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Community of Inquiry Framework in Basic Science Process During Synchronous Learning Modality

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Abstract

This study was grounded on the established Community of Inquiry (CoI) Framework to assess the behavior of students during the synchronous classes and its association with the Basic Science Process Skills (BSPS). The participants of the study were twenty-eight students from the seventh grade class of a public elementary school in the Philippines. The quantitative data were collected from the survey questionnaires while the pre-test and post-test were measured using a rating scale instrument facilitated via Google forms. Pearson-r was used to find the correlation among the variables while the T-test for the differences between variables. The results divided the CoI into three presences. The teaching presence, social presence, and cognitive presence with an acceptable mean, implies a good sense of community among the learners. Furthermore, few students' basic science process skills were advanced and proficient, while most were still approaching proficiency and developing levels. The constructs of the CoI Framework were associated with the basic science process skills for classifying. Similarly, there is a significant difference between the pre-test and post-test scores of the respondents in classifying and measuring. The results suggest that continuous exposure of the students to CoI during synchronous classes improves their ability to self-study during asynchronous classes.

Keywords: *Community of inquiry, basic science process skills, synchronous learning*

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1. Introduction

Over half of the world's children are still affected by partial or complete school closures one year after the COVID-19 pandemic began, and the health catastrophe caused over 100 million additional children to fall below the minimum reading competency level (UNESCO, 2022). While the majority of the talents were beginning to erode rapidly, the Department of Education (DepEd), publicized the official school calendar and activities for the years 2021-2022, applying blended learning as a new method of delivering education amidst the global health crisis. In the Philippines, a "*blended learning*" program that included online classes, printed materials, and lessons broadcast on television and social media was launched. According to the United Nations, whereas practically every other country has partially or reopened schools for in-person instruction, the Philippines has kept its schools closed since the pandemic began.

The Philippine educational system did not have a formal online platform for delivering formal instruction to the students until the break-out of the pandemic. Unfortunately, due to the impending calamity already spreading, education's future has become questionable. While online education is quickly evolving, more studies on students' experiences in online courses are needed (Panergayo & Aliazas, 2021). One topic that has been investigated in connection to the quality of the online learning experience is the cognitive, social and teaching presence that was just among the presences on the Community of Inquiry Framework (Garrison & Akyol, 2013). It is primarily well-researched because online learning has gained popularity worldwide due to technological advances and the increase of the internet.

The community of inquiry (CoI) framework is an essential and relevant concept for framing this research which may be applied to analyze and describe the three presences of the participants as they interact within the community of synchronous classes. As such, its main purpose is to evaluate the total experience of the Grade 7 students who took science online class built upon the CoI framework through cognitive, social and teaching presence and how would synchronous online modality enhances student's basic science process skills (BSPS). This study also examines the processes of synchronous learning through CoI structure as the primary lens for analyzing the content of synchronous learning modality towards enhanced BSPS. BSPS is an integral part of students holistically developing and managing their learning in science through their journey.

In the new education platform, problems arise from low expectations, inadequate understanding due to insufficient teacher and student interaction, and the number of students in an online class. The progress to web-based learning has affected teachers, learners and the learning environment, which has also sparked debate on the applicability of online class. Although online classes are seen challenging as a result of educational structure, obstacles are identified to making online classrooms a reality. The epidemic has to light the need to enhance the educational system, which now provides an opportunity to do so (Aliazas et al., 2021).

Specifically, the study aimed to assess the effectiveness of synchronous online modality built upon the CoI framework towards BSPS enhancement, determine the pre-test and post-test scores of the respondents on BSPS, evaluate the significant relationship between synchronous modality built upon CoI and the BSPS, and evaluate the significant difference between the pre-test and post-test scores on BSPS.

2. Literature Review

Online courses are becoming increasingly popular. Students are drawn to online classes because of the ease of participating at any time and from any location, but once enrolled, they may be unsatisfied with the experience (Moskal et al., 2010). One of the causes of this dissatisfaction is that online students sometimes feel cut off from the rest of the world. This gap might make it difficult for students to communicate and learn together. Furthermore, teachers have reported having difficulty encouraging online student interactions. As a result, there is a pressing need to develop online learning settings that can preserve a strong feeling of community while supporting students socially and cognitively (De Noyelles et al., 2010). In addition, chat rooms, instant messaging, and web conferencing with whiteboard, audio, and video capabilities can help synchronous collaboration (e.g., Blackboard Collaborate, Adobe Connect). According to Hsiao (2012), synchronous communication can help overcome some of the drawbacks of asynchronous learning environments, such as offering possibilities for instant feedback and assisting in the development of relationships between instructors and students.

Stenbom et al. (2012) introduced the relationship of inquiry framework, which is an adaptation of the community of inquiry framework for an online coaching context, to conceptualize the one-to-one learning environment of online coaching. According to Anderson (2017), the current CoI model's major flaw is that, while it aids in the construction and definition of a successful teaching model, it ignores the reality that the efficacy of teaching is equally

dependent on the learners. As a result, the author agrees with Shea and Bidjerano (2010) that a new presence, the learner presence, should be included in the framework.

In online education research, several techniques for assessing learning processes have been considered by Garrison and Akyol (2013). The community of inquiry framework, which has been widely researched and validated, is regarded as one of the best and most popular models for evaluating online learning (Akyol et al., 2009; Jézégou, 2010). Kanuka and Rourke (2013) critiqued of the CoI framework considered the central indicator of a successful online learning experience to be *"deep and meaningful learning"* as *"the critical examination of new facts and the effort to make numerous connections with existing knowledge structures,"* contrasting it with surface learning, "the uncritical acceptance of new facts and ideas."

According to Garrison and Akyol (2013), the CoI framework is designed to support teacher and student reflection upon discursive behaviors in online environments to facilitate deep, meaningful learning. The philosophical premise of the COI framework is a collaborative constructivist approach to teaching and learning that comprises three interdependent structural elements: social, cognitive, and teaching presence. It is a relevant and significant framework to describe the three presences, namely social, cognitive and teaching, as the students participate in synchronous learning in an active community. The validity of the CoI has been tested by Swan et al. (2008).

2.1. Social Presence

Social presence refers to participants' capacity to identify with the community, speak meaningfully in a safe atmosphere, and build interpersonal relationships by projecting their personalities (Weissman, 2010). However, social presence alone will not guarantee the establishment of critical discourse in online learning, and such discourse will be exceedingly difficult to emerge without a foundation of social presence.

Common goals and inquiries provide the basis of a sense of community. Furthermore, if the learning activities are knowledge acquisition and there are no collaborative tasks where students may benefit from the viewpoints of others, social presence is less critical (Picciano, 2021). In contrast, the issue here is the nature of social presence and how it must change as a course of study progresses. As important as it is to establish effective communication and social

relationships, a community's long-term viability depends on the group's ability to speak openly and unify around a shared objective or purpose (Kabilan & Annamalai, 2022).

Emotional Expression. Emotion became one consideration for successful online learning, similar to face-to-face learning. Cleveland-Innes and Campbell (2012) include emotional expression as the fourth presence of the CoI framework and defined it as the "*outward expression of emotion, affect, and feeling by individuals in a community of inquiry, as they relate to and interact with the learning technology, course content, students, and instructors."*

In a study by Jiang and Koo (2020), recognition, emotions shared by the teacher, students and peers and directed effectiveness showed a strong need to make emotional connections. The study of Garrison and Akyol (2013) found that affective expressiveness declined over three periods, and group cohesiveness increased sharply. It might be claimed that collaborative activities boost students' sense of belonging to the group, which they were guided from an individual to a collective perspective. Furthermore, several of the students' responses to open-ended questions also indicated the significance of collaborative actions for their successful learning.

Open Communication. A study by Chen (2014) discussed the interactivity of the students, which is a contributor characteristic of communication settings. Its definition implies subjectivity. Thus, interactivity is considered a parameter of a communication setting and not a medium. According to Gunawardena et al. (2018), an online wisdom community's lifeblood is communication. A community's identity and relationships are formed and strengthened via good communication. Good communication sets the foundation for transformative learning by offering clarity of goal and motivation.

Group Cohesion. A study by Chen (2014) states that immediacy is associated with the connectedness and closeness one feels with another. Group cohesiveness can be seen in the students who feel a sense of belongingness and commitment. She unveiled the valuable relationship between teacher nonverbal immediacy and students' effective learning. Non-verbal immediacy behaviors include smiling and eye contact when talking to students.

2.2. Teaching Presence

Teaching presence refers to designing, assisting, and leading cognitive and social processes to achieve personally meaningful and educationally worthwhile learning outcomes

(Garrison, 2016). According Weissman (2017), the value of teaching presence in the CoI framework and the world of online education is the subject earlier studies. Previous studies have verified teaching presence in an asynchronous setting. Teaching presences play a big part in students' overall learning during synchronous classes. Rules, techniques and various methods incorporated by the teacher during synchronous classes help identify students' development.

Instructional Management. When examining teachers' self-efficacy beliefs, classroom management is one of the six primary domains of teacher functioning. Teacher effectiveness has been linked to teachers' classroom actions, levels of effort, aspiration, preparation, and organization, as well as their tenacity and resilience in difficult situations (Yildiz, 2017). Martin (2016) discusses that teachers' control, rules, best instructions, instructional styles, and managing students' misbehavior are under instructional management. Futch et al. (2016) add that clear instructions, feasible assignments, and applicable activities support students' total learning outside and during classes.

Lang (2013) refers instructional management as teachers' actions, including communicating and demonstrating classroom rules, allotment of learning topics, objectives and materials and keeping an eye on student output and homework submission. As such, good instruction implies good classroom management (Yildiz, 2017) encompassing classroom management as more comprehensive than student discipline. The three aspects of instructional management include teacher preparation, the physical environment and various strategies for presenting lessons. Misbehavior and problems might not arise when they are prevented with best planning, curriculum pacing, and clear instruction that engages students in academic subjects.

Building Understanding. Building understanding among the learners made their attention span longer during classes and piqued their curiosity, creativity, and knowledge acquisition. It engaged in the learning process, where they explored different concepts and developed a sense of community among them. Within *"building understanding,"* one category/aspect under teaching presence. According to Anderson et al. (2012), building understanding is a method for students to interact and expand on the knowledge offered in the course's instructional materials. The educator may employ techniques such as communicating meaning, highlighting areas of agreement and disagreement, and achieving consensus and understanding (Arbaugh, 2008). As a result, facilitating discourse necessitates the instructor to review and comment on student comments, raise questions and make observations to move

discussions in an intended way, maintain the discussion going smoothly, mark out unresponsive students, and try to limit the activity of dominating students who may be disadvantageous to the learning of the students.

Direct Instruction. Relating current and relevant issues during discussions got students' interest and attention and optimized learning feedback that helped teachers meet learning outcomes. According to Hatziapostolou and Paraskakis (2010), formative feedback in the students' learning is instrumental. Providing high standard feedback and ensuring engagement helps and encourages learning. Feedback must be timely, customized, manageable, direct and motivating.

Anderson et al. (2012) describes direct instruction as the instructor's intellectual and scholarly leadership, which included sharing their subject matter expertise with the pupils. A subject matter expert, not just a facilitator, should perform this function because of the requirement to diagnose comments for appropriate comprehension, infuse sources of information, guide conversations in productive directions, and scaffold student knowledge to take it to a new level. Direct instruction is concerned with the indicators that measure the discourse and the efficacy of the educational process, in addition to transferring information by a topic expert. In addition, Yang et al. (2010) emphasizes that questioning and collaborating have been identified as helpful strategies for motivating pupils, promoting communication skills, and assisting in constructing meaning. This is supported by Weissman (2017) describing questioning as a powerful strategy for encouraging learning and serves as a foundation for thinking since it motivates students, focuses their attention, and

2.3. Cognitive Presence

Cognitive presence is the amount to which learners may generate and reinforce meaning in a critical Community of Inquiry via persistent contemplation and dialogue (Garrison & Akyol, 2013). Garrison et al. (2001) describe cognitive presence as the extent to which learners can construct and confirm meaning through sustained reflection and discourse. Cognitive presence in online learning is developed as the result of a four-phase process: 1) a triggering event, in which some topic or problem is discovered for further investigation; 2) exploration, in which students investigate the subject individually and collectively via critical reflection and discussion. 3) integration, in which learners generate meaning from the concepts developed during the inquiry;

and 4) resolution, in which learners apply newly acquired information to educational or workplace situations.

2.4. Theoretical Framework

The CoI framework (Garrison & Akyol, 2013) proposes that online learning is the participation of a community in the course of an inquiry based on the essential elements of cognitive presence, social presence, and teaching presence. Knowledge construction is a process in this investigation carried out by cognitive, social, and teaching presence. Each of the three types of presence, has its qualities but depends on the others. The environment is shaped by social and teaching presence, with active social presence encouraging discourse and thereby increasing cognitive presence. Direct facilitation and instruction are used to give the material needed to enhance cognitive presence. The three aspects of the CoI are interconnected and work together to create a positive, practical, engaging, and socially beneficial educational experience.

The CoI is a hypothetical framework for creating ideal internet learning environments that stimulate fundamental thinking, inquiries, and conversation among students and educators (Garrison, 2016). Instructors can use instructional models to relate the findings of instructive research to the practical job of educational planning, improvement, and sequencing of informative encounters to improve learning (Cooper & Scriven, 2017). An ideal CoI includes a "*cohesive and interactive community of learners whose aim is to critically investigate, build, and validate useful information*" (Garrison & Vaughan, 2008, p. 9). The social dynamics, connections, and collaboration that exist to generate an atmosphere that encourages inquiry are referred to as "community." The "process of generating meaning via personal responsibility and choice" is referred to as "inquiry" (Garrison & Vaughan, 2008). According to Garrison (2016), online academic staff and students collaborate to create a productive online learning environment in which knowledge is generated by skillfully marshaling several types of presence.

Social Presence. Participants' capacity to identify with the community, speak meaningfully in a safe atmosphere, and build interpersonal relationships by projecting their personalities (Garrison, 2016). Social presence, formerly regarded as a novel theoretical approach (Short et al., 1976), has been investigated in several different settings. People involved in this conversation are separated by a significant amount of time and space.

***Cognitive Presence*.** The amount to which learners may generate and reinforce meaning in a critical CoI via persistent contemplation and dialogue (Garrison, 2016).

***Teaching Presence*.** This includes designing, assisting, and leading cognitive and social processes to achieve personally meaningful and educationally worthwhile learning outcomes (Garrison, 2016).

3. Methodology

This study used a quasi-experimental research design, a quantitative survey descriptive analysis and correlational research to investigate the effectiveness of synchronous learning modality built upon the CoI framework towards the basic science process skills development and enhancement of the students. It involved collections of quantitative information tabulated along a continuum in numerical forms, such as scores on a test (Maranan, 2017). It entails collecting data that characterizes the activities and organizing, tabulating, depicting, and interpreting the data collected.

The study participants comprised only 28 enrolled online students from Grade 7 of a public integrated school in the Philippines. The respondents of the study were chosen by purposive sampling, a judgmental, selective, or subjective sampling, where a sample is a non-probability sample selected based on population characteristics and the study's objectivity (Crossman, 2017).

The study was conducted between March and April 2022. The data gathering tools for this study were the researcher-made lesson plan, the pre-assessment and the post-assessment test to determine the student's performance in basic science process skills. The constructed lesson plans employed the three presences of the CoI that are very important in an online class to have meaningful learning. The study coverage was weeks 4, 5, 6, 7, and 8 of the third grading period of Grade 7 Science. The second instrument was the assessment tool, consisting of 60-item questions in the pre-and post-assessment tests that measure the basic science process skills of the students. The last instrument was the adapted CoI survey questionnaires.

The research applied the independent and dependent conceptual models. Independent variables included the teaching presences such as instructional management, building understanding and direct instruction; social presences such as emotional expression, open

communication and group cohesion; cognitive presences such as triggering events, exploration, resolution and integration. The dependent variables were the basic science process skills such as observing, communicating, classifying, measuring, inferring and predicting.

4. Findings and Discussion

Table 1

Level of teaching presence

Teaching Presence	Mean	SD	Verbal Interpretation
Instructional Management	4.10	.85	Agree
Building Understanding	3.96	.96	Agree
Direct Instruction	3.88	.88	Agree

Under instructional management, majority of the respondents agree with all the indicators. Based on the composite mean of 4.10 and standard deviation of .85, it was indicated in the verbal interpretation, *"agree"* is the major answer from the respondents. Classroom management played an important role during the duration of the synchronous class, as the teacher set clear instructions beforehand. These are the same findings of Futch et al. (2016) and Hatziapostolou and Paraskakis (2010) emphasizing on clear instructions and effective communication. The data imply a uniform response from teachers sets a tone for classroom atmosphere and instructional management that assert the findings of Martin (2016) and Oliver and Reschly (2007).

Under building understanding, most respondents agree with all the indicators evidenced by a composite mean of 4.01 and standard deviation of .72. Guiding students, encouraging and helping them engage with the learning process led to the successful integration of learnings. Positive reinforcement minimizes negative behaviors and boosts self-confidence to build total learning experiences. The data imply a uniform response where the teacher could connect ideas, clear up misconceptions, and ask the class for clarification (Arbaugh et al., 2010). Furthermore, to strengthen blended learning, teachers and students must have support and enrich different

resources (Futch et al., 2016). Building understanding among the learners made their attention span longer during classes and piqued their curiosity, creativity, and knowledge acquisition.

Most respondents agree with all the indicators under direct instruction based on the composite mean of 3.88 and standard deviation of .88. Feedback assists students' progress and tends to become more productive once accurate and inaccurate things are cleared up. It also improves students' confidence, active participation and elicits the power of good conversation.

Table 2

Level of social presence

Social Presence	Mean	SD	Verbal Interpretation
Emotional Expression	3.74	.74	Agree
Open Communication	3.65	.79	Agree
Group Cohesion	3.50	.68	Agree

Under emotional expression, majority of the respondents agree with all the indicators as indicated by a composite mean of 3.74 and standard deviation of .74. Inclusivity was practiced during the synchronous class, where students felt a sense of belongingness. Social interaction was also practiced as the students met and greeted their classmates on the first day. This is similar to the dynamic experience of social presence in emotional presence assessed by Cleveland-Innes and Campbell (2012) that emotional presence is more than simply an expressive reaction manifested through social presence; it also underlies the overall online experience. Expressing emotions appropriately made them feel a sense of belongingness among other students. The power of students' connectedness for learning is what makes social interaction possible and attainable.

Under open communication, most respondents agree with all the indicators based on the composite mean of 3.65 and standard deviation of .79. Most of them found the online class comfortable. The most talked about issue for social presence in online discussion is setting the climate and bearing the sense of community vital to building strong communication and learning. This was evident in the study of Arbaugh et al. (2010) that learning perception could affect once

learners feel fear of interacting with the teacher or classmates online. Communicating with the students openly is still one of the best ways to establish a sense of community during an online class. Teachers communicate one-to-one or one-to-many while students in many ways, such as group chat, emails, Google classroom etc. (Richardson & Lowenthal, 2017). Student's level of connectedness determined how they are motivated to take active participation during synchronous class.

Under group cohesion, the majority of the respondents agree with all the indicators with a composite mean of 3.50. Acknowledgment shows respect for someone's idea, recognition of someone's contribution and makes them feel that they exist. In addition, a sense of collaboration is significant for creating growth and improving student outputs. Collaboration improves the group strategy, teamwork, suggestions and opinions of the students in the online class, which leads to deeper learning. This supports the study of Arbaugh (2008) that interpersonal communication increased students' sociability during synchronous classes, leading to more interaction.

Table 3

Level of Cognitive Presence

Cognitive Presence	Mean	SD	Verbal Interpretation
Triggering Event	3.88	.97	Agree
Exploration	3.76	.78	Agree
Integration	3.95	.71	Agree
Resolution	3.85	.63	Agree

Under triggering event, the majority of the respondents agree with all the indicators based on the composite mean of 3.88. Strategies for properly delivering the lesson became essential during the synchronous classes. Asking many questions as a form of motivation caught students' interest until the end of the class while providing them problems led to further inquiries. Triggering event catches students' attention, piques their interest and motivates them. The art of questioning is critical in this part. Fiock (2020) showed that activities related to inquiry and questioning must be seen in this part of cognitive presence for best results.

Under exploration, most respondents agree with all the indicators based on the composite mean of 3.76, interpreted as "agree." Brainstorming was also practiced during synchronous class, allowing students to think without limitations and fear of being judged. The exploration phase is about exchanging information and ideas, where students explore different views and learn through critical reflection and serious discussions of a particular lesson. Similar to the findings of Guo et al. (2021), exploration phase greatly affects students' performance. This phase used different sources of information and made them explore problems posed during an online class. Encouraging numerous perspectives and conversations led to an understanding of different topics.

Under integration, most respondents agree with all the based on the composite mean of 3.95. Different activities were done during the synchronous classes wherein students were given a chance to express their opinions and insights. In addition, reflections were also seen during the class as they encouraged a better learning experience. As integration emphasizes different ideas and thoughts during the exploration, similar findings were observed from Akyol and Garrison (2008) that the apparent rise of activity around the integration phase was due to the expansion of knowledge from diverse sources. Students' ability to support and integrate their thoughts using multiple resources improved as they began to employ additional sources. The integration of learnings ended with reflections that served as a fundamental concept in an online class.

Under resolution, the majority of the respondents agree with all the indicators with a composite mean of 3.85. Applying real-life ideas in lessons support good classroom management as engagement increases (Medina & Del Rosario, 2022). The resolution phase, where the students apply their gained knowledge and learnings to their everyday lives or workplace settings, emphasizes Akyol and Garrison (2008) findings that it necessitates enhanced teaching presence to explore and diagnose various concepts so students may go to a higher level of thinking while developing their thoughts.

Table 4 shows the overall BSPS results for both pre-test and post-test. The result implies balanced scores of the respondents who got a 7-10 and 0-4, and there is an urgency to help the respondents come up with greater BSPS. While under a score rating of 5-6 with remarks of *"approaching proficiency,"* there are no changes in pre-test and post-test.

Table 4

Overall Performance of Basic Science Process Skills

Rating	Pre-test		Post-Test		Remarks
	F	%	F	%	
74 & Below	7	25.0	7	25.0	Beginning
75-79	6	21.4	4	14.3	Developing
80-84	6	21.4	6	21.4	Approaching Proficiency
85-89	5	17.9	4	14.3	Proficient
90-100	4	14.3	7	25.0	Advanced
Total	**28**	**100**	**28**	**100**	

The data reveal that respondents were improving to a good result, which had a big chance of progressing towards proficiency and advanced as they were continuously exposed to the COI framework during their online class. The overall BSPS of the students was inadequate similar to the findings of Zulkarnaen et al. (2018) that mastery of information and science process skills is insufficient to train students to be creative and science-driven but needs other skills.

The obtained data indicate no change in the respondents who got a score of 0-2 from the pre-test to post-test exam results. This means respondents who were in a heterogenous group of students were maybe unsure of their chosen mode of learning. Respondents had difficulty grasping the lessons due to limited time and resources. However, respondents with a score rating of 3-4 with a remark of *"developing"* apparently decreased in number and added improved to 9-10. This gives a positive implication on utilizing the COI framework during synchronous learning modality. To address the problems reflected in the results, Ango (2002) suggested that communication skills must be taught and studied early in science learning and teaching. Thoughts and ideas must be communicated for better outcomes and students' awareness. The flexibility of online classes does not mean they provide efficient and purposeful learning; hence, individual differences of the students affect their learning styles (Law et al., 2022).

Table 5

Correlation between CoI Framework and the Basic Science Process Skills

Community of Inquiry Framework	Basic Science Process Skills					
Teaching	Observing	Communicating	Classifying	Measuring	Inferring	Predicting
Instructional Management	-.283	.075	-.384*	.026	-.026	-.175
Building Understanding	-.153	-.042	-.322	-.132	-.040	-.250
Direct Instruction	-.221	.102	-.327	.025	-.028	-.119
Social						
Emotional Expression	-.153	.050	-.403*	-.026	.085	-.154
Open Communication	-.224	.035	-.472*	-.029	.017	-.136
Group Cohesion	-.352	-.039	-.576**	-.038	.198	-.043
Cognitive						
Triggering Event	-.245	-.031	-.332	-.100	-.015	-.203
Exploration	-.348	-.007	-.547**	.020	.081	-.093
Integration	-.182	.188	-.404*	.131	.082	-.085
Resolution	-.304	-.146	-.340	-.062	-.147	-.312

The table shows the relationship between students' perception on CoI Framework during synchronous classes and the students' BSPS. Only classifying skill has significant relationship with the instructional management of teaching presence, emotional expression, open communication, and group cohesion of social presence, exploration and integration of cognitive presence. Classifying, an essential skill where students categorize or group things by recognizing their similar and different properties, is also rooted within the rest of the skills especially observing, good observations lead to progressive growth of the other skills, being keen observer made you to be aware and be more vigilant of the things around us.

As gleaned on the table, most of the sub-variables under the COI framework are significantly related with only one science process skills which is classifying. This means

students who can classify satisfactorily can also understand the lesson well. The result also imply that the skill of grouping things gives an important mirror with the three presences of the COI framework.

While the rest of the BSPS are not significantly related to the COI framework, this only implies that students who just rely on the limited resources would not seek for additional data, learning scope is constrained, and distance learning process in line with the COI framework became insufficient. According to a DepEd memorandum DM-CI-2020-00162, a minimum of 2 hours daily are given to Grade 7. With this kind of platform, students had a limited time to make online classes effective and worthy though lessons are not totally discussed the way it must be. Lowenthal (2016) also found on his study that teachers gave importance on spending time with own strategy of social presence like greetings, empathy, salutations but then shifted quickly to teaching presence behavior such as dealing with lesson proper, mostly likely because of time limits.

All sub-variables under social presence is significantly related to classifying. Wei and Chen (2012) also found that social presence influenced students' learning interaction during online class and the students feel comfortable only once it is achieved. For this, Drouin and Vartanian (2010) suggest teachers design learning environments with SOC in mind to increase learning, satisfaction, and retention.

Under cognitive presence, only exploration and integration variables are significantly related to classifying. This indicates that exploring more of what have been told by the teacher was very significant even not during the synchronous class. Seeking solutions to a certain problems became so apparent to the learners, brainstorming and asking different questions as well as bringing opinion during online class was achieved. A fast paced of pre and post-test greatly affect the students gained scores. Although DeNoyelles et al. (2014) revealed that online discussions beyond the exploration phase rarely show the level of cognitive presence, Gorksy and Blau (2009) found social presence not related with students' cognitive performance rather cognitive presence correlates with subject matter in terms of difficulty. Various learning styles must be incorporated during synchronous class, not all were visual learners, some are auditory, some needs to undergo remediation program on areas such as reading and writing (Panoy et al., 2022). Online classes were hard to achieve successfully if these learners were not honed and molded holistically.

Table 6

Difference between the PRE and POST scores of the respondents in Basic Process Skills

Basic Science Process Skills	Pre-Test		Post-Test		Mean Difference	t	df	Sig. (2-tailed)
	Mean	SD	Mean	SD				
Observing	7.50	2.77	6.39	2.99	-1.107	-2.12	27	.054
Communicating	3.36	2.63	3.68	3.01	.321	.648	27	.523
Classifying	4.32	3.07	6.32	2.78	2.000	3.535	27	.001
Measuring	3.11	3.14	4.71	3.41	1.607	3.324	27	.003
Inferring	5.50	3.13	5.39	3.01	-.107	-.165	27	.871
Predicting	6.29	2.93	5.61	2.35	-.679	-1.30	27	.205

Table 6 shows that significant differences exist between the pre-test and post-test results of classifying and measuring among the six BSPS. This explains that respondents who participated in synchronous classes noticeably had interest in comparing things, looking at the similarities and differences and categorizing things according to its characteristics and properties. Likewise, respondents under the skill of measuring were highlighted, computation were the focus, formulas were used, lessons were explained well and profoundly. Both skills resulted on a way that online classes must be done accordingly, with proper delivery and continuous flow of the lesson.

The COI framework played a big part on the synchronous classes in trying to find out the current status of the respondents in terms of their basic science process skills. Unfortunately, only classifying and measuring made a significant difference, while the other skills resulted to be imprecise. A lot of reasons can be made from this occurrence such as insufficient time given to each major subjects, students from this group are not serious when they were inside the classroom, incorporation of strong and strict rules, giving of additional activities, providing more video lessons and giving all students ample time to think, express, and participate.

5. Conclusion

This study found a significant relationship between the three presences of the CoI Framework and the BSPS as to classifying. Likewise, there is a significant difference between the pretest and posttest scores of the respondents in basic science process skills as to classifying and measuring.

Teaching presence during synchronous class is very important as it helps the students to experience quality education. In line with this, teacher facilitation, clear communication and instructions, timely feedback, and effective reinforcement must be emphasized. Cognitive presence which highlights the intense discussion, insightful and engaging interaction among the students virtually could help them construct meaning through continuous communication. Students must be given enough time learning different concepts, formulas, science vocabulary and reading scientific text. As Basic Science Process Skills need to be achieved in science education, utilization of open ended questions and activities is a way to enhance student's skills in the long run. Adapt think-pair-share during synchronous classes as well as providing a lot of learning activities over assignments will encourage more discussions and comprehensions. In addition, enabling breakout rooms during group activities is highly suggested as it offers a wide variety of interactions among students. Simple and safe laboratory experiment that could be done at home is advisable so that students could continue with inferring and predicting skills development. Motivate students by letting them communicate through different illustrations, drawings, and figures.

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