

# Influence of Transformational Leadership and Teacher Collaboration on Teachers' Ability in Implementing Interdisciplinary Learning.

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## ABSTRACT

In today's world, it is not enough for students to just learn from a single-track learning. Moreover, it is even more important for students as well as teachers to tackle issue they learn in the classroom from various points of views, one way is through an interdisciplinary learning approach. In order for teachers to be competent in applying interdisciplinary learning, the right type of leadership needs to guide these teachers. Besides the right type of leadership, teachers cannot tackle a particular issue on their own, there needs to be a collaboration among the teachers. The purpose of this quantitative study is to analyse the influence of transformational leadership and teacher collaboration on teachers' ability in implementing interdisciplinary learning at XYZ Schools. Forty-seven teachers at XYZ Schools completed the online questionnaires. The path analysis through PLS SEM method was employed to test the proposed hypothesis. The results showed that transformational leadership has a positive influence on teachers' ability in implementing interdisciplinary learning. Added to that, teacher collaboration has a positive influence on teachers' ability in implementing interdisciplinary learning. Also, transformational leadership has a positive influence on teacher collaboration.

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## 1. Introduction

The 21st century has shifted today's education from single-track learning to cross-subject learning. Students and teachers are learning that underneath the various subjects and disciplines there are connections and differences that can be drawn. Added to that, today's students need to explore relevant themes and issues and strive to explore ways to solve problems through these connections.

One way of doing this is through interdisciplinary learning. However, this can come with many challenges. It is a journey that demands educators to collaborate and come up with a problem based or thematic approach to connect course content across various disciplines. In trying to cohere various disciplines to a particular theme, teachers may face a few challenges in trying to implement an interdisciplinary approach. One of these challenges is related to the diversity of strategies and methods of each teacher in approaching a particular subject (Ibsen & Eriksen, 2022). In a classroom, there is usually one teacher or an exchange of one teacher that oversees the teaching and learning process of the students. But with interdisciplinary, teachers need to set time to come together and learn to work with other teachers. These teachers may have different teaching backgrounds, characteristics, teaching methods, teaching skills which may add to the challenges (Ibsen & Eriksen, 2022).

With teachers having different types of teaching backgrounds striving to collaborate, an ideal leadership style is needed so that interdisciplinary learning can run effectively. One of those leadership styles is transformational leadership, especially in the world of education. So for schools to go far and reach their full potential, the leaders of the school need to be aware of the teachers' wellbeing and guide them so that teachers can have the ability to implement teaching and learning strategies such as interdisciplinary learning. In leading and managing the school, the school leaders are also expected to create a system where the teachers can work together, improve, and carry out their professional duties as good as possible, such as implementing interdisciplinary learning. A teacher's work performance needs to be accompanied by good cooperation between teachers who then become the driving force for teachers to work and implement interdisciplinary learning even better. In every activity such as interdisciplinary learning, the teachers don't only teach the students, but they also need to cooperate with other teacher. The collaboration is carried out so the goal of interdisciplinary learning will be achieved, and by doing so, teachers can prepare students to face the challenges of the 21<sup>st</sup> century.

Leadership is a crucial process where a person influences others to become subordinates in achieving a common goal (Muliati et al., 2022). It involves personal skills that can guide the group towards joint efforts towards achieving specific goals (Syahrani et al., 2022 & Endiana & Sudiartana, 2015). Leadership also plays a role in strategically organizing members within an organization (Syahrani et al., 2022). It involves an action taken by an individual or group to coordinate and provide direction to others. A leader has the authority to direct and motivate their followers, enabling them to achieve specific goals together (Syahrani et al., 2022). Furthermore, studies also show an individual's initiative and creativity, as well as exemplary and charismatic leadership, play a guiding role in inspiring employees to engage in innovative work behaviours (Miao, Lu, Cao, & Du, 2020).

According to Northouse, 2019, Bass & Riggio, 2006, Matar, Aldhaheri, & Nuussari, 2019, transformational leadership has 4 factors:

- a. **Idealized Influence:** Another word for this is charisma. This factor deals with the emotional component in where leaders strive to be role models for their followers. It is also characterised by the leader's high standards of moral and ethical actions which provides followers with a vision and mission to follow.
- b. **Inspirational Motivation:** Transformational leaders also communicate these high standards to their followers and inspiring them to go beyond and achieve more than their own expectation. This can be done through encouraging words and motivating speeches.
- c. **Intellectual Stimulation:** Transformational leaders also stimulate their followers to be creative and innovative. They push their followers to challenge what they believe and encourage followers to engage in careful problem solving.
- d. **Individualized Consideration:** Lastly, transformational leaders act as coaches and advisors. This is proved by a supportive environment in where they take the time to listen to the individual needs of the followers. Transformational leaders also act as coaches in where they help followers grow through their challenges.

In regard to their interaction with others, transformational leaders motivate and move others to do more than initially planned and often even more than they thought possible (Nuel, K, Nnenne, & Ifeoma, 2021). So even with the initial plans laid out, a transformational leadership pushes the followers to go beyond what is expected. It is said that leaders who apply this type of transformational leadership will tend to spur their followers to produce work beyond what is expected, namely by changing the vision, becoming an example, providing support, and stimulating the desire to change for the better (Purwanto, Purba, Bernarto, & Sijabat, 2021, p. 62). This is because, followers have trust, admiration, loyalty, and respect for

their leaders, so they will easily do more work than expected (Purwanto, Purba, Bernarto, & Sijabat, 2021, p. 62). Not only in achieving beyond what is expected, Al-husseini & Elbeltagi (2018) also define transformational leadership as leadership that stimulates and inspires people to improve their individual performance and improve the organisational effectiveness. So as the name suggests, transformational leadership is a leadership style that has an element of motivation which focuses on the process of changing and transforming people for the better good.

In a school environment, Leithwood (2021), Marks & Printy, (2003), and Galloway & Ishimaru (2015) state the main dimensions of transformational leadership are in:

- a. Setting Directions which includes building a shared vision; identifying goals: creating high performance expectations; and communicating the vision and goals.
- b. Building Relationships and Developing People which includes stimulating growth and demonstrating consideration for each individual member in the school environment. This also involves establishing productive working relationships with teachers.
- c. Designing the Organisation to Support Desired Practices which includes building collaborative cultures and distributing leadership.
- d. Improving the Instructional Program which includes staffing the instructional program; providing instructional support; and monitoring student learning and school improvement progress.
- e. Securing Accountability which includes building staff members with a sense of internal accountability and meeting the demands for external accountability.

In a school organisation, teachers are encouraged towards collaborating with other teachers to successfully accomplish their goal as a teacher. Many researchers have also shown that teacher collaboration have helped in successfully implementing innovative, student-centred, and collaborative learning methods (Vangrieken et al. 2015, Ghedin & Aquario, 2020, Slavik et al. 2011). Teacher collaborations has also shown to prompt teachers to using more innovative pedagogies (Ghedin & Aquario, 2020, Vangrieken, et al. 2015). However, an important characteristic of collaboration is its tasks related focus, including working, and reflecting together for job related purposes to target a common goal throughout common activities such as professional development and improvement of student achievement (Walędziak et al 2019).

With that being said, Vangrieken et al. (2015) mentions these key concepts on teacher collaboration:

- a. Professional (learning) community (P(L)C)

A professional learning community (PLC) is a collaborative culture of teachers in schools, characterized by shared values and vision. It involves teachers working together with a common set of students to collaborate on shared practice problems and improve student achievement outcomes. PLCs collect, analyze, and evaluate information about teaching practices and student performance, fostering a learning-oriented environment (Zito, 2015).

- b. Community of Practice (CoP)

CoP is a socially interdependent teacher community that engages in discussion and decision-making, sharing knowledge and examining instructional practices, student learning, and performance. It focuses on ways to maintain, improve, adjust, develop, or discontinue these areas, ensuring a shared identity, shared domain, goals, and interactional repertoire (Zito, 2015).

- c. Team

A team is a group of individuals who work together to achieve shared goals, sharing responsibility and holding each other accountable. They are interdependent and committed to

the common purpose, requiring equal participation and participation in meetings. This interdependence is crucial for effective teamwork (Zito, 2015).

d. Group

A group can be defined as a collection of individuals who share a common social categorisation and identity, but the focus remains on individual goals and individual accountability. It can be discerned from a team by the fact that groups do not have to comply with all criteria of a team as described above.

Added to that, de Jong, Meirink, & Admiraal (2019), da Ponte & Quaresma (2019), and Martin (2014) describe as school-based teacher collaboration as:

a. Storytelling and scanning for ideas

Occasional exchange of experiences among colleagues which can take place in the hallway or in the staff room with the aim of providing informational and social support. Here educators look for precise concepts, answers or validations through quick casual experience exchanges.

b. Aid and assistance

Teacher interactions with the ready availability of mutual aid or help. Teachers share ideas and give each other advice, mostly on specific difficult or problematic teaching situations. Da Ponte & Quaresma (2019) describes this relation as unidirectional and unequal because eventually the individual teacher becomes the sole decision maker.

c. Sharing methods and materials

Besides giving advice, teachers share with each other actual materials and methods with regard to the curriculum and instruction. Meaning, this specifically involves the exchange of resources, methods, ideas and opinions, and involves some level of exposition of the teachers regarding his/her colleagues (da Ponte & Quaresma, 2019). Added to that, de Jong, Meirink, & Admiraal (2019) state that this involves moderate levels of interdependence amongst teacher.

d. Joint work

Joint work fosters high levels of interdependence among teachers, promoting critical inquiry, sustained practice scrutiny, analysis, and improvement. This collaborative approach involves teachers trying, testing, and evaluating learning and teaching results. Donohoo & Mausbach (2021) differentiate between goal and task interdependence, stating that goal interdependence depends on the goal leaders encourage, while task interdependence refers to the interconnectedness of teachers based on collaborative tasks.

In regard to interdisciplinary learning, and with how the world is changing through more advanced technology and the rise of various social issues, there is a level of expectations in place for educators and students. You (2017) states that even with these expectations, many scholars believe that the current state of education is not preparing students to be creative, collaborative problem solvers. However, You (2017) believes that interdisciplinary learning method provides the opportunity for students to see cross-curricular connections that would lead them to a more meaningful learning experience.

To define interdisciplinary learning, Wood (2015, pp. 2-8) states that interdisciplinary learning has at least four different unique characteristics:

- a. Interdisciplinary studies are organized into comprehensive unit plans focusing on a specific topic, theme, or problem, involving multiple academic subjects or fields. These studies should be related to real-world issues (Hubert, 2021). The organization and design of an interdisciplinary approach can be activity-centered or backward design. Activity-centered studies focus on specific lessons and activities, followed by unit objectives and assessments. Backward design starts with unit objectives and determines lesson and activities that align with the objectives.

- b. Interdisciplinary studies utilize academic disciplines' skills and techniques to investigate topics, themes, or problems. Students are encouraged to participate in the planning process by guiding them with essential questions and applying techniques from various disciplines. This approach helps students observe connections between disciplines and creates engagement through real-world context, connections, and relevance. Students learn not only about the connections between disciplines but also how they correlate with the real world.
- c. Interdisciplinary studies emphasize mastering both content and processes related to a topic, theme, or problem. Teachers play a crucial role in this process-focused approach, focusing on relevant skills and ways of knowing for each subject, rather than solely on content (de Fouw et al, 2020).
- d. Interdisciplinary studies accommodate student diversity by providing for the differentiation of student investigating and reporting techniques. Wood describes 4 elements to be considered in differentiation of instructions:

- 1) the content that is taught
- 2) the different opportunities students are given to process the information
- 3) various ways students can complete their culminating products
- 4) various ways students work to gain information

Furthermore, Peters-Burton & Holincheck (2020, p. 8) state that there are four approaches in implementing the interdisciplinary model of learning:

- 1) Fusion: Teachers combine two or more subject into a new course.
- 2) Integrated: Teachers use overarching concepts and emergent patterns to reorganize subject areas. Usually, one subject area takes the lead.
- 3) Shared: Teachers share the planning and discover emergent topics that appear when they overlap the content areas.
- 4) Webbed: Teachers apply a theme to different content areas for the purposes of illuminating concepts and ideas in each content area.

Seeing Peter-Burton and Holincheck's approach in implementing interdisciplinary model of learning, it is clearly seen that the teachers' ability to collaborate and connect through various subjects plays an essential role in implementing interdisciplinary.

In addition, Wood (2015, p. 20) & de Fouw et al. (2020) state that teachers must possess these following abilities to implement interdisciplinary learning in the classroom:

- 1) A compatible approach in the educational philosophy of constructivism:
- 2) A considerable store of knowledge
- 3) Excellent skills in classroom management
- 4) Skill in planning lessons, interdisciplinary units, and multidisciplinary units
- 5) Skills in the use of instructional technology
- 6) The ability to collaborate with others in the school community.

Obviously, the interdisciplinary approach is not something that can be done alone by one teacher. Wood (2015) suggests that teachers work with other specialist that can add significance to the study. The teachers must have a scheduled time for collaboratively planning in which they design the interdisciplinary units from its unit objectives to the assessments. Another important part in the collaborative planning is determining how each teacher will relate the lessons in their classes to the unit topic or theme. Apart from planning, teacher can use the planning time to share knowledge and exchange information on the progress of the students. As it pertains to in the classroom, each teacher needs to teach the academic skills and the process related to the theme or topic of the interdisciplinary approach.

Moreover, the purpose of this study is to 1) analyse if transformational leadership has a positive influence on teachers' ability in implementing interdisciplinary learning, 2) analyse if teacher collaboration has a positive influence on teachers' ability in implementing interdisciplinary learning 3) analyse if transformational leadership has a positive influence on teacher collaboration.

Added to that, the researcher hopes that the result of this study have the following benefits: 1) For leaders: help leaders be more effective with promoting and encouraging teachers in interdisciplinary learning, 2) For academics: This research can be used as material studies or references for further research on transformational leadership, teacher collaboration, and interdisciplinary learning, 3) for other researchers: this research gives an opportunity for other researchers to be able to deepen their knowledge and theoretical concepts on the topic of transformational leadership, teacher collaboration, and interdisciplinary learning,

## **2. Method**

This quantitative research examines the impact of transformational leadership on teachers' interdisciplinary learning implementation at XYZ Schools. Using descriptive research design and hypothesis testing, the study aims to determine if transformational leadership positively influences teachers' ability to implement interdisciplinary learning, a positivistic method based on positivism philosophy.

This research was conducted online among various XYZ Schools namely: Lippo Village, Manado, Holland Village, Palembang, Daan Mogot, Kupang, Jember, Bangka, Lubuklinggau, and Makassar. The time of the research started on September 2023. The researcher conducted the research in these schools because these schools were available and willing to participate in the research.

In doing this research, the researcher took these following steps: 1) Preparation: The researcher reviewed literature, conducted interviews, and developed indicators for a questionnaire on interdisciplinary learning in XYZ Schools, supporting the research's background. 2) Implementation: The researcher validated the questionnaire questions and collected data by sending Microsoft Forms to interdisciplinary learning teachers at XYZ Schools. 3) Data Management: The researcher analyzed questionnaire results using Smart PLS to examine the impact of transformational leadership and teacher collaboration on interdisciplinary learning implementation, aiming to describe and analyze relationships between variables.

The researcher used convenience sampling to gather data from XYZ schools in Indonesia. The researcher contacted the principals and head of schools to ask permission to distribute questions to them. These teachers and leaders had experience in implementing interdisciplinary learning. The researcher obtained 47 teachers from these schools who have implemented interdisciplinary learning in their classrooms. The researcher used the census method and questionnaires via Microsoft Form to gather primary data from XYZ teachers, as they cannot provide in-person responses due to distance. The research instrument used in this study was in a form of questionnaire with the Likert scale as the mode of measurement namely: strongly agree, agree, neutral, disagree, and strongly disagree. These choices will also range in score from 1-5, strongly agree being 5 and strongly disagree being 1.

This quantitative research used descriptive statistic and inferential statistic. The descriptive statistic was used by the researcher to study the data that has been collected and present it graphically. The inferential statistic is to test the convergent validity and the discriminant validity by using the Smart PLS application. By using PLS-SEM, the researcher analyzed in two steps namely: outer model and inner model. To summarize, the rule of thumb outer model can be seen through the following table:

Table 1

Outer Model	Parameter	Rule of thumb
<b>Convergent Validity</b>	Loading Factor	>0.7
	Average Variance Extracted	>0.5
<b>Discriminant Validity</b>	Cross Loading	>0.7
	Square root of AVE	Square root of AVE > correlation between the latent constructs
<b>Reliability</b>	Composite Reliability	>0.7

To summarize, the rule of thumb inner model can be seen through the following table:

Table 2

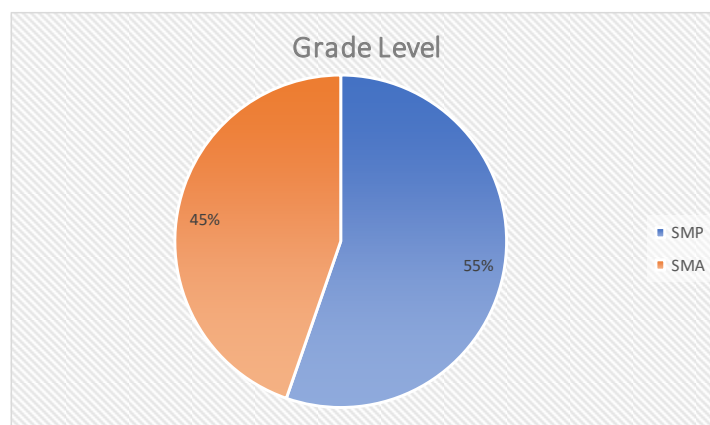
Inner Model	Parameter	Rule of Thumb
<b>Multicollinearity Analysis</b>	Variance Inflation Factor (VIF)	VIF < 5
<b>Coefficient of Determination Analysis (R<sup>2</sup>)</b>	R <sup>2</sup>	0 ≤ R <sup>2</sup> ≤ 1 (closer to 0 shows model as weak, closer to 1 shows model as strong.
	p ≤ 0 or p ≥ 0	p ≤ 0, hypothesis is rejected p > 0 hypothesis is accepted
<b>Path Coefficient Analysis</b>		

The statistical hypothesis in this research are as follows:

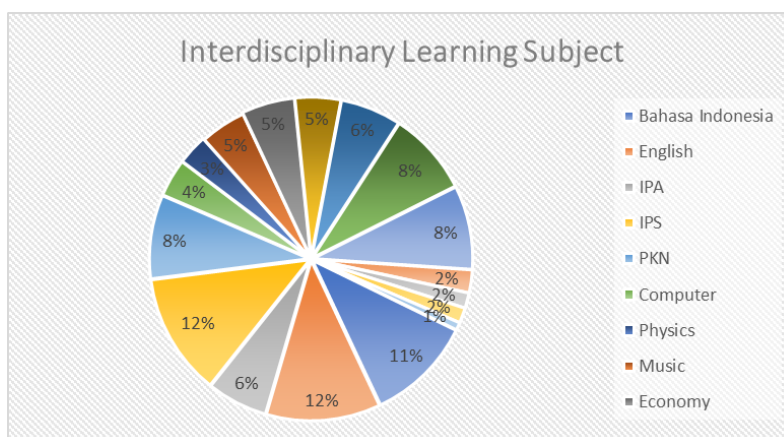
- 1) H<sub>0</sub>: p ≤ 0  
 H<sub>1</sub>: p > 0  
 There is a positive influence between transformational leadership and teachers' ability in implementing interdisciplinary learning.
- 2) H<sub>0</sub>: p ≤ 0  
 H<sub>1</sub>: p > 0  
 There is a positive influence between teacher collaboration and teachers' ability in implementing interdisciplinary learning.
- 3) H<sub>0</sub>: p ≤ 0  
 H<sub>1</sub>: p > 0  
 There is a positive influence between transformational leadership and teacher collaboration.

### 3. Result and Discussion

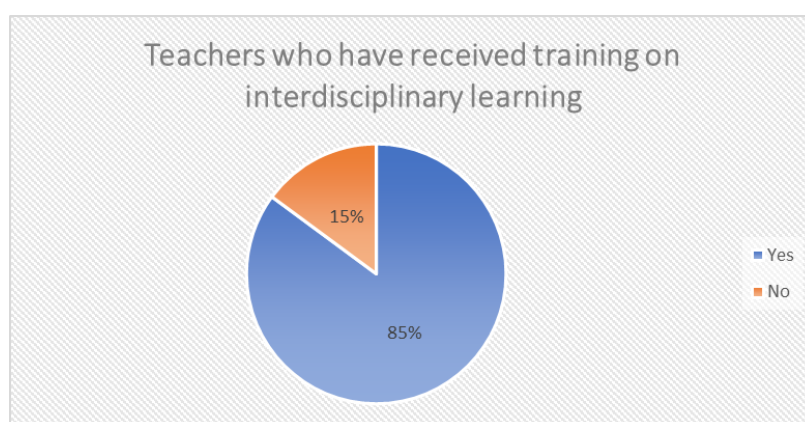
In this research, the researcher was able to collect 47 respondents from 10 XYZ schools across Indonesia. The respondent profile was differentiated through position, grade level, and the subject implemented in the interdisciplinary learning. The data analysis was carried out by the researcher based on the 47 respondents that responded to the questionnaire at XYZ Schools across Indonesia. The data description is based on: grade level, subject implementation, and teacher training which can be seen in the table below.



Picture 3



Picture 2



Picture 3

The distribution of answers for each variable namely transformational leadership (TL), teacher collaboration (TC), and teachers' ability in implementing interdisciplinary learning (TA) can be seen in each table below.

Table 4

No. Item	Transformational Leadership Answer Frequency				
	1	2	3	4	5
<b>TL4</b>	0%	0%	2%	49%	49%
<b>TL5</b>	0%	2%	4%	57%	36%
<b>TL6</b>	0%	0%	6%	62%	32%
<b>TL9</b>	0%	0%	4%	64%	32%
<b>TL10</b>	0%	0%	6%	68%	26%
<b>TL15</b>	0%	0%	11%	53%	36%
<b>TL16</b>	0%	2%	6%	60%	32%
<b>TL17</b>	0%	4%	2%	53%	40%
<b>TL18</b>	0%	4%	4%	62%	30%
<b>TL20</b>	0%	0%	4%	53%	43%
<b>TL21</b>	0%	0%	9%	55%	36%
<b>TL22</b>	0%	9%	15%	55%	21%



<b>TL23</b>	0%	4%	11%	49%	36%
<b>TL24</b>	0%	4%	11%	60%	26%
<b>TL25</b>	0%	2%	4%	49%	45%
<b>TL26</b>	0%	2%	6%	45%	47%
<b>Average</b>	0%	2%	7%	56%	35%

Table 5

No. Item	Teacher Collaboration Answer Frequency				
	1	2	3	4	5
<b>TC4</b>	0%	2%	4%	47%	47%
<b>TC5</b>	0%	2%	4%	49%	45%
<b>TC6</b>	0%	2%	4%	55%	38%
<b>TC7</b>	0%	2%	15%	51%	32%
<b>TC8</b>	0%	2%	13%	60%	26%
<b>TC9</b>	0%	2%	4%	53%	40%
<b>TC10</b>	0%	2%	6%	47%	45%
<b>TC11</b>	0%	2%	6%	47%	45%
<b>TC12</b>	0%	2%	6%	57%	34%
<b>Average</b>	0%	2%	7%	52%	39%

Table 6

No. Item	Teachers' Ability in Implementing Interdisciplinary Learning Answer Frequency				
	1	2	3	4	5
<b>TA13</b>	2%	4%	19%	62%	13%
<b>TA14</b>	2%	0%	6%	79%	13%
<b>TA15</b>	0%	2%	13%	57%	28%
<b>TA16</b>	0%	2%	6%	53%	38%
<b>TA20</b>	0%	2%	11%	62%	26%
<b>TA21</b>	0%	4%	17%	60%	19%
<b>TA22</b>	2%	4%	40%	45%	9%
<b>TA23</b>	0%	4%	13%	66%	17%
<b>TA24</b>	0%	4%	13%	66%	17%
<b>TA25</b>	0%	2%	23%	60%	15%
<b>TA26</b>	0%	2%	19%	66%	13%
<b>TA27</b>	0%	2%	19%	64%	15%
<b>TA28</b>	0%	2%	32%	53%	13%
<b>TA29</b>	0%	2%	19%	60%	19%
<b>TA30</b>	0%	2%	4%	55%	38%
<b>TA31</b>	0%	2%	6%	53%	38%
<b>TA32</b>	0%	2%	6%	47%	45%
<b>TA33</b>	0%	2%	6%	45%	47%
<b>TA34</b>	0%	2%	9%	47%	43%
<b>TA35</b>	0%	2%	9%	47%	43%
<b>Average</b>	0%	3%	15%	57%	25%

In terms of inferential statistics, the researcher used the outer model testing as follows. The convergent validity testing can be seen through the average variance extracted (AVE) value and the outer loading. The result of the AVE and outer loadings can be seen in the tables below.

Table 7

Validity Test with AVE Table	
Variable	Average Variance Extracted (AVE)
Transformational Leadership	0,57
Teacher's Collaboration	0,79
Teachers Ability in Implementing Interdisciplinary Learning	0,62

Table 8

Validity Test with Outer Loadings Table		
Variable	Item	Outer Loadings
	TL10	0.67
	TL15	0.70
	TL16	0.85
	TL17	0.91
	TL18	0.83
	TL20	0.72
	TL21	0.70
	TL22	0.75
Transformational Leadership	TL23	0.80
	TL24	0.79
	TL25	0.70
	TL26	0.70
	TL4	0.69
	TL5	0.72
	TL6	0.77
	TL9	0.68
	TC10	0.94
	TC11	0.94
	TC12	0.92
Teacher's Collaboration	TC4	0.93
	TC5	0.90
	TC6	0.90
	TC7	0.77
	TC8	0.85
	TC9	0.85
	TA13	0.69
	TA14	0.82
	TA15	0.74
	TA16	0.79
Teachers Ability in Implementing Interdisciplinary Learning	TA20	0.75
	TA21	0.69
	TA22	0.73
	TA23	0.78
	TA24	0.81
	TA25	0.89
	TA26	0.88
	TA27	0.85
	TA28	0.75
	TA29	0.79

TA30	0.72
TA31	0.74
TA32	0.83
TA33	0.84
TA34	0.81
TA35	0.82

To test the discriminant validity there are two ways namely: comparing the square root of the AVE for each variable and the cross loading of each variable should be above 0.7. The results can be seen in the table below.

Table 9

Discriminant Validity Table			
	TL	TC	TA
TL	0.75		
TC	0.55	0.89	
TA	0.48	0.71	0.79

The reliability test is carried out to rest the consistency of each construct by paying attention to the composite reliability value from all the indicators. The results can be seen in the table below.

Table 10

Reliability Tests with Cronbach's Alpha and Composite Reliability Table		
Variable	Cronbach's alpha	Composite Reliability
Transformational Leadership	0,97	0,97
Teacher's Collaboration	0,97	0,97
Teachers Ability in Implementing Interdisciplinary Learning	0,95	0,97

The inner model is used to estimate the relationship between the variables. The inner model testing in this research uses the Variance Inflation Factor (VIF) value, and the R-Squared and path coefficient value obtained from SmartPLS. The results can be seen in the table below.

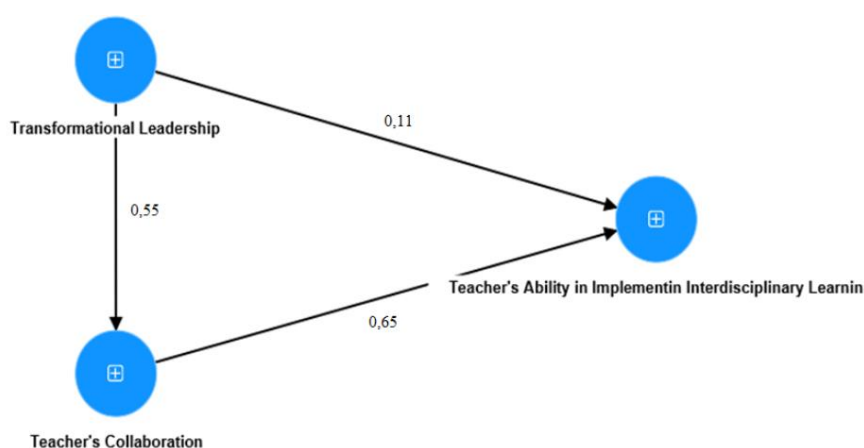
Table 11

Inner Collinearity Statistic (VIF)		
Variable	Teacher's Ability in Implementing Interdisciplinary Learning	Teacher's Collaboration
Teacher's Ability in Implementing Interdisciplinary Learning		
Teacher's Collaboration	1,44	
Transformational Leadership	1,44	1

Table 12

Hypothesis	Path coefficient
Transformational Leadership >> Teachers' ability in implementing interdisciplinary learning.	0,111
Teacher collaboration >> Teachers' ability in implementing interdisciplinary learning.	0.651
Transformational Leadership >> Teacher Collaboration	0,551

As a result, the research model obtained using path analysis is as follows:



Picture 4

With the results shown, the results of the researcher's hypothesis testing can be concluded in the table below.

Hypothesis Test Results Table

Path	Hypothesis	Result
TL → TA	Transformational leadership on teacher's ability in implementing interdisciplinary.	Supported
TC → TA	Teacher collaboration on teacher's ability in implementing interdisciplinary.	Supported
TC → TL	Transformational leadership on teacher collaboration	Supported

Based on the testing of the first hypothesis, the variable transformational leadership has a positive influence on teachers' ability in implementing interdisciplinary learning with a path coefficient of 0.11.

Although there isn't specific research that explicitly says so, according to de Fouw, Klaassen, & van der Tang (2020), interdisciplinary learning requires teachers to go the extra mile especially in terms of designing and preparing for the lessons to be more creative and think critically about a certain issue that they want their students to learn about. This is in line with the role of a transformational leadership which states that transformational leadership not only sets high standards and communicates them but also, they motivate their followers to go beyond and achieve more than expected and engage followers in thinking critically and problem solving (Northouse, 2019, Bass & Riggio, 2006, Matar, Aldhaferi, & Mussari, 2019). The indicators that support this is inspirational motivation and intellectual stimulation.

The response the researcher received from the questionnaire also supports this in TL5 which shows a 57% agree that the leaders set the high standards and communicates them, TL9 which shows 64% agree that the leaders push their teachers to think critically about various issues, and TL10 which shows 68% agree that the leaders push their teachers to think critically about various issues. And also in terms of the teachers ability, a majority of the respondents agree that they are involved in thinking critically about making lessons to be more creative and think critically about interdisciplinary learning process (TA26 & TA27).

Based on the testing of the second hypothesis, the variable teacher collaboration has a positive influence on teachers' ability in implementing interdisciplinary learning with a path coefficient of 0,65.

Because interdisciplinary learning encourages teachers to ensure students to view a specific theme/topic through different perspectives (Wood, 2015), team teaching can aid teachers in giving students an expanding worldview and diverse perspective on a certain topic or theme (Little & Hoel, 2011). Also in teacher collaboration, it helps students increase their understanding on a certain subject, students' interest, increase willingness to learn, and improves students' overall course performance (Kostko, 2019), which is an ability teachers need to have in interdisciplinary learning. The questionnaire item TC12 supports this saying that teachers work together in the teaching and learning experience with 57% responded with agree and 34% responded with strongly agree. Also, TA26 support this in saying the teachers design lessons that interest students with 66% respondents agree and 13% strongly agree and TA27 which states teachers design units that involve students to be active with 64% respondents agree, and 15% strongly agree.

Based on the testing of the third hypothesis, the variable transformational leadership has a positive influence on teacher collaboration with a path coefficient of 0,55.

As Michael Fullan (2014) mentions, one importance of leadership is in strengthening collaboration and which has a positive impact on the organisational and systemic improvement. He also goes on to mention that school leaders who show a positive example of continuous learning will have a positive impact in the process of creating improvement in the collaborative culture of teachers. This character of striving to improve and being a positive impact does go hand in hand with the dimension of transformational leadership that aims to be a role model for their followers and push their followers to beyond and keep improving. In questionnaire item TL17 53% of the respondents agree that leaders show integrity and 40% of the respondents strongly agree. And in questionnaire item TC11, 47% of the respondents agree that each teacher contributes in the collective task and 45% strongly agree.

#### **4. Conclusion**

This research looked to study 3 variables namely, transformational leadership, teacher collaboration, and teachers' ability in implementing interdisciplinary learning. This research was conducted towards the teachers at XYZ Schools across Indonesia. Here are the results of the research:

1) Transformational leadership has a positive influence on teachers' ability in implementing interdisciplinary learning.

2) Teacher collaboration has a positive influence on teachers' ability in implementing interdisciplinary learning.

3) Transformational leadership has a positive influence on teacher collaboration.

This transformational leadership style is an important factor that positively influences teachers' ability in implementing interdisciplinary learning. However, this transformational leadership must start at the very top of the school namely head of school, so that it will trickle down to the other leaders such as the CCTT's that are also working closely with the teacher in each unit. But it should not just stop with the appointed leaders at the school such as the head of school, principal, CCTT and others. Each teacher in their classroom is also a leader. Teachers also need to be transformational leaders in their respective classrooms, as they motivate, influence, intellectually stimulate, and consider each of their students.

Teacher collaboration is crucial for implementing interdisciplinary learning and preparing students for the future. It involves sharing responsibility and belonging among teachers at XYZ, ensuring they do their best for the benefit of students. As teacher collaboration increases, it will improve their ability in interdisciplinary learning, real-world preparation, and broader perspectives.

Transformational leadership positively influences teacher collaboration at XYZ. Leaders who serve as positive role models for their teachers, especially in responsibilities, encourage them to follow suit and fulfil their responsibilities in joint work, fostering a culture of collaborative teaching.

The researcher suggests future research should use different data collection instruments, such as interviews or interviews with teachers or students, to deepen and support the data. Also, because the study's subject was limited to a few teachers from each school, the variables were also limited. In the future, the subjects can be broadened to explore more variables. Further research should explore other factors influencing teachers' ability to implement interdisciplinary learning.

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