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Science Teacher's Knowledge about Lesson Study as A Professional Investigation Approach in Learning

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Abstract: Lesson study is a teacher collaborative approach to professional development. Lesson study is a model for fostering educator professionalism through collaborative and continuous learning assessments based on collegial and mutual learning principles to build learning communication. The aim of this research is to get an overview of science teachers' knowledge about lesson study as a professional inquiry approach in learning. Surveys of lesson study activities carried out by teachers can help to understand the characteristics of professional learning through effective lesson study and the extent to which teachers carry out and are involved in the lesson study process. The research was conducted in Salatiga, Central Java, Indonesia. This research method uses quantitative descriptive. The data collection technique uses a survey using a questionnaire as an instrument consisting of 70 statements from seven categories regarding lesson study. Respondents were science teachers selected using purposive sampling. Data analysis uses percentage techniques. Based on a survey conducted on science teachers regarding the implementation of lesson study, it is known that there are 5% of respondents who have never heard of lesson study, 30% of respondents have never been involved in lesson study activities, and there are around 40 % of respondents who have never carried out lesson study activities in teaching. Based on the seven categories of lesson study asked to teachers who have carried out lesson study in learning, it is known that there are still teachers who have weak motivation to improve the quality of learning, there are still science teachers who do not understand how to implement lesson study and how to use time in lesson study. Apart from that, it was found that science teachers still had a weak understanding of the benefits of lesson study in increasing teacher collaboration, the benefits of lesson study in improving the quality of teaching and learning, and there were still science teachers who did not understand how lesson study was started.

Keywords: Lesson study, professional, learning, community

Introduction

Lesson study (LS) is defined as a model for developing the profession of educators through collaborative and continuous learning assessments based on the principles of collegiality and shared learning to build a learning community to see and improve the quality of learning faced by working together with fellow teachers , both at the individual and managerial levels (Abizar, 2020; Hird, Larson, Okubo, & Uchino, 2014; Nuryanta, 2016; Putri et al., 2021; Safriana & Marina, 2020; Satriani, 2018). The interesting thing about implementing of lesson study approach is that the learning process that takes place is open to suggestions and input on the learning process from students so that improvements can be made in the learning process

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(Nuryanta, 2016). The learning process that is carried out with lesson study involves collaboration between teachers and students, where teachers act as facilitators while students as the subjects of learning. In addition, teachers will be able to build good communication and collaboration with fellow members in the lesson study team, for example, determining methods, media and learning strategies, and asking for suggestions and input from other teachers in one team. The establishment of communication and discussion among teachers is one of the benefits received by teachers. With good communication, it is possible to increase teacher knowledge and skills in teaching. Through the discussion process and providing input from members of the lesson study team, teachers will become more aware of the shortcomings in the learning process and try to prepare better for learning in the future. It can also increase teachers' self-confidence when carrying out the learning process even though it is being supervised by the observation team and can reduce the teacher's trauma about the supervision process in the learning (Nugraha & Suratno, 2014). Lesson study also provides benefits for teachers in deepening the materials to be taught and the scope of the curriculum and creates an exchange of knowledge about students' understanding of thinking (Rismayanthi, 2019).

The main steps taken through this approach are planning learning, conducting and observing the learning process, reflecting and discussing the learning that has been carried out, and planning further learning (Halidjah, 2020). Lesson study can provide benefits in helping teachers observe the ongoing learning process, helping teachers in making preparations for teaching and helping teachers' efforts to improve learning. In implementing learning using lesson study, there are 3 stages i.e., plan, do, and see. Lesson study activities begin with the planning stage, namely the teacher analyzes the problems in the learning process, such as students' problems in understanding the material or problems on how to teach students (Asri, Suryadi, & Jupri, 2022). Next, the teacher prepares devices that support the learning process. These devices include the learning implementation plan that determines the material to be taught, learning media, assessment instruments or tests, learning strategies and methods. At this stage, the observation team can provide input on the devices that will be used in the learning (Mayasari, Taufik, & Natsir, 2022).

The next stage is the implementation stage. In implementing lesson study, teachers collaborate with team members to make plans before teaching, observe, analyze, reflections after teaching, and improve their learning (Asterius Juano, Zephisius R. E. Ntelok, & Mariana Jediut, 2019; Sairo, 2021). The model teacher will carry out a series of learning activities according to the previously designed Learning Implementation Plan. Meanwhile, other teachers who act as the observation team will observe and record each learning process and student learning activities in the teaching and learning process. The advantages and disadvantages of the learning process will be recorded by the observation team through the observation instruments that have been provided to then become materials for analysis and evaluation of the learning process (Mayasari et al., 2022). In this implementation activity, observers do not assess the activities of the model teacher. At this implementation stage, the learning process takes place according to the learning implementation plan which includes preliminary activities, core activities and closing activities (Asri et al., 2022).

The reflection stage is the last stage in the lesson study activity. At this stage, the observation team will provide reflection and input on the learning that has taken place based on evidence obtained during the observation process. This is done to see the achievement of the implementation of learning that has been carried out with the learning plan and objectives that have been designed. So that, the results of the reflection can be used as improvements in carrying out further learning. In addition, the observation team will also report concerning student learning activities during the learning process. Students in the class are also involved in the reflection process with the aim of seeing student responses to the teaching and learning activities given by the teacher (Tanujaya, Prahmana, & Mumu, 2023).

Students get benefits from this approach by receiving good quality education by implementing supportive learning methods. In addition, it can improve collaboration or cooperation skills in order to achieve effective learning. This collaboration will emerge as an interaction between students and study groups or classmates as well as interaction between students and the material to be taught. By implementing collaborative learning, a good quality learning can be created which is marked by an increase in knowledge, skills and attitudes in students (Nurwidodo, Hendayana, Hindun, & Sarimanah, 2018). Lesson study also provides benefits for the observation team. Observers can learn from the results of the reflections given and from what the model teacher uses (Wihastyanang, 2017). Lesson study is very useful for improving and changing the way of learning and teaching both from teachers and students to be better than previous learning that has been held (Sairo, 2021). The aim of this research is to get an overview of science teachers' knowledge about lesson study as a professional inquiry approach in learning. Surveys of lesson study activities carried out by teachers can help to understand

the characteristics of professional learning through effective lesson study and the extent to which teachers carry out and are involved in the lesson study process (Godfrey, Seleznyov, Anders, Wollaston, & Barrera-Pedemonte, 2019).

Method

This study was conducted in Salatiga City from September 2023 to February 2024. This study is a type of quantitative descriptive study. The respondents in this study were 40 junior high school science teachers and high school biology teachers in Salatiga City. The selection of respondents was carried out using a purposive sampling technique.

Survey was used for data collection technique which was carried out using a questionnaire as an instrument. The questionnaire consisted of 70 statement items with seven categories. The categories are 1) typical teacher learning; 2) type of lesson study; 3) time creation; 4) team building; 5) reform promotion; 6) daily lesson reform; 7) why lesson study is powerful.

The data analysis technique used is quantitative descriptive. Percentage is used for data analysis technique. The procedures of the study include: 1) preparation of research instruments; 2) obtaining data on the number of junior high school science teachers and senior high school biology teachers in Salatiga City; 3) obtaining data on the number of junior high school science teachers and senior high school biology teachers in Salatiga City; 4) distributing questionnaires on teacher understanding of lesson study; 5) data analysis; 6) data presentation.

$$P = \frac{F}{N} X100\% \quad (1)$$

Result and Discussion

Figure 1 presents data on the percentage of knowledge of science and biology teachers about lesson study with 40 teacher respondents. Through Figure 1, it is known that the percentage of teachers who have heard of lesson study is only 95% (38 people), the percentage of teachers who have participated in lesson study activities in seminars/workshops/practices reaches 70% (28 people), and the percentage of teachers who have carried out lesson study activities only reaches 60% (24 people).

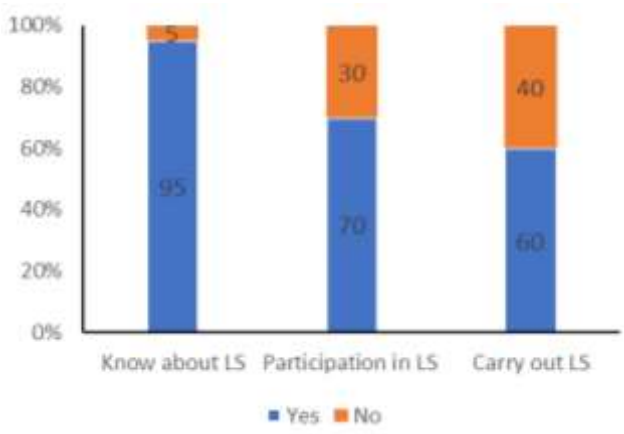

Figure 1. Science teachers' knowledge of lesson study based on experience

Figure 2 presents data on the percentage of science and biology teachers' knowledge of lesson study based on gender consisting 27 female respondens and 13 female teacher respondents. Figure 2 shows that 3.70% (1 person) of female teachers have never heard of lesson study, while 96.30% (9 people) of female teachers have heard of lesson study. Through this figure, it is also known that 33.33% (9 people) of female teachers have never participated in lesson study activities, and 66.70% (18 people) of teachers have participated in lesson study activities through workshops/seminars/practices. Based on the analysis of the results of the study, it is also known that 40.70% (11 people) of female teachers have never implemented lesson study and 59.30% (16 people) of teachers have implemented lesson study.

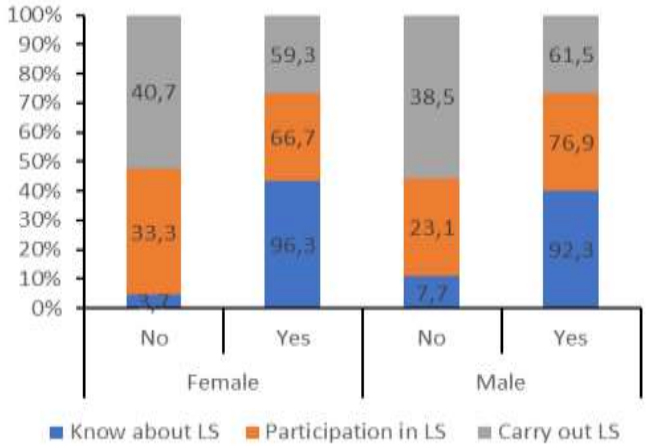

Figure 2. Differences in knowledge of female and male teachers about lesson study based on experience

Figure 2 shows that 7.70% (1 person) of male teachers have never heard of lesson study, while 92.30% (12 people) of male teachers have heard of lesson study. Through the figure, it is also known that 23.10% (3 people) of male teachers have never participated in

lesson study activities, and 76.90% (10 people) of teachers have participated in lesson study activities through workshops/seminars/practices. Based on the analysis of the results of this study, it is also known that 38.5% (5 people) of male teachers have never implemented lesson study and 61.50% (8 people) of teachers have implemented lesson study.

Figure 3 presents the knowledge of science and biology teachers about lesson study based on seven categories. The seven categories about lesson study include what is lesson study, typical teacher learning, time creation in lesson study, how to build the team, how to promote reform, how to reform daily lesson, and why is lesson study powerful.

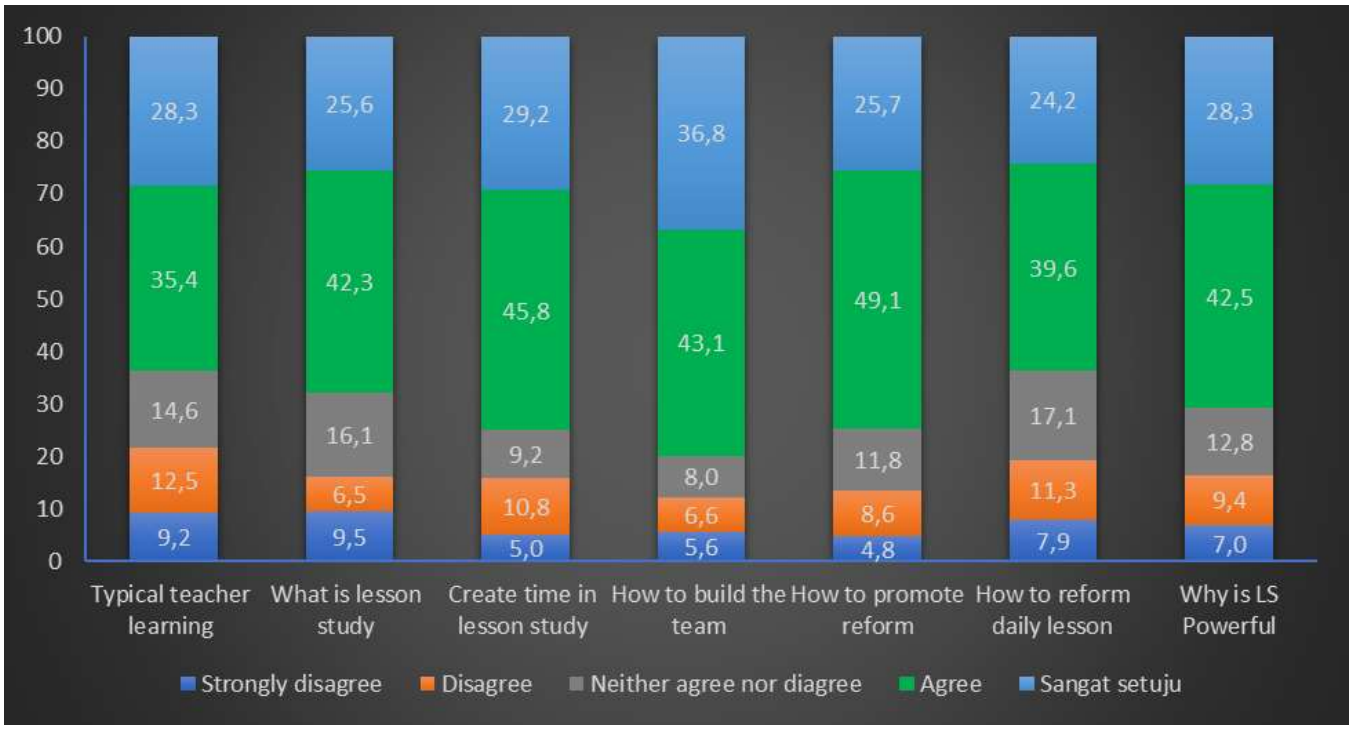

Figure 3. Percentage of teacher knowledge about lesson study

Based on the results of the analysis of the answers of teachers who have implemented lesson study compared to the typical teacher learning indicators in Figure 3, an interesting fact is that 9.2% of respondents strongly disagreed, and 12.5% of respondents disagreed and 14.6% of respondents answered hesitantly regarding statements about improving the quality of teaching and learning. Examples of statements *1) I do not analyze the reasons why my students do not understand the material, 2) I want to apply new ideas in my teaching, 3) I think about how different lessons relate to each other, I try to understand why a particular teaching method works, 4) I try to understand how students learn* there are teachers who choose the answers strongly disagreed, disagreed and hesitantly. This shows that there are still teachers who have weak motivation in improving the quality of teaching and learning.

Effective teachers have the ability to attend to students' thinking professionally and incorporate their knowledge of how students think and reason into future learning opportunities (Norton & McCloskey, 2008). Through their research stated that lesson study provides opportunities for teachers to be involved in lessons and focus on student learning and thinking (Amador & Weiland, 2015).

Based on the results of the analysis of the answers of teachers who have implemented lesson study compared to lesson study indicator in Figure 3, an interesting fact is that 9.5% of respondents strongly disagreed, and 6.5% of respondents disagreed and 16.1% of respondents are doubtful regarding the statement about teachers' understanding of the implementation of lesson study. Examples of statements *1) during* lesson study *activities, teachers work collaboratively to formulate learning objectives and student development, 2) through lesson study practices, participants are given the opportunity to reflect on the teaching and learning processes that have been carried out, 3) lesson study learning is sometimes revised and re-implemented in other classes, 4) when the school decides to hold an open class for the public, parties from outside the school such as teachers, educators, and university lecturers have the opportunity to attend the open house, 5) at the lesson study open house, all participants can observe learning and be involved in discussions about the learning in order to think about improving the teaching and learning process and lesson study is a learning approach whose implementation is carried*

out individually there are still teachers who strongly disagreed, disagreed, and doubt. This shows that there are still teachers who do not fully understand about the implementation of lesson study.

Based on create time category in lesson study, 5% of respondents answer strongly disagreed, 10.8% of respondents disagreed, and 9.2% of respondents were hesitant regarding the statement of time creation in lesson study. Examples of statements related to teachers' understanding of the use of time in lesson study are *1) through lesson study activities, I am able to use time effectively in completing and responding to various tasks and in dealing with unexpected problems in class, 2) through lesson study activities I can determine learning materials that are in accordance with the time allocation and learning model that will be carried out, 3) through lesson study activities I am able to manage the time for implementing learning, the implementation of lesson study does not require good management* there are still teachers who strongly disagreed and disagreed, and are hesitant/doubt. This shows that there are still teachers who have a weak understanding of the use of time in lesson study.

Based on the category of how to build the team, 5.6% of respondents disagreed, 6.5% of respondents disagreed, and 8.0% of respondents were hesitant regarding the statements in the category. Some examples of statements related to teachers' understanding of collaborative activities in lesson study are *1) through the collaboration of colleagues in lesson study, I will get valuable input in the discussion of compiling learning tools, 2) through lesson study activities and collaboration with colleagues I can develop more challenging learning strategies, 3) through collaborative lesson study activities, colleagues, I can design innovative and student-centered learning, 4) by implementing collaboration with colleagues in lesson study, I am able to create a learning community, 5) the implementation of lesson study can strengthen collegiality between lesson study teams.* Based on the results of the respondents' answers, there were still respondents who chose to strongly disagreed, disagreed, as well as respondents that are hesitant. This shows that there are still teachers who have a poor understanding of collaborative activities in lesson study.

Lesson study can encourage professional development of learning communities (PLC) in schools. There are several factors that can increase PLC, namely, principal leadership, middle leader facilitation, and teacher awareness of lesson study can increase lesson study (Chichibu & Kihara, 2013).

In the category of how to promote reform, 4.8% of respondents choose the answer strongly disagreed, 8.6% of respondents disagreed and 11.8% of respondents were hesitant. Some examples of statements related to teachers' understanding of improving the quality of learning through lesson study are *1) through lesson study activities, my team and I can plan a better learning, 2) through the implementation of lesson study, my teaching skills have increased, 3) lesson study strategies contribute to changing beliefs about the importance of various teaching and learning experiences, 4) lesson study contributes to a better understanding of students' thinking patterns, 5) lesson study contributes to my understanding of better ways for some biology/science content, 6) through lesson study activities I can see mistakes during the learning process in class, 7) lesson study makes me more aware of students' needs, 8) lesson study contributes to my classroom management skills, 9) lesson study provides feedback on my strengths and weaknesses in knowledge, 10) the implementation of lesson study can help shape mutual learning and teacher professionalism, 11) the lesson study learning community is able to measure my growth more clearly by improving my professional attitude in teaching, 12) through lesson study I am able to identify children's needs, especially individual needs consisting of academic needs and human needs, 13) through lesson study I can prepare learning that is more appropriate for my students, 14) through lesson study activities I am able to plan learning according to the existing curriculum, 15) through lesson study activities I can utilize relevant learning media so that it can improve students' understanding of the material being taught, 16) lesson study activities create a strong teacher community, 17) through lesson study I can improve my understanding of my abilities, 18) through lesson study I have learned new teaching approaches for the future, lesson study is an effective professional development model for me*. Based on the respondents' answers, it is known that there are still teachers who have a poor understanding of improving the quality of learning through lesson study.

The decisions in lesson study activities are made collectively based on mutual understanding reached during meetings aimed at improving the quality of teaching. Improvements made through lesson study activities are tested by the teacher who teaches the next lesson (Elliott, 2012).

In lesson study, teachers together choose a topic and plan and prepare a lesson (called a research lesson), one teacher carries out a research lesson and the other observes students in class, and finally the teachers discuss the results of their observations (Verhoef, Coenders, Pieters, van Smaalen, & Tall, 2015). During lesson preparation, teachers predict how students will react to certain activities and this requires teachers to reflect and reassess their teaching approaches. Lesson Study is effective in teacher professional development programs (Verhoef et al., 2015).

Based on the category of how to reform daily lesson, it was found that there were 7.9% of respondents who strongly disagreed, 11.3% of respondents who disagreed, and 17.1% of respondents who were hesitant about the statements in this category. Some examples of statements about how to reform daily lesson *are 1) to be effective, lesson study must become a cultural activity, which*

is included in the teacher's daily teaching experience, 2) teachers can learn lesson study effectively just by reading it, 3) practicing lesson study allows to learn important things such as how Learning Implementation Plan is different from traditional Learning Implementation Plan, why a detailed Learning Implementation Plan is needed, what kind of data should be collected during observation, 4) teachers should know the type of teaching materials used, the textbooks used, and what the researcher (if any) teaches about the teaching method, 5) lesson study can be carried out with a good understanding of the content and the relationship between topics is very important, 6) the lesson planning group decides to use a particular problem for learning, 7) the lesson study group can choose certain manipulatives in learning, 8) the main purpose of observing research learning is to understand students' thinking and learning processes, collect data to support these points and determine how students receive the lesson plan so that observers understand what the teacher wants to teach, 9) research lessons are ideally held in larger classrooms, in lesson study activities teachers should give their colleagues the opportunity to take turns observing their practices. Based on the respondents' choice of answers, it is known that there is still a weak or poor understanding of teachers about how to start learning with lesson study.

Figure 4 presents the average data of respondents' answers obtained in seven categories. The seven categories are typical teacher learning, what is lesson study, create time in lesson study, how to build the team, how to promote reform, how to reform daily lesson, and why is lesson study powerful.

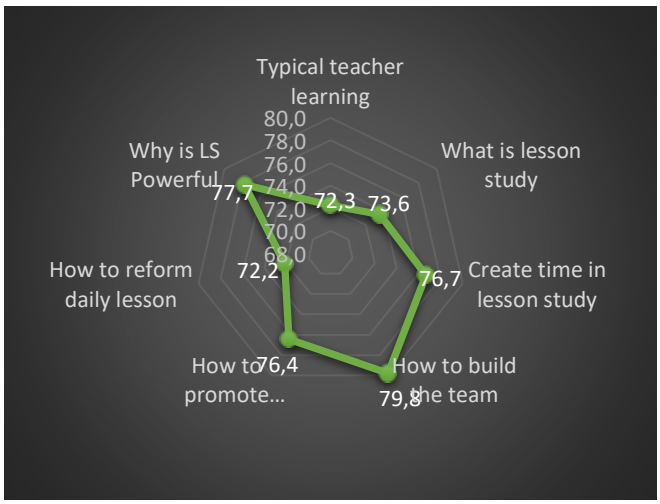

Figure 4. Percentage of mean value of respondents' answers for each lesson study category

Figure 4 shows that the percentage of mean value of respondents' answers for the typical teacher learning category reaches 72.3%, the category of what is lesson study category reaches 73.6%, the category of create time in lesson study reaches 76.7%, the category of how to build the team reaches 79.8%, the category of how to promote reform reaches 76.4%, the category of how to reform daily lesson reaches 72.2%, and the category of why is lesson study powerful reaches 77.7%. This is in accordance with study A which concluded that teachers' acceptance and understanding of the Lesson Study program were still at a moderate level (Copriady, 2013). Lesson study needs to be conducted in Indonesia, because the government's efforts to improve the quality of education through various teacher training programs are generally limited to improving understanding of subject matter, while the introduction of learning methods is carried out separately from the subject matter. This makes it difficult for teachers to integrate (Rahayu, Mulyani, & Miswadi, 2012).

Conclusion

Based on a survey conducted on science teachers regarding the implementation of lesson study, it is known that there are 5% of respondents who have never heard of lesson study, 30% of respondents have never been involved in lesson study activities, and there are around 40 % of respondents who have never carried out lesson study activities in teaching. Based on the seven categories of lesson study asked to teachers who have carried out lesson study in learning, it is known that there are still teachers who have weak motivation to improve the quality of learning, there are still science teachers who do not understand how to implement lesson study and how to use time in lesson study. Apart from that, it was found that science teachers still had a weak understanding of the benefits of lesson study in increasing teacher collaboration, the benefits of lesson study in improving the quality of teaching and learning, and there were still science teachers who did not understand how lesson study was started. Based on these findings, it is recommended that universities collaborate with schools to further socialize the benefits and application of lesson study as a professional inquiry approach in learning. The lesson study approach was chosen to improve the learning process and outcomes of students, improve the quality of teacher teaching and collaboration between teachers in improving the quality of teaching and learning.

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Author Contributions

N.R.K contributed to conceptualization the research, methodology, research instrument, data analysis and article writing, review, editing; P.P.A contributed to data analysis, and article writing, editing; J.A.T contributed to article writing and editing.

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Conflicts of Interest
The authors declare no conflict of interest

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