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PROFESSIONAL COLLABORATION AND PEDAGOGICAL SKILLS AMONG MATHEMATICS TEACHERS IN THE IMPLEMENTATION OF THE NATIONAL LEARNING CAMP (NLC)

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Abstract:
In the context of education, teachers are being challenged in imposing their pedagogical skills. Moreover, professional collaboration is essential since it influences teachers' pedagogical skills. This descriptive-predictive quantitative analysis included 60 randomly selected mathematics teachers from various secondary schools across Digos City who are part of the National Learning Camp (NLC) EOSY 2022-2023. The adopted questionnaire was answered using a 5-point Likert scale. Based on the findings, the level of professional collaboration and pedagogical skills among mathematics teachers was very high. It implies that professional collaboration and pedagogical skills are always observed. Based on the correlation analysis using Pearson Correlation Coefficient or Pearson's r, the results revealed that there is a significant relationship between professional collaboration and pedagogical skills among mathematics teachers. Regression analysis predicting pedagogical skills through professional collaboration revealed that professional collaboration is a significant predictor of pedagogical skills. It indicates that an increase in professional collaboration is an increase in pedagogical skills. The study recommends that future researchers determine other predictors that could be significant in the teacher's pedagogical skills.

Keywords: education, professional collaboration, pedagogical skills, national learning camp (NLC), mathematics, teachers, Digos City, Philippines

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1. Introduction

Educators in the context of global education face hurdles and concerns in the teaching-learning process when it comes to imposing pedagogical skills. The study of Valzado et al. (2023) stated an empirical study that about 95% of teachers struggled to adjust their pedagogical skills in the new normal educational setting. Gomez et al. (2020) indicated that to become a teacher, one must possess pedagogical abilities. Pedagogical skills are defined as teaching abilities and classroom management.

However, many studies underline the importance of teachers' pedagogical skills in the teaching and learning process. Gaining knowledge about and expertise in pedagogy can be very beneficial to teachers. To interact with students and impart knowledge more successfully, many educators develop their pedagogical skills over time (Alzeebaree & Zebari 2021). Anwer (2019) found out that pedagogical skills help teachers adopt student-centered teaching strategies and are essential for effective instruction. Also, Tharayil et al. (2018) stated that teachers use a range of pedagogical strategies to promote student learning. Thus, providing quality instruction is the main duty of a professional teacher.

Meanwhile, it is essential to comprehend the qualities of an instructor's pedagogical skills in the new normal concerning various teaching modalities. TALIS recognizes collaboration as a distinguishing feature of teacher professionalism (Ainley & Carstens, 2018). According to Mora-Ruano et al. (2019), teacher collaboration contributes to good growth as professionals. As teachers work collaboratively, they establish communities that positively impact the culture and instruction of their entire department and school.

In Finland, a study conducted by Halinen (2015) as cited by MoraRuano et al. (2019) revealed that a "collaborative atmosphere" is a key aim for the improvement of the school thus, by working collaboratively, the development of teacher competence can be met. For instance, Reeves et al. (2017) suggest that through collaboration, teachers can assess and reflect on their teaching practices. Also, Svendsen (2016), in the study of MoraRuano et al. (2019), discovered that collaboration practices allowed teachers to gain confidence, think critically, and reflect on their teaching practices. Additionally, Mora-Ruano et al. (2018) give one definition geared solely at the teacher level, in which variables such as relational trust, school administration, collaboration, and exchange of ideas and materials amongst instructors play critical roles in teaching effectiveness.

In the Philippines, the DepEd emphasized the importance of a learning recovery program like the National Learning Camp (NLC) in addressing "learning losses" caused by the COVID-19 pandemic. The National Learning Camp has a two-fold purpose, which is to strengthen the learning of the students and to improve teacher capacity. The National Learning Camp took place from July 24 to August 25, 2023, for three to five weeks, with two days for collaborative expertise through Learning Action Cell (LAC) sessions among teachers and three days of teacher-learner engagement. The National Learning Camp is a part of the National Learning Recovery Program (NLRP) of the

DepEd in its commitment to addressing "*close learning gaps and assist K to 12 learners in all public elementary and secondary schools nationwide in attaining learning standards*." In implementing the National Learning Camp, the DepEd also cited the results 3 of the National Achievement Test (NAT) and International Large-Scale Assessments (ILSA), which highlight the need for more "*teaching support to improve the academic performance of students*." DepEd said the National Learning Camp aimed to improve learning in the form of remedial, consolidation, or intervention programs in all areas of K-12 learning.

In addition, as first stated by Lev Vygotsky (1962), we learn through our interactions and communications with others. The theory about social interaction helps us understand how people learn in social contexts and informs how teachers construct active learning communities. According to Vygotsky (1962), social environments influence the learning process. He asserted that the acquisition of knowledge takes place through social interactions with peers, teachers, and other experts. Furthermore, Albert Bandura's (1997) social learning theory is increasingly cited as an important component for the promotion of desirable behavioral change. This hypothesis is founded on the notion that we learn through our interactions with others in a social setting. People develop similar behaviors by seeing those of others. People absorb and mimic other people's conduct after witnessing it, especially if their observations are good or include rewards related to the observed behavior. According to Bandura, imitation entails the real replication of observed motor behaviors.

Previous research has focused on pedagogical skills and professional collaboration of teachers (De Neve & Devos 2017). In Digos City, professional collaboration and pedagogical skills of mathematics during the implementation of the National Learning Camp (NLC) have yet to be identified, measured, and evaluated. Hence, the researchers sought to determine the significant relationship between professional collaboration and the pedagogical skills of mathematics teachers.

In the context of the National Learning Camp (NLC), professional collaboration and pedagogical skills among mathematics teachers are very important. Locally, by identifying collaboration as a key predictor of high pedagogical skills provides valuable insights for educational institutions and policymakers. The study can promote a culture of collaboration, which could lead to improved teaching practices. Globally, the study contributes to the broader discourse on teacher collaboration and its impact on teaching quality. The relationship between professional collaboration and pedagogical skills is relevant across educational contexts, making findings valuable for educators and policymakers worldwide. The study can inform local education policies and professional development programs, leading to a more effective and cohesive teaching community that is better prepared to deliver high-quality education.

Lastly, by establishing the link between professional collaboration and pedagogical skills, the study highlights a pathway to improve quality teaching, which is essential in achieving the targets of SDG 4 quality education. Fostering professional collaboration can be an effective strategy for teacher development, leading to more qualified and competent educators. SDG 4 also emphasizes the importance of increasing

the number of qualified teachers with effective teaching practices. The study directly supports SDG 4, which aims to ensure inclusive and equitable quality education for all. By fostering a collaborative culture among teachers, the study contributes globally to promoting lifelong learning opportunities.

1.1 Research Objectives

The main objective of this study is to determine the level of Professional Collaboration and Pedagogical Skills of Mathematics Teachers in the implementation of the National Learning Camp (NLC). The specific objectives are enumerated as follows:

1. To determine the level of professional collaboration of Secondary School mathematics teachers in the implementation of the National Learning Camp (NLC) in terms of collaborative practices.
2. To determine the level of pedagogical skills of Secondary School mathematics teachers in the implementation of the National Learning Camp (NLC) in terms of:
   2.1 curriculum and planning;
   2.2 instruction and delivery;
   2.3 learning environment;
   2.4 learning materials; and
   2.5 learning assessment.
3. To determine the significant relationship between the level of professional collaboration and pedagogical skills of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) of the Department of Education.
4. To establish if Professional Collaboration significantly influences Pedagogical Skills among Secondary School Mathematics Teachers in the implementation of the National Learning Camp.

2. Material and Methods

2.1. Research Respondents

This research was conducted at Digos City, comprised of 60 Mathematics Teachers from different Public Secondary Schools who have been part of the implementation of the National Learning Camp (NLC) EOSY 2022-2023.

Respondents were randomly selected using the following criteria:

1) the teachers with degree of Bachelor of Secondary Education major in Mathematics across Digos City, and
2) the teachers must be a volunteer of the National Learning Camp during 2022-2023. This study provides withdrawal mechanisms for respondents if the teachers were part of the NLC but did not complete the full duration or required activities of the camp.

Table 1: Characteristics of the respondents

Profile	*f*	%
Age		
20-29	18	30
30-39	22	36.67
40-49	9	15
50-59	11	18.33
Gender		
Male	17	28.33
Female	42	70
LGBTQIA+	1	1.67
Prefer not to say	0	0
Civil Status		
Single	22	36.67
Married	37	61.67
Separated	0	0
Widowed	1	1.67
Years In Teaching		
0-5 years	20	33.33
6-10 years	20	33.33
11-15 years	5	8.33
15 years	15	25
Total	**60**	**100.0**

2.2 Instruments

In data gathering, one primary adopted survey questionnaire, entitled the Teachers Self-Assessment Tool from the Department of Education, was used to effectively assess and measure the level of demonstration of mathematics teachers in the implementation of the national learning camp.

The survey questionnaire was categorized into two. First, pedagogical skills, which have 17 questions. It comprises five distinct indicators, each accompanied by a set of questions aimed at gauging specific aspects of the pedagogical skills of mathematics teachers. These indicators include curriculum and planning with 5 questions, instruction and delivery with 3 questions, learning environment with 3 questions, learning materials with 3 questions, and learning assessment with 3 questions. Second, there is the professional collaboration with one indicator, which is the collaborative practices with 7 questions.

The researchers requested the respondents' cooperation and response via a survey questionnaire using a 5-point Likert scale; 5 - always demonstrated 4 - often demonstrated 3 - sometimes demonstrated 2 - rarely demonstrated 1- never demonstrated. This comprehensive approach allows for a thorough evaluation of the extent to which the pedagogical skills and professional collaboration of mathematics teachers are integrated into the implementation of the national learning camp.

The variable of the study was scaled using the 5-point Likert scaling system as follows:

2.2.1 Professional Collaboration

DepEd emphasizes that professional collaboration refers to the collaborative practices in how the teachers work 8 as a team, share responsibilities, provide feedback, and build trust in attaining learning outcomes. The NLC devotes two days for collaborative expertise which is Monday and Friday.

Parameter	Descriptive Level	Interpretation
4.20-5.00	Very High	The level of Professional Collaboration of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is always observed.
3.40-4.19	High	The level of Professional Collaboration Secondary High and Senior High School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is often observed.
2.60-3.39	Moderate	The level of Professional Collaboration of Secondary High School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is sometimes observed.
1.80-2.59	Low	The level of professional collaboration among secondary school mathematics teachers in the implementation of the National Learning Camp (NLC) is rarely observed.
1.00-1.79	Very Low	The level of Professional Collaboration of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) has never been observed.

2.2.2 Pedagogical Skills

DepEd explains that pedagogical skills identify the proficiencies that allow the teacher to manage and instruct their learners in the classroom. This refers to the art of teaching and the strategies you employ to communicate learning content effectively. This indicator is very helpful in identifying the proficiency of the teachers during the three days of teacher and learner engagement.

Parameter	Descriptive Level	Interpretation
4.20-5.00	Very High	The level of Pedagogical Skills of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is always observed.
3.40-4.19	High	The level of Pedagogical Skills of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is often observed.
2.60-3.39	Moderate	The level of Pedagogical Skills of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is sometimes observed.
1.80-2.59	Low	The level of Pedagogical Skills of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is rarely observed.
1.00-1.79	Very Low	The level of Pedagogical Skills of Secondary School Mathematics Teachers in the implementation of the National Learning Camp (NLC) is never observed.

2.3 Design and Procedure

This study employed a quantitative descriptive-predictive research design. A descriptive research design was used to get information concerning the present status of the phenomena to explain "what exists" concerning variables or conditions in a state. This research design is instrumental in examining the relationship between two or more variables without the need for experimental manipulation. This approach is a quantitative way to determine whether the null hypothesis (H_0) should be rejected. There are only two potential valid outcomes since H_0 can only be true or false: an accurate rejection of H_0 when it is false and a correct retention of H_0 when it is true (Kuhar, 2010). In this study, this research design allows for the exploration of potential associations between the pedagogical skills and professional collaboration of mathematics teachers in the implementation of the National Learning Camp.

The researchers gave permission letters to the DepEd Division office of Digos City and after the approval of the letter the researcher requested a permission form the principals of the chosen Public Secondary Schools to perform a study. Moreover, the researchers conducted the study with survey questionnaire. Lastly, the researchers arranged the data for uncomplicated statistical analyses to answer and analyze the study's goal.

JAMOVI was used to perform statistical analyses. The statistical tools used in this study are mean and standard deviation to determine the level of professional collaboration and pedagogical skills of mathematics teachers during the implementation of the National Learning Camp (NLC). Also, the study utilized a correlation research design using the Pearson Correlation Coefficient or Pearson's r to examine the links and relationships between the dependent and independent variables. Regression analysis was used to model and assess the effect of the independent variable towards the dependent variable. Thus, the null hypothesis that there is no significant relationship between professional collaboration and pedagogical skills of mathematics teachers during the implementation of the National Learning Camp (NLC) is rejected.

3. Results and Discussion

3.1 Level of Professional Collaboration Among Mathematics Teachers

Table 2 shows the respondents' level of professional collaboration in the implementation of the National Learning Camp (NLC). It was revealed 14 that mathematics teachers' overall level of professional collaboration was very high ($\bar{x}$= 4.67; SD = 0.380). It indicates that the professional collaboration of mathematics teachers is always observed during the implementation of the National Learning Camp (NLC).

Table 2: Level of professional collaboration of Junior High School mathematics teachers in the implementation of the National Learning Camp (NLC)

Items	$\bar{x}$	SD
1. Supports collegial relationships among instructional leaders.	4.70	0.462
2. Creates and sustains a learning community as learners and leaders.	4.63	0.520
3. Collaborates with colleagues and other school personnel in the improvement of pedagogical skills, and social, and instructional practices.	4.70	0.497
4. Promotes a culture of cooperative work among colleagues, superiors, learners, and other stakeholders.	4.67	0.475
5. Develop professional relationships among peers that nurture openness, trust, respect, and integrity.	4.67	0.475
6. Reviews with colleagues on learners' feedback to plan, facilitate, and enrich teaching practices.	4.58	0.561
7. Participates actively with an open mind, sharing thoughts and ideas without inhibiting the contributions of others in learning action Cell Sessions.	4.75	0.437
Overall	4.67	0.380

In the past few decades, in the field of education, professional collaboration has drawn a lot of attention. According to Datnow (2018), a professional collaboration is not only a critical element of good and quality education but is also seen to be essential for educational reform. Furthermore, according to OECD 2014 as cited by Schleicher (2016) revealed that the results of the 2013 Teaching and Learning International Survey (TALIS) demonstrated that high-achieving countries with high scores on international assessments, such as Finland, Canada, and Singapore, have resources set aside specifically for their teachers to collaborate, and they see professional collaboration as a necessary component of the educational setting. Additionally, Hargreaves and O'Connor (2018) stated that professional collaboration is one of the most practical and scientifically supported approaches to teacher development and school transformation.

Moreover, Hartwig and Schwabe (2018) claim that teachers' instructional conduct can be significantly influenced by their collaboration with one another. Also, Finkelstein et al. (2019) indicated that collaboration is when two or more educators collaborate with other pedagogical experts to create inclusive learning environments and assist students in their social and personal development.

3.2 Level of Pedagogical Skills Among Mathematics Teachers

Table 3 shows the level of pedagogical skills in the implementation of the National Learning Camp (NLC) of the respondents included in the study. The overall level of pedagogical skills of mathematics teachers was described as very high ($\bar{x} = 4.54\ SD = .394$). It indicates that the level of pedagogical skills is always observed. It implies that respondents have a very high level of perceived pedagogical skills in terms of learning environment, instruction and delivery, curriculum and planning, and learning assessment. However, the learning materials were described as high.

Table 3: Level of pedagogical skills of Junior High School mathematics teachers in the implementation of the National Learning Camp (NLC)

Indicators	$\bar{x}$	**SD**
Learning Environment	4.66	.440
Instruction and Delivery	4.57	.431
Curriculum and Planning	4.55	.368
Learning Assessment	4.52	.515
Learning Materials	4.39	.526
Overall	**4.54**	**.394**

3.2.1 Learning Environment

Table 3 shows that the level of pedagogical skills of mathematics teachers in the learning environment was very high ($\bar{x} = 4.66\, SD = .440$). It indicates that this level of pedagogical skills toward the learning environment is always observed. It means that the teachers excel in creating classrooms where students feel engaged, motivated, and supported in their learning process.

Stronge (2018) said that the learning environment is an essential aspect of effective teaching. It encompasses the establishment of fair, caring, and respectful relationships with students, the creation of an engaging and positive classroom climate, and maximizing teaching time. To create a conducive environment, effective teachers must prioritize learning activities and promote student-teacher interactions. Also, Balog (2018) said that the learning environment is a composite of human activities and material systems, similar to how ecology is the union of living creatures and their natural surroundings. Moreover, Shamaki (2015) asserted and confirmed that the idealness of the learning environment is likely to determine educational attainment and achievement.

3.2.2 Instruction and Delivery

Table 3 shows that the level of pedagogical skills of mathematics teachers in instruction and delivery was very high ($\bar{x} = 4.57\, SD = .431$). It indicates that this level of pedagogical skills toward instruction and delivery is always observed. It means that the teachers are highly effective in communicating mathematical concepts and engaging students in the learning process.

Instructional planning and strategies encompass the use of diverse instructional techniques and strategies to maximize student learning. According to Stronge (2018), in teaching strategies, an effective teacher must employ evidence-based methods, keep students engaged, motivated, and facilitate the reorganization of learners' understanding. Zhu et al. (2020) stated that learning methods serve as enablers and supports that boost student interest in learning, improve the effectiveness of the learning process, and make the subject matter easier for students to understand. Ultimately, these factors help students achieve satisfactory learning outcomes.

3.2.3 Curriculum and Planning

Table 3 shows that the level of pedagogical skills of mathematics teachers on curriculum and planning was very high ($\bar{x} = 4.55$ $SD = .368$). It indicates that this level of pedagogical skills toward curriculum and planning is always observed. It means that the teachers are highly effective in organizing, structuring, and planning their curriculum to meet educational goals and cater to students' learning needs.

According to Rothland et al. (2022), lesson planning is essential to teaching in schools for all subject areas. Teachers need to make sure they are prepared to use a variety of teaching approaches when they are developing lesson plans. Additionally, planning and curriculum development foster a supportive learning atmosphere in the classroom that raises students' motivation and self-assurance and affects their attitude toward learning as a whole.

3.2.4 Learning Assessment

Table 3 shows that the level of pedagogical skills of mathematics teachers on learning assessment was very high ($\bar{x} = 4.52$ $SD = .515$). It indicates that this level of pedagogical skills toward learning assessment is always observed. It means that the teachers are adept at evaluating student learning effectively, using assessments to measure understanding, provide feedback, and guide instructional decisions.

Assessment plays a crucial role in teaching effectiveness. Effective teachers gather, analyze, and utilize assessment data to measure student performance, provide formative and summative feedback, and help students assess their learning needs (Stronge, 2018). Also, Black and William (1998) claim that well-aligned assessment practices, accompanied by timely feedback, positively influence student learning. To evaluate students' knowledge, a variety of thought processes are used to gauge their mastery of factual, conceptual, and procedural knowledge (Widiastuti, 2018). Instructors can use assessment results to plan and execute the learning process more accurately. Additionally, the evaluation gives teachers insightful feedback on what, how much, and how well their students are learning (Taras, 2005).

3.2.5 Learning Materials

Table 3 shows that the level of pedagogical skills of mathematics teachers on learning materials was high ($\bar{x} = 4.39$ $SD = .526$). It indicates that this level of pedagogical skills toward learning materials is often observed. It means that the teachers are effective in selecting, developing, and using instructional materials that enhance student learning, although there may be occasional differences in how consistently these skills are applied. Additionally, Ezekoka (2008), as cited by Portana et al. (2021), said that developed learning materials played a significant role in the teaching and learning delivery modalities that transfer all crucial messages, data, and information from a transmitting source (teachers) to a recipient (learners).

In addition to having strong subject-matter expertise, an effective teacher also has to possess teaching abilities (pedagogy). A thorough comprehension of the ideas,

information, rules, regulations, and theories pertaining to the subject being taught is a prerequisite for material mastery Asmawati and Bintang (2020). A key component of initiatives to raise the standard of learning is the pedagogical abilities of teachers. Superior pedagogical abilities enable educators to design learning environments that are student-centered, productive, and engaging (Archambault et al., 2022). Students' character and social education are also taught during this process, which is not just restricted to formal and academic settings (Onishchuk et al., 2020).

3.3 Correlation Analysis on the Level of Professional Collaboration and Pedagogical Skills During the Implementation of the National Learning Camp

Table 4 shows the correlational analysis between professional collaboration and pedagogical skills of mathematics teachers in the implementation of the national learning camp. Statistical evidence showed a significant relationship between the two variables with an r-value of 0.607. This indicates that there is a positive relationship, which means that professional collaboration significantly affects the pedagogical skills of secondary school mathematics teachers during the implementation of the National Learning Camp. Professional collaboration has a significant relationship with all of the pedagogical skills indicators. First, there is a strong positive correlation between curriculum planning and professional collaboration among mathematics teachers. This high correlation suggests that teachers who are better at curriculum planning are also more likely to engage effectively in professional collaboration. Second, there is a positive correlation between the quality of the learning environment created by teachers and their level of professional collaboration. This suggests that teachers who excel in creating a supportive and effective learning environment tend to collaborate well with their colleagues. Third, learning assessment has a positive correlation towards professional collaboration, which means that teachers who are proficient in assessing student learning and providing meaningful feedback are also more likely to engage in collaborative practices with their peers. Also, there is a positive correlation between instruction and delivery skills and professional collaboration. This indicates that teachers who are effective in delivering instructional content and engaging students are also more likely to participate in professional collaboration. Lastly, for learning materials, there is a positive correlation that indicates teachers who are good at utilizing learning materials tend to collaborate effectively.

Table 4: Correlation matrix between the level of professional collaboration and pedagogical skills during the implementation of the National Learning Camp

Pedagogical Skills	**Professional Collaboration**	
	r-value	**p-value**
Curriculum Planning	0.708***	<.001
Learning Environment	0.554***	<.001
Learning Assessment	0.550***	<.001
Instruction and Delivery	0.506***	<.001
Learning Materials	0.361**	0.005
Overall Pedagogical Skills	0.607***	<.001

*p < .05, ** p < .01, *** p < .001

According to Mora-Ruano et al. (2019), one of the elements of successful professional development is teacher collegiality. Through collaborative efforts, educators can build communities that have a positive impact on the instruction and culture of their department and school as a whole. Henderson (2021) added that cooperation among teachers fosters professional development by giving educators the chance to share knowledge, pick up new skills, and learn from one another. In the end, it raises the standard of instruction by promoting ongoing development and the acquisition of new abilities (Patzer, 2020). According to Saka (2021), children who had teachers who participated in collaborative activities outperformed students who had teachers who did not participate in cooperation.

Furthermore, according to Kalra (2020), instructors cooperate in a variety of ways when they talk with their colleagues, share resources and ideas, collaborate on group projects, and create new knowledge together. In order to give their students high-quality learning experiences, educators can co-create and improve their own learning in these ways. Apart from endorsing the educational function of educators, Brackett (2020) mentioned that collaboration is crucial in fostering connections among educators, enabling them to experience a sense of belonging in the industry and find personal satisfaction in their work.

Moreover, the social development theory associated with Lev Vygotsky emphasizes the fundamental role of social interaction in the development of cognition. When it comes to teachers' professional collaboration, this theory suggests that teachers learn and develop best in a socially interactive environment where they can collaborate, share ideas, 22 and learn from one another. Additionally, the social learning theory of Albert Bandura emphasizes that social interactions and shared experiences are essential in professional development.

3.4. Regression Analysis Predicting Pedagogical Skills Through Professional Collaboration

Table 4.1 shows that a linear regression was calculated to predict the professional collaboration of the respondents, which significantly predicted the pedagogical skills. The Omnibus ANOVA test revealed that professional collaboration significantly influences the pedagogical skills of mathematics teachers. The F-value of 33.9 and the highly significant p-value (< 0.001) are significant predictors. Therefore, the increase in professional collaboration will intensify the pedagogical skills of the teachers. It supports and proves that the pedagogical skills of teachers are related to professional collaboration.

The linear model explains that for each unit increase of professional collaboration, the pedagogical skills are expected to increase by 0.630 units, with the respective coefficients, where Y is the pedagogical skills, and X is the collaborative practices. Then the following model can be obtained $y = 1.596 + (0.630 * x)$

Moreover, the teacher's general pedagogical skills grow by 0.630 points when they collaborate with others. The OECD (2020) provided support for this outcome, stating that

instructors can function better in demanding circumstances when they collaborate with one another. For example, Reeves et al. (2017) indicated the possibility that teachers who collaborate more often may have more time to consider their methods, determine whether they are effective, and then modify or reinforce their classroom behaviors. Furthermore, good correlational and perhaps causative benefits of collaboration on teachers' and pedagogical skills were found in the findings of a study done in 336 Miami-Dade County public schools by Ronfeldt et al. (2015).

Table 4.1: Regression Analysis Predicting
Pedagogical Skills Through Professional Collaboration

Variable	β	**SE Beta**	**p-value**
Intercept	1.596	0.507	0.003
Collaborative Practices	0.630	0.108	<.001
$R^2=0.369$			
$F=33.9$			

Also, Drossel et al. (2018) claim that teacher collaboration has a significant impact on teachers' professionalism through constant feedback and reflection with other teachers, they can improve their teaching practice and teaching quality. Webs and Holtappels (2018) also reported that teacher collaboration has a positive impact on teachers' development. To add, Kim et al. (2017) revealed that teacher collaboration has a positive impact on teaching practices. Ultimately, Bush and Grotjohann (2020) revealed that teacher collaboration made teachers more reflective towards their teaching practices and tends to have more potential in improving teachers' professionalism.

4. Conclusion

The primary goal of this study is to determine the level of Professional Collaboration and Pedagogical Skills of Mathematics Teachers in the implementation of the National Learning Camp (NLC). The findings revealed that the level of professional collaboration among secondary mathematics teachers is very high, which means that collaboration is always observed. The level of pedagogical skills of secondary mathematics teachers is very high, meaning pedagogical skills are always observed. In addition, the teachers show a very high level of pedagogical skills in terms of curriculum and planning, instruction and delivery, learning environment, learning materials, and learning assessment. Moreover, the professional collaboration and pedagogical skills of mathematics teachers have a significant relationship, and professional collaboration is revealed as a significant predictor of a high level of pedagogical skills of mathematics teachers. This means that when teachers engage in collaborative practices with their peers, such as sharing resources, co-planning lessons, and discussing instructional strategies, they are more likely to develop and exhibit high levels of pedagogical skills. This underscores the importance of fostering a collaborative culture among educators to enhance their teaching effectiveness and overall pedagogical competence.

5. Recommendations

Research findings suggest the need for more future research. It is recommended that future research adopt more comprehensive instruments and approaches, considering more factors that can be significant predictors of pedagogical skills and employ a more diverse sample.

The Department of Education may enhance the Learning Action Cell sessions under DepEd Order No. 35, s. 2016 for more professional collaboration of teachers during the implementation of the National Learning Camp (NLC). Also, DepEd must create a memorandum order about policies and guidelines on Collaboration as a framework for School Improvement, where monitoring and evaluation are strictly observed.

The Teacher Education Institutions (TEIs) may include a structured internship collaboration framework in the curriculum to create professional development opportunities where collaboration has already been practiced and observed. Teachers may actively participate and volunteer in workshop programs, mentorship, and seminars to enhance and improve their pedagogical skills. Teachers may be active in Professional Learning Communities (PLCs) to work more collaboratively and avoid working in isolation. Schools, especially the principals, shall posit leadership to encourage collegiality and professional collaboration. Schools may have a collaborative planning session with a regular schedule to plan and design lessons.

Furthermore, since professional collaboration accounts for only 36.9% of the variance of pedagogical skills of teachers, this study recommends that future researchers to determine other predictors that could be significant in the teacher's pedagogical skills.

Conflict of Interest Statement
The authors declare no conflicts of interest.

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References

Ainley, J. & R. Carstens (2018). "Teaching and Learning International Survey (TALIS) 2018 Conceptual Framework", *OECD Education Working Papers,* No. 187, OECD Publishing, Paris, https://doi.org/10.1787/19939019

Alzeebaree, Y., & Zebari, I. (2021). What makes an effective EFL teacher: High School Students' Perceptions. *The Asian ESP Journal*. https://doi.org/10.12973/ejmste/79603

Anwer, F. (2019). Activity-Based Teaching, Student Motivation and Academic Achievement. *Journal of Education and Educational Development, 6,* 154-170 http://dx.doi.org/10.22555/joeed.v6i1.1782.g502

Archambault, Leanna, Leary, Heather, & Rice, Kerry. (2022). Pillars of online pedagogy: A framework for teaching in online learning environments. *Educational Psychologist*, *57*(3), 178–191. http://dx.doi.org/10.1080/00461520.2022.2051513

Asmawati, Erni, & Bintang Kejora, M. T. (2020). The effect of using simple aircraft concrete media on the mastery of concepts in inquiry science learning in elementary school students. *MUDARRISA: Jurnal Kajian Pendidikan Islam, 12*(2), 150–168. https://doi.org/10.18326/mdr.v12i2.150-168

Balog, N. (2018). *Impacts of the Learning Environment on Developer's Progress.* Accessed 4/10/2019 from https://www.codingdojo.com/blog/impacts-of-the-learning-nvironment

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191. https://doi.org/10.1037/0033-295X.84.2.191

Black, P., & Wiliam, D. (1998). Assessment and Classroom Learning. *Assessment in Education Principles Policy and Practice, 5*(1), 7-74. http://dx.doi.org/10.1080/0969595980050102

Bush A., Grotjohann N. (2020). Collaboration in teacher education: A cross-sectional study on future teachers' attitudes towards collaboration, their intentions to collaborate and their performance of collaboration. *Teaching and Teacher Education, 88*, 1–9. http://dx.doi.org/10.1016/j.tate.2019.102968

Brackett, M. & Cipriano, C. (2020, April 30). *How to Support Teachers' Emotional Needs Right Now. Greater Good Magazine.* https://www.edsurge.com/news/2020-04-07-teachers-are-anxious-and-overwhelmed-they-need-sel-now-more-than-ever.

Datnow, A. (2018). "Time for change? The emotions of teacher collaboration and reform", *Journal of Professional Capital and Community, Vol. 3* No. 3, pp. 157-172. https://doi.org/10.1108/JPCC-12-2017-0028

De Neve, D., & Devos, G. (2017). How do professional learning communities aid and hamper professional learning of beginning teachers related to differentiated instruction? *Teachers and Teaching, 23*. http://dx.doi.org/10.1080/13540602.2016.1206524

Delisle, D. S., Roth, S., Ostertag, G., Houtz, J., Ressler, J. S., Smith, L., Kalyan, M., Hoffman, A., Stock, C., & Stronge, J. H. (2018). *Qualities of Effective Teachers.*

https://files.ascd.org/staticfiles/ascd/pdf/siteASCD/publications/books/QualitiesOfEffectiveTeachers3rdEd_Stronge_0318.pdf

Drossel, K., Eickelmann, B., van Ophuysen, S., & Bos, W. (2018). Why teachers cooperate: An expectancy-value model of teacher cooperation. *European Journal of Psychology of Education, 34*(1), 187–208. https://doi.org/10.1007/s10212-018-0368-y

DepEd Order No. 014, s. 2023 on *Policy Guidelines on the Implementation of the National Learning Camp.* https://www.deped.gov.ph/wp-content/uploads/DO_s2023_014.pdf

Ezekoka, M. A. (2008). Teaching Materials and Students' Academic Achievements. *Proceedings of the 43rd Annual Conference of STA* 7-416-419. Ibadan: Heinemann https://dx.doi.org/10.22161/ijaems

Finkelstein, S., Sharma, U., & Furlonger, B. (2019). The inclusive practices of classroom teachers: A scoping review and thematic analysis. *International Journal of Inclusive Education, 25*(6), 735–762. https://doi.org/10.1080/13603116.2019.1572232

Gómez, G. Á., Moya, J. V., & Ricardo, J. E. (2020). Method to measure the formation of pedagogical skills through neutrosophic numbers of unique value. *Revista Asociación Latinoamericana de Ciencias Neutrosóficas*, 11, 41-48.

Halinen, I. (2015). *What is Going on in Finland? – Curriculum Reform* 2016. Retrieved from the Finnish National Agency of Education Blog: https://www.oph.fi/english/current_issues/101/0/what_is_going_on_in_finland_curriculum_reform_2016 (accessed November 27, 2018).

Hargreaves, A., & O'Connor, M. T. (2018). Cultures of professional collaboration: Their origins and opponents. *Journal of Professional Capital and Community, 2*(2), 74–85. https://doi.org/10.1108/JPCC-02-2017-0004

Hargraves, A. & O'Connor, M. T. (2018), *Leading Collaborative Professionalism, Centre for Strategic Education, East Melbourne.* https://www.andyhargreaves.com/uploads/5/2/9/2/5292616/semina_series_274-april2018.pdf

Hartwig, S. J., & Schwabe, F. (2018). Teacher attitudes and motivation as mediators between teacher training, collaboration, and differentiated instruction. *Journal for Educational Research Online, 10*(1), 100–121. https://doi.org/10.25656/01:15415

Henderson, K. (2021, June 23). *Benefits of and Strategies for Teacher Collaboration In & Outside of MTSS. Branching Minds.* https://www.branchingminds.com/blog/teacher-collaboration-mtss

Kalra, A. (2020, September 24). *Teacher collaboration in challenging learning environments. OECD Education and Skills Today.* https://oecdedutoday.com/teacher-collaboration-challenging-learning-environments/

Kim, J. H., Kang, H. S., Kuusinen, C. M., & Park, K. (2017). Exploring the relationship between teacher collaboration and learner-centered instruction. *KEDI Journal of Educational Policy, 14*(1), 3-24. https://journals.sagepub.com/doi/abs/10.1177/21582440231177908

Mora-Ruano, J. G., Gebhardt, M., & Wittmann, E. (2018). Teacher collaboration in German schools: Do gender and school type influence the frequency of collaboration among teachers? *Frontiers in Education, 3*. https://doi.org/10.3389/feduc.2018.00055

Mora-Ruano, J. G., Heine, J. H., & Gebhardt, M. (2019). *Does teacher collaboration improve student achievement? Analysis of the German PISA 2012 sample*. *In Frontiers in Education (Vol. 4, p. 85). Frontiers Media.* https://www.frontiersin.org/articles/10.3389/feduc.2019.00085/full

OECD (2020), TALIS 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals, TALIS, *OECD Publishing, Paris,* https://doi.org/10.1787/19cf08df-en.

Onishchuk et al. (2020). Characteristics of foreign language education in foreign countries and ways of applying foreign experience in pedagogical universities of Ukraine. *Revista Romaneasca Pentru Educatie Multidimensionala, 12*(3), 44–65. https://doi.org/10.18662/rrem/12.3/308

Patzer, R. (2020, February 18). *Sharing good practice: Strategies to encourage teacher collaboration. IRIS Connect.* https://blog.irisconnect.com/uk/sharing-and-collaboration-in-schools

Reeves, P., W. Pun and K. Chung (2017), Influence of teacher collaboration on job satisfaction and student achievement, *Teaching and Teacher Education, Vol. 67*, pp. 227-236, http://dx.doi.org/10.1016/J.TATE.2017.06.016.

Ronfeldt, M., Owens Farmer, S., McQueen, K., & Grissom, J. A. (2015). Teacher collaboration in instructional teams and student achievement. *American Educational Research Journal, 52*(3), 475–514. https://doi.org/10.3102/0002831215585562

Saka, O. A. (2021). Can Teacher Collaboration Improve Students' Academic Achievement in Junior Secondary Mathematics? *Asian Journal of University Education.* https://doi.org/10.24191/ajue.v17i1.8727

Schleicher, A. (2016), Teaching Excellence through Professional Learning and Policy Reform: Lessons from around the World, International Summit on the Teaching Profession, *OECD Publishing, Paris,* https://doi.org/10.1787/9789264252059-en

Shamaki, T.A. (2015). Influence of Learning Environment on Students' Academic Achievement in Mathematics: A Case Study of Some Selected Secondary Schools in Yobe State, Nigeria. *Journal of Education and Practice, Vol. 6*, No. 34, pp. pp. 40-44. accessed 30/10/19 from: https://files.eric.ed.gov/fulltext/EJ1086080.pdf

Taras, M. (2005). Assessment- Summative and Formative Theoretical Reflections. *British Journal of Educational Studies, 53*(4), 466-478. https://doi.org/10.1111/j.1467-8527.2005.00307.x

Tharayil, S., Borrego, M., Prince, M., Nguyen, K. A., Shekhar, P., Finelli, C. J., & Waters, C. (2018). Strategies to mitigate student resistance to active learning. *International Journal of STEM Education, 5*(1), 1-16. https://doi.org/10.1186/s40594-018-0102-y

Valzado, R. B., Subaldo, C. B., Diacor, R. S., & Rellon, J. (n.d.). Dimensions of Pedagogical Skills of Teachers in the New Normal: *An Exploratory Sequential Design. Southeast*

Asian Journal of Multidisciplinary Studies. https://cmc.edu.ph/research/index.php/journals/article/view/102

Voogt, J. M., Pieters, J. M., & Handelzalts, A. (2016). Teacher collaboration in curriculum design teams: effects, mechanisms, and conditions. *Educational Research and Evaluation, 22*(3–4), 121–140. https://doi.org/10.1080/13803611.2016.1247725

Vygotsky, L. S. (1962). *Thought and Language.* Cambridge, MA: MIT Press. https://www.gowriensw.com.au/thought-leadership/vygotsky-theory

Webs, T., & Holtappels, H. G. (2018). School conditions of different forms of teacher collaboration and their effects on instructional development in schools facing challenging circumstances. *Journal of Professional Capital & Community, 3*(1), 39–58. https://doi.org/10.1108/JPCC-03-2017-0006

Widiastuti, I. A. M. S. (2018). Teachers' classroom assessment and grading practices. *SHS Web of Conferences, 42*(00052), 1–7. https://doi.org/10.1051/shsconf/20184200052

Zhu, Y., Zhang, J. H., Au, W., & Yates, G. (2020). University students' online learning attitudes and continuous intention to undertake online courses: A self-regulated learning perspective. *Educational Technology Research and Development, 68*(3), 1485–1519. https://doi.org/10.1007/s11423-020-09753-w