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COMMUNICATING WHAT THEY KNOW: THE CHANGE IN AND RELATIONSHIP BETWEEN PERCEIVED TEACHING SELF-EFFICACY AND SCIENCE COMMUNICATION AMONG SCIENCE PRACTICE TEACHERS

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Abstract:
Real classroom experiences provided by teaching internship allow science practice teachers to apply theories in authentic settings. Over and above their mastery of science concepts, they have to master how to communicate these concepts to learners who are non-science experts in accurate and engaging way to ensure scientific literacy among these learners. Their confidence in their teaching (self-efficacy) and their way of communicating science concepts (science communication) are two important determinants of their development as a would-be science teachers. Hence this study was conducted to investigate the change in the science practice teachers' perceived teaching self-efficacy and science communication skills after their teaching internship. In addition, the relationship of these two variables were also analyzed. The change in these two variables were analyzed with z-test with a threshold significance of 0.05. It was found out that the perceived teaching self-efficacy and science communication skills of the science practice teachers increased significantly after their 12-week internship. Moreover, it was found that their perceived teaching self-efficacy and science communication skills are positively related to each other. This study recommends to investigate further the roles of other factors such as mentoring and peer relationship in the development of the science practice teachers; perceived teaching self-effcacy and science communication skills during internship.

Introduction:
The classroom is a space that requires effective communication between the learners and the teacher. The Department of Education describes a quality teacher as someone that is proficient in their communication skills (D.O. 42, s. 2017). Teachers make use of communication in different channels – class discussion, classroom management, pedagogy, and interaction with the students.
More often, a teachers communicate concepts specific to a subject matter; thus, it is required of them to be masters of the subject matters in the courses they are teaching. Science student teachers, usually enrolled in the Bachelor of Secondary Education Science (BSE-Science) program are trained to possess mastery of concepts in science throughout their program. The Commission on Higher Education set a minimum requirement of 73 units in science courses (CMO 75 s. 2017). The goal is to develop a good level of mastery in science based on the principle that science teachers with a good grasp of science concepts can teach science better and can correct any science misconceptions on the part of their learners. Hence, the curriculum develops in the students both mastery of science content and the pedagogy along science teaching.
According to Gardener (2010), mastery of the subject matter is not enough because, if this were

true, scientists would make good teachers. Several science teachers face the problem of having low pedagogical content knowledge despite being the experts in scientific content (Khaokhajorn and Srisawasdi, 2024; Brownell, Price, and Steinman, 2013). To be a good agent of quality education, a teacher should have good instructional strategies, good communication skills and effectively uses instructional materials (Akpan, Essien, and Obot, 2008).

The bridge that links between science teachers' mastery of topics and the learners is a good science communication (Suwansil and Pruekpramool, 2024). Science communication (SciComm), according to Mercer-Mapstone and Kuchel (2015) is "*the process of translating complex science into language and concepts that are engaging and understandable to non-scientific audiences*." Similar activities are done by science teachers – they present concepts in science in the classroom in languages appropriate to the learners in approaches that are creative, engaging, and interactive. Therefore, science teachers must be both knowledgeable in science and good communicators of science concepts to produce a scientifically literate learner.

In addition, teaching also requires self-efficacy or confidence on the part of the teacher. Teachers' self-efficacy beliefs are teachers' beliefs in their ability to effectively handle the tasks, obligations, and challenges related to their professional activity and play a key role in influencing important academic outcomes (e.g., students' achievement and motivation) and well-being in the working environment. Teachers' beliefs serve as cognitive filters that screen their experiences and thus shape their thoughts and actions. Beliefs about students, teaching, and learning drive teachers' planning and their moment-to-moment decisions about class management, teaching strategies, relationships with students, and assessment (Hoy et al, 2009; Gill, Ashton, & Algina).

Tschannen-Moran and Hoy have defined teachers' self-efficacy as a future oriented belief about the level of competence a person expects he/she will display in a given educational situation. Such beliefs influence the courses of action teachers choose to take, their level of effort, their perseverance in the face of obstacles and what they ultimately accomplish. As self-efficacy beliefs are context-related and dependent on perceptions of the desired outcomes , it follows that teachers' self efficacy perceptions on science communication and their experience with implementing an integration approach influence their self-efficacy belief in Science education.

Several researches have established the positive effect of practice teaching on the teaching self-efficacy of practice teachers. Though, communication skills are attributes to their self-efficacy, science communication needs to be investigated separately. According to Rodriguez (2021), science communication abilities are more specialized, with the goal of promoting understanding of scientific concepts by converting complicated scientific data into understandable, accurate, and engaging content for audiences that are not experts. Since SciComm is not formally embedded in the BSE-Science curriculum, this study investigated its development during the teaching internship course.

OBJECTIVES

The study is proposed to determine the teacher self-efficacy beliefs of science pre-service teachers and relate it to their perceived self-efficacy in science communication.

This study specifically seeks to;

1. Determine if there is a significant change in the perceived teaching self-efficacy among science practice teachers after their teaching internship.
2. Determine if there is a significant change in the perceived self-efficacy in science communication among science practice teachers after their teaching internship.
3. Relate teaching self-efficacy belief nd perceived self-efficacy in science communicati on among science practice teachers.

The following hypotheses were tested in the study;

H1:0 – There is no significant difference in the perceived teaching self-efficacy among science practice teachers before and after their teaching internship.

H2:0 – There is no significant difference in the perceived self-efficacy in science communication among science practice teachers before and after their teaching internship.

H3:0 – There is no relationship between the perceived teaching self-efficacy and the perceived self-efficacy in science communication among science practice teachers.

METHODOLOGY

This is a cross-sectional quantitative study that makes use of the Descriptive Correlational and Comparative Design. It only included science pre-service teachers in two State universities enrolled in the teaching internship course.

To measure the teacher Self-efficacy Belief of the practice teachers, the study used the Teachers' Efficacy Beliefs System-Self (TEBS-Self) instrument developed by Dillinger et al (2008). The instrument is composed of 31 items that measures the pre-service teachers' confidence along 6 distinct factors in handling their day-to-day classroom tasks. Response scale ranges from 1 (Weak Beliefs in my Capabilities) to 4 (Very Strong Beliefs in my Capabilities)

Their perceived Self-Efficacy in Science Communication within middle and high school was measured using the instrument developed by Chi, Liu, and Gardelle (2016). The instrument measures the practice teachers' beliefs in their capabilities to help middle and high school students understand science. The 20-item instrument was rated by the respondents with a four-point Likert scale (1—None , 2—Some, 3—Quite a bit, and 4—A Great Deal).

The two questionnaires were administered to 69 science practice teachers in 2 State Universities before and after their 12-week teaching internship. The data were evaluated using the following statistical analyses.

- Paired z-test was used to measure objectives 1 and 2. The means are described using the following.

Mean	Description
3.26–4.00	Very high (VH)
2.51–3.25	High (H)
1.75–2.50	Low (L)
1.00–1.74	Very low (VL)

- Regression analysis was used to determine the relationship between teacher self-efficacy beliefs and perceived self-efficacy in science communication. The table below shows the interpretation of the size of correlation.

Table 1: Interpretation of the size of correlation

Size of Correlation	Interpretation
0.90 to 1.00 (-0.90 to -1.00)	Very high positive (negative) correlation
0.70 to 0.90 (-0.70 to -0.90)	High positive (negative) correlation
0.50 to 0.70 (-0.50 to -0.70)	Moderate positive (negative) correlation
0.30 to 050 (-0.30 to -0.50)	Low positive (negative) correlation
0.00 to 0.30 (0.00 to -0.30)	Negligible correlation

RESULTS AND DISCUSSION

Objective Number 1

Results from z-test for paired two Sample for means (see Table 2) show that there is an increase in the teaching self-efficacy beliefs among practice teachers after teaching internship. Before the internship, their perceived teaching self-efficacy was described as high (H) and improved to a very high (VH) value after. They were able to develop their abilities on how to communicate ideas, give feedbacks, accommodate and motivate their learners, manage their class and their tasks and to think critically.

Table 2: Teaching self-efficacy beliefs among practice teachers before and after practice teaching.

Factors	Before	After	p-value
Communication Clarification	3.177 (H)	3.593 (VH)	2.30689E-10**
Management	3.191 (H)	3.591 (VH)	1.75668E-09**
Accommodation	2.956 (H)	3.418 (VH)	3.79696E-12**
Motivation	3.261 (VH)	3.696 (VH)	1.43195E-08**
Managing Routines	3.174 (H)	3.613 (VH)	5.09958E-08**
HOTS	2.964 (H)	3.478 (VH)	4.66294E-15**
General weighted mean	3.112 (H)	3.544 (VH)	0**

*** - there is a highly significant difference (increase) at p-value < 0.05*

This result corroborates with the findings of Nafziger et al (2026) that practice teaching gives a significant increase in the teaching self-efficacy of science practice teachers. Their exposure to a real-world setting and experience greatly contributed to this development (Hoq, 2022). Aside from practical experience, Xia (2024) emphasized the role of peer interactions and mentor support in enhancing self-efficacy. The 12-week practice teaching is attended by a practice teacher together with their peers and under the supervision and mentorship of a Univerity Supervisor and a Cooperating teacher. The collaborations, support, and sharing among their peers provided an encouraging environment resulting to higher confidence and growth. Furthermore, the continuous feedback, guidance and modelling provided by their Supervisor and Cooperating teacher posed a positive effect. (Navarro-Ibáñez and Cárdenas, 2026)

Objective Number 2

The result of the 20-item survey implied that there is a significant increase in the perceived SciComm among science practice teachers after their teaching internship (see Table 3), from high (H) to very high (VH) perceived SciComm skills. This means that the science practice teachers were able to improve their science teaching both in class and out of the classroom activities. They can better handle difficult lessons and are able to develop appropriate strategies in handling science lessons.

Table 3: Perceived efficacy in science communication (SciComm) before and after practice teaching

Item	Statement	Before	After
1.	Understand middle and high school students' science background knowledge.	3.279	3.618
2.	Understand middle and high school students' interest in science	3.059	3.632
3.	Understand middle and high school students' cognitive abilities	2.956	3.529
4.	Decide what science topics are appropriate to students	2.941	3.515
5.	Decide how much science content is appropriate to students	3.132	3.588
6.	Help teachers find relevant resources (e.g., science activities)	3.265	3.735
7.	Develop science labs	2.588	3.059
8.	Develop out-of-school science learning activities	2.515	2.985
9.	Assist teachers in teaching lessons	3.338	3.588
10.	Assist teachers in conducting labs	2.985	3.456
11.	Teach science labs to students	2.765	3.294
12.	Facilitate out-of-school science learning activities	2.294	2.971
13.	Lead small group activities/discussions with students in class	3.191	3.632
14.	Demonstrate scientific content, procedures, tools, or techniques to students	3.412	3.735
15.	Teach lessons or give lectures to students in class	3.588	3.868
16.	Explain a difficult science concept to students	3.162	3.618
17.	Relate current research to K-12 curriculum	2.809	3.382
18.	Explain current research to teachers	2.515	3.059
19.	Facilitate student learning in museums	2.191	2.647
20.	Explain science to parents	2.265	2.838
General Weighted Mean		2.911 (H)	3.387 (VH)
p-value		7.66227E-05**	

p-value < 0.001: There is a significant difference (increase)

This result may be linked to their experiential learning from the teaching internship. In this study, the teaching internship were conducted in real classroom settings. The challenges associated with experiential learning have positioned student teachers to be reflective and critical, elements necessary for their growth in transmitting scientific knowledge clearly, rigorously and purposefully (Fuentes-Cancell et al 2026).

This finding shows that practice teaching prepares future science teachers to be effective in their field. According to Choomponla et al (2024), a good science communication skill can effectively bridge the gap between difficult science concepts and student, an important role that can promote scientific literacy and interest in science among students.

Objective Number 3

The result in Table 4 indicates a moderate positive relationship between the perceived teaching self-efficacy and science communication skills among the science practice teachers. This indicates that an increase in their perceived teaching self-efficacy will result to an increase in their science communication skills

A teacher with high self-efficacy can hone their skills and improve instructional practices. Highly self-efficacious teachers offer quality classroom interactions that involve designing complex learning tasks, effective classroom management and use a variety of assessment techniques that promote students learning engagement (Emiru & Gedifew, 2024).

Table 4: Correlation of TEBS-self and SciComm before and after practice teaching.

Variables	**before**		**after**	
	Mean	**correlation**	**mean**	**correlation**
TEBS-self	3.112	0.4946**	3.544	0.6483**
SciComm	2.911		3.387	

*** - moderate positive correlation*

Conclusions and Recommendations

The results of this study showed that the 12-week internship improves the perceived teaching self-efficacy and science communication skills of BSE-Science practice teachers. It is also found that these two variables are positively related to each other. The results show that the teaching internship program provided by the two state universities under this study have positively honed the teaching self-efficacy and science communication of their science practice teachers. It is recommended that a study that investigates how other factors such as mentoring and peer relationship contribute to these developments among science practice teachers during their teaching internship.

References:

1. Akpan, O., Essien, E. & Obot, I. (2008). Teacher's level of mastery of subject matter and students' academic achievement in Social Studies in Cross River State, Nigria. West Africa Journal of Educational Research. 11(1), 11-17. https://www.researchgate.net/publication/340845032_Te acher%27s_level_of_m astery _of_subject_matter_and_students%27_academic_achievement_in_Social_Studies_in_Cross_River_State_N igria
2. Brownell, S. E., Price, J. V., & Steinman, L. (2013). Science Communication to the General Public: Why We Need to Teach Undergraduate and Graduate Students this Skill as Part of Their Formal Scientific Training. *Journal of undergraduate neuroscience education*, *12*(1), E6–E10. https://www.ncbi.nlm.nih.gov/p mc/arti cles/ PMC3852879/
3. Chi, S., Liu, X., & Gardella. J. (2016). Measuring University Students' Perceived Self-efficacy In Science Communication in Middle and High Schools. Universal Journal of Educational Research 4(5): 1089-1102. https://files.eri c.ed.gov/fulltext/EJ1099784.pdf
4. Choomponla, C., Tonsinon, K., & Klinkaewnarong, J.. (2024). Enhancing Science Teacher Students' Communication Skills: The Effect of Model-Based Learning. 769-777. 10.22492/issn.2186-2303.2024.65.
5. Dellinger, A. B., Bobbett, J. J., Olivier, D. F., & Ellett, C. D. (2008). Measuring teachers' self-efficacy beliefs: Development and use of the TEBS-Self. Teaching and Teacher Education, 24(3), 751–766. https://doi.org/10.1016/J .TATE.2007.02.010
6. Emiru, E. K., & Gedifew, M. T. (2024). The effect of teacher self-efficacy on learning engagement of secondary school students. Cogent Education,11(1).https://doi.org/10.1080/2331186X.2024.2308432
7. Fuentes-Cancell, D. R., Estrada-Molina, O., & Gutiérrez-Ortega, M. (2026). Developing Science Communication Competence in Initial Teacher Training. *Education Sciences*, *16*(1), 86. https://doi.org/ 10.3390/educsci16010086
8. Gardener, W., 29Decemeber, 2010. Is Subject Matter Expertise Enough for Successful Teaching?https://www.edweek.org/education/opinion-is-subject-matter-expertise-enough-for-successful-teaching/2010/12
9. Gill, M., Ashton, P., and Algina, J. (2004). Changing preservice teachers' epistemological beliefs about teaching and learning in mathematics: An intervention study, *Contemporary Educational Psychology*, 29(2), pp164185.https://doi.org/10.1016/j.cedpsych.2004.01.003
10. Hoq, T. (2022). Exploring self-efficacy beliefs of Pre-Service Teachers: An evidence from biological science education program in Bangladesh. Teacher's World: Journal of Education and Research, 48. https://doi.org/10.3329/twjer.v48i1.67544
11. Hoy, A. W., Hoy, W. K., & Davis, H. A. (2009). Teachers' self-efficacy beliefs. In K. R. Wenzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 627–653). Routledge/Taylor & Francis Group. Retrieved from https://psycnet.apa.org/record/2009-24219-028

12. Khaokhajorn, W., & Srisawasdi, N. (2024). Assessing pre-service science teachers' understanding of the nature of scientific inquiry to develop a sustainable technology-infused pedagogical program in teacher education. *Cogent Education*, *11*(1). https:/ /doi.org/10.1080/2331186X.2024.2439160
13. Mercer-Mapstone, Lucy & Kuchel, L.. (2015). Core Skills for Effective Science Communication: A Teaching Resource for Undergraduate Science Education. International Journal of Science Education, Part B. 7. 1-21. https://www.research gate.net/publication/285385784_Core_Skills_for_Effective_Science_Communication_A_Teaching_Resource_for_Undergraduate_Science_Education
14. Nafziger, B., Moldavan, A. M., & Brady, A. C. (2026). Examining Growth in Preservice Science Teaching and Learning Self-Efficacy Using Mixed Methods. *Journal of Research in Science, Mathematics and Technology Education, 9*(1), 23-43. https://doi.org/10.31756/jrsmte.912
15. Navarro-Ibáñez, M. and Cárdenas, V. (2026). Teacher self-efficacy and mentorship: Exploring the roles of Cooperating Teachers and University Supervisors in practicum experiences of preservice teachers. Teaching and Teacher Education, 176, https://doi.org/10.1016/j.tate.2026.105531
16. Pruekpramool, C., & Suwansil, P. (2024). Enhancing Science Communication Skills for Future Science Teachers: A Redesign of Inquiry-Based Learning. *Science Essence Journal*, *40*(2), 26–44. Retrieved from https://ejournals. swu.ac.th/index.php/sej/article/view/16434
17. Rodriguez, D. 2021. Science Communication: A basic skill that needs to be developed in undergraduate and graduate programs *Sciential - McMaster Undergraduate Science Journal*. DOI: 10.15173/sciential.vi7.2922
18. Tschannen-Moran, M., & Woolfolk Hoy, A. (2007). The Differential Antecedents of Self-Efficacy Beliefs of Novice and Experienced Teachers. Teaching and Teacher Education, 23, 944-956. https://doi.org/ 10.1016/j.t ate.2006.05.003