

The Role of Intrinsic Motivation in Moderating the Influence of Learning Strategies, Lecturer Competence, and Learning Engagement on Academic Achievement of Students at Politeknik Pertanian Negeri Samarinda

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ABSTRACT: This study aims to analyze the influence of learning strategies, lecturer competence, learning engagement, and intrinsic motivation on the academic achievement of students at Politeknik Pertanian Negeri Samarinda. The research employs a quantitative approach using Partial Least Square-Structural Equation Modeling (PLS-SEM). The study population consisted of 1,084 students, with a sample of 115 respondents selected through proportional stratified random sampling. The findings reveal that learning engagement and intrinsic motivation have a positive and significant impact on academic achievement, while learning strategies and lecturer competence show a positive but not significant influence. Intrinsic motivation, as a moderating variable, does not significantly enhance the relationship between learning strategies, lecturer competence, and learning engagement with academic achievement. Theoretical implications suggest that intrinsic motivation is a critical factor in supporting academic success but may not always function effectively as a moderator. From a managerial perspective, the results highlight the importance of institutions developing learning programs that integrate innovative teaching strategies, lecturer competence development, and enhanced student engagement and motivation to improve academic performance.

KEY WORD: Learning Strategies, Lecturer Competence, Learning Engagement, Intrinsic Motivation, Academic Achievement

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I. INTRODUCTION

Higher education institutions play a strategic role in shaping individuals into competitive professionals who are prepared to face global challenges. The success of higher education is not solely dependent on a well-structured curriculum or adequate physical facilities but also on various interacting factors. One of the primary indicators of a university's success is students' academic achievement, which reflects the quality of education, the effectiveness of learning processes, and the institution's ability to produce competent graduates. Academic achievement is not only measured through GPA but also includes critical thinking skills, problem-solving abilities, and the application of knowledge in practical contexts. Internal factors such as intrinsic motivation significantly influence students' academic performance. Intrinsic motivation, driven by curiosity, personal satisfaction, and challenges, enhances students' commitment to learning and helps them stay focused on their academic goals despite challenges or pressure. External factors such as lecturer competence, learning strategies, and the learning environment also impact academic achievement. Lecturer competence includes the ability to effectively deliver material, design engaging learning experiences, and provide constructive assessments. Competent lecturers serve not only as educators but also as mentors who help students maximize their potential. Furthermore, students' learning strategies, such as summarizing key concepts, using mind maps, and leveraging learning technology, are crucial in optimizing academic outcomes.

At Politeknik Pertanian Negeri Samarinda, observations and preliminary data indicate significant disparities in students' academic performance. Some students excel academically, while others struggle with understanding material, managing time, or maintaining focus. These challenges highlight the need for targeted interventions to enhance learning quality, such as faculty development programs, the implementation of innovative teaching strategies, and the creation of a supportive academic environment. As an institution specializing in agricultural education, Politeknik Pertanian Negeri Samarinda has a responsibility to ensure its graduates possess not only technical knowledge but also strong academic capabilities. Improving students' academic performance is vital not only to meet institutional standards but also to prepare competent graduates who contribute to the advancement of Indonesia's agricultural sector. By identifying and managing factors affecting academic performance, universities can strengthen their role in producing high-quality, competitive

human resources. Shelke et al. (2017) describe Politeknik Pertanian Negeri Samarinda as an institution offering diploma, undergraduate, and postgraduate programs in agriculture. Graduates are expected to have a comprehensive set of competencies, integrating theoretical knowledge with practical skills relevant to both the public and private sectors. This equips them to significantly contribute to agricultural development while meeting professional standards across various career fields.

The demand for high-achieving agricultural graduates in Indonesia is reflected in employment opportunities offered by leading companies such as PT Hardaya Inti Plantation, PT Cipta Agro Sakti, PT Indofood, and Wismilak. These companies offer competitive salaries ranging from 8 to 12 million IDR per month due to the shortage of skilled professionals in the agricultural sector. This demonstrates the importance of high-performing graduates, not only to meet industry demands but also to sustain agricultural productivity. Competent agricultural graduates are essential in promoting sustainable agriculture and enhancing economic development in Indonesia, where natural resources play a crucial role. Furthermore, they contribute to poverty alleviation through the implementation of pre-harvest and post-harvest technologies, allowing local agricultural products to compete in the global market (Waychal, 2018). Academic achievement encompasses more than high GPA scores; it also includes accomplishments in scientific competitions. In corporate recruitment, certificates from academic competitions often serve as critical supporting factors alongside GPA. Winning certificates not only enhance an individual's professional profile but also assure employers of their competency and ability to handle responsibilities. Pecoraro & Tani (2023) highlight that employers rely on educational qualifications as a filtering mechanism in recruitment but often require additional validation of a candidate's skills. Certificates from academic competitions function as a positive signal to employers, reducing uncertainty regarding a candidate's competency. To address these competitive demands, Politeknik Pertanian Negeri Samarinda encourages students to participate in national competitions, such as the *Program Kreativitas Mahasiswa (PKM)* within the *Pekan Ilmiah Mahasiswa Nasional (PIMNAS)*. Winning these competitions not only enhances students' employability but also improves the institution's reputation. These certificates serve as tangible proof of successful collaboration between faculty mentors and students in the learning process.

However, a 2023 PIMNAS report revealed that Politeknik Pertanian Negeri Samarinda students struggled to compete against 525 teams from 106 universities across Indonesia. This underscores the need for institutional improvements in learning quality, student coaching, and competition strategies. Success in such competitions not only reflects student achievement but also serves as an indicator of the effectiveness of the university's academic programs. Enhancing students' academic performance remains a top priority for Politeknik Pertanian Negeri Samarinda. Students are expected to excel both in academics and extracurricular activities while developing competencies aligned with industry demands. Understanding and managing factors influencing academic performance is essential for achieving this goal. A critical factor in academic success is learning strategies. Effective learning strategies tailored to students' abilities in absorbing knowledge from lecturers have been shown to support academic improvement. Properly structured learning approaches enhance students' concentration and reduce distractions, thereby improving their comprehension and application of knowledge. Wang et al. (2022) emphasize that lecturers should continuously refine teaching strategies to improve students' academic outcomes, fostering more effective learning experiences that enhance both theoretical and practical skills.

Research by Hafeez et al. (2022) highlights the importance of structured learning strategies in skill development. Biwer et al. (2023) assert that without a solid knowledge foundation, students struggle to transfer theoretical understanding into practical expertise. Effective learning strategies are essential for maintaining academic excellence (Amorri, 2020). Additionally, studies by Muelas & Navarro (2015) and Mariana et al. (2023) confirm the significant positive impact of learning strategies on academic performance. Politeknik Pertanian Negeri Samarinda has implemented an intensive learning strategy with full-day classes, scheduled five days a week as per the 2020–2024 strategic plan (RENSTRA). This policy aims to improve students' academic performance to ensure they remain competitive in the job market. However, evaluations indicate that the policy has yet to achieve the desired academic outcomes, particularly in national competitions. Castillo et al. (2019) stress that a high-quality learning system plays a crucial role in enhancing students' academic performance, suggesting the need for continuous refinement of the RENSTRA learning strategies. Studies at Politeknik Pertanian Negeri Samarinda reveal that current learning strategies have not significantly improved academic achievement (Tan et al., 2021). This aligns with findings by Viet (2022), who reported that academic pressure resulting from learning strategies can negatively affect student outcomes. Almoslamani (2022) further asserts that lecturer competence is a crucial external factor supporting academic success, necessitating further research to explore these relationships in depth.

Lecturer competence is a key external factor influencing educational success. Competent lecturers foster effective teaching systems through innovative and student-friendly teaching techniques that positively impact academic performance (Qurtubi, 2023). Lecturer competence is also considered a strategic measure in developing high-quality human resources in educational institutions (Baryanto, 2020). It encompasses a

combination of knowledge, skills, creativity, and innovation (Suwarni et al., 2020). Studies by López-Martín et al. (2023) and Azis et al. (2020) confirm that lecturer competence significantly enhances students' academic performance. Despite improvements in lecturer competence at Politeknik Pertanian Negeri Samarinda, academic performance has not met expectations. Enhanced faculty qualifications, including Ph.D. degrees and industry certifications, have yet to translate into optimal student outcomes. This indicates the need for further optimization in applying lecturer competencies to maximize students' academic achievements. Research gaps highlight the importance of intrinsic motivation as a moderating variable in this study. Identifying and integrating intrinsic motivation can enhance the influence of learning strategies, lecturer competence, and student engagement on academic achievement. This study employs Self-Determination Theory (SDT) to analyze these relationships, emphasizing that intrinsic motivation is a key determinant of academic success. The research aims to provide a comprehensive understanding of how intrinsic motivation interacts with external academic factors, offering a novel perspective on improving student performance.

II. LITERATURE REVIEW

Learning strategies play a crucial role in shaping students' academic achievement.

Properly designed learning methods, as highlighted by Biwer et al. (2023), enable students to optimize their study time and absorb knowledge more effectively. Selecting appropriate strategies often depends on the complexity of the material and students' capacity to comprehend information, resulting in a more structured and focused learning process. Effective learning strategies help students allocate their time and energy efficiently, leading to improved understanding and academic performance. Practical learning methods have a more significant impact than theory-based approaches. According to Muelas and Navarro (2015), engaging students in hands-on activities, such as laboratory work, simulations, or case studies, enhances their ability to apply theoretical concepts to real-world problems. This approach not only strengthens cognitive skills but also fosters critical and analytical thinking, which are essential for academic and professional success. Further studies by Amorri (2020) and Mariana et al. (2023) reinforce the relationship between learning strategies and academic achievement, emphasizing the importance of adapting strategies to students' needs. Students who can choose learning methods that match their learning styles tend to be more motivated and achieve better academic results. Instructors also play a key role in providing flexible teaching approaches, such as project-based learning, group discussions, and interactive technology. At Politeknik Pertanian Negeri Samarinda, the implementation of practice-based learning strategies in technical agricultural courses, such as crop cultivation and resource management, has yielded positive outcomes. Students who actively participate in field practices not only grasp theoretical concepts more effectively but also develop industry-relevant technical skills. This approach underscores that effective learning strategies go beyond content delivery by engaging students in meaningful learning experiences. A well-structured learning strategy fosters active and in-depth learning, enabling students to master academic material while developing essential skills for future challenges. Research consistently shows that well-implemented learning strategies are directly and significantly correlated with optimal academic achievement.

H1: Learning strategies have a positive and significant influence on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

Lecturer competence plays a crucial role in determining the quality of learning and students' academic achievement.

Prasetyo et al. (2017) highlight that lecturers not only serve as knowledge transmitters but also as facilitators who help students understand and apply their knowledge effectively. Highly competent lecturers, characterized by advanced education, extensive teaching experience, and additional training in specific fields, significantly influence students' academic performance. Training programs for lecturers enhance their subject matter expertise and enable them to adopt innovative teaching methods. López-Martín et al. (2023) state that lecturers who undergo specialized training are better equipped to deliver structured, relevant, and comprehensible material. Skilled lecturers foster an interactive learning environment that encourages intellectual exploration, ultimately increasing students' motivation to learn and positively impacting their academic performance. Mastery of subject matter is another key indicator of lecturer competence. Baryanto (2020) asserts that lecturers with deep knowledge of their field can implement more effective teaching practices. When lecturers successfully connect theoretical concepts to real-world applications, students find it easier to grasp and internalize the material. At Politeknik Pertanian Negeri Samarinda, lecturers who integrate real-world examples through laboratory sessions or fieldwork help students apply theoretical knowledge in practical settings, such as agribusiness management or agricultural technology. Lecturer competence also influences students' ability to develop analytical and critical thinking skills. Azis et al. (2020) explain that competent lecturers do more than just deliver information—they also encourage students to engage in deeper thinking through discussions, case

studies, and group projects. Exposure to these teaching methods prepares students to tackle academic and professional challenges, significantly enhancing their academic performance. In higher education, the relationship between lecturer competence and academic achievement is evident. Lecturers with extensive knowledge and experience provide optimal guidance in both academic subject mastery and practical skill development. When lecturer competence is strengthened through training, experience, and innovative teaching approaches, students' learning outcomes improve, and their academic achievements reflect the effectiveness of high-quality education.

H2: Lecturer competence has a positive and significant influence on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

Learning engagement has a significant impact on students' academic achievement, as it reflects the extent to which students actively participate in the learning process.

Luo et al. (2023) highlight that students with high learning engagement tend to develop effective learning strategies, such as time management and problem-solving skills, which ultimately enhance their self-confidence. This confidence is essential in helping students overcome academic challenges and complete their tasks efficiently. Engaged students not only focus on academic outcomes but also enjoy the learning process itself. Zheng et al. (2023) emphasize that enthusiasm and interest in responding to lectures make learning more enjoyable and less burdensome. When students perceive the material as relevant and engaging, they are more likely to absorb knowledge effectively, which fosters internal motivation for continuous learning. In a collaborative learning environment, engagement also includes active participation in group discussions and academic activities. González and Blackford (2022) stress the importance of student involvement in jointly designing solutions to academic challenges. Engaged students have opportunities to share knowledge, discuss complex concepts, and learn from their peers' perspectives, which enhances their critical thinking and collaborative skills. Schnitzler et al. (2021) add that structured learning engagement, such as group projects or simulations, encourages students to remain focused on their learning goals. Students who actively contribute to group discussions demonstrate a significant improvement in their understanding of concepts and the ability to apply knowledge in practical settings. These activities also help students develop a sense of responsibility and teamwork, which are essential skills for their future careers. Jian (2022) highlights that high learning engagement positively correlates with academic achievement. At Politeknik Pertanian Negeri Samarinda, students who participate actively in group discussions for practice-based courses, such as agribusiness management or agricultural technology, show notable improvements in analytical skills and knowledge application. This engagement enables students to gain a deeper understanding of course materials and bridge the gap between theory and practice. The relationship between learning engagement and academic achievement not only demonstrates a direct impact but also reflects a broader process of character development. Students who actively engage in learning tend to develop better comprehension of subject matter, stronger collaboration skills, and higher motivation to achieve their academic goals. This underscores the importance of fostering a learning environment that encourages active student participation to support their academic and professional success.

H3: Learning engagement has a positive and significant influence on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

Intrinsic motivation is an internal factor that drives students to continuously strive for their academic goals.

This motivation arises from within individuals who believe that learning has significant benefits for both their present and future. Fithri (2021) explains that intrinsic motivation encourages students to develop behaviors that support academic success, such as independently structuring study schedules and maintaining discipline in their implementation. Students with a strong desire to progress in their studies tend to be more focused and enthusiastic in understanding lecture materials, ultimately leading to improved academic performance. Pascoe et al. (2018) emphasize the importance of intrinsic motivation in education to prepare students for future challenges. Intrinsically motivated students not only absorb knowledge more effectively but also develop critical and analytical thinking skills that allow them to find solutions to problems, expand their perspectives, and take responsibility for their decisions. In higher education, intrinsic motivation helps students manage the increasing academic demands, including research, project completion, and practical skill development. A decline in motivation during adolescence often becomes an obstacle to achieving optimal academic performance. Without strong intrinsic motivation, students may lose direction and enthusiasm for learning. Pascoe et al. (2018) assert that intrinsic motivation provides a fundamental basis for lifelong learning, enabling students to continue learning even in the absence of external pressures. In practice, students with high intrinsic motivation are more active in class discussions, seek additional materials independently, and participate in extracurricular activities relevant to their field of study. At Politeknik Pertanian Negeri Samarinda, students with high intrinsic motivation excel in practice-based courses such as natural resource management and

agricultural technology. They not only strive to understand theoretical concepts but also take the initiative to apply their knowledge in real-world projects. This demonstrates that intrinsic motivation serves as a primary driver in fostering discipline, creativity, and self-confidence among students, ultimately contributing to better academic performance. The relationship between intrinsic motivation and academic achievement highlights the importance of developing student awareness regarding the goals and benefits of the learning process. When intrinsic motivation is well-nurtured, students establish a strong foundation for overcoming academic challenges, enhancing their skills, and preparing themselves for professional roles in the future. Intrinsic motivation not only supports academic success but also shapes students into independent and responsible individuals.

H4: Intrinsic motivation has a positive and significant influence on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

Intrinsic motivation plays a crucial role in moderating the influence of learning strategies on students' academic achievement.

Froiland and Worrell (2016) explain that intrinsically motivated students can maintain focus and enthusiasm in achieving academic success by independently determining learning strategies and setting achievement targets. This motivation serves as the primary driver for students to utilize their time effectively and efficiently in understanding the material delivered by lecturers, ultimately improving their academic performance (Aji & Khan, 2019). Intrinsically motivated students demonstrate autonomy in regulating their learning approaches based on their interests, creating an enjoyable learning environment. This condition enables optimal material absorption regardless of the learning strategies applied by lecturers (Alonso et al., 2023). Intrinsic motivation not only fosters self-regulation but also provides energy and direction for students' learning behavior. Stover et al. (2014) emphasize that academic motivation strongly influences the use of learning strategies, which ultimately impacts academic performance. This includes applying well-planned cognitive strategies such as organizing materials, summarizing information, and creating concept maps, all supported by an internal drive to learn. In understanding this relationship, Pintrich and De Groot (1990) found that intrinsic value correlates strongly with self-regulation and the use of cognitive learning strategies. Students with high intrinsic motivation tend to be more disciplined in monitoring their learning process, setting realistic goals, and evaluating their academic progress. Martínez-Vicente et al. (2023) add that a strategic motivation profile, characterized by optimal motivation toward academic tasks and effective learning strategy use, has a positive relationship with academic achievement. Students who combine intrinsic motivation with structured learning strategies exhibit superior performance compared to those who rely solely on external motivation. Eladl and Alkharusi (2020) highlight the importance of self-directed learning supported by intrinsic motivation as a key factor in academic success. In practical settings, students at Politeknik Pertanian Negeri Samarinda who demonstrate high intrinsic motivation achieve better results in practice-based courses such as agricultural product processing technology and agribusiness management. This motivation drives them not only to understand theoretical concepts but also to apply their knowledge in real-world contexts, such as group projects or fieldwork. These studies indicate that intrinsic motivation plays a central role in strengthening the influence of learning strategies on academic achievement. Intrinsic motivation not only supports students in optimizing their learning strategies but also ensures they remain committed to their academic goals despite challenges. A strong internal drive allows students to utilize learning strategies more effectively, leading to better learning outcomes.

H5: Intrinsic motivation positively and significantly moderates the influence of learning strategies on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

Intrinsic motivation plays a significant role in moderating the influence of lecturer competence on students' academic achievement.

Guay et al. (2001) state that intrinsic motivation can amplify the impact of contextual factors such as lecturer competence on academic performance. Students with high intrinsic motivation tend to achieve better academic results, including increased self-perceived competence and reduced academic anxiety (Gottfried & Gottfried, 1996; Cornell, 1998). This type of motivation not only encourages students to engage more actively in the learning process but also enhances their perceived competence, ultimately influencing their academic success (Gottfried et al., 1998). Seli et al. (2016) further emphasize that students with high intrinsic motivation tend to perform better than those with lower motivation, making intrinsic motivation a crucial factor in academic success. Lecturer competence plays a central role in determining the quality of learning. Ruhendi and Marta (2022) explain that lecturer competence, including pedagogical skills, subject mastery, and interpersonal abilities, directly impacts students' academic performance. Students who perceive their lecturers as highly competent tend to have a more positive view of the learning process, which influences their motivation and academic outcomes (Sumarsono et al., 2021; Tegowati et al., 2022). Lecturer competence can also be optimized

through job motivation and job satisfaction, contributing to better teaching performance and, indirectly, student academic achievement (Kamma et al., 2023; Dunggio, 2021). Misdalina et al. (2018) highlight that lecturer work motivation significantly impacts the quality of education they provide, which in turn affects student success. The relationship between intrinsic motivation, lecturer competence, and academic achievement reflects a complex dynamic of mutual influence. Intrinsic motivation can strengthen the effect of lecturer competence on academic performance by increasing student engagement and comprehension of the material taught. Badri et al. (2014) state that fulfilling basic psychological needs, such as autonomy, competence, and social connections, supported by intrinsic motivation, can significantly improve academic performance. Highly motivated students are more capable of leveraging their lecturers' expertise, including subject mastery and teaching techniques, to achieve optimal academic outcomes. At Politeknik Pertanian Negeri Samarinda, students with strong intrinsic motivation are more responsive to competent lecturers' teaching approaches, especially in practice-based courses such as agribusiness management and agricultural technology. Intrinsic motivation helps students see the value of their learning experiences, which in turn drives them to participate more actively in class discussions, complete assignments on time, and master course materials. This relationship highlights that fostering intrinsic motivation among students can enhance the positive impact of lecturer competence on academic success. Therefore, the synergy between students' intrinsic motivation and lecturer competence is a key factor in improving education quality and learning outcomes in higher education.

H6: Intrinsic motivation positively and significantly moderates the influence of lecturer competence on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

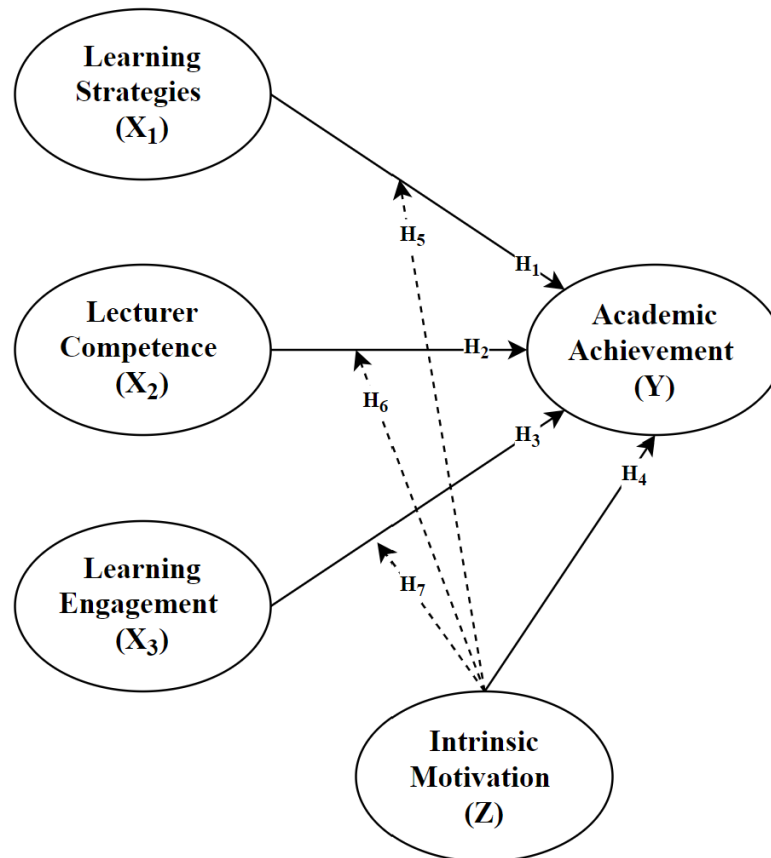
Intrinsic motivation plays a significant role in moderating the influence of learning engagement on students' academic achievement

Schnitzler et al. (2021) explain that students with a strong academic self-concept, supported by intrinsic motivation, tend to exhibit more intensive learning engagement. These students consistently participate in the learning process, actively engage in class and group discussions, and achieve more structured and optimal academic performance. A conducive learning environment enhances intrinsic motivation, encouraging students to participate actively in learning activities, ultimately contributing to their academic success (Abildaeva et al., 2022). Genuine learning engagement driven by intrinsic motivation has a lasting impact on students' academic performance. Fuertes et al. (2023) highlight that students who engage in group learning due to personal interest in the subject matter show improved collaboration skills and a better conceptual understanding. Intrinsic motivation, such as deep interest in the learning process, also helps students overcome learning obstacles by increasing their focus and quality of interaction with instructional materials (Qi Li et al., 2022). In practice, intrinsically motivated students tend to attend classes consistently, complete assignments on time, and demonstrate greater initiative in understanding the concepts being taught (Al-Said, 2023). Intrinsic motivation not only enhances learning engagement but also serves as a key predictor of academic success. Zaccone and Pedrini (2019) state that intrinsic motivation fosters deeper engagement, leading to perseverance and dedication in learning. Students with strong intrinsic motivation tend to stay focused on their learning goals despite facing significant academic challenges (Bayoumy & Alsayed, 2021). Algharaibeh (2020) further reveals that intrinsic motivation contributes to reducing academic anxiety and enhancing perceived competence, ultimately leading to higher academic achievement. Intrinsic motivation often acts as a mediator between external factors and academic outcomes. Jiwen Chen et al. (2022) note that intrinsic motivation mediates the relationship between family social class and academic achievement, creating opportunities for students from diverse socioeconomic backgrounds to achieve better learning outcomes. Wu et al. (2020) also find that intrinsic motivation plays a crucial role in mediating the relationship between self-efficacy and academic performance, particularly in highly demanding medical education settings. This motivation drives students to persist in their studies even when faced with challenging tasks. At Politeknik Pertanian Negeri Samarinda, intrinsic motivation is a primary driver of students' learning engagement, particularly in activities such as fieldwork and project-based learning. Highly motivated students exhibit greater dedication in understanding the practical applications of theoretical concepts, reinforcing their engagement in learning. This relationship highlights that fostering intrinsic motivation not only strengthens the impact of learning engagement on academic achievement but also establishes a solid foundation for sustained academic success. This underscores the need for educators to focus on strategies that enhance intrinsic motivation to effectively support student learning engagement.

H7: Intrinsic motivation positively and significantly moderates the influence of learning engagement on the academic achievement of students at Politeknik Pertanian Negeri Samarinda

Based on the formulation of hypotheses, the research model proposed by the authors is as shown in Figure 1.

Figure 1: Conceptual Framework



Source: Result of author's analysis, 2025

III. RESEARCH METHODOLOGY

This study employs a quantitative explanatory approach using survey methods to examine the influence of Learning Strategies (X₁), Lecturer Competence (X₂), and Learning Engagement (X₃) on Academic Achievement (Y), with Intrinsic Motivation (Z) as a moderating variable. Data were collected from 115 students at Politeknik Pertanian Negeri Samarinda using a structured questionnaire measured on a five-point Likert scale. The study applies Structural Equation Modeling (SEM) based on Partial Least Squares (PLS) to analyze relationships between latent variables and evaluate moderation effects. The SEM-PLS method was chosen due to its ability to assess complex models and its effectiveness in handling small sample sizes. The findings aim to provide theoretical and practical contributions by explaining how learning strategies, lecturer competence, and learning engagement impact academic achievement, while also assessing whether intrinsic motivation strengthens these relationships. The results offer insights for educational institutions to enhance teaching strategies, optimize lecturer performance, and encourage student engagement. This study highlights the importance of integrating effective learning strategies and motivational factors to improve student performance and academic success.

IV. RESULT AND DISCUSSION

Data Analysis

The first-stage model evaluation focuses on the measurement model. Examination of the PLS-SEM estimation for the measurement model allows the researcher to evaluate the reliability and validity of the constructs. Multivariate measurement involves using multiple variables to measure a concept indirectly. Evaluation of the measurement model includes tests of internal consistency reliability, indicator reliability, convergent validity and discriminant validity as shown in Table 1. There are two methods that can be used to measure reliability of a construct, namely Cronbach's alpha or composite reliability. However, the use of Cronbach's alpha tends to provide a lower estimated value so that PLS-SEM is recommended to use composite reliability. Indicator reliability on PLS-SEM is measured from the outer loading value which shows the

correlation between the indicator and its construct. Convergent validity in constructs can be measured using AVE. Discriminant validity can be measured from cross loading or the loading value of other constructs is a comparison to the value of the outer loading indicator associated with a construct where the required loading indicator value must be more than the cross-loading value.

Table 1: Evaluation of Measurement Model

Variables	Indicators	Loadings	Composite Reliability	AVE	Cross Loading
Learning Strategies (X1)	X1_1	0,738	0,893	0,832	Yes
	X1_2	0,873			
	X1_3	0,881			
	X1_4	0,794			
Lecturer Competence (X2)	X2_1	0,679	0,821	0,659	Yes
	X2_2	0,600			
	X2_5	0,585			
	X2_6	0,684			
	X2_7	0,640			
	X2_8	0,752			
Learning Engagement (X3)	X3_1	0,514	0,730	0,693	Yes
	X3_2	0,790			
	X3_3	0,745			
Academic Achievement (Y)	Y1	0,662	0,818	0,656	Yes
	Y2	0,717			
	Y3	0,529			
	Y4	0,677			
	Y5	0,646			
	Y6	0,685			
Intrinsic Motivation(Z)	Z1	0,855	0,861	0,869	Yes
	Z2	0,883			

Source: Calculated using SmartPLS, 2025

The evaluation of the measurement model confirms the reliability and validity of the constructs used in this study. The composite reliability (CR) values for all variables exceed the recommended threshold of 0.70, indicating strong internal consistency. The average variance extracted (AVE) values are also above 0.50, confirming that each construct explains a significant proportion of variance in its indicators. The loading values for most indicators are above 0.60, demonstrating acceptable convergent validity, except for some indicators in the Lecturer Competence (X2) and Academic Achievement (Y) constructs, which exhibit relatively lower factor loadings. However, the cross-loading results confirm discriminant validity, ensuring that indicators load higher on their respective constructs compared to other variables. Overall, the measurement model meets the required reliability and validity standards, allowing for further structural model analysis. The findings suggest that Learning Strategies (X1), Lecturer Competence (X2), Learning Engagement (X3), and Intrinsic Motivation (Z) significantly contribute to explaining Academic Achievement (Y). The high reliability of Intrinsic Motivation (Z) (CR = 0.861, AVE = 0.869) indicates its potential as a strong moderating variable. However, the Lecturer Competence (X2) construct has relatively lower loadings and AVE, suggesting potential improvements in indicator measurement for future studies.

Hypothesis Test

The results of this test are summarized in the table presented below. The table provides detailed information on the t-statistic values for each path in the model, along with the corresponding significance levels. From this table, we can identify which paths indicate a significant relationship and which do not. The table provides an overview of the analysis results on direct effects and moderation effects between the variables in this study on Academic Achievement. This analysis includes the direct influence of independent variables (Learning Strategies, Lecturer Competence, and Learning Engagement) and the moderation effect of Intrinsic Motivation on the dependent variable. Below is a comprehensive explanation of the results:

1. Learning Strategies on Academic Achievement (X1 → Y). The original sample value of 0.100 indicates a positive influence, but the T-statistic of 1.151 and P-value of 0.250 suggest that this effect is not significant. This implies that Learning Strategies alone are not strong enough to significantly influence the Academic Achievement of students at Politeknik Pertanian Negeri Samarinda.
2. Lecturer Competence on Academic Achievement (X2 → Y). The original sample value of 0.167 shows a higher positive influence compared to Learning Strategies. However, with a T-statistic of 1.879 and a P-value of 0.060, this effect approaches the significance threshold (0.05). These findings indicate that Lecturer Competence has the potential to contribute to Academic Achievement, but its impact is not statistically significant.

3. Learning Engagement on Academic Achievement ($X_3 \rightarrow Y$). The original sample value of 0.300, T-statistic of 3.994, and P-value of 0.000 indicate a positive and significant influence. This result suggests that Learning Engagement plays a crucial role in enhancing Academic Achievement, as students who actively engage in the learning process tend to achieve better academic results.
4. Intrinsic Motivation on Academic Achievement ($Z \rightarrow Y$). The original sample value of 0.351, T-statistic of 4.307, and P-value of 0.000 demonstrate a positive and significant effect. Intrinsic Motivation is proven to be a key factor in driving students to achieve optimal academic performance. The internal motivation of students plays a crucial role in encouraging their learning enthusiasm.
5. Intrinsic Motivation Moderating the Influence of Learning Strategies on Academic Achievement ($X_1 \rightarrow Y$ moderated by Z). The original sample value of 0.077, T-statistic of 1.013, and P-value of 0.311 indicate that Intrinsic Motivation does not significantly moderate the effect of Learning Strategies on Academic Achievement. This means that even when students possess intrinsic motivation, it is not strong enough to enhance the relationship between Learning Strategies and academic performance.
6. Intrinsic Motivation Moderating the Influence of Lecturer Competence on Academic Achievement ($X_2 \rightarrow Y$ moderated by Z). The original sample value of 0.027, T-statistic of 0.341, and P-value of 0.733 show that Intrinsic Motivation does not significantly moderate the relationship between Lecturer Competence and Academic Achievement. Despite lecturers having high competence, the role of students' Intrinsic Motivation in strengthening this effect is not significant.
7. Intrinsic Motivation Moderating the Influence of Learning Engagement on Academic Achievement ($X_3 \rightarrow Y$ moderated by Z). The original sample value of 0.102, T-statistic of 1.402, and P-value of 0.161 indicate that Intrinsic Motivation does not significantly moderate the relationship between Learning Engagement and Academic Achievement. Even though students are actively engaged in learning, their Intrinsic Motivation does not significantly strengthen this relationship.

The analysis results show that Learning Engagement and Intrinsic Motivation have a significant direct impact on Academic Achievement. However, the moderating role of Intrinsic Motivation in the relationships between other independent variables (Learning Strategies and Lecturer Competence) and Academic Achievement is not significant. This suggests that these variables are more effective when functioning independently in the research model, particularly Learning Engagement and Intrinsic Motivation.

Table 2.
Bootstrapping Results

Value of Influence Between Variables	Original sample	T-Statistik	P-Values
Learning Strategies (X_1) $\rightarrow$ Academic Achievement (Y)	0,100	1,151	0,250
Lecturer Competence (X_2) $\rightarrow$ Academic Achievement (Y)	0,167	1,879	0,060
Learning Engagement (X_3) $\rightarrow$ Academic Achievement (Y)	0,300	3,994	0,000
Motivation Intrinsic (Z) $\rightarrow$ Academic Achievement (Y)	0,351	4,307	0,000
Learning Strategies (X_1) $\rightarrow$ Academic Achievement (Y) Moderate by Motivation Intrinsic (Z)	0,077	1,013	0,311
Lecturer Competence (X_2) $\rightarrow$ Academic Achievement (Y) Moderate by Motivation Intrinsic (Z)	0,027	0,341	0,733
Learning Engagement (X_3) $\rightarrow$ Academic Achievement (Y) Moderate by Motivation Intrinsic (Z)	0,102	1,402	0,161

Source: Calculated using SmartPLS, 2025

Discussion

Learning Strategies for Academic Achievement

The results showed that Learning Strategies had a positive influence on Academic Achievement, but this influence was not significant. This indicates that learning strategies, although useful, have not been able to independently have a strong enough impact on the academic achievement of Samarinda State Agricultural Polytechnic students. Indicators in Learning Strategies, such as Microstrategies which include note-taking or summarizing, Memory Keys and Metacognition which involve the use of symbols to help remember information, Emotional and Social Support from the surrounding environment, and Learning Habits organized, plays an important role in supporting the student learning process. However, the effectiveness of these indicators may not be fully utilized by students, or their application has not been consistent and in-depth. For example, students who do not have organized study habits or who lack emotional and social support may have difficulty optimizing the learning strategies they implement. This can lead to suboptimal learning outcomes even though the strategies used theoretically have the potential to improve academic achievement. Institutional contexts and

individual factors, such as student motivation and engagement, can also influence these outcomes. While learning strategies play an important role, their impact may only be felt when supported by other, stronger factors, such as intrinsic motivation and learning engagement. Thus, these results show the need for a more comprehensive approach in integrating learning strategies with other elements in the educational process. Learning strategies play an important role in shaping students' academic achievements. As a variable that shows a positive influence even though it is not significant on academic achievement, learning strategies function to direct and organize the student learning process. Biwer et al. (2023) emphasized that well-designed learning methods can help students make optimal use of their study time. This happens because the right method can accommodate the level of material difficulty and the ability of students to absorb knowledge, thus creating a structured and focused learning environment. Practice-based approaches, as expressed by Muelas and Navarro (2015), have a deeper impact than theory-based methods alone. Activities such as labs, simulations, or case studies allow students to apply theory directly. This application not only strengthens the understanding of concepts, but also improves critical and analytical thinking skills. Students of the Samarinda State Agricultural Polytechnic, for example, who are involved in field practice in agricultural technical courses, gain a better understanding of theory and develop relevant technical skills for the industry. This shows that learning strategies that involve hands-on practice are able to provide significant results on academic achievement.

Research by Amorri (2020) and Mariana et al. (2023) shows that the adaptation of learning strategies to student needs is very important. This approach includes flexibility in teaching methods, such as project-based learning or group discussions, which allow students to choose a learning approach that suits their learning style. In the field, lecturers who are able to provide various learning options can increase students' motivation to actively participate in the learning process, which ultimately has an impact on their academic achievement. In this case, the learning strategy at the Samarinda State Agricultural Polytechnic which is designed to actively involve students through direct practice is proof of the importance of a needs-based learning approach and industry relevance. Students not only learn to understand theories, but also apply them in real life. This emphasizes the importance of learning strategies that are able to bridge theory with practice to achieve better academic results. Other empirical research, such as by Zhao and Yang (2021), suggests that technology-based learning strategies can also improve learning effectiveness, especially in higher education settings. Thus, effective learning strategies include technology-based approaches, hands-on practice, and adaptation to student needs to achieve optimal academic outcomes. Recent research by Wu et al. (2022) found that the use of technology-based learning strategies, such as interactive digital learning, is able to improve students' ability to understand material faster and more deeply. This is also supported by the findings of Chen et al. (2021) which show that digital platform-based learning that incorporates practical simulations can significantly increase student learning motivation. This strategy allows students to access materials flexibly while gaining learning experiences that are relevant to the needs of the world of work. The use of group discussion-based learning strategies, as revealed by Park et al. (2023), has been proven to be able to strengthen student involvement in the learning process. Group discussions provide space for students to share perspectives, solve problems collaboratively, and understand the material from different perspectives, thereby improving their analytical and critical skills. Other research by Liu and Zhang (2022) shows that project-based learning strategies can improve students' skills in completing complex tasks, ultimately impacting higher academic achievement. In addition, strategies that involve continuous formative assessment also provide constructive feedback, thus helping students improve and improve their understanding of the material (Nguyen & Le, 2023). The theoretical implications of the results of this study confirm the importance of learning strategies as a key factor in the learning process. Strategies designed to support collaborative, technological, and hands-on approaches provide a strong theoretical basis for the development of more adaptive learning models. This study also enriches the literature on the relationship between learning strategies and academic achievement, especially by showing that technology-based and collaborative methods can significantly improve learning effectiveness. The managerial implications lead to the need for educational institutions, such as the Samarinda State Agricultural Polytechnic, to integrate technology-based learning strategies and hands-on practices into their curriculum. Lecturers need to be given intensive training to develop and apply innovative learning methods that are relevant to student needs. Institutions can also facilitate digital learning infrastructure, such as virtual labs or AI-based learning platforms, to enhance the student learning experience. This strategy will help produce graduates who not only have high academic competence, but are also ready to face challenges in the world of work.

Lecturer Competence on Academic Achievement

The results showed that Lecturer Competence had a positive influence on Academic Achievement that was higher than Learning Strategy, although this influence was close to a statistically significant limit. This indicates that Lecturer Competence plays an important role in the learning process of Samarinda State Agricultural Polytechnic students, but the impact has not been fully optimal to significantly improve academic achievement. Indicators of Lecturer Competence, such as Understanding the Foundations of Education,

Understanding of Students, Curriculum Development/Syllabus, Learning Design, Educational and Dialogical Learning, Utilization of Learning Technology, Evaluation of Learning and Learning Outcomes, and Developing Students to Develop Their Potential, are aspects that directly affect the quality of teaching. For example, lecturers who understand the needs and characteristics of students can create a more inclusive and relevant learning atmosphere. The development of a curriculum and syllabus that suits the needs of students also has the potential to increase their interest and involvement in the learning process. In addition, the effective use of learning technology can help students understand the material better, while objective evaluation can provide constructive feedback. However, the impact of this Lecturer Competency may be hampered by other factors, such as a lack of intrinsic motivation of students or limitations in their learning engagement. For example, even though lecturers provide objective evaluations or use learning technology, if students do not have an internal drive to learn or are not active in the learning process, then the positive impact of Lecturer Competence on academic achievement is reduced. These results show the importance of synergy between lecturer competence and other factors, such as students' intrinsic motivation and learning engagement, to achieve a significant increase in academic achievement. Although Lecturer Competence has the potential to make a major contribution, its effectiveness can be increased with the support of other elements in the learning process. Lecturer competence plays a crucial role in improving student academic achievement. Prasetio et al. (2017) emphasized the importance of lecturers not only as presenters of material, but also as facilitators who help students understand and apply science. López-Martín et al. (2023) stated that the training that lecturers receive allows them to improve their understanding of the subjects taught, adopt innovative teaching methods, and create an interactive learning atmosphere. This is reflected in students who are more motivated to learn so that it has an impact on better academic achievement. Another study by Azis et al. (2020) emphasized that high lecturer competence has a direct impact on students' ability to think critically and analytically through a more directed and systematic teaching approach.

Zhang et al. (2023) found that the mastery of learning technology by lecturers plays an important role in increasing student participation in the class. Technology allows the delivery of material to be more interactive and engaging, which supports student understanding. Research by Liu and Wu (2022) shows that intensive training of lecturers in collaborative learning methods is able to increase student engagement in class discussions, which ultimately improves academic outcomes. In addition, Lee et al. (2021) revealed that lecturers with good communication skills tend to create a supportive learning environment, which contributes to increasing student learning motivation. Baryanto (2020) said that lecturer competence, including the ability to relate theory to practice, can help students understand concepts in depth. At the Samarinda State Agricultural Polytechnic, for example, lecturers who provide direct guidance through laboratory activities or field practice allow students to apply theory in real life, such as in natural resource management or agricultural product technology. Recent research by Wu et al. (2023) also confirms that lecturers who are competent in guiding students on academic projects are able to encourage the development of analytical thinking skills, which are important for students' academic success and professional careers. Theoretically, these findings emphasize the importance of lecturer competence in supporting quality learning. Competencies that include mastery of technology, communication skills, and pedagogical skills add to the literature on the strategic role of lecturers in creating effective learning. This research also strengthens the theory that lecturer competence not only affects the mastery of the material by students, but also shapes their critical and analytical mindset. Managerially, higher education institutions need to encourage regular training of lecturers to improve their ability to use learning technology and adopt modern teaching methods. Investment in this training will produce lecturers who are more competent and able to meet the increasingly complex learning needs of students. Institutions must also provide a platform for lecturers to share best practices in teaching, both through internal seminars and external conferences. This is expected to create an optimal learning environment for students, as well as improve the academic reputation of the institution.

Learning Engagement on Academic Achievement

The results of the study show that Learning Engagement has a positive and significant influence on Academic Achievement. This confirms that the active involvement of students in the learning process is a key factor that encourages better academic achievement at the Samarinda State Agricultural Polytechnic. Indicators of Learning Engagement, such as Autonomy, Social Support, and Engagement in Educational Activities, are particularly relevant. Students who have autonomy tend to be able to manage their study strategies independently and effectively, which allows them to maximize the time and resources available to understand the material. Social support from friends, lecturers, or the surrounding environment helps create a conducive learning atmosphere and encourages students to stay motivated in facing academic challenges. Additionally, involvement in educational activities, such as group discussions or collaborative projects, provides opportunities for students to apply the theories they have learned and strengthen their understanding through interaction with others. Actively involved students not only attend lectures attentively, but also participate in additional learning

activities, such as group discussions, project completion, or other academic activities. These activities increase their interest in the material being studied, build confidence, and create a sense of responsibility for their academic success. When college students have high engagement, they are more likely to overcome learning difficulties, use their time wisely, and seek help when needed, ultimately contributing to improved academic achievement. Learning engagement reflects the extent to which students are emotionally, cognitively, and physically involved in the learning process. With optimal engagement, students are able to take advantage of all the learning opportunities provided, such as utilizing learning technology or discussing complex concepts with lecturers and peers. Therefore, these results emphasize the need to encourage active student involvement in learning to achieve higher academic achievement. Learning involvement has a significant influence on student academic achievement. Active participation in the learning process helps students develop effective learning strategies, such as time management, problem-solving, and self-regulation. Luo et al. (2023) affirmed that students with high learning engagement are more confident in facing academic challenges, which has a direct impact on improving their performance. This confidence is an important element to support academic success.

Students who are actively involved in learning tend to enjoy the learning process and find relevance between the material taught and their needs. Zheng et al. (2023) stated that enthusiasm in responding to teaching makes the learning process more interesting and meaningful. When the material is delivered in an interesting and relevant manner, students can more easily understand the concepts taught, increasing intrinsic motivation to learn. Group discussions and collaborative academic activities also play an important role in learning engagement. González and Blackford (2022) mentioned that collaboration in study groups allows students to share knowledge, understand complex concepts, and develop critical thinking skills. Schnitzler et al. (2021) added that activities such as group projects and simulations help students focus on learning objectives while practicing the application of science in real-life situations. New research by Zhang et al. (2023) shows that structured student learning engagement, such as active participation in cross-disciplinary projects, enhances problem-solving and innovation skills, which supports academic achievement. Meanwhile, Lee and Kim (2022) identified that students who have a high level of involvement in formal and informal academic activities show greater learning satisfaction and better academic outcomes. Research by Farhan et al. (2024) emphasizes that the integration of technology in learning activities can increase student involvement through more flexible access to learning materials, thereby supporting academic success. At the Samarinda State Agricultural Polytechnic, student involvement in practice-based activities such as laboratories and field simulations in technical courses has been proven to improve analytical skills and knowledge application skills. This shows that a learning approach that actively involves students can create a more meaningful and relevant learning experience. The results of this study reinforce active learning theories, such as *Constructivist Learning Theory*, which emphasizes that learning occurs effectively when students are actively involved in the learning process. This research also supports the concept of *Self-Determination Theory*, where active involvement in learning contributes to the fulfillment of students' psychological needs, such as competence and autonomy, which ultimately supports academic success. Higher education institutions need to develop learning strategies that encourage active student engagement, such as the use of collaborative methods, cross-disciplinary projects, and technology-based simulations. Lecturers need to be provided with training to design and implement teaching methods that are interactive and relevant to student needs. Campus management must also create a learning environment that supports student engagement, such as providing adequate learning facilities and access to supportive educational technology.

Intrinsic Motivation for Academic Achievement

The results of the study show that Intrinsic Motivation has a positive and significant influence on Academic Achievement. This confirms that the encouragement that comes from within students plays an important role in encouraging them to achieve optimal academic results at the Samarinda State Agricultural Polytechnic. Intrinsic Motivation indicators, such as Challenge Motivation and Enjoyment Motivation, are particularly relevant in explaining these results. Students who have a challenging motivation feel driven to take on difficult tasks as an opportunity to develop their abilities. This encouragement makes them more proactive in finding solutions, utilizing learning resources, and actively participating in academic activities. Meanwhile, the motivation of enjoyment describes the sense of satisfaction and happiness that students feel when they successfully complete learning tasks well, which gives them inner satisfaction and encourages them to continue to improve. This intrinsic motivation contributes to the creation of students' awareness of the importance of learning, makes them set clear academic goals, and directs them to use appropriate learning strategies. This inner drive also helps students stay focused, even when facing academic difficulties, and triggers the desire to continue learning without relying on external awards. Students who have high intrinsic motivation tend to be able to manage their study time effectively, show perseverance in completing tasks, and are more enthusiastic in attending lectures or group discussions. This motivation also makes students enjoy the learning process more, so that they can absorb the material better and show superior academic performance. Therefore, intrinsic

motivation is a key factor that not only directly affects academic achievement but also helps students face academic challenges with a more positive and adaptive attitude.

Intrinsic motivation is an internal drive born from an individual's belief that learning has immediate and long-term benefits for self-development. This motivation is the main basis for students to achieve optimal academic achievement. Fithri (2021) stated that students with high intrinsic motivation tend to make a structured and disciplined study schedule in their implementation, so that they are better prepared to face academic challenges. The desire to advance in learning makes students more focused on the learning process, both in understanding theory and in completing academic assignments. Pascoe et al. (2018) highlight that intrinsic motivation not only promotes academic success, but also develops critical thinking and analytical skills. Intrinsically motivated students have the initiative to explore more learning resources, actively engage in class discussions, and develop creative solutions to the problems they face. This motivation helps students in mastering complex concepts and their application in the real world. The research of Zhang et al. (2023) adds that students who have high intrinsic motivation are more resilient in completing cross-disciplinary projects, which significantly improves their academic performance. Students at the Samarinda State Agricultural Polytechnic with high intrinsic motivation show better success in practice-based courses, such as agricultural technology and natural resource management. They not only understand the theory, but also actively apply that knowledge in field simulations and group projects. This is in line with research by Lee and Kim (2022), which found that intrinsic motivation increases students' active participation in project-based activities and results in a deeper understanding. The study of Farhan et al. (2024) revealed that intrinsic motivation plays an important role in improving academic performance through active student involvement in technology-based learning. Educational technology provides more flexible access to learning resources, allowing motivated students to explore more material and improve their learning outcomes. Students who have intrinsic motivation are also more likely to develop independent skills, such as time management and decision-making. Theoretically, these findings support the *Self-Determination Theory* which emphasizes that intrinsic motivation plays an important role in supporting individual success. Intrinsic motivation allows the fulfillment of basic psychological needs, such as competence, autonomy, and connectedness, which contribute to the achievement of optimal academic achievement. The findings are also relevant to the *Expectancy-Value Theory*, which states that students are more motivated to learn if they understand the value and benefits of these academic activities. Higher education institutions need to create a learning environment that supports the development of students' intrinsic motivation. Training lecturers to apply interactive and relevant teaching methods is essential. In addition, a curriculum that integrates project-based learning, field simulations, and educational technology can help students develop practical skills relevant to industry needs. Institutions should also provide mentoring programs to help students discover their interests and build strong intrinsic motivation.

Intrinsic Motivation in Moderating the Influence of Learning Strategies on Academic Achievement

The results of the study showed that Intrinsic Motivation did not significantly moderate the influence of Learning Strategies on the Academic Achievement of students at the Samarinda State Agricultural Polytechnic. This indicates that although students are motivated from within, the influence is not strong enough to strengthen the relationship between the learning strategies applied and their academic achievement. In the Learning Strategy variable, indicators such as Microstrategy, Memory and Metacognition Keys, Emotional and Social Support, and Learning Habits are designed to help students manage their learning process. While this strategy is important, the results show that its success does not depend significantly on the level of intrinsic motivation of students. For example, students who apply microstrategies such as note-taking may still face difficulties in connecting those strategies to their academic achievements, despite being highly motivated. One of the main reasons that may explain these findings is the possibility that the learning strategies implemented are not fully aligned with the individual needs of students and their learning. High intrinsic motivation, such as the drive to face challenges or the satisfaction of the learning process, may not be enough to bridge the gap between the learning strategies designed by the lecturer and the student's learning preferences. In this case, students who have intrinsic motivation still need more targeted support in choosing and implementing effective learning strategies. Additionally, other factors such as the learning environment, academic load, or access to adequate learning resources can also affect the effectiveness of these relationships. Intrinsic motivation is not able to function as a balancer or reinforcement when there is a mismatch between the learning strategy and the actual learning of students. Therefore, although intrinsic motivation is important in encouraging learning enthusiasm, the results of this study show that its impact in strengthening the relationship between learning strategies and academic achievement is limited. Intrinsic motivation is an internal factor that gives students the impetus to learn because they find personal value or satisfaction in the learning process itself. This drive is often associated with a passion for exploring, understanding, and developing knowledge independently without external pressure. However, the results of this study show that intrinsic motivation does not significantly moderate the relationship between learning strategies and academic achievement. In other words, even though students have high intrinsic

motivation, it is not strong enough to strengthen the impact of learning strategies on their academic achievement.

Froiland and Worrell (2016) mentioned that intrinsic motivation allows students to regulate themselves, including in setting learning targets and choosing relevant learning strategies. This inner encouragement can increase the efficiency of study time, strengthen focus, and motivate students to achieve better academic results. In this study, the effectiveness of intrinsic motivation depends on the relevance and quality of the learning strategies implemented by lecturers or institutions. Previous research by Aji and Khan (2019) found that intrinsic motivation contributes significantly to learning success, especially in helping students make optimal use of their study time. Students who have intrinsic motivation tend to be more proactive in seeking additional learning resources, participating in discussions, or utilizing learning technology. However, without relevant and structured learning strategies, this motivation is not enough to have a significant impact on academic achievement. Alonso et al. (2023) explained that intrinsic motivation encourages students to create a more enjoyable and productive learning experience. Students who have a strong internal drive are usually better able to manage academic challenges, such as compiling summaries, analyzing materials, or completing group assignments. However, when learning strategies are not designed to support students' needs, intrinsic motivation becomes less effective in improving their academic outcomes. Another study by Pintrich and De Groot (1990) stated that intrinsic value and cognitive learning strategies are positively correlated. Students with high intrinsic motivation tend to utilize strategies such as concept mapping, material organization, and self-evaluation, all of which help them understand the material more deeply. Martínez-Vicente et al. (2023) added that strategic motivation profiles, which combine intrinsic motivation and effective learning strategies, can significantly improve academic achievement. Students who have intrinsic motivation but are not supported by relevant learning strategies often face difficulties in optimizing their academic potential. Eladl and Alkharusi (2020) also underline the importance of independent learning in utilizing intrinsic motivation. At the Samarinda State Agricultural Polytechnic, students who have high intrinsic motivation often perform better in practice-based tasks, such as agribusiness management simulations or agricultural technology laboratories. However, when the learning strategies implemented do not support their practical needs, the impact of intrinsic motivation becomes limited. This study confirms that intrinsic motivation has great potential to moderate the relationship between learning strategies and academic achievement, but its effectiveness depends on the alignment between the applied learning strategies and the needs of students. Strong internal drive requires the support of a relevant and structured learning approach in order to have a significant impact on student academic outcomes. Theoretically, these results reinforce the view in *Self-Determination Theory* that intrinsic motivation requires support from a conducive learning environment to achieve optimal outcomes. This theory emphasizes that intrinsic motivation, while important, cannot work optimally in the absence of learning strategies designed to meet the cognitive and emotional needs of students. This study adds to the literature on how a combination of intrinsic motivation and learning strategies can improve academic achievement, although in these cases no significant moderation effect was found. Managerially, educational institutions need to improve the design of learning strategies that are more flexible and adaptive to student needs. Training for lecturers in designing teaching methods that are relevant to students' backgrounds and interests can help optimize the role of intrinsic motivation. In addition, institutions can provide mentoring or tutoring programs that support the development of students' intrinsic motivation more effectively. These measures can create a more inclusive learning environment and support academic achievement.

Intrinsic Motivation in Moderating the Influence of Lecturer Competence on Academic Achievement

The results of the study show that Intrinsic Motivation does not significantly moderate the influence of Lecturer Competence on Academic Achievement. This means that even though lecturers have high competence, such as a deep understanding of the foundations of education, the ability to develop a curriculum, and utilize learning technology, the motivation from within students is not strong enough to strengthen these relationships. Indicators on the Lecturer Competency variables, such as Understanding the Foundations of Education and Learning Design, show that good teaching quality is an important element in supporting students' academic achievement. Lecturer competencies include their ability to design engaging and dialogical learning, as well as encourage students to develop their potential. However, the results of this study show that although students have high Intrinsic Motivation, such as the drive to face challenges or enjoy the learning process, the strengthening effect on the relationship between lecturer competence and their academic achievement is not significant. This phenomenon can be caused by several factors. First, students may not fully utilize the competence of lecturers due to their own limited ability to apply the knowledge taught, even though they have high motivation. Second, students' intrinsic motivation may not be focused on the academic aspect, so it does not make a strong contribution to the way they respond to lecturers' teaching. Third, there is a possibility that external factors, such as learning facilities or the academic environment, play a greater role in strengthening these relationships than intrinsic motivation. Thus, although lecturer competence and intrinsic motivation each

have an important role in supporting academic achievement, these findings indicate that students' intrinsic motivation is not significant enough to moderate or strengthen the influence of lecturer competence on their academic outcomes. This shows the need for a more holistic approach in improving interaction between students and lecturers to achieve optimal academic results. Students' intrinsic motivation has an important role in the learning process and the achievement of their academic achievements. In theory, intrinsic motivation is the internal drive that drives students to study for personal satisfaction and the achievement of greater academic goals. However, in this study, it was found that intrinsic motivation did not significantly moderate the relationship between lecturer competence and student academic achievement. This indicates that although lecturer competence can improve the quality of learning and influence academic outcomes, the influence of students' intrinsic motivation in strengthening these relationships is not strong enough. Guay et al. (2001) explained that intrinsic motivation can strengthen the influence of contextual factors such as lecturer competence on academic achievement. Students who have high intrinsic motivation tend to be more focused and active in learning, improve their perception of self-competence, and lower academic anxiety (Gottfried & Gottfried, 1996; Cornell, 1998). However, although intrinsic motivation has the potential to support lecturers' competence in improving academic achievement, this study shows that its effect as moderation is not significant. One explanation of this finding is that the influence of lecturer competence on academic achievement is more influenced by other factors, such as the teaching approach applied by lecturers and direct interaction between lecturers and students, rather than intrinsic motivation alone.

Lecturer competence serves as a key element in determining the quality of learning, which includes mastery of the material, pedagogical skills, and interpersonal skills. Ruhendi and Marta (2022) revealed that lecturers who have high competence not only provide academic information, but also create a learning atmosphere that invites active student participation. Research by Sumarsono et al. (2021) and Tegowati et al. (2022) shows that lecturer competence plays an important role in motivating students and improving the quality of their learning outcomes. However, although students with good faculty competencies have higher academic outcomes, students' intrinsic motivation, which plays a role in maintaining a spirit of learning, is not strong enough to strengthen these relationships. One possible reason is that while intrinsic motivation can improve self-regulation and learning efficiency, it is not always enough to facilitate deeper engagement in learning. The research of Badri et al. (2014) states that the fulfillment of basic psychological needs, such as autonomy and social relationships, supported by intrinsic motivation, can facilitate significant improvements in academic achievement. However, in this case, even though the lecturer has high competence, there is no guarantee that the intrinsic motivation of the student can directly strengthen the influence. This can show that the relationship between intrinsic motivation and lecturer competence is more complex and influenced by other factors, such as the need for a learning approach that is more in line with students' interests and needs. In practice, at the Samarinda State Agricultural Polytechnic, students who have high intrinsic motivation are more involved in practice-based courses such as agribusiness management and agricultural technology. However, while lecturers' competence in imparting knowledge through practice-based teaching can improve their understanding, intrinsic motivation does not significantly strengthen this relationship. This suggests that although students with high intrinsic motivation can be more disciplined and enthusiastic in participating in learning, other factors such as the quality of interaction with lecturers, as well as the way of learning applied, may be more dominant in influencing their academic performance. Several studies have shown that lecturer competence can directly affect student academic achievement, but the role of intrinsic motivation as a moderation variable is more varied. For example, research by Misdalina et al. (2018) shows that lecturers' work motivation has a significant impact on the quality of teaching and student academic outcomes. Meanwhile, research by Kamma et al. (2023) emphasizes the importance of the influence of lecturer competence on student performance, but does not find significant evidence that students' intrinsic motivation modifies this relationship directly. On the other hand, several studies show that students' intrinsic motivation plays an important role in increasing the influence of lecturer competence, as found by Azis et al. (2020) who emphasized the importance of the influence of competent lecturers on students' academic achievement with strong motivational support. The *Self-Determination Theory* by Deci and Ryan (2000) argues that intrinsic motivation is essential in supporting academic achievement, especially when individuals feel in control of their learning process. However, although intrinsic motivation can play a role in strengthening material engagement and mastery, these findings suggest that intrinsic motivation is not enough to significantly moderate the relationship between lecturer competence and academic achievement. This shows that the influence of lecturer competence is more influenced by other external factors, such as the quality of teaching methods and interactions in the classroom, rather than internal factors alone. The theoretical implications of these findings show that although intrinsic motivation plays an important role in learning, its influence on academic achievement through lecturer competency moderation has not been proven to be significant. This indicates the need for researchers to consider other factors that affect the relationship between lecturer competence and academic achievement. In terms of managerial, these results emphasize the importance of improving lecturer competence through training and experience as well as the

importance of creating a learning environment that supports students' intrinsic motivation. Educational institutions need to facilitate more flexible learning and support the development of lecturer competencies and students' intrinsic motivation to achieve better academic results.

Intrinsic Motivation in Moderating the Effect of Learning Engagement on Academic Achievement

The results showed that Intrinsic Motivation did not significantly moderate the relationship between Learning Engagement and Academic Achievement. This means that although students are actively involved in various learning activities, such as self-regulating learning styles, obtaining social support, and participating in educational activities, their intrinsic motivation is not strong enough to strengthen the influence of learning engagement on academic achievement. Indicators on the variables of Learning Engagement, such as Autonomy, Social Support, and Involvement in Educational Activities, illustrate the importance of the role of students' active participation in the learning process. Students who have a high degree of autonomy tend to be able to set their own learning strategies, while social support from friends and an academic environment helps create a conducive learning atmosphere. Active participation in activities such as group discussions or academic projects is also key in increasing learning engagement. Intrinsic motivation, which includes indicators such as the drive to face challenges and a sense of enjoyment in learning, is not significant enough to strengthen these relationships. This can be due to several factors, such as students' limitations in internalizing these motivations into their learning activities, or the existence of external barriers that prevent them from fully optimizing learning engagement. Another possibility is that students may be more dependent on external factors, such as lecturers' teaching methods or support facilities, than on their own motivations. Thus, although learning engagement is an important factor in supporting academic achievement, the intrinsic motivation of students in this study did not contribute strongly enough to strengthen the relationship. This indicates the need for more integrated strategies to encourage learning engagement supported by more effective intrinsic motivation. Intrinsic motivation is one of the important factors in supporting student learning involvement. However, the results showed that intrinsic motivation did not significantly moderate the relationship between learning engagement and academic achievement. Although students show active involvement in learning, their internal drive is not strong enough to strengthen these relationships significantly. These findings provide insight that the influence of intrinsic motivation on learning engagement and academic achievement may depend on other, more complex factors. Schnitzler et al. (2021) highlight that high intrinsic motivation allows students to be more consistent in following the learning process. Students who have a positive academic self-concept tend to show active involvement in group discussions and other learning activities, which contributes to better academic achievement. Abildaeva et al. (2022) affirmed that a learning environment that supports student engagement can facilitate the improvement of their academic achievement through increased intrinsic motivation. Intrinsic motivation also plays a role in encouraging students to overcome academic barriers. Fuertes et al. (2023) found that learning engagement supported by intrinsic motivation helps students to develop collaboration skills and a deep understanding of teaching materials. Qi Li et al. (2022) added that intrinsic motivation improves students' ability to focus on learning despite facing challenges such as academic pressure and time constraints. In practice-based learning activities, students who have high intrinsic motivation are able to integrate theory with practical applications, creating a more meaningful learning experience (Al-Said, 2023).

Intrinsic motivation not only influences learning engagement, but it is also a key predictor of academic success. Zaccone and Pedrini (2019) showed that students with high intrinsic motivation have greater dedication in completing academic tasks. These students demonstrate high perseverance, even in the face of complex academic challenges (Bayoumy & Alsayed, 2021). In addition, Jiwen Chen et al. (2022) noted that intrinsic motivation acts as a mediator in the relationship between external factors such as family support and academic outcomes, providing opportunities for students to achieve better success. Theoretically, the results of this study contribute to understanding the relationship between intrinsic motivation, learning engagement, and academic achievement. The finding that intrinsic motivation does not moderate the relationship between learning engagement and academic achievement suggests that intrinsic motivation is not the only factor that strengthens the relationship. *Deci and Ryan's Self-Determination Theory* can be used to explain that basic needs such as competence, autonomy, and social relationships may need to be met more holistically to maximize the impact of intrinsic motivation on learning engagement. This study confirms that the influence of intrinsic motivation is more effective when combined with learning strategies that support social interaction, learning autonomy, and the relevance of teaching materials. This research also expands the understanding of the role of learning involvement in improving academic achievement. Learning engagement, as explained by Schnitzler et al. (2021), has a significant impact on students' cognitive understanding and analytical abilities. However, the results of this study suggest that learning engagement requires additional support, such as increased learning resources or more innovative teaching approaches, to optimize its impact on academic achievement. Managerially, these findings highlight the importance of educational strategies designed to increase students' intrinsic motivation and learning engagement at the same time. Higher education institutions, including

the Samarinda State Agricultural Polytechnic, need to design learning programs that emphasize practical and collaborative experiences. Students can be encouraged to actively participate in project-based activities, simulations, or internships, which not only increase learning engagement but also strengthen their intrinsic motivation. Managers of educational institutions also need to create a conducive learning environment to support the development of intrinsic motivation. This can be done by giving non-material awards to students who show high dedication, such as rewards for active participation in discussions or achievements in group projects. Lecturers can be trained to adopt teaching approaches that support active student engagement, for example by using interactive educational technology or compiling learning materials that are relevant to students' needs and interests. Counseling and self-development programs can also be integrated to help students understand the importance of intrinsic motivation in achieving their academic goals. By providing space for students to set their personal goals and understand the benefits of long-term learning, educational institutions can build a generation of students who not only excel academically but also have a high level of awareness and responsibility towards their learning process.

V. CONCLUSION, LIMITATION AND FUTURE RESEARCH

Based on the analysis and discussion, several conclusions can be drawn. Learning strategies have a positive but insignificant impact on students' academic achievement at Politeknik Pertanian Negeri Samarinda. While learning strategies hold the potential to improve academic performance, their effect is not statistically significant, possibly due to a lack of adaptation to students' needs or limited instructional variety. Lecturer competence has a positive influence on academic achievement, with results that are close to being statistically significant. Lecturer competencies, such as understanding student needs, curriculum development, and the use of educational technology, play a crucial role in academic success. However, their impact remains suboptimal due to implementation challenges. Learning engagement demonstrates a significant positive effect on academic achievement, as students who actively participate in discussions, group projects, and academic activities tend to achieve better results. Higher engagement levels improve comprehension and analytical skills. Intrinsic motivation also has a significant positive impact on academic achievement, as students with strong internal motivation exhibit greater discipline, focus, and commitment to their studies, leading to optimal academic performance. However, intrinsic motivation does not significantly moderate the relationship between learning strategies and academic achievement, indicating that while students may possess internal motivation, it is not strong enough to enhance the effect of learning strategies. Similarly, intrinsic motivation does not significantly moderate the relationship between lecturer competence and academic achievement, suggesting that other factors, such as environmental support or self-efficacy, may play a more critical role. Moreover, intrinsic motivation does not significantly moderate the relationship between learning engagement and academic achievement, implying that although students actively engage in the learning process, their internal motivation is not sufficient to amplify the impact of engagement on academic performance.

Based on these conclusions, several recommendations are proposed. Higher education institutions, particularly Politeknik Pertanian Negeri Samarinda, should enhance learning strategies by integrating technology-based learning, field simulations, and project-based approaches to help students bridge the gap between theory and practice. Continuous lecturer training is essential, particularly in educational technology and innovative pedagogical methods, supported by adequate learning facilities to ensure effective knowledge delivery. Students should be encouraged to engage actively in academic activities, such as group discussions, collaborative projects, and other educational initiatives, while institutions should foster a learning environment that promotes student-lecturer interaction. Furthermore, institutions should develop self-improvement and motivation programs, such as time management workshops and leadership training, to help students understand the importance of intrinsic motivation in achieving academic success. Learning strategies should not only focus on content delivery but also on strengthening intrinsic motivation, for instance, through academic recognition and constructive feedback. Collaboration between lecturers and students should be strengthened through more interactive teaching methods, such as individual consultations or mentoring programs, to enhance both lecturer competencies and students' intrinsic motivation. Institutions should also design extracurricular activities and academic competitions that encourage students to actively engage in learning while simultaneously boosting intrinsic motivation. Lastly, future research should explore other moderating or mediating factors, such as self-efficacy, family support, or organizational culture, that may influence the relationship between learning strategies, lecturer competence, learning engagement, and academic achievement. A mixed-method approach is recommended for more comprehensive findings. By implementing these recommendations, educational institutions can create a more dynamic and effective learning environment that optimizes both learning strategies and intrinsic motivation to improve students' academic performance.

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