JPPIPA 11(1) (2025)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Correlation between TPACK and Conation of Certified Biology Teachers in State High Schools in Banda Aceh

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Received: August 25, 2024
Revised: October 22, 2024
Accepted: January 25, 2025
Published: January 31, 2025

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DOI: 10.29303/jppipa.v11i1.9501

Abstract: The ability to apply TPACK will make it easier for teachers to teach material to students. One of the factors that influences TPACK in teachers is conation. If a teacher has a connection, TPACK can run well. This research aims to determine the relationship between TPACK and the certification of Biology teachers at State High Schools in Banda Aceh. The approach used in this research is to use a quantitative approach while the type of research is correlational research. The subjects used in this research were all Biology teachers who had been certified at the high school level in Banda Aceh. The data analysis technique used in this research is qualitative data and quantitative data. Qualitative data was obtained from interviews and observations, while quantitative data was obtained from questionnaires filled in by respondents and then data analysis was carried out using SPSS. The results of the research show that the calculated r_{value} for the relationship between TPACK and conation is 0.538 > r_{table} 0.316, so it can be concluded that there is a medium category relationship between the TPACK variable and the conation variable. Because the calculated r in this analysis is positive, it means that the relationship between the two variables is positive.

Keywords: Conation; Teacher Certification; TPACK

Introduction

Regulation of the Minister of National Education of the Republic of Indonesia No. 17 of 2007 concerning academic qualification standards and teacher competency requires that Biology teachers have four competencies, namely pedagogical competency, personality competency, social competency and professional competency. One of the important frameworks included in teacher competency is TPACK. TPACK is a conceptual framework that displays the relationship of the three basic components of knowledge, namely technology, pedagogy and content (Malubay et al., 2018). TPACK differs from knowledge of the three concepts individually. In contrast, TPACK is a basis for effective teaching using technology so it requires an understanding of concept representation using technology. Apart from that, pedagogical techniques use technology in a constructive way to teach content and overcome various problems (Koehler et al., 2013).

TPACK is an important part of teacher professional development. Because in normal education and in-service training, teachers must have the knowledge, skills and inclination to try new technology and learn from technology that they themselves have developed, be able to predict possible problems and insist on using technology in a way that is conducive to the learning process (Zhang, 2021). The teacher's ability to implement TPACK will make it easier for teachers to teach material to students, for example science material. Biology is included in science material. In biology learning there is material related to systems that students cannot see directly. So combining technology with biology learning will make it easier for students to understand the material. The use of this technology is marked by the

How to Cite:
Fhonna, R. R., Pada, A. U. T., Nurmaliah, C., Safrida, & Huda, I. (2025). Correlation between TPACK and Conation of Certified Biology Teachers in State High Schools in Banda Aceh. *Jurnal Penelitian Pendidikan IPA*, *11*(1), 809–817. https://doi.org/10.29303/jppipa.v11i1.9501

teacher's ability to apply TPACK in the biology learning process (Raja et al., 2018). TPACK offers integration of developing knowledge about learning materials with technological developments and knowledge about the teaching and learning process (Horzum, 2013).

Teachers' TPACK abilities certainly vary, one of the factors that influences teachers is the presence of conation. Conation is a subjective truth that is believed only for oneself. This conation is related to human encouragement for a belief obtained from the process of cognition and emotion so that the final result is conation power (Hamiyati et al., 2022). Information that has been received will then be processed so that it can give rise to awareness (cognition), attitudes (emotions) and actions (conation) (Elce et al., 2022). Therefore, this conation plays an important role in TPACK, with the conation that a teacher has then TPACK can run well.

Another factor that can influence TPACK is a teacher's performance. Teachers are required to be able to carry out their performance well and are required to have high motivation in order to manage learning so that they can achieve national education goals (Hasbay et al., 2018). The Indonesian government has provided salary increases for professional teachers who have met qualifications in order to improve teacher performance and the quality of education. In Teacher and Lecturer Law no. 14 article 16 (2005), states that a teacher has the right to receive a professional allowance in the amount of one time his basic salary if he already has a certificate. Teacher certification is a process of providing recognition that a teacher has competence and after passing a competency test can carry out educational services in a particular educational unit. This competency is carried out by certification bodies, namely universities that have an accredited education staff procurement program (Mulyasa, 2009).

Technological knowledge is a competency that teachers must master to support improvements in the learning process. It's not enough for teachers to just package things learning materials (content) and designing learning abilities (pedagogic) only, but teachers can combine the two which will then be collaborated using technology (technological). To be able to achieve this, teachers need to have TPACK capabilities to support the learning process. Biology teachers who have been certified are required to be professional and able to apply TPACK by utilizing information and communication technology and can be an alternative in the learning process. To be able to integrate information and communication technology in the learning process, a teacher needs a Technological Pedagogical Content Knowledge or TPACK framework.

Conation can be defined as a mental process that can activate or direct behavior and actions. Conation refers to the relationship of knowledge and influence to behavior and is associated with the question "why". This is a component of motivation that is personal, planned and goal oriented. Conation can also be called vector energy, namely personal energy that has direction, this is related to the concept of intrinsic, will, self-directed agency and self-regulation. One important factor in successful conation is realizing that a person has the ability and freedom to choose and control his thoughts and feelings (Huitt et al., 2005).

Conation is placed in the middle of affection and cognition so that after the appearance of conation, something will happened behavior (Militello et al., 2006). Teachers who have undergone certification can be said to have had professional duties. The professionalism possessed by teachers certainly has an impact on improving teacher performance. Teacher performance can be shown from the teacher's ability to carry out their duties as well as the behavior shown by the teacher in the learning process. One of the things that professional teachers must master is mastery of technology. Mastery of technology is a competency that teachers must master to support improvements in the learning process (Nurhaliza, 2021).

This research is important to carry out because the integration of technology in the learning process is an important thing, this really needs to be done to be able to change the context of teachers' thinking in today's era which has the demands of 21st century learning. TPACK is one that can implement technology in the learning process. TPACK can implement pedagogy, technology and content in one learning process. This makes it very easy for teachers to carry out the learning process. Teachers can determine learning media according to the material to be taught (Aulia et al., 2022). Apart from implementing TPACK in the learning process, conation is also an important thing to research because it is a mental process that can lead to behavior. So TPACK and conation are important things to research because teachers who have been certified are professional teachers who have four teacher competencies so they are able to apply TPACK and have good conation.

TPACK was first proposed by Shulman in 1987 and has been developed by Koehler and Mishra in 2008. TPACK is considered as a framework that has the potential to provide new directions for teachers to solve problems. These problems can be related to integrating ICT into the learning process in the classroom (Hewitt, 2008). TPACK which has been proposed by Shulman is about PCK (Pedagogical Content Knowledge) which is about educational technology and the interaction of PCK with each other to create effective learning using technology. TPACK is a combination of technology,

pedagogy, content or materials applied in one context (Mishra et al., 2006).

TPACK must be owned by professional teachers, because in TPACK there are four main competency domains of a teacher which include pedagogical, personality, social and professional competencies. According to Doering et al. in their research, TPACK integration can increase self-confidence and can improve teacher content, pedagogical and technological competencies in designing learning. Therefore, the pattern of teacher competency development with TPACK is a path that is in accordance with the demands and changes that occur (Hewitt, 2008). The TPACK framework has seven components that can be defined as.

Content Knowledge (CK) or content knowledge. This knowledge contains the actual learning material that will be taught and studied. The nature of knowledge is different for each content area so teachers must know about the content to be taught (Koehl et al., 2013).

Pedagogical Knowledge (PK) or pedagogical knowledge. This knowledge refers to methods, learning processes and knowledge in organizing classes, such as assessment and developing student learning plans (Deng et al., 2023).

Technological Knowledge (TK) or technological knowledge. This knowledge is about various technologies such as digital video and other software programs (Koh et al., 2014).

Technological Pedagogical Knowledge (TPK) or technological pedagogical knowledge. This knowledge refers to how the technology can be used in the learning process and can understand that using technology can change the way teachers carry out the learning process.

Pedagogical Content Knowledge (PCK) or pedagogical content knowledge. This knowledge is knowledge that refers to content knowledge related to the teaching process because this pedagogical content knowledge varies in various content areas, therefore content and pedagogy are combined to develop better teaching in each content area.

Technology Content Knowledge(TCK) or technological content knowledge. Knowledge that refers to how the technology can create new representations for certain content. This knowledge aims to enable teachers to understand concepts in certain areas using technology and can change the way students learn.

Technological Pedagogical Content Knowledge(TPACK) or pedagogical content knowledge of technology. This knowledge refers to the knowledge that is very much needed by teachers in integrating technology into the learning process in any content area (Deng et al., 2023).

TPACK measurement is done using the TPACK framework. This TPACK measurement is an assessment activity of the level of TPACK mastery. This TPACK measurement is usually carried out on educators and trainers in formal, informal and non-formal education, such as lecturers, teachers, tutors, and instructors. This TPACK measurement is seen to determine a person's mastery of TPACK in relation to the ability to be able to integrate technology in the learning carried out. TPACK measurement can be done quantitatively or qualitatively. In carrying out TPACK measurements there are three benefits, namely.

By measuring TPACK, it helps to obtain a TPACK mastery profile that can describe the level of mastery in each knowledge domain. For prospective teachers, TPACK measurement can be a reflection in the implementation of education. TPACK measurement can determine the impact of learning interventions related to technology integration provided to prospective teachers when undergoing teacher education (Koehler et al., 2013).

Humans have a psychic life in the form of various activities such as will, thinking, remembering, suggesting, fantasizing, sadness, happiness, and so on. There are several aspects that are included in psychiatric symptoms, namely cognition (recognition symptoms), emotion (feeling symptoms), conation (will symptoms) and combination (mixed symptoms). Conation is one of the functions of a human's psychic life. Conation can be interpreted as a psychic activity that contains active effort and is related to achieving a goal (Mudjiran, 2021).

Conation is a tendency of a person to be able to behave. The conation component is a component related to habits and willingness to act. This conation component is closely related to psychomotorics and is a readiness to behave towards an object or situation that will be faced. So when someone is facing a certain event, it is first processed through the cognitive, affective components, then the last one only gives rise to behavior (Marʻat, 1984).

An important factor in success in conation or will is to realize that one has the ability and freedom to choose and control one's own thoughts. Conation has two subcomponents, namely, Covert, which refers to controlling one's own actions. Open, which refers to environmental control that impacts a person's actions (Kivinen, 1997).

There are five stages in conation, namely perception, focus, engagement, involvement and transcendence. Perception is an openness to various forms of sensory and intuitive stimuli. This perception is important for individuals to be able to understand the relationship and flow between phenomena. Focus is the ability to distinguish certain stimuli or patterns from the background. This focus is the stage where individuals can set goals or desired outcomes. Engagement is related

to individuals who begin to examine their goals more closely and begin to develop plans to achieve them. Depending on the level of attention shown at each stage. This involvement can range from minimal to absorbed. Transcendence is related to individuals who are truly united with the task, that the mind, body and task become one (Kathryn et al., 1987).

One of the symptoms found in all living creatures, humans, animals and plants. This symptom is related to a movement and actions that are centered on the physical. Included in this symptom is a tendency, namely a reactive readiness that is directed at an object and always appears repeatedly and desire, namely a passion that has a certain direction and purpose (Abu-Asab et al., 2013).

Conation is included in the three components that form attitudes after cognitive and affective. Measuring this attitude is one of the important things to be able to understand a person's attitude. There are several methods in measuring attitudes, namely Covert Measres or Covert Measurement. This method is carried out not by observing behavior that appears either intentionally or not but through physiological reactions that occur beyond the control of the person concerned (Azwar, 2005).

The conation domain can be described through a preferred approach in realizing thoughts in an action or interaction with the environment. One of the stages of taxonomy in the conation domain is Transcendence, a stage where the individual is fully immersed in the task, so that the mind, body and task become one (Baker et al., 2018).

Teacher certification is a program designed to see the eligibility of a teacher in acting as a learning agent who can realize national education goals. The government determines the number of participants who will be certified, therefore teachers must be able to compete to be able to participate in the program. Teachers who can participate in the certification program are teachers who have taught at a certain level of education, both in early childhood education, elementary education, and secondary education under the Ministry of National Education and the Ministry of Religion (Sujanto, 2009).

Method

The method used in this research is the survey research method. The approach used in this research is to use a quantitative approach while the type of research is correlational research. This correlational research was used to determine the relationship between certified Biology teachers' TPACK and conation. Correlational research or correlation can be interpreted simply as a relationship.

The data collection techniques used in this research were TPACK and CONATION questionnaires. The data that has been obtained will then be analyzed. This data was obtained from an online survey conducted using Google Form. This survey questionnaire was then distributed to all high schools in Banda Aceh. The distribution process is carried out by sharing the questionnaire via social media such as WhatsApp, Telegram, Facebook and email.

The instruments used in this research were the TPACK questionnaire and the conation questionnaire. The questionnaire has been validated and improvements have been made according to lecturer input. From the results of the questionnaire, the results of the teacher competency analysis of the TPACK components and teacher conation will be obtained. To ensure that the data obtained is valid, this research used data triangulation using the main instrument, namely a questionnaire, which was then complemented by observation sheets and interviews.

To find out the correlation between TPACK and teacher conation, this was done using a correlation test. The correlation test is used to determine whether or not there is a relationship between two or more variables (Sappaile, 2017). The correlation analysis technique used is correlation product moment using the equation 1.

$$r_{xy} = \frac{N.\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{\{N.\Sigma X^2 - (\Sigma X)^2\}\{N.\Sigma Y^2 - (\Sigma Y)^2\}}} \quad (1)$$

Information:

r_{xy} : Correlation coefficient between variable X and variable Y, two variables that are correlated (x= X-$\bar{X}$ and y = Y − $\bar{Y}$)

N : The number of students

ΣX : Total score for question number i

ΣY : Total score

ΣXY: The sum of the products of x and y

Next, the results obtained will be categorized into the magnitude of the correlation coefficient using the Table 1.

Table 1. Correlation Coefficient (Aswegen et al., 2009)

TPACK value	Criteria
less than 0.19	No correlation
0.20 - 0.39	Low correlation
0.40 - 0.69	Medium correlation
0.70 – 0.89	High correlation
0.90-1.00	Very high correlation

Result and Discussion

The TPACK capabilities of certified biology teachers were obtained from data from teachers in sixteen public high schools in Banda Aceh, totaling 43 certified biology teachers. Several aspects of TPACK that will be analyzed are Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK). The value of the TPACK aspect can be seen in Table 2.

Table 2. The Value of the TPACK Aspect

Aspects of TPACK	TPACK Aspect Value	Criteria
TK	83.97	Very good
CK	87.01	Very good
PK	86.69	Very good
PCK	87.17	Very good
TCK	85.73	Very good
TPK	84.08	Very good
TPACK	80.44	Good

Based on the output above, the overall TPACK ability score for certified biology teachers is 85.16% in the very good category. Meanwhile, for the value of each TPACK component, there are very good criteria, except for the TPACK aspect which only gets good criteria. This data shows that in the learning process the use of technology needs to be improved and teachers are able to collaborate with technology. This is in accordance with research conducted by Mutiani et al. (2021), which states that in the 21st century teachers are required to be able to utilize technology. This is because the interaction between students and teachers and learning resources in the 21st century is carried out in a technology-rich learning environment, so that technology not only acts as a tool but also as a process and learning resource.

The conation aspects that will be analyzed are fact finding, following, quick start, implementation, directing and energizing. This analysis was obtained from the results of a questionnaire that was distributed and filled in by certified biology teachers. A graph to see the percentage of certification criteria for biology teachers who have been certified at SMA Negeri Banda Aceh can be seen in Figure 1.

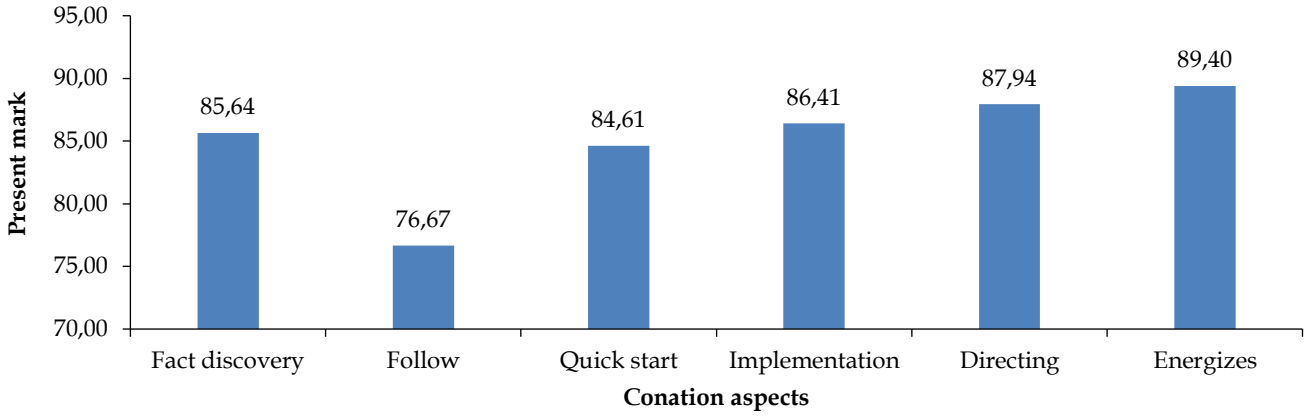

Figure 1. Percentage of certification criteria for biology teachers who have been certified at SMA Negeri Banda Aceh

Based on the output above, the overall conation value of certified biology teachers is 85.44% in the very good category. The highest score was obtained in the aspect of giving energy with a score of 89.40% in the very good category, which means that respondents can overcome problems that occur, can motivate themselves to use technology in the learning process and are aware of the importance of using technology in the learning process.

The next step is to test the hypothesis using product moment correlation analysis. This test aims to determine the basis for the decision whether there is a relationship between the two variables and whether the relationship is positive or negative. The results of the product moment correlation test between TPACK and conation can be seen in Table 3.

The learning process carried out by utilizing and integrating technology will be able to achieve an effective learning process and teachers who have a role in achieving the learning process. One way that can be done in creating an effective learning process is by mastering information and communication technology (ICT) (Ismail et al., 2022). One of the knowledge that must be mastered by teachers in the learning process is TPACK. TPACK can be used as a framework by teachers to be able to design an educational curriculum that is in accordance with 21st century learning, besides that it can

be used to analyze knowledge about technology integration in the learning process (Rahmadi, 2019).

The application of TPACK in the learning process will enable teachers to be creative through applications or media using interactive learning media. Teachers will find it easier to deliver learning materials if they use technology, especially for abstract materials that can be used using animated learning videos so that students can understand them more easily. In addition to creating learning media, teachers can also follow things that are trending in the world of education and can be interacted with the learning process so that students can be motivated to follow the learning process. The use of technology in the learning process carried out by teachers is creative and innovative (Septia et al., 2023).

Based on the output above, the overall value of the biology teacher's conation who has been certified is 85.44% with a very good category. This is in accordance with the research of Iba et al. (2021) which states that as a teacher, it is expected to have internal factors in themselves such as very great motivation. Motivation will give rise to an action that plays a very important role in moving a teacher to achieve achievements and affiliates, making it one of the important factors in improving teacher competence (Iba et al., 2021).

Table 3. The Results of the Product Moment Correlation Test between TPACK and Conation

		TPACK	Conation
TPACK	Person correlation	1	.538**
	Sig. (2-tailed)		.000
	n	39	39
Conation	Person correlation	.538**	1
	Sig. (2-tailed)	.000	
	n	39	39

Based on the output above, it can be interpreted by referring to the basis for decision making in analyzing person correlation, namely, based on the significance value of Sig. (2-tailed), from the output table above, the Sig value is known. (2-tailed) between TPACK and conation is 0.000 < 0.05, which means there is a significant correlation between the TPACK and conation variables.

Based on the calculated r_{value} (Pearson Correlation), it is known that the calculated r_{value} for the relationship between TPACK and conation is 0.538 > r_{table} 0.316, so it can be concluded that there is a medium category relationship between the TPACK variable and the conation variable. Because the calculated r in this analysis is positive, it means that the relationship between the two variables is positive. This means that it can be concluded that the higher the teacher's TPACK ability, the higher the teacher's connection in the learning process.

Competence can also be interpreted as ability. This ability is based on a visible ability and an invisible ability. This visible ability is called appearance, which can be seen in the form of behavior that is then demonstrated so that it can be seen, observed and felt. Teacher performance is one of the visible abilities so that teachers can carry out their duties professionally. This attitude towards the teaching profession is a regularity in terms of feelings (affection), thoughts (cognition), and actions (conation) of a teacher towards the profession he is pursuing (Sappaile, 2017).

The teaching and learning process is one of the competencies possessed by teachers which will be directed to achieve the planned goals. The responsibility of a teacher is to be able to manage the learning process to be more positive, efficient, and effective which can be marked by the existence of awareness and action and active involvement between teachers and students, so that students who experience it can be actively involved and obtain self-change in the learning process (Mohammad, 2023).

The first step taken in conducting a correlation analysis is to conduct a normality test. This normality test aims to determine whether the data obtained comes from a normally distributed population (Gito, 2021). The next step is to conduct a linearity test. This test aims to determine whether the dependent variable and the independent variable have a significant linear relationship or not (Sugiyono et al., 2015).

Rahmi et al. (2023) stated that the correlation between TPACK and teacher performance is included in the moderate category. Teacher performance is the result of a teacher's work achieved based on the will, ability and effort to achieve a goal in school. One of the abilities that a teacher must have is teaching.

A teacher's ability to teach can affect the learning process, teachers must be able to make changes by making the learning process modern and technology-based. The existence of technology will make the learning process easier and can add sources of information (Turmuzi et al., 2021). TPACK is a competency component that teachers must have to be able to integrate technology based on their knowledge. Teachers who have TPACK skills can improve quality and can face the demands of technology in the learning process (Haka et al., 2020).

Interview

Data from the questionnaire results that have been filled in via Google Form are then used to triangulate the data using the main instrument, namely the questionnaire, then equipped with observation and interview sheets. Interview data was taken from 50% of the total sample so that the total number of respondents

interviewed was 20 people. The criteria for teachers being interviewed are those who have flexible time or when the teacher is not teaching or has other activities. This was done because there were several teachers who refused to be interviewed on the grounds that they did not have the time.

Interviews were conducted at several randomly selected school points. This interview was conducted to find out the TPACK criteria and certification of biology teachers. From the results of the interviews conducted, most of the respondents used technology in the learning process using Power Point applications, learning videos obtained from YouTube or those designed by themselves and quizzes. But there is one teacher who uses other learning media such as macromedia flash. Apart from using applications to display learning media, teachers also use WhatsApp to deliver learning materials and distribute reading materials to students.

Observation

The results of questionnaires and interviews can be strengthened by making observations during the learning process. Observation data was taken from 50% of the total sample so that the total number of respondents observed was 20 people. The criteria for teachers being observed are teachers who have class hours on that day and teachers who give permission for the observation to be carried out. This was done because there were several teachers who refused to carry out observations.

Based on observations, almost all teachers can integrate technology in the learning process, such as using laptops and Infocus. Apart from that, there are several teachers who have their own infocus so that the learning process does not depend on the infocus provided by the school. However, there are also older teachers who experience difficulties in using technology, this can be overcome by asking students for help to be able to operate Infocus and laptops.

Conclusion

The TPACK ability and conation scores of certified biology teachers are included in the very good category and there is a relationship in the moderate category between the TPACK variable and the conation variable. This means that it can be concluded that the higher the teacher's TPACK ability, the higher the teacher's connection in the learning process.

Acknowledgments

Thank you to the leadership, teaching staff and Biology teachers at SMA Negeri Banda Aceh who have provided opportunities and service facilities while carrying out research and thanks to the supervisors who have provided guidance in completing this article.

Author Contributions

Conceptualization, A.U. and C.N.; methodology, R.R. software, R.R; validation, A.U., C.N., S., and I.H.; formal analysis,R.R., A.U., and C.N.; investigation, R.R.; resources, R.R.; data curation, R.R., A.U., and C.N.; writing—original draft preparation, R.R.; writing—review and editing, R.R., A.U., and C.N.; visualization, R.R.; supervision, I.H. and S.; project administration, R.R.; funding acquisition, R.R.; All authors have read and agreed to the published version of the manuscript.

Funding

This article was independently funded by Risma Rahmawati Fhonna

Conflicts of Interest

The authors declare no conflict of interest.

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