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## Science Teachers' Perceptions on Continuing Professional Development (CPD) Self-Efficacy, and Instructional Performance

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### ABSTRACT

This study examined science teachers' perceptions of Continuing Professional Development (CPD) and its impact on their self-efficacy and instructional performance. It investigated the types of CPD activities attended, perceptions of CPD, the relationship among perceptions, self-efficacy, and instructional performance, and the challenges faced in attending CPD activities. The study involved 71 Junior high school science teachers from major schools in ten districts in Baguio City, selected through purposive sampling. Data were collected using checklists, a survey-checklist, a self-assessment instrument, and an open-ended questionnaire. Findings showed that teachers mainly attended conferences, seminars, and workshops for CPD, while advising dissertation and thesis candidates was the least attended. CPD positively influenced self-efficacy in classroom management, instructional strategies, and student engagement. Most teachers strongly agreed that they could teach proficiently according to objectives. Significant correlations were found between self-efficacy and perceptions of CPD in instructional strategies and classroom management, but not in student engagement. Positive correlations were observed between self-efficacy and instructional performance in all areas. Meanwhile, major challenges faced by educators in their pursuit of advancement undertakings included financial constraints, work-related conflicts, and limited availability of authorized CPD providers.

### INTRODUCTION

Science education plays a crucial role in developing a nation, as it provides a systematic approach to understanding the world and fosters empirical skills and scientific literacy among students. However, despite indications of Filipino learners' enthusiasm for science concepts and engagement in scientific competitions, national assessments such as the 2018 Programme for International Student Assessment (PISA) and the 2019 Trends in International Mathematics and Science Study (TIMSS) revealed poor performance of Filipino students in scientific assessments. As a result, science educators face the challenge of undermining science and scientific literacy in the country (Palines and Ortega- Delacruz, 2021). Nipales (2019) further stated that the country's science teachers' competency in terms of knowledge, skills, and attitude is considerably lacking, with a cascading effect on the level of scientific instruction and learning interactions in schools.

To address the constraints the teaching profession faces, the expansion of qualifications, expertise, and positive disposition is necessary. Faculty development programs and continuing professional development (CPD) have been implemented. The CPD law (Republic Act 10912) was introduced in the Philippines to raise the baseline of professional prowess through CPD activities, which require professional teachers in the country to earn 15 CPD units within three years for license renewal.

Yuksel (2022) stated that improved instructional practices are crucial for career progression and promotion among

faculty members, necessitating training in optimal pedagogical approaches. Teachers need to possess the necessary expertise, abilities, attitudes, and instruments to meet professional standards. Furthermore, teachers' professional self-efficacy and psychological well-being play a vital role in their performance, necessitating appropriate training. While the impact of self-efficacy on teacher performance is not extensively researched, it is recognized that high self-efficacy among science teachers is essential for instructional competency (Baysal & Mutlu, 2021).

However, implementing CPD activities faces challenges, including high costs, the need for travel to attend activities in larger cities, lack of relevant training material, shortage of qualified facilitators, and inadequate support (Bernadine, 2019). Some professionals argue that the CPD requirements are unnecessary, while others struggle to justify the cost and manage the associated work absences (Tan, 2021). Teachers in remote locations face additional difficulties in fulfilling the CPD requirements. Overall, the effectiveness of CPD activities is hindered by various constraints, which impact their efficiency and fail to adequately support teachers' reflective thinking and career prospects (Dogar *et al.*, 2021).

As concerns about the efficiency of CPD activities for teachers grow, this study investigated the perceived impacts of CPD in the local context of science teachers. Further, the development of science teachers' self-efficacy vis- a- vis their instructional performance after the completion of various CPD activities were studied.

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## LITERATURE REVIEW

### Continuing Professional Development (CPD) Law in the Philippines

As global industry sectors continue to grow, it becomes increasingly impossible to overestimate the value of ongoing professional development. CPD allows individuals to reinforce and improve their present abilities while decreasing knowledge gaps and giving them a comparative advantage in situations when one is required, such as an employment screening. CPD may also help individuals stand out in the job market since numerous applicants seeking for certain opportunities frequently have comparable basic skills. Professionals may gain control of their profession's progress and objectives with a structured CPD strategy (BPP Learning Media, 2020). Individual privilege generated from professional autonomy may boost optimism regarding one's efficacy and competence, therefore it immediately translates into greater productivity at work. CPD likewise makes certain that educational and occupational credentials are not rendered, enabling individuals, irrespective of age, employment, or level of education, to consistently up-skill and expand their proficiencies. Moreover, the development and assessment of a CPD scheme could be of help in the development of optimal educational processes and boost teacher proficiency in facing the difficulties encountered in teaching learners.

The United Nations' Sustainable Development Goals (SDGs) have pointed out adequate CPD as an indispensable policy mechanism for guaranteeing educators' advancement and development throughout their careers. In fact, education lies at the core of the 2030 Goals for Sustainable Development: it is recognized to be an independent objective (SDG 4) as well as additionally featured among aims underneath other SDGs including well-being, economic development and job creation, environmentally friendly production and consumption, and the mitigation of climate change (WorldWideMedia Consulting, n.d.). SDG 4.c. assists systems in carrying out this approach, including a set of quantitative indicators about educators' performance and progress. The measure of progress on professional development is matched with the TALIS indicator, which is described as: "Percentage of teachers who received in-service training in the last 12 months, by type of training". As it stands, United Nations Educational, Scientific and Cultural Organization (UNESCO) established its subsequent educational system tactics: "Review, analyze, and enhance on the standard of training for educators (both pre-service and in-service), while offering every educator with outstanding initial training as well as ongoing educational opportunities and assistance (UNESCO, 2020)."

In an effort to realize the abovementioned goals, the Department of Education (DepEd) in the Philippines is geared towards providing excellent education by preparing teachers with the necessary globalization competencies. Hence, completing CPD programs had already been adopted by the Professional Regulation Commission

(PRC) as a must-have for professional license renewal. As a legal mandate, the legislation intends to enhance professionals in accordance with global benchmarks for the nation's economic progress. Various educational training courses recognized by the PRC are now being provided in support of the law by private training institutions, although they are expensive for educators to attend.

Under the New Implementing Rules and Regulations (IRR) of the Republic Act 10912, otherwise known as the Continuing Professional Development Law, professional teachers in the country are required to earn 15 CPD units over the course of 3 years preceding the renewal of PRC licenses. The CPD statute intends to develop professional expertise and abilities, enhance the standard of professional services, and match national competence requirements with global standards of excellence. Professionals must acquire needed CPD credit units through seminars, training sessions, as well as other initiatives as a condition of renewing their license or Professional Identity Cards (PIC), according to the law. As a legal mandate, the legislation intends to enhance professionals in accordance with global benchmarks for the nation's economic progress. The legislation applies to a wide range of careers, ranging from medical professionals, engineers, developers, educators, practitioners, and a number of others. In the said law, recognized CPD activities have been categorized into 5 namely: Professional track, Academic track, Self-directed, Productive scholarship, and further initiatives to be suggested by the CPD committee and authorized by the Commission's Board of Directors.

Through these various CPD activities, self-efficacy can further be fostered. Including an emphasis on teacher self enhancement marks a significant progression in the design of CPD programs that can increase teacher effectiveness and, eventually, student performance. Nonetheless, it is critical to verify that these kinds of training courses are sufficiently resourced and conducted successfully. The effectiveness of such initiatives is determined on the standard of instruction, the accessibility of funding, and teachers' devotion to ongoing professional development.

### Teachers' Perceptions of Continuing Professional Development (CPD)

Every educator profess as desire to acquire knowledge and consistently improve significantly. Teaching is a calling; its nature is flexible and constantly changing. In simpler terms, professional development is an essential component of being a teacher. Looking at a number of circumstances, teachers vary with regard to how they convey their motivation for expert growth (Alruqi & Al-Harbi, 2022). Certain educators consider intrinsic drives for their professional growth, including feeling of achievement and pleasure of the challenge of instruction, whereas others value external motivators, like that of satisfying the demands of others and seeking their profession to be valued by the ones surrounding them.

Carroll *et al.* (2021) found that professionals in remote regions had limited access to social/ peer networks of support, fewer prospects for interacting in person, as well as faced extra obstacles such as lengthy journeys when attending organized CPD conferences. The job setting exacerbates locality concerns. Teachers who operate as solitary practitioners may find it challenging to engage in CPD owing to their restricted ability to be involved in social contact throughout daily practice. As a result, they are unable to engage in critical tasks such as observational learning, imitation, peer debate, and reflective dialogue. In a similar investigation by Qader in 2020, he stated that CPD could possess a favorable influence on the execution of teaching practitioners and increase the performance of educational facilities where learning occurs in action. That said, it also became apparent that CPD programs are not as pertinent as they look. Further, evidence demonstrates a disparity between policy objectives, professional demands, and the true nature of policy results executed by the featured institution. The aforementioned distinction is the result of policymakers failing to interact with educators while designing CPD programs in broad terms, including the cited institution in particular. As a consequence, the given development programs fail to fulfill the demands of the teachers given that they weren't taken into account.

Interestingly, Bunane, Kampire, and Karegeya (2022) found that both chemistry teachers and school administrators exhibit good perspectives on the influence of continuing education programs on increasing instructional subject matter learning. However, the findings revealed that there isn't any proof to support the immediate influence of CPD activities on the learning of students.

In furtherance of the studies previously discussed, Widayati, MacCallum, and Woods (2021) noticed that seminars, workshops, and networks involvement were among the most commonly participated events. Each of the teachers participated in either accredited or non-certified workshops (presence of practical exercises) or symposia (discussions with no actual engagements) given that these activities helped them strengthen their expertise. It was additionally demonstrated that public servant educators got involved with more organized CPD than their private school peers, owing to the fact that CPD activities have been more directly tied to promotions. In the overall picture, teachers displayed a desire to develop their capability for furthering their CPD, but they require assistance in developing their competence through the microsystem and the exosystem aspects.

### **Teachers' Self-Efficacy as a Result of Involvement to CPD Activities**

Educators' self-efficacy has gradually acquired prominence in school psychology studies owing to its repercussions on instruction efficacy, methods of instruction, and students' scholastic accomplishment. Recognizing the fundamental determinants of self-

efficacy may thus have significant ramifications when striving for the well-being of teachers as well as school performance and advancement. Educators want to feel adept and secure in their abilities to educate and connect with every student, therefore their feeling of effectiveness is critical. Within education, self-efficacy has emerged as an essential paradigm for predicting and explaining the perceptions and beliefs that drive educators' choices and conduct in the educational setting (Hood, 2020).

The social- cognitive theory of behavior transformation by Bandura generated the notion of self-efficacy. Self-efficacy implies the conviction that one can carry out an activity or accomplish a desired outcome. It includes an individual's self-assurance in their ability to manage their conduct, have an impact on their surroundings, and remain committed in the pursuit of a specific objective (Cherry, 2023). Self-efficacy is a trait that people might possess in a variety of contexts and fields, including interactions, employment, and various critical domains.

Teachers' self-efficacy is a significant element that can be impacted by participating in CPD programs. Programs for continuing professional development are intended to improve the expertise of professionals in their particular sectors. In the context of education, attending CPD programs may enable teachers to become better educators, boost their self-confidence in the classroom, and feel more fulfilled in their work. A high level of self-efficacy has been linked to higher performance in the classroom and student outcomes in the context of teaching.

The teachers' views on scientific instruction and classroom proceedings are directly tied to this. Educators who exhibit a high degree of self-efficacy in delivering science instruction tend to use student-focused approaches to instruction, dedicating themselves on science education and exhibiting a propensity for research-based instruction (Baysal & Mutlu, 2021).

To boost the advancement of sciences, it is thought vital to establish scientific learning self-efficacy beliefs (Yildirim, 2021). This will further cascade into the promotion of permanent learning. Permanent learning occurs when theory is applied in practice, renewing recently learnt conceptions within the mind and organizing such information.

Educators who indicate partaking in meaningful training had greater levels of self-efficacy and work fulfillment. Additionally, teachers who participate in courses centered around instruction in diverse educational settings report an elevated level of self-efficacy when instructing in various circumstances (OECD, 2018). Furthermore, instructors who participate in trainings focused on the application of pedagogical techniques claim more frequent execution of efficacious practices.

Acknowledging the key determinants of self-efficacy could therefore hold significant ramifications in striving for educators' well-being, including school performance as well as development. Shu (2022) further added that teacher effectiveness is a particularly significant element of career engagement as it corresponds to the unique

abilities and capacities that teachers may use in their teaching profession across all educational institutions or situations. In this regard, teachers' effectiveness has been attributed to their conviction in their capacities to implement instructional approaches in a learning atmosphere that results in favorable outcomes for students.

### **Effects of CPD on Instructional Performance and Self-Efficacy**

Professional growth is crucial for improving quality education in about any organization, and the education sector is no different. Educators have a vital position in transforming the educational system, therefore the value of their credibility as professionals ought not to be underestimated. Teachers pursue professional development to better equip themselves with skills and qualities fit to meet the expectations of 21st century learners in order to improve educational quality (Bernadine, 2019). Such training courses are intended to assist educators in improving their instructional abilities and expertise, as well as staying abreast on trends in education and advancements.

Adding to these, Panth and Tulivuori (2021) said that enhancing the general productivity of the education system necessitates improving the caliber of teacher quality via teacher professional development programs, rendering the dispute over type of school, individual school performance, and student number, among several others, unnecessary. Training for educators ought to be produced as an entire package rather than in response to specific project demands. Teachers must be encouraged to enhance their education through extensive academic programs. Guidelines and promotions to encourage career pathways including professional development opportunities for teachers should be specified in a framework that describes the laws, organization and assets needed to be an effective educator.

Germuth and Works (2018) highlighted that teachers' professional development is vital in improving educators' instructional practices and aiding them to progress from superficial knowledge to something like a greater comprehension of a matter. The said continuous, ingrained personal growth is required to guarantee that learning is transferred to instructional practice. Instruction, otherwise referred to as teaching, involves the implementation of techniques to enable students to access understanding centered around what teachers undertake in multiple ways, such as postgraduate education, research, or even the most frequent, joining seminars and training sessions. Likewise, educators gain a host of novel skills that prepare them for advancement through training. This content acquisition is very crucial in science, Technology, Engineering, and Mathematics (STEM) career advancement. It was additionally stated that in order to boost student comprehension, majority of educators must acquire scientific and mathematical fundamental expertise alongside pedagogical strategies

relevant to the science, Technology, Engineering, and Mathematics curriculum area.

Further prior studies have shown that professional development programs do boost teachers' self-efficacy while also indirectly influencing them being student-centered during instruction through enhancement of their sense of expertise (Fabriz *et al.*, 2020). The investigation looked at how a professional training course affected university instructors' self-efficacy, self-image, including perceived comprehension of instruction. The results imply that professional training programs can help educators improve their sense of self-worth beliefs, self-image, and personal insight into teaching. Furthermore, the study emphasizes the necessity of teacher participation in these programs for optimal impact in their practice. The investigation has implications not merely for faculty at universities, but rather to teachers across different educational contexts. It highlights the value of continual professional development among educators as well as the necessity to plan and administer successful professional development initiatives that target teachers' individual requirements. The said finding is in congruence with the discoveries of Noben *et al.* (2021) stating that the Professional Development Program on Fundamentals of Teaching increased the self-efficacy of the teachers as well as improved their view of leaning towards student-centered approaches in their instruction. Li *et al.* (2019) further suggest that involvement in CPD programs serves as an intermediary in the development of self-efficacy, which results in enhanced instructional performance. In particular, it underlines the merits that young teachers gain from engaging in CPD activities to increase their self-efficacy.

### **The Influence of Teachers' Self-Efficacy on Instructional Performance**

The examination of assumed self-efficacy and how it relates to social conduct has expanded into the realm of education, specifically the effectiveness of educators. It was additionally studied with regard to its impact on the achievement of students. Several research investigations have been conducted to establish a connection between student accomplishment, which is the most important expression of instructional efficiency, and teacher efficacy. A few aspects of teacher performance have been attributed to teacher self-efficacy. For instance, Catalano, Albulescu, and Stan (2020) noted that self-efficacy exerts an impact on the retention and attrition of teachers. They pointed out that teachers' affective reactions to work, influence their commitment to teaching. The study posited that some teachers established authority and simply continued with educational procedures as usual, whereas others became overwhelmed with negative thoughts, resulting to withdrawal and, ultimately, attrition. Meanwhile, Khanshan and Yiusefi (2020) reported that teachers' self-efficacy and level of expertise impact their instructional performance. A teacher's professional learning engagement and preparedness to teach both

impact instructional competence. Educators' perceptions regarding their students' capacities to learn, as well as their own abilities to educate, take an impact on their instructional quality. Teachers' sentiments of ineptitude and incompetency in carrying out their duties may have an influence on their students' motivation to study. They further described a substantial association between educators' self-efficacy in addition to classroom routines regardless of discipline. In echo, teachers' self-efficacy may be developed and refined as a result of specific training programs that push educators to dive deeper into their understanding of learning and instruction.

In terms of the learning environment, Ortan, Simut, and Simut (2021) affirmed a positive relationship between teachers' performance and their self-efficacy. Accordingly, when teachers realize the beneficial results of their choices and behaviors, both for learners and for the school community, along with encouragement from administrators and their colleagues, their drive to be active intensifies. Feeling valued and possessing an elevated sense of confidence have a good impact on career fulfillment and well-being for educators. On additional note, they asserted that teachers' self-efficacy is closely associated with their performance during classes. It was observed that low self-efficacy leads to poor performance in instructional settings. High self-efficacy, on the contrary, results in enhanced performance and preparedness in class. As cited by Barni, Danioni, and Benevene (2019), self-efficacy views may certainly boost a teacher's capacity in reacting to challenging circumstances. Educators with high efficacy frequently take a gamble and try innovative teaching methods, which results in significantly greater learning outcomes for students. To put it the other way, enhanced self-efficacy translates into better skill development, which causes shifts in classroom practices. In exploring the repercussions of teacher self-efficacy and instructional performance, Alibakhshi, Nikdel, and Labbafi (2020) identified positive effects for the variables in issue. Teachers' instructional tactics were further characterized as follows: pedagogical/instructional assistance, administration of the classroom, and emotional reinforcement. They indicated that the respondents' instructional behaviors, techniques, and approaches used to promote overall emotional, intellectual, and educational progress of language students were heavily influenced by their self-efficacy. This conclusion is congruent with the research results of others who contend that the instructional tactics, actions, and practices used by educators to enhance students' intellectual improvement may be influenced to some extent by their self-efficacy. The results are in congruence with the results of Hernandez's study (2019), stating that after going through learning opportunities, teachers' degree of effectiveness and quality of pedagogical performance, as judged by their views about how alignment may help their students and enhance how they construct lesson plans, and improved overall. These insights may be leveraged to spark constructive societal change, beginning with education.

### Issues and Challenges in the Involvement to CPD Activities

Development as a professional is essential in every aspect of any firm in order to equip personnel in accordance with shifting trends in internationalization. Subsequently, as the argument goes, after a significant expenditure of the organization's efforts to find appropriate personnel, the task that organizations must undertake is to guarantee that human resources are conserved, polished, and employed. These are attained by the implementation of a systematic strategy to staff development and training, which has usually evolved into a new concept known as "continual professional development." The necessity for such a strategy stems from the reality that the presence of recognized and developed knowledge and abilities is critical to an organization's continued advancement amid a continuously shifting and growing complicated setting. While the CPD law has been controversial, with some professionals and organizations arguing that it places an unnecessary burden and is not properly implemented, supporters argue that it is necessary to ensure that professionals keep up with developments in their field and maintain high standards of practice. The obstacles of teachers' professional growth in the educational system arise from several directions. These problems, complications, impediments, or tough conditions are in contrast to the desired consequences of teachers' progress.

In a study conducted by Campos, *et al.* (2022), the participants acknowledged the value of CPD and indicated an eagerness to acquire new knowledge. However, preexisting CPD programs failed to satisfy their anticipated requirements, resulting in significant disengagement. Additionally, stated CPD concerns were connected to the institutional strategy for administering educational activities (deficits in management, educators, and material supplies), which may be comparable to those reported from equivalent rural regions.

In line with these challenges, Herrmann and Grossman (2021) pinpoint five main difficulties for teacher professional development: it is lacking a lofty purpose of learning and instruction; it struggles to foster teacher control; its duration is brief, intermittent, and detached from the learning environment; it has become one-size-fits-all; and finally, it doesn't seem open to collaboration. Among the most prevalent difficulties that instructors experience in their CPD is the lack of time. Teachers face a demanding schedule, and it may prove tricky to find time to complete CPD. In the work of Bwanga (2020) it was discovered that a shortage of time owing to workload constituted an impediment towards attending CPD learning activities. Respondents were unable to complete CPDs beyond work hours due to familial and social obligations. Moreover, educators frequently struggle to reconcile their teaching obligations with their CPD requirements. Time constraints can have a variety of effects on teachers' involvement in CPD sessions. For instance, it may limit the amount of programs that

educators can participate in, causing them to lose critical opportunities for learning. In addition, this could leave an impact on the extent of their involvement since they won't have sufficient time within the session to properly engage with the subject or communicate with their peers. Finally, it can have an impact on the success of the CPD session since instructors may not have enough time to apply what they've learned in their classrooms. In its entirety, these research findings indicate that, while teachers believe CPD to be essential for their professional development, the success of such programs may be impacted by a variety of criteria such as method of delivery, content, length of time, application, as well as assistance offered by their institutions. As a result, it is critical to create and administer CPD programs that match the demands and standards of teachers, as well as to offer continuous support to ensure that newly acquired abilities and expertise are effectively implemented.

### MATERIALS AND METHODS

The study made use of a descriptive-correlational approach to determine and describe the perceived impact of Continuing Professional Development on the self-efficacy and instructional performance of science teachers. In particular, this study employed descriptive approach to provide a snapshot of the influence of CPD activities on science teachers' performance and self-efficacy. This likewise looked into the association between the teachers' CPD attendance and their self-efficacy and instructional performance. Further, the study examined the connection between educators' self-efficacy and their instructional performance. The study made use of four (4) research instruments, namely: 1) A combined checklist and survey of the status of CPD activities and their relative impact to the science teachers' development patterned from Tulo and Lee (2022); 2) an interview guide for the enrichment of the gathered data on the teachers' perceptions adopted

from Qablan, *et al.* (2015); 3) a Self-Efficacy survey checklist adopted from Digap (2014); and 4) a Self-Assessment Instrument for Teacher Evaluation II (SITE II) developed by Akram and Zepeda (2016).

### RESULTS AND DISCUSSION

#### CPD Activities Involvement of Science Teachers

Notably, the most frequent CPD activity/ program availed by 68 science teachers is participation in conferences, seminars, and workshops (Table 1). This includes In-service Training (INSET) and other faculty development programs offered by the Department of Education. The indicated result coincides with the findings of Garcia and Weiss (2019), who claim that a substantial proportion of educators typically access specific forms of professional development, like conferences or trainings. Moreover, in 2018, the Organization for Economic Cooperation and Development reported that, for both primary and secondary, in-person courses and seminars are the most frequently cited type of career advancement for educators. Meanwhile, 51 of the respondents pursued graduate studies, largely at the master's level. Since the vast majority of teacher-respondents are in Teacher III positions, graduate studies, in addition to professional development and advancement in the field, is deemed necessary. As McRell, Wilson, and Levkoff (2021) argued, completing postgraduate education is a vital aspect of CPD as it allows professionals to keep abreast with the newest advances in their chosen field. Postgraduate also allows them to gain specific expertise and abilities. On another note, with a frequency of 2, advising dissertation and thesis candidates comes last in the attended CPD activities. While this activity may not be as popular as others, it may still be a beneficial method of sharing knowledge and expertise with people in the profession. This can also serve to promote the profession by training and developing the future generation of practitioners.

**Table 1:** CPD Activities where science teachers are involved

CPD Activities / Programs Attended	Frequency	Percentage (%)	Rank
1. Scholarly research publications	16	22.54	8
2. Book publications	6	8.45	16
3. Development of instructional manual and audio-visual materials	42	59.15	4
4. Article in professional magazine/ newspaper	9	12.68	14
5. Innovations and inventions/ creative work	39	54.93	5
6. Recognition/ Title (e.g. Fellows/ Hall of Fame Award, Outstanding Professional, Lifetime Achievement Awardee, etc.)	10	14.08	12
7. Participation in conferences seminars, and workshops	68	95.77	1
8. Training course with at least one year duration	11	15.49	11
9. Coordinator, lecturer, resource person, or guest speaker in conferences, workshops, and training courses	35	49.30	6
10. Services in accreditation work membership	9	12.68	14
11. Short-term consultancy or expert services in an activity of an educational, technological, professional, scientific, or cultural nature sponsored by the government or other agencies	12	16.90	9.5

12. Membership of relevant professional organizations	33	46.48	7
13. Adviser to dissertation and thesis candidates	2	2.82	17
14. Post- graduate studies/ Fellowship degree	51	71.83	2
15. Awards of distinction in recognition of achievement in areas of specialization	12	16.90	9.5
16. Participation in community outreach or extension program	47	66.20	3
17. Study Tours/ Visits (Includes Benchmarking and the like)	9	12.68	14

**Perceptions of Science Teachers Towards Involvement to CPD Activities**

Findings indicate that the teacher- respondents had a general awareness concerning various CPD activities. Nonetheless, the teachers’ notions of CPD and the manner in which they got involved with CPD vary (Table 2). Statements marked as agree indicates that teachers feel their participation in continuing education programs would help them: improve employability, develop public image and reputation as informed and competent specialists in their profession, cultivate new ideas and skills that will contribute to the betterment of society, stay engaged and enthusiastic about their work, enhance their organization’s performance and contribute to its success, and develop a more profound understanding of their profession and its broader implications.

The remaining six statements interpreted as strongly agree implies that teachers see CPD as a necessary requirement to: maintain their license and continue practicing their profession, keep pace with the constantly evolving landscape of their profession, provide high-quality services, gain a better understanding of their own learning and development, contribute to the development of their profession by developing new ideas and skills that can help advance the field, and ensure that they remain competitive and relevant in their field, by keeping up with the latest developments and standards.

The said result is supported by the data derived from the interview in which respondents indicated that the insights they gained while participating in various teacher development programs benefited their performance. Statements of some teachers who agreed to its efficacy include the following:

**Table 2:** Teachers’ perceptions towards involvement to CPD activities

Continuing Professional Development Will	Mean	Descriptive Interpretation
1. Enhance my employability.	3.38	Agree
2. Increase my public confidence and professionalism.	3.48	Agree
3. Contribute to improved protection and quality of life, the environment, sustainability, property, and the economy.	3.45	Agree
4. Allow me to renew my license to practice my profession.	3.52	Strongly agree
5. Ensure that I and my knowledge stay relevant and up to date.	3.56	Strongly agree
6. Help me to stay interested and interesting.	3.49	Agree
7. Maintain and enhance the knowledge and skills I need to deliver a professional service to my students and the community.	3.62	Strongly agree
8. Allow me to make meaningful contributions to my institution.	3.48	Agree
9. Deliver a deeper understanding of what it means to be professional, along with a greater appreciation of the implications and impacts of my work.	3.42	Agree
10. Enable me to evaluate my learning and recognize its real value.	3.54	Strongly agree
11. Help advance the body of knowledge and technology within my profession.	3.54	Strongly agree
12. Ensure my capabilities to keep pace with the current standards of others in the same field.	3.52	Strongly agree
<b>Overall</b>	<b>3.50</b>	<b>Strongly agree</b>

It is effective because I became more committed to my profession.

-Respondent 11

I always believe that trainings I attended to are effective. It gives me chance to reflect on my work ethics, my next goals, and to improve my craft.

-Respondent 35

At some point, yes, especially this time that we have diverse learners. Teachers must also update themselves.

-Respondent 58

Nonetheless, several claimed that a great deal of CPD programs they attended did not meet their expectations,

leaving them unable to discern its significance in their profession as educators. As support to this, some teachers stated:

It is repetitive since most of it are being addressed during LAC sessions, INSET, and other DepEd- funded seminars and trainings.

-Respondent 16

...but it can't be called wholesome since it can't be fully utilized. Implementation might be a challenge.

-Respondent 69

In a nutshell, the various perspectives of science teachers are subjected to their own standpoints depending on the relevance of the attended CPD events in their particular circumstances. The majority of teachers considered the initiatives beneficial, while a significant proportion thought they were inefficient. The findings align with Bueno, Matriano, and Sahagun's (2019) study, which highlighted that participation in CPD activities is driven by career advancement, improving individual competence, enhancing teaching methods, and improving learning outcomes. Calleja (2019) further emphasized that teachers' eagerness to learn, recognition of the benefits of learning, and motivation to enhance classroom practices motivate their involvement in diverse CPD activities.

**Science Teachers' Self-Efficacy**

The science teachers' level of self-efficacy as a result of their engagement to various CPD programs and activities has been measured descriptively using parameters along students' engagement, classroom management, and

instructional strategies.

**Students' Engagement**

Most indicators of engagement scored above average, with a mean score of 3.62, suggesting high overall student involvement (Table 3). Students showing reactions when they agree with the teacher received the highest rating, followed by displaying attentiveness via body postures, taking notes, maintaining eye contact, sharing their responses when asked, confidently participating in activities, demonstrating interest and enthusiasm in a task, using positive humor, sharing their profound opinions, and readily volunteering to participate. These signs demonstrate that learners were engaged and interested in the learning process. In general, the mean scores indicate high engagement which means that teachers have the confidence to include 81% to 90% of students in class participation.

On the contrary, the lower-rated indicators include displaying disagreement with what the teacher is saying, not displaying any disruptive behavior, starting and finishing a task with minimal supervision, confidently asking relevant questions, and working harder to meet the teacher's standard/expectations. These indications demonstrate the strong conviction of teachers in their capacity to provide significant encouragement and support to students in the above-mentioned specific domains. The mean scores reflect an average level of engagement, suggesting teachers' ability to involve 71% to 80% of students.

**Table 3:** Science teachers' self-efficacy level along students' engagement

My Students	Mean	Descriptive Interpretation
1. Exhibit body postures (properly seated) that indicate their attentiveness.	3.85	High
2. Show reaction (nod, smile, thumbs up, etc.) When they agree with what the teacher is saying.	4.11	High
3. Demonstrate disagreement (raised brows, head shaking, and frowning, etc.) To what the teacher is saying.	3.49	Average
4. Do not display any disruptive behavior during discussion or classroom activities.	3.41	Average
5. Take down notes during lectures.	3.73	High
6. Maintain eye contact with the teacher.	3.68	High
7. Express their thoughtful ideas about the topic being discussed.	3.55	High
8. Confidently ask relevant/ appropriate questions.	3.42	Average
9. Share their answers when I call on them to recite.	3.68	High
10. Initiate and complete a task with limited coaching.	3.41	Average
11. Confidently participate in group or pair activities.	3.69	High
12. Readily volunteer to participate in a teacher- fronted activity.	3.54	High
13. Exhibit interest and enthusiasm in accomplishing a given task.	3.69	High
14. Work harder than they thought they could do to meet the teacher's standard/ expectations.	3.44	Average
15. Use positive humor while performing given tasks/ activities.	3.61	High
<b>Overall</b>	<b>3.62</b>	<b>High</b>

*Legend*

*Ranges of Means*

4.50- 5.00

3.50- 4.49

2.50- 3.49

1.50- 2.49

1.00- 1.49

*Descriptive Interpretation*

*Very high*

*High*

*Average*

*Low*

*Very low*

*Range (Students' Participation)*

91 to 100%

81% to 90%

71% to 80%

51% to 70%

50% and below

**Classroom Management**

Based on the mean scores, science teachers generally exhibit a high level of self-efficacy in various aspects of classroom management (Table 4). Specifically, the teachers consistently exhibit very high levels of engagement in certain practices including establishing rules that promote respect among students, creating procedures related to instruction, placing presentations visibly for students, and listening to students' thoughts and needs. Moreover, the teachers report frequently providing opportunities for student interaction and clear directions for classroom activities, posting assignments clearly, preparing materials ahead of time, and distributing materials efficiently. They also prioritize planning the effective use of time, minimize distractions, and ensure a comfortable learning environment.

Overall, the table indicates that science teachers possess a strong sense of self-efficacy in implementing effective classroom management strategies. They demonstrate

**Table 4:** Science teachers' self-efficacy level along classroom management

<b>I</b>	<b>Mean</b>	<b>Descriptive Interpretation</b>
1. Provide clear directions for classroom activities, laboratory activities, and assignments.	4.49	Often/ High
2. Post assignments clearly.	4.31	Often/ High
3. Prepare materials ahead of time.	4.37	Often/ High
4. Distribute materials efficiently.	4.42	Often/ High
5. See to it that time is well planned, leaving little down time.	4.34	Often/ High
6. Make sure that classroom temperature and lighting are comfortable.	4.46	Often/ High
7. Place presentations visible to students.	4.56	Always/ Very high
8. Arrange the room to minimize crowding and distraction.	4.45	Often/ High
9. Create rules and procedures related to instructional events (getting ready for lessons, expected behavior of the instructional group, obtaining help, seatwork procedures, etc.)	4.59	Always/ Very high
10. Establish rules that involve respect for other members of the class and provide verbal reminders to students about how to treat others.	4.65	Always/ Very high
11. Use nonverbal signals whenever possible to direct students in a non- disruptive manner when teaching other group of students.	4.42	Often/ High
12. Use positive reinforcement and a variety of reinforcers.	4.38	Often/ High
13. Portray a friendly, positive attitude.	4.31	Often/ High
14. Listen to what students have and need to say.	4.56	Always/ Very high
15. Provide students with opportunities to interact.	4.49	Often/ High
<b>Overall</b>	<b>4.45</b>	<b>Often</b>

*Legend*

*Ranges of Means: 4.50- 5.00, 3.50- 4.49, 2.50- 3.49, 1.50- 2.49, 1.00- 1.49*

*Descriptive Interpretation*

*Always/ Very high, Often/ High, Sometimes/ Average, Rarely/ Low, Never/ Very low*

a commitment to creating a supportive and engaging learning environment through various practices, which are often implemented with high consistency.

**Instructional Strategies**

The instructional strategies that received the highest scores, providing clear instructions and supportive structured activities, and modifying and adjusting language to maximize comprehensibility, indicate that the teachers very highly believe that they can perform these well (Table 5).

This suggests that teachers are putting a significant emphasis on ensuring they convey their messages clearly

**Table 5:** Science teachers’ self-efficacy level along instructional strategies

I	Mean	Descriptive Interpretation
1. Use varied examples, materials, and strategies.	4.32	Often/ High
2. Use effective questioning techniques/ asks high level questions.	4.32	Often/ High
3. Allow sufficient response time for students to answer questions.	4.30	Often/ High
4. Provide true to life situations.	4.45	Often/ High
5. Convey enthusiasm and sustained interest.	4.30	Often/ High
6. Integrate concepts/ skills from other subjects.	4.34	Often/ High
7. Provide remedial/ reinforcement/ enrichment activities.	4.38	Often/ High
8. Use appropriate error correction techniques.	4.13	Often/ High
9. Provide effective and timely feedback on students’ performance and efforts.	4.24	Often/ High
10. Facilitate teacher- to- student and student- to student interaction.	4.38	Often/ High
11. Call on a relatively equal distribution of students.	4.27	Often/ High
12. Consistently check for comprehensions and/ or attention.	4.31	Often/ High
13. Modify and adjust language to maximize comprehensibility.	4.51	Always/ Very high
14. Provide clear instructions and supportive structure activities.	4.56	Always/ Very high
15. Plan hands- on activities whenever appropriate.	4.45	Often/ High
<b>Overall</b>	<b>4.35</b>	<b>Often</b>

*Legend*

*Ranges of Means*

4.50- 5.00

3.50- 4.49

2.50- 3.49

1.50- 2.49

1.00- 1.49

*Descriptive Interpretation*

Always/ Very high

Often/ High

Sometimes/ Average

Rarely/ Low

Never/ Very low

and understandably to students.

Meanwhile, strategies that are less frequently used include calling on a relatively equal distribution of students, providing effective and timely feedback on students’ performance, and using appropriate error correction techniques. While these strategies are still being used often, they may indicate areas where teachers could improve their instructional practices.

In general, the table indicates that teachers employ a wide range of methods of instruction as a product of their attendance to CPD activities in order to engage and assist their students’ learning. Teachers who use such strategies on a daily basis serve to create a good and successful learning environment for their students.

**Overall Self-Efficacy of Science Teachers**

The first area, students’ engagement, has a mean score of 3.62, which is interpreted as high (Table 6). This indicates that teachers feel confident in their ability to engage students in learning activities and maintain their interest in the subject. This is an important aspect of teaching, as engaged students are more likely to be motivated and learn more effectively.

The second area, classroom management, has a mean score of 4.45, which is interpreted as often/high. This suggests that science teachers feel very confident in their ability to manage their classrooms effectively, including maintaining a safe and orderly learning environment, setting clear expectations for behavior, and addressing disciplinary issues when they arise. Effective classroom management is crucial for creating a positive learning environment and maximizing students’ learning potential.

The third area, instructional strategies, has a mean score of 4.35, which is also interpreted as often/high. This indicates that science teachers feel very confident in their ability to use a variety of teaching strategies to effectively convey complex scientific concepts to their students. This is particularly important in science, where students may struggle to understand complex theories or concepts without the use of effective instructional strategies.

In its entirety, the table indicates that science teachers

**Table 6:** Science teachers’ overall self-efficacy level along the three areas

Areas of Self-Efficacy	Mean	Descriptive Interpretation
Students’ Engagement	3.62	Often / High
Classroom Management	4.45	Often / High
Instructional Strategies	4.35	Often / High

have a high level of self-efficacy in all three areas. This demonstrates their confidence and competence to successfully teach science to their students.

**Science Teachers’ Instructional Performance**

The overall mean score for instructional performance is 3.52, which indicates a very satisfactory rating (Table 7). This suggests that respondents have a positive view on their instructional performance practices

Looking at the individual items, the teachers have highest mean scores for ensuring students’ participation in the learning process, encouraging students to interact respectfully, keeping official record of students’ learning progress, and maintaining a supportive classroom environment. These items received mean scores of ranging from 3.63 to 3.69, indicating teachers strongly agreed that they were able secure a safe and healthy learning environment.

**Table 7:** Science teachers’ instructional performance

I am Able to	Mean	Descriptive Interpretation
1. Demonstrate accurate knowledge of my subject matter.	3.52	Very satisfactory
2. Link content with past and future learning experiences.	3.52	Very satisfactory
3. Demonstrate a variety of skills of my subject area (s)	3.46	Satisfactory
4. Communicate content in ways that students can understand.	3.56	Very satisfactory
5. Use school and community resources to help students.	3.37	Satisfactory
6. Teach according to the intellectual, and emotional needs of my students.	3.44	Satisfactory
7. Effectively address appropriate curriculum standards.	3.45	Satisfactory
8. Base instruction on goals that reflect high expectation.	3.38	Satisfactory
9. Use strategies to enhance students’ understanding.	3.55	Very satisfactory
10. Change methodology to make topics relevant.	3.49	Satisfactory
11. Understand individual differences of students and teach accordingly.	3.46	Satisfactory
12. Use appropriate material, technology, and resources.	3.48	Satisfactory
13. Engage, motivate, and maintain students’ attention.	3.51	Very satisfactory
14. Teach the required curriculum according to timetable.	3.44	Satisfactory
15. Use student learning data to guide planning.	3.45	Satisfactory
16. Conduct class tests to monitor student performance.	3.52	Very satisfactory
17. Valuate students’ performance and provide feedback.	3.55	Very satisfactory
18. Maintain students’ results and use for future improvement.	3.48	Satisfactory
19. Revise content to enhance students’ achievement.	3.41	Satisfactory
20. Keep official record of students’ learning progress.	3.65	Very satisfactory
21. Create a climate of mutual trust and respect in classroom.	3.59	Very satisfactory
22. Maintain a classroom setting that minimizes disruption.	3.58	Very satisfactory
23. Create friendly and supportive classroom environment.	3.63	Very satisfactory
24. Ensure students’ participation in the learning process.	3.69	Very satisfactory
25. Encourage students to interact respectfully.	3.69	Very satisfactory
26. Use correct vocabulary and grammar in speaking and writing.	3.49	Satisfactory
27. Explain lessons according to the age and ability of students.	3.55	Very satisfactory
28. Respond to students’ questions in appropriate language.	3.61	Very satisfactory
<b>Overall</b>	<b>3.52</b>	<b>Very satisfactory</b>

*Legend*

*Ranges of Means*

4.50- 5.00, 3.50- 4.49, 2.50- 3.49, 1.50- 2.49,1.00- 1.49

*Descriptive Interpretation*

Very satisfactory, Satisfactory, Fair, Needs improvement

On the other hand, the teachers have relatively lower mean scores for using school and community resources, basing instruction on goals that reflect high expectation,

revising content to enhance students’ achievement, teaching according to intellectual, and emotional needs of students, and teaching the required curriculum according to timetable. These items received mean scores ranging from 3.37 to 3.44, indicating that the teachers agreed that they were able to perform these instructional practices but not as strongly as the other items.

As a whole, the results imply that the teachers were

effective in their instructional performance practices. The teachers are very satisfied that they were able to create a positive classroom environment, engage and motivate students, and monitor and evaluate student performance. However, there is room for improvement in areas such as using school and community resources, setting high expectations, revising content, and using correct language.

**Teachers’ Perceptions on CPD, Their Self-Efficacy, and Their Instructional Performance**

The effectiveness of teachers is primarily determined by how educators perceive their professional growth, design goals, utilize tactics, assess the likelihood of accomplishment, and finally handle difficulties and obstacles. This idea of one’s own action—teachers’ ability to operate as independent, reflective, self-monitoring and purposeful with regard to their behavior—underpins the significance of self-efficacy as an essential element in teacher effectiveness (Darling-Hammond *et al*, 2020).

**Teachers’ Perceptions on CPD and Self-Efficacy**

There is a significant positive correlation between science teachers’ perceptions and their self-efficacy as a whole (Table 8). The result implies that science teachers who have a positive perception of their teaching abilities are more likely to have higher levels of self-efficacy. The significant positive correlation between science teachers’ perception and their self-efficacy suggests that interventions aimed at improving teachers’ perception of their teaching abilities may also enhance their self-efficacy.

The table likewise represents the relationship between science teachers’ perception and their self-efficacy in three areas: student engagement, classroom management, and instructional strategies. The correlation coefficient between teachers’ perceptions and student engagement is 0.160, which is positive but not statistically significant at the 0.01 level. This result endorses the findings of Tantawy (2020), which indicates that the learning engagement of learners

**Table 8:** Coefficient of correlation between the science teachers’ perceptions and their self-efficacy along the three areas

Variables		Teachers’ Self-Efficacy	Students’ Engage-Ment	Class-Room Manage-Ment	Instruction-AI Strategies
Science Teachers’ Perceptions	Pearson Correlation	0.407**	0.160	0.427**	0.468**
	Sig. (2- tailed)	0.0000	0.1820	0.0000	0.0000
	N	71	71	71	71

\*\* - Significant at 0.01 level

should be closely examined through scrutinizing the outcomes of assessments in order to acquire concrete proof on the relevance of the professional growth of teachers.

On the other hand, the correlation coefficients between teachers’ perceptions and classroom management and instructional strategies are both positive and statistically significant at the 0.01 level. This suggests that teachers who have high self-efficacy in classroom management are more likely to have effective management skills and be able to create a positive learning environment for their students. Likewise, teachers who have high self-efficacy

in instructional strategies are more likely to have effective teaching strategies and be able to engage their students in learning.

**Teachers’ Perceptions and Instructional Performance**

The Pearson correlation coefficient between teachers’ perceptions of CPD involvement and instructional performance is 0.553, indicating a positive association that is statistically significant at the 0.01 level (Table 9). This implies that teachers who have positive perceptions about their teaching are more likely to

**Table 9:** Coefficient of correlation between the science teachers’ perceptions and their instructional performance

Variables		Instructional Performance
Science Teachers’ Perceptions	Pearson Correlation	0.553**
	Sig. (2- tailed)	0.0000
	N	71

\*\* - Significant at 0.01 level

be effective in delivering instruction and facilitating learning. For example, teachers who have a positive attitude towards their students and are motivated to help them learn are more likely to be effective in their teaching performance.

Further, the interviewed teachers’ opinions cannot be discounted in the analysis. Eight of the teachers who took part in the interview claimed that the lack of resources primarily affects the successful transfer of their acquired

knowledge.

Teachers claimed to have attended seminars on advanced pedagogical techniques, but they are unable to use the techniques in their teaching settings due to a lack of resources, including applications, materials and equipment, laboratory instruments, and computer units, to mention a few. Similarly, ocular assessments conducted by the researcher during the distribution and retrieval of survey-questionnaires revealed that some schools do not

have adequate space to undertake activities outside of the classroom.

**Teachers’ Self-Efficacy and Their Instructional Performance**

There is a positive and significant correlation between teachers’ instructional performance and their self-efficacy across all three areas (Table 10). Specifically, science teachers’ self-efficacy along student engagement

and instructional performance has a highly statistically significant correlation value of 0.39\*\*. This indicates that science teachers who are more confident in their ability to engage pupils do better in this area of instruction.

In terms of classroom management, the correlation coefficient between teachers’ self-efficacy and instructional performance is 0.582\*\*. This demonstrates that science educators who have higher self-efficacy also have higher level of instructional performance.

**Table 10:** Coefficient of correlation between science teachers’ self-efficacy along the three areas and their instructional performance

Self- Efficacy		Instructional Performance
Science Teachers’ Perceptions	Pearson Correlation	0.39**
	Sig. (2- tailed)	0.001
	N	71
Classroom Management	Pearson Correlation	0.582**
	Sig. (2- tailed)	0.000
	N	71
Instructional Strategies	Pearson Correlation	0.612**
	Sig. (2- tailed)	0.000
	N	71

\*\* - Significant at 0.01 level

Finally, with a correlation coefficient of 0.612, the result portrays that educators with profound level of self-efficacy in adopting effective teaching methodologies have high level of instructional performance.

The overall correlation coefficient of 0.631 indicates that there is a strong and significant positive relationship between teachers’ self-efficacy across all three areas and their instructional performance. These findings affirm the discoveries of Khanshan and Yousefi (2020), who reported that overall self-efficacy of both soft science and hard science educators was substantially associated

with their respective pedagogical practices.

**Issues and Challenges Encountered by Science Teachers in Their Involvement to CPD Activities**

The most frequently pointed out limitation faced by science teachers in attending CPD activities is the high cost of registration fees, with 50 indicating this as a concern (Table 11). This signifies that cost is a substantial barrier to teachers’ access to CPD opportunities, impeding their ability to improve their professional practice.

Magwenya and Ross (2021) articulated exactly the same

**Table 11:** Issues and challenges encountered by science teachers in their involvement to CPD activities

Challenges and Issues Encountered	Frequency	Rank
1. Lack of high-quality external expertise.	15	17
2. Limited authorized CPD providers.	39	3
3. Poorly designed professional development programs.	14	19
4. Too many one-off activities.	34	5
5. Too much listening/ no collaboration.	20	12.5
6. There was a lack of employer support.	15	17
7. Lack of information dissemination about the CPD in the institution.	32	6.5
8. Accountability pressures.	16	15
9. Lack of employer support.	15	17
10. Bias of officials during the selection of participants	17	14
11. Professional development conflicted with my work schedule.	44	2
12. Conflicts with family responsibilities.	22	10
13. There was no suitable professional development offered.	12	20
14. Not enough time for professional learning.	24	9
15. Feeling of drawbacks to change.	4	22.5

16. Obstacle on how to practically make the change.	4	22.5
17. Lack of self-motivation in career plan.	11	21
18. Distance of training centers from where I live.	21	11
19. Costly registration fee.	50	1
20. Costly transportation expense.	32	6.5
21. Costly accommodation expense.	31	8
22. Lack of source of subsidy.	35	4
23. Additional cost for PRC's evaluation of certificates.	20	12.5

issue in which they claimed that the financial and time restrictions involved with accessing various continuing education events were cited as a deterrent among certain professionals, given that they were obligated to make payments not solely for the training sessions but also for accommodation and transportation.

Conflicts with work schedule has also been mostly cited as a constraint acknowledged by 44 out of 71 science educators. Other challenges and issues encountered include limited authorized CPD providers, too many one-off activities, lack of information dissemination in the institution, family responsibilities, and distance from home. These challenges suggest that there is a need for more accessible, affordable, and relevant CPD activities for professionals. As pointed out by Hapal (2018), the seminars and trainings provided by CPD providers are mostly expensive and not readily available to teachers who have busy schedules. This means that attending such events can take a toll on teachers' finances and time.

Moreover, the lack of superior's support may present difficulty in effectively involving themselves in various CPD activities. As Currie (2022) made mention, being involved collaboratively creates a feeling of shared vulnerability and direction. This is supported by the six of the interviewed teachers who stated that the absence of assistance from their immediate superior makes it difficult for them to put their learnings into action.

Looking into these circumstances, teachers face significant burdens when it comes to attending different teacher development activities. These circumstances demonstrate the deficiency of an adopted CPD regulatory framework, necessitating an appeal for a more comprehensive CPD guidelines that would govern the provision, inclusion, and CPD operations of teachers.

### CONCLUSION

This study revealed that the most commonly attended CPD activities for the science teachers of Baguio City were conferences, seminars, and workshops, followed by enrollment in post-graduate studies or fellowship degrees. Conversely, two of the least popular CPD activities were providing guidance to students writing their dissertations/ theses. In its entirety, science teachers have a high level of self-efficacy measured in the areas of student engagement, classroom management, and instructional strategies. Likewise, it can be concluded that science teachers' perceptions on CPD has an effect on

their instructional performance and their self-efficacy. It has also been established that the teachers' self-efficacy level impacts their instructional performance. This highlights the importance of developing science teachers' self-efficacy through professional development programs to improve their instructional performance in these areas. Adding to this, the financial weight of the hefty cost of CPD programs emerges to be the most significant barrier that science teachers confront while participating in such activities. In a comparable manner, work-related issues add to these difficulties, making it harder for them to participate in more teacher development offers than they would want.

Furthermore, the findings adhere to Albert Bandura's Self-Efficacy Theory and Malcolm Shepherd Knowles' Adult Learning Theory, which both emphasize the significance of individual characteristics such as attitudes and goals in determining learning success. Moreover, both theories highlight the need to establish a healthy learning environment that supports individuals' learning goals and encourages their engagement in the learning process. In this case, science teachers' favorable outlook toward professional development events were reflected in both their instructional and classroom management practices as well as their overall self-efficacy.

The availability of CPD activities to science teachers proves the difference in the improvement of their practices. Hence, reallocation of financial resources across various educational fields, with a particular emphasis on supporting teachers' CPD endeavors should be considered. Such form of investment in CPD can empower teachers to boost the quality of their teaching and learning instruction. This likewise remedies the fundamental constraint that teachers face in attending these professional development programs owing to the high expense. On top of that, developing a strategic CPD program execution design that would target the individual needs of teachers be taken into account, too. This would permit for a variety of activities that put forward up-to-date, pertinent and practical knowledge and skills.

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