others who experience success when common characteristics such as age, gender, and perceived similar abilities are shared, and that anxiety and stress lower self-efficacy while excitement and positive mood increase it. Jungert and Anderson (2013) confirmed that children without learning disabilities had significantly higher self-efficacy in mathematics than those with disabilities, and that improving a student's ability to accurately assess their abilities in a content area will improve performance, with specific content programs and meaningful teacher interactions serving to improve self-efficacy beliefs (Bandura, 1997).

With regard to verbal persuasion and its role in teacher-student interactions, the feedback that teachers give students and the manner in which it is presented constitute an important source of self-efficacy (Klassen and Lynch, 2017). Kieffer and Henson (2000) found that all four sources of self-efficacy significantly predicted teacher efficacy scores, with social persuasion emerging as the strongest predictor in that context. Research on the Pygmalion effect further supports the importance of verbal persuasion, as Kurose (2013) defined it as a form of self-fulfilling prophecy in which a leader's expectations for a subordinate's performance lead the subordinate to perform in line with those expectations. When a principal has confidence in a teacher's ability, that teacher tends to perform at a higher level than would otherwise be the case, and the explanation lies in the subordinate internalizing the leader's expectations, which in turn influences self-efficacy and actual performance.

Physiological and emotional states, the fourth source, have been found to significantly moderate the relationship between self-efficacy and performance. High anxiety can undermine self-efficacy, as people who experience dread when approaching a task tend to interpret their apprehension as evidence of lack of skill, while increasing physiological and emotional well-being and reducing negative emotional states strengthens self-efficacy (Hattie and Timperley, 2007). An individual's mood can greatly affect judgments of self-efficacy (Velthuis et al., 2015), and Bergen (2013) noted that few qualitative studies have examined how early teacher-student interactions can improve or impede the formation of sufficient self-efficacy, pointing to a gap that continues to warrant scholarly attention. Kelchtermans, Piot, and Ballet (2011) added that monitoring student participation through daily drills and frequent diagnostic exercises serves as an avenue for evaluating performance and provides the feedback necessary for modifying strategies to enhance future outcomes.

A study oversight by Ulriksen (2013) proved that self-efficacy was negatively related to fear of failure in examinations, with science students who feared failing finding it difficult to develop confidence to achieve better results. Domenech-Betoret et al. (2014) found that students' academic self-efficacy had a significant and direct effect on achievement expectations and learning engagement in a university context, while Bong et al. (2012) confirmed that task

value and test anxiety significantly mediated the relationships of self-efficacy to achievement. Betoret et al. (2017) noted that although considerable evidence supports the direct effects of self-efficacy on academic achievement, very few studies have explored the motivational mechanisms that mediate this relationship, representing a continuing gap in the literature. Schunk (2008) confirmed across both cognitive and sport domains that self-efficacy helps predict motivation and performance regardless of domain, and that interventions involving models, goal setting, and feedback can affect self-efficacy, highlighting the important role it plays in learning and training contexts. Harrison (2010) tested the self-efficacy-performance model in a work setting with 776 American university employees and found that performance with computers significantly predicted perceptions of high and low self-efficacy, providing additional support for Bandura's social cognitive theory in applied settings.

Taken as a whole, the body of literature consistently demonstrates that self-efficacy is a multifaceted construct shaped by mastery experiences, vicarious experiences, verbal persuasion, and physiological and emotional states, all of which interact to influence both teacher performance and student achievement. Despite the breadth of research affirming these relationships across general and academic contexts, fewer studies have examined these four sources specifically within the context of science teachers operating under the K to 12 program, particularly at the division level in the Philippine educational setting. The convergence of theoretical frameworks from Bandura, Alderfer, and Vroom, together with empirical findings from diverse educational settings, builds a coherent argumentative foundation for investigating the sources of self-efficacy among science teachers in the Division of Cebu City, and for understanding how these sources may influence the quality of science teaching and the learning outcomes of students.

Statement of the problem

This study determined the sources of self-efficacy of science teachers in the Cebu City Division for School Year 2018 to 2019. The findings served as the basis for a proposed action plan.

Specifically, the study sought answers to the following questions:

1. What is the profile of the respondents in terms of age, gender, highest educational attainment, and years of teaching experience?
2. What are the sources of self-efficacy of science teachers in terms of mastery experience, vicarious experiences, verbal persuasion, and emotional or physiological states?
3. Is there a significant relationship between the respondents' profile and their sources of self-efficacy?
4. Based on the findings of the study, what action plan can be proposed?

METHODOLOGY

This study employed a descriptive research design to determine the sources of self-efficacy of science teachers in the Division of Cebu City for School Year 2018 to 2019. The descriptive method was deemed appropriate given the study's aim to systematically gather, organize, analyze, and interpret data pertaining to the existing conditions and characteristics of the respondents and their self-efficacy sources without manipulating variables or establishing causal relationships.

The study was conducted from December 2018 to February 2019 across three selected secondary public high schools in the Division of Cebu City, namely Talamban National High School, Apas National High School, and Mabolo National High School. These schools were

purposely selected because they offered both the Special Science Class program and the regular program, and because the science program in these institutions is a hands-on program that has primarily resulted in student science achievement across the division. The Special Science Class program is a joint venture between Cebu City and the Division of Cebu City, offering a curriculum similar to that of a science high school. Students admitted to this program are required to have an average grade of 85 and above in English, Science, and Mathematics, and 83 and above in other subjects. Students enrolled in the program must maintain their academic achievement in accordance with the standards of the program, as a failure in one subject disqualifies the student from continued enrollment and results in transfer to the regular classes.

Talamban National High School is located along Borbajo Street, Talamban, Cebu City. The school is managed by one principal and four assisting principals overseeing the junior high school, senior high school, night high school, and the learners' support and operation departments. It has a total of 130 teachers and 3,994 enrollees distributed across 94 sections, 12 of which are under the Special Science Class program and manned by approximately 108 teachers. Students follow a two-shift schedule in which the first shift begins at 6:30 in the morning and ends at 2:45 in the afternoon, while the Special Science Classes begin at 1:45 in the afternoon for the second shift. The school is equipped with three computer laboratory rooms, three science laboratory rooms, and one room for the SPFL Mandarin Class. Apas National High School is situated 150 meters from the main Banilad-Talamban Road and is accessible via the road along the I.T. Park leading to Apas proper. It has 108 teachers and 2,499 enrollees and is managed by one principal and three assisting principals overseeing the junior high school, senior high school, and night high school departments. The school likewise offers the Special Science Class program from Grade 7 through Grade 10. Mabolo National High School, situated within a highly commercialized area along busy and densely populated streets, has a total of 91 teachers and 1,878 enrollees.

The respondents of this study were the science teachers of the three aforementioned secondary public schools in the Division of Cebu City for School Year 2018 to 2019. The total number of respondents was 53, distributed as follows: Apas National High School contributed 17 science teachers, Mabolo National High School contributed 18 science teachers, and Talamban National High School contributed 18 science teachers, yielding the total of 53 respondents. All science teachers in the three schools who were actively teaching science subjects during the school year were included as respondents, making the study a total enumeration of the target population within the selected research locale.

Data were gathered using a self-made and modified survey questionnaire designed to collect information on the teachers' profile and their sources of self-efficacy. The questionnaire on sources of self-efficacy was adapted from a scale originally used to measure the construct in the domain of mathematics, specifically drawing from the standardized factor pattern loadings for final sources of self-efficacy items, and was subsequently modified by the researcher based on Bandura's four factors of self-efficacy. The resulting instrument, entitled Survey on the Sources of Self-Efficacy of Science Teachers on the K to 12 Program Implementation, was composed of 40 items.

Prior to its administration to the actual respondents, the research instrument was pilot tested with twenty secondary school science teachers of Abellana National School who were actively teaching science subjects at the time. The computed Cronbach's Alpha coefficient was 0.7649, indicating that the instrument possessed excellent internal consistency and reliability. The results of the pilot testing were carefully checked, analyzed, and verified, and necessary

revisions were made to improve the phrasing and wording of questionnaire items before the instrument was finalized for administration to the actual respondents.

Respondents rated themselves on each item by checking the column that best described the degree of manifestation of their sources of self-efficacy. Items were measured using a 4-point response scale. A rating of 4, corresponding to the description "Exactly True," was interpreted as Very High Efficacy. A rating of 3, described as "Moderately True," was interpreted as High Efficacy. A rating of 2, described as "Hardly True," was interpreted as Low Efficacy. A rating of 1, described as "Not True At All," was interpreted as Very Low Efficacy.

The data gathering process followed a series of systematic steps. The researcher first planned and modified the questionnaire items, relying primarily on the standardized factor pattern loadings for final sources of self-efficacy as described by Bandura, and introduced slight revisions to item wordings to fit the science teaching context. The revised and modified items were then prepared for printing and reproduction. Following the finalization of the questionnaire, the researcher addressed data permission and distribution. A letter was sent to the Schools Division Superintendent requesting permission to conduct the study, and upon approval, separate letters were sent to the school principals of the three participating schools. With the approval of the respective school principals secured, letters were subsequently sent to the respondents. The researcher requested the list of science teachers for School Year 2018 to 2019 from the administrative clerks of the principals' offices in the respective schools through the schools' department chairs, from which the respondents were identified.

In the distribution and collection of the questionnaires, a complete set of survey questionnaires was brought to each participating school. The researcher personally distributed the letter of permission and a copy of the research questionnaire to the science department coordinators of the respective schools. The coordinators then requested the science teachers to gather in their faculty rooms, and the researcher personally handed the questionnaire to each teacher respondent. The directions and items in the instruments were read and explained carefully and with clarity to the respondents, who were given assurance that their responses would be used solely for the purpose of the study and treated with utmost confidentiality and truthfulness. The data collection process took approximately two weeks. After receiving the accomplished questionnaires from the respondents, the researcher arranged, checked, and verified the correctness and completeness of the data and information supplied.

For the statistical analysis of data, three statistical tools were employed. Frequency count and percentage were used to summarize, analyze, and interpret the profile of the respondents. Weighted mean and ranking were used to summarize, analyze, and interpret the respondents' sources of self-efficacy. Chi-square was used to test the significance of the relationship between the respondents' profile and their sources of self-efficacy.

For the purposes of this study, the key terms are defined as follows. Profile refers to the teachers' age, gender, educational attainment, and years of teaching experience. Proposed Action Plan refers to the proposed recommendations offered by the researcher intended to improve teachers' competence and to provide solutions to prevalent concerns, issues, gaps, and problems encountered. Sources of Self-Efficacy refers to a teacher's personal judgment of one's capability to plan and execute action in terms of mastery experience, vicarious experience, verbal persuasion, and physiological or emotional state.

RESULTS AND DISCUSSION

This chapter presents the results and discussion of data gathered from 53 secondary science teachers across three public high schools in the Division of Cebu City, namely Apas National High School, Mabolo National High School, and Talamban National High School, for School Year 2018 to 2019. The study employed a descriptive research design using a self-

made and modified survey questionnaire composed of 40 items anchored on Bandura's four sources of self-efficacy. Data were analyzed using frequency count and percentage for the respondents' profile, weighted mean and ranking for the sources of self-efficacy, and chi-square for testing the significance of relationships between the respondents' profile variables and their sources of self-efficacy. The results are interpreted in direct relation to the objectives of the study and are discussed in light of relevant theoretical frameworks and scholarly literature.

Profile of the respondents

The profile of the 53 respondents was examined in terms of age, gender, highest educational attainment, and number of years in teaching experience. With respect to age, the largest group of respondents belonged to the 30 to 39 age bracket, comprising 24 respondents or 45.28% of the total. The second largest group consisted of those aged 20 to 29, with 14 respondents or 26.42%, followed by those in the 40 to 49 age bracket at 9 respondents or 16.98%, and those aged 50 to 60, comprising 6 respondents or 11.32%. The concentration of respondents in the 30 to 39 age range suggests that the majority were in the prime years of their teaching career. Many of these teachers were previously employed in private schools before entering government service under the Department of Education. The second highest age group, representing 26.42%, consisted of newly hired teachers who were absorbed into the public school system largely in response to the emerging demands of the Senior High School department under the K to 12 program.

In terms of gender, the respondents were predominantly female, with 42 or 79.25% identifying as female and 11 or 20.75% identifying as male. This distribution reflects the broader trend in the Philippine educational system wherein teaching, particularly at the secondary level, remains a profession predominantly occupied by women.

Regarding highest educational attainment, 33 respondents or 62.26% held master's units, making this the largest category. Seven respondents or 13.21% held a bachelor's degree, while 5 respondents or 9.43% had completed a master's degree and another 5 or 9.43% had earned doctorate units. Three respondents or 5.66% had completed a doctorate degree. The relatively small proportion of doctorate degree holders is attributable to two primary factors: financial constraints and time limitations arising from heavy teaching workloads. Nevertheless, the predominance of respondents pursuing postgraduate studies reflects a broader commitment to professional growth and development, motivated by the desire to elevate their professional standing and to enhance the quality and effectiveness of their teaching practice.

With respect to years of teaching experience, the largest group comprised those with 6 to 10 years of experience, accounting for 15 respondents or 28.30%. Those with 1 to 5 years of experience numbered 14 or 26.42%, followed by those with 11 to 15 years at 10 respondents or 18.87%, those with more than 20 years at 9 respondents or 16.98%, those with 16 to 20 years at 2 respondents or 3.77%, and those with less than 1 year of service at 3 respondents or 5.66%. The notable proportion of respondents with 1 to 5 years of experience reflects the mass hiring initiative undertaken by the Department of Education in conjunction with the implementation of the K to 12 Senior High School program, which necessitated a significant expansion of the teaching workforce. The 5.66% who had less than one year of service were teachers who had recently received their appointments and were still within the introductory period of their government service.

Sources of self-efficacy of the respondents

The 40-item survey instrument yielded item-level mean scores and rankings that provided a detailed picture of how the respondents rated themselves across all four sources of self-efficacy. Among all 40 items, item 7, which pertained to the strong monitoring of student attendance and absences in science classes, obtained the highest mean of 3.62 and was ranked first, interpreted as Very High Efficacy. This result reflects a strong sense of commitment among the respondents to tracking and monitoring student progress in science. Items 32 and 26, ranked second and third respectively, addressed the emotional and physical sensations of teachers in relation to their teaching environment. Item 32, with a mean of 3.55 interpreted as Very High Efficacy, captured the feeling of calm and comfort that respondents experienced simply by being in their science classes, while item 26, with a mean of 3.49 also interpreted as Very High Efficacy, reflected the relaxation that respondents reported feeling as soon as they began teaching science. These items collectively highlight the significance of positive physiological and emotional arousal in reinforcing teachers' readiness and engagement. High emotional arousal, when experienced positively, stimulates bodily action and readiness for activity, which can strengthen the quality of instruction. At the other end of the spectrum, item 29, which stated that teaching science takes all of the respondent's energy, obtained the lowest mean of 2.38 and was ranked 40th, interpreted as Low Efficacy. This single item at the low efficacy level reveals that while science teachers generally feel energized and motivated, the demands of the profession can occasionally surface as a source of strain and exhaustion. Taken as a whole, the item-level results suggest that the respondents' sense of self-efficacy functioned as an internal fuel that sustained their enthusiasm, confidence, and engagement across the teaching task.

On the first subscale, mastery experience, the ten items produced an aggregate mean of 3.09, interpreted as High Efficacy. Item 24, which stated that respondents performed well in science even when they had not studied very hard, obtained the highest mean of 3.42 and was ranked first under this subscale, interpreted as Very High Efficacy. Item 17, which pertained to creating situations that develop a positive attitude among learners toward science, obtained a mean of 3.36 and was ranked second, also interpreted as Very High Efficacy. Item 1, on gauging students' comprehension of what had been taught, obtained a mean of 3.20 and was ranked third, interpreted as High Efficacy. Item 30, pertaining to receiving a very satisfactory performance rating in the RPMS-IPCRF, obtained a mean of 3.11 and was ranked fourth, followed by item 34 on doing well in teaching science with a mean of 3.09 and ranked fifth, and item 6 on describing how to test students' ideas and questions in science with a mean of 3.08 and ranked sixth, both interpreted as High Efficacy. Item 38, on rewarding targeted positive behaviors with incentives, obtained a mean of 3.06 and was ranked seventh, while item 4, on always having been successful with science, obtained a mean of 2.91 and was ranked eighth. Item 19, on doing well even on the most difficult science topics, obtained a mean of 2.87 and was ranked ninth, while item 13, on making excellent questions on science tests, obtained the lowest mean of 2.83 under this subscale and was ranked tenth. All items in this subscale were interpreted as either Very High Efficacy or High Efficacy. The aggregate mean of 3.09 indicates that the respondents recognized and drew confidence from their accumulated achievements in teaching science over time. These results are consistent with the assertion of Ashton and Webb (1986) that teachers' self-efficacy in teaching science plays a vital role in how they approach their mission and goals, and that students' learning is more powerfully influenced by the teacher's technique, approach, enthusiasm, knowledge, and understanding of the subject matter. Success resulting from overcoming obstacles in the teaching practice produces positive mastery experiences and elevates teachers' sense of efficaciousness, and this pattern is clearly reflected in the data.

The second subscale, vicarious experience, yielded an aggregate mean of 2.97, interpreted as High Efficacy. Item 18, which addressed imagining oneself working through challenging science topics successfully through peer observations, obtained the highest mean of 3.25 and was ranked first, interpreted as High Efficacy. Item 27, on being pushed to do better upon seeing students perform better in science, obtained a mean of 3.21 and was ranked second. Items 10 and 36 were tied at ranks 3.5, both obtaining a mean of 3.08 and interpreted as High Efficacy. Item 10 pertained to teaching using innovative and appropriate strategies modeled by the coordinator, while item 36 addressed teaching accurate and updated content through seminars. Item 3, on crafting good questions based on modeled test questionnaires, obtained a mean of 3.04 and was ranked fifth, while item 39, on picturing oneself solving science problems in the same way as other teachers, obtained a mean of 3.00 and was ranked sixth. Item 15, on being pushed to do better upon seeing the coordinator teach well in science, obtained a mean of 2.96 and was ranked seventh, while item 33, on picturing oneself teaching in the same way as co-teachers, obtained a mean of 2.74 and was ranked eighth. Item 23, on competing with oneself in science, obtained a mean of 2.72 and was ranked ninth, while item 20, on being modeled by the coordinator on how to spend enough time with students, obtained the lowest mean of 2.64 and was ranked tenth. The aggregate mean of 2.97 under this subscale indicates that respondents' confidence in teaching science was meaningfully shaped by observing and learning from those around them, including peers, coordinators, and even students. This finding aligns with the theoretical proposition that vicarious experiences through the observation of social models exert a significant influence on one's perception of self-efficacy (Bandura, 1997). Eggen and Kauchak (2004) further affirm that motivation, conceptualized as a process whereby goal-directed activities are instigated and sustained, influences learning by maintaining the effort needed to reach personal goals, and this motivational dimension is clearly visible in how respondents engaged with the performance of those they observed.

The third subscale, verbal persuasion, produced an aggregate mean of 2.99, interpreted as High Efficacy. Item 8, which pertained to being encouraged by the administrator to provide necessary interventions and remediation to failing students, obtained the highest mean of 3.36 and was ranked first, interpreted as Very High Efficacy. Item 25, on appreciating students who show high interest in science because of the supervisor's motivation, obtained a mean of 3.19 and was ranked second, followed by item 31 on students affirming the respondent's teaching ability, with a mean of 3.15 and ranked third. Item 16, on co-teachers recognizing the respondent's talent in science, obtained a mean of 3.06 and was ranked fourth, while item 14, on being inspired by the coordinator to provide personally relevant information to students, obtained a mean of 2.98 and was ranked fifth. Items 11 and 28 were tied at ranks 6.5, both obtaining a mean of 2.92 and interpreted as High Efficacy. Item 11 pertained to receiving help from peers on handling students performing poorly in science, while item 28 addressed being praised for ability in teaching science. Item 35, on family members affirming the respondent's teaching quality, obtained a mean of 2.91 and was ranked eighth, while item 37, on co-science teachers preferring to work with the respondent because of perceived competence, obtained a mean of 2.83 and was ranked ninth. Item 21, which reflected the principal's affirmation of the respondent's teaching ability, obtained the lowest mean of 2.57 and was ranked tenth, interpreted as High Efficacy. The aggregate mean of 2.99 indicates that social encouragement from administrators, supervisors, coordinators, peers, students, and family members served as a meaningful source of professional confidence among the respondents. This is consistent with Hattie and Timperley's (2007) observation that supportive messages and actions bolster effort

and are particularly effective when accompanied by conditions and instruction that promote success and enthusiasm.

The fourth subscale, emotional and physiological state, yielded the highest aggregate mean among all four sources at 3.31, interpreted as Very High Efficacy. Item 7, on strongly monitoring student attendance and absences, obtained a mean of 3.62 and was ranked first. Item 32, on feeling calm and comfortable in the science class, obtained a mean of 3.55 and was ranked second. Item 26, on starting to feel relaxed as soon as science teaching begins, obtained a mean of 3.49 and was ranked third. Item 9, on feeling confident in making students feel comfortable in the class, obtained a mean of 3.47 and was ranked fourth, while item 22, on the whole body becoming relaxed when teaching science, obtained a mean of 3.40 and was ranked fifth. Item 40, on the mind being clear and focused when teaching difficult science topics, obtained a mean of 3.38 and was ranked sixth, while item 12, on feeling elated and delighted when thinking about teaching science, obtained a mean of 3.36 and was ranked seventh. Item 5, on believing in one's ability to do well in science teaching, obtained a mean of 3.23 and was ranked eighth, interpreted as High Efficacy, while item 2, on being able to adjust one's perception of science concepts, obtained a mean of 3.19 and was ranked ninth, also interpreted as High Efficacy. Item 29, on teaching science taking all of the respondent's energy, obtained the lowest mean of 2.38 under this subscale and was ranked tenth, interpreted as Low Efficacy. The aggregate mean of 3.31 for this subscale, the highest among the four sources, identifies emotional and physiological state as the predominant source of self-efficacy among the science teacher respondents. This finding resonates with Billingsley's (2004) observation that emotional and physiological states significantly affect teachers' responses to their performance and activities, and that excessive stress, mental tension, worry, and anxiety can erode teachers' belief in their capacity to carry out their responsibilities. Conversely, positive emotional states can elevate confidence, reduce stress, and ultimately reflect the quality of teaching performance. Velthuis et al. (2015) similarly noted that reductions in stress reactions involve both physical and psychological dimensions of the teaching career and are shaped by how these experiences are perceived and interpreted by the individual teacher. Self-efficacy, described as the optimistic self-belief in one's competence to successfully accomplish a task and produce a favorable outcome, is substantially influenced by an individual's mood and emotional condition, and this dynamic is strongly evidenced by the present data.

Relationship between respondents' profile and sources of self-efficacy

The chi-square test was used to determine whether significant relationships existed between the respondents' profile variables and their four sources of self-efficacy, with the alpha level set at 0.05. For age in relation to mastery experience, the computed d-value was 3.695 against a critical value of 9.488 at $df = 4$, resulting in a failure to reject the null hypothesis and a finding of not significant. For age in relation to vicarious experience, the computed d-value was 3.839 against a critical value of 9.488 at $df = 4$, likewise resulting in a failure to reject the null hypothesis and a finding of not significant. For age in relation to verbal persuasion, the computed d-value was 7.868 against a critical value of 12.592 at $df = 6$, resulting in a failure to reject the null hypothesis and a finding of not significant. For age in relation to emotional and physiological state, the computed d-value was 3.889 against a critical value of 5.991 at $df = 2$, again resulting in a failure to reject the null hypothesis and a finding of not significant.

For gender in relation to mastery experience, the computed d-value was 1.241 against a critical value of 5.991 at $df = 2$, resulting in a failure to reject the null hypothesis and a finding of not significant. For gender in relation to vicarious experience, the computed d-value was 2.986 against a critical value of 5.991 at $df = 2$, resulting in a failure to reject the null hypothesis and a finding of not significant. For gender in relation to verbal persuasion, the computed d-

value was 4.938 against a critical value of 7.815 at $df = 3$, resulting in a failure to reject the null hypothesis and a finding of not significant. For gender in relation to emotional and physiological state, the computed d-value was 1.292 against a critical value of 3.841 at $df = 1$, resulting in a failure to reject the null hypothesis and a finding of not significant.

For educational attainment in relation to mastery experience, the computed d-value was 8.278 against a critical value of 15.507 at $df = 8$, resulting in a failure to reject the null hypothesis and a finding of not significant. For educational attainment in relation to vicarious experience, the computed d-value was 12.696 against a critical value of 15.507 at $df = 8$, resulting in a failure to reject the null hypothesis and a finding of not significant. For educational attainment in relation to verbal persuasion, the computed d-value was 11.741 against a critical value of 21.026 at $df = 12$, resulting in a failure to reject the null hypothesis and a finding of not significant. For educational attainment in relation to emotional and physiological state, the computed d-value was 5.312 against a critical value of 9.488 at $df = 4$, resulting in a failure to reject the null hypothesis and a finding of not significant.

For number of years in teaching in relation to mastery experience, the computed d-value was 1.397 against a critical value of 9.488 at $df = 4$, resulting in a failure to reject the null hypothesis and a finding of not significant. For number of years in teaching in relation to vicarious experience, the computed d-value was 6.321 against a critical value of 9.488 at $df = 4$, resulting in a failure to reject the null hypothesis and a finding of not significant. For number of years in teaching in relation to verbal persuasion, the computed d-value was 2.483 against a critical value of 12.592 at $df = 6$, resulting in a failure to reject the null hypothesis and a finding of not significant. For number of years in teaching in relation to emotional and physiological state, the computed d-value was 1.375 against a critical value of 5.991 at $df = 2$, resulting in a failure to reject the null hypothesis and a finding of not significant.

Across all 16 tested relationships, the null hypothesis was consistently not rejected, indicating that none of the profile variables, namely age, gender, highest educational attainment, and number of years in teaching experience, demonstrated a statistically significant relationship with any of the four sources of self-efficacy at the 0.05 level of significance. These findings collectively suggest that the sources from which science teachers draw their professional confidence are not differentiated by demographic or career characteristics. Rather, self-efficacy among science teachers in this context appears to be a broadly shared professional attribute that transcends age, gender, educational background, and years of service. This is consistent with the theoretical understanding that self-efficacy is a dynamic and malleable construct shaped primarily by experiential, social, and emotional processes rather than by fixed personal demographics. Weasmer and Woods observed that classrooms where teachers exhibit high levels of teaching efficacy tend to yield higher levels of student learning outcomes, suggesting that the development of self-efficacy carries direct and practical implications for educational quality regardless of the teacher's personal profile. Soodak and Podell (1996) further argued that the higher the teacher's self-efficacy, the more positive the student and teacher behaviors, and the greater the improvements in educational settings, underscoring the importance of systematically cultivating high self-efficacy among science teachers. Tamiz and Mojavezi (2012) similarly affirmed that teachers with a strong sense of efficacy in their strength and ability are more capable of motivating students and improving their cognitive development, while those with a low sense of efficacy tend to rely on negative sanctions and hold limiting beliefs about what students can achieve. Taken together, these perspectives reinforce the finding that self-efficacy is a professional resource that must be actively nurtured through institutional support, professional development, and collaborative teaching environments, independent of the teacher's demographic background.

The findings of this study collectively demonstrate that the 53 science teachers of the Division of Cebu City for School Year 2018 to 2019 exhibited high to very high levels of self-efficacy across all four sources identified by Bandura. Among the four sources, emotional and physiological state emerged as the strongest, yielding an aggregate mean of 3.31 interpreted as Very High Efficacy, identifying it as the primary predictor of the respondents' sense of professional competence. Mastery experience followed with an aggregate mean of 3.09 interpreted as High Efficacy, while verbal persuasion obtained an aggregate mean of 2.99 and vicarious experience an aggregate mean of 2.97, both interpreted as High Efficacy. No statistically significant relationship was found between any of the profile variables and the four sources of self-efficacy, indicating that self-efficacy among this group of science teachers is a shared and broadly distributed professional characteristic not contingent on demographic or experiential differences. These results advance the existing body of knowledge on teacher self-efficacy by providing locally situated empirical evidence from the Philippine secondary education context, and they carry meaningful implications for school administrators, instructional supervisors, and curriculum developers seeking to strengthen science teaching quality. The consistent finding of high self-efficacy across all sources affirms the capacity of the respondents to sustain effective science instruction and suggests that targeted interventions that reinforce positive emotional states, affirm successful teaching experiences, strengthen peer modeling opportunities, and promote encouraging professional communities can further elevate the quality of science education in the Division of Cebu City. These findings provide the empirical basis for the proposed action plan presented in the succeeding chapter.

CONCLUSION

This study examined the sources of self-efficacy of 53 science teachers from Apas National High School, Mabolo National High School, and Talamban National High School in the Division of Cebu City for School Year 2018 to 2019. Employing a descriptive research design, data were gathered through a self-made and modified survey questionnaire and analyzed using frequency count, percentage, weighted mean, ranking, and chi-square. The study sought to determine the respondents' profile in terms of age, gender, highest educational attainment, and number of years in teaching experience; to identify their sources of self-efficacy across the four dimensions of mastery experience, vicarious experience, verbal persuasion, and emotional and physiological state; to test the significance of the relationship between their profile and their sources of self-efficacy; and to propose an action plan based on the findings.

With respect to the respondents' profile, the ages of the participants ranged from 20 to 60 years old, with the largest group belonging to the 30 to 39 age bracket, comprising approximately 45.28% of the total respondents. A great number of respondents were female, and most held master's units as their highest educational attainment. In terms of teaching experience, respondents ranged from those with less than one year to those with more than 20 years of service, with the largest proportion, totaling 28.30% or 15 respondents, having 6 to 10 years of experience in the field.

With respect to the sources of self-efficacy, the respondents revealed very high efficacy in terms of their emotional and physiological state, which obtained the highest aggregate mean among the four sources examined. In terms of mastery experience, vicarious experience, and verbal persuasion, the respondents consistently demonstrated high efficacy. These findings collectively indicate that the science teachers in this study possessed a strong and well-developed sense of professional confidence across all four dimensions of self-efficacy as identified by Bandura, with emotional and physiological arousal standing out as the most prominent contributor to their overall sense of competence. With respect to the relationship

between the respondents' profile and their sources of self-efficacy, the chi-square analyses revealed no significant relationship between any of the profile variables and the four sources of self-efficacy. This finding holds across all combinations of profile variables and self-efficacy dimensions, confirming that the respondents' age, gender, highest educational attainment, and number of years in teaching experience did not significantly differentiate their levels of mastery experience, vicarious experience, verbal persuasion, or emotional and physiological state.

The findings of this study lead to the conclusion that science teachers' self-efficacy offers a potent and far-reaching influence on science achievement and instructional quality. Emotional and physiological arousal, in particular, has been identified as the strongest predictor of academic achievement and performance, serving as a critical facilitating force that shapes how teachers approach their students and how confidently they engage with the demands of science instruction. The finding that self-efficacy levels were high to very high across all four sources, irrespective of the teachers' demographic and career profile, underscores the view that self-efficacy is not a fixed characteristic determined by personal background but rather a dynamic professional resource that can be cultivated and strengthened through deliberate institutional and professional interventions. These results carry meaningful implications for school administrators, instructional supervisors, and curriculum planners in the Division of Cebu City, who are encouraged to develop programs and structures that reinforce positive emotional and physiological experiences among science teachers, affirm and recognize successful teaching practices, create opportunities for meaningful peer modeling and collaborative observation, and sustain encouraging professional communities built on genuine feedback and recognition. By systematically addressing all four sources of self-efficacy through targeted program planning and professional development initiatives, educational stakeholders can further enhance the academic motivation of science teachers and, by extension, improve the quality of science teaching and learning outcomes across the division.

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