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Understanding the Transition from Perception to Action: A Path Analysis of Students' Perceptions of Science and Their Intention to Act in Learning

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Abstract

Students' perceptions of science were not only a response, but this is one of the factors that influence the motivational process and the formation of intention to act. This study aimed to analyze the causal relationship between students' perceptions of science learning and their intention to act in learning. The research method used is a survey method (exposure facto) using path analysis. The research instrument used was a questionnaire. The questionnaire statements consist of positive and negative statements measured using likert scale with five response categories. The subjects in this study were students of at a Private Senior High School in Serang, Indonesia with a total of 76 respondents. The results of the study indicate an influence of students' perceptions of science on their intention to act in learning with a path coefficient of $p_{21} = 0.805$. These results can be a basis for strengthening teachers in designing learning.

Keywords: Behaviour, Intention to Act, Motivation, Students' Perseptions, Path Analysis

INTRODUCTION

Science learning in the 21st century requires students to not only understand concepts and emphasize cognitive skills, but also demonstrate concrete attitudes and actions during the learning process, such as observing, designing and conducting experiments, asking questions, solving problems, evaluating, and making data-based decisions. This aligns with the demands of scientific literacy, the primary goal of modern science education (OECD, 2019). To achieve this, students' intention to act during learning is a crucial factor.

Intention to act is a person's desire to perform an action (Mahardika et al., 2021). Students must possess a strong desire to act and actively engage in scientific activities during learning. This intention is important because it serves as a bridge between scientific knowledge and scientific behaviors observed in the classroom (Ajzen, 2020). The intention to act is a measurable variable in which a person consciously performs actions or behaviors according to their own will. Someone who has the intention to act will be very likely to be involved in taking steps or attitudes (Zheng et al., 2018).

Intention to act in science learning is a psychological construct that describes a student's internal readiness to engage in scientific activities such as observing, asking questions, conducting experiments, collecting and analyzing data, and drawing conclusions based on

evidence. According to the Theory of Planned Behavior (Ajzen, 2020), a person's perception of an activity significantly influences their intention and willingness to perform that action. In the context of science learning, positive perceptions of the learning environment, the clarity of teacher explanations, the relevance of assignments, and meaningful learning experiences predict student activeness and initiative in scientific activities, such as observations, experiments, or investigations.

Perception is the set of processes by which an individual becomes aware of and interprets information about many things (Suyadi & Aisyah, 2021). Qiong (2017) also argues that perception is an experienced process to achieve awareness or understanding of sensory information. Students' perceptions encompass their views on the relevance of the material, the learning experience, the quality of interactions, and the usefulness of science in everyday life. When students have positive perceptions of science learning, they tend to be more motivated, confident, and more prepared to actively engage in activities. Positive perceptions have also been shown to increase participation in experimental activities, discussions, problem solving, and inquiry-based activities.

Several recent studies have also shown that perceptions of science play a significant role in increasing student engagement. Research conducted by Setyaningrum et al. (2019) examined student and teacher perceptions of virus learning in high school. Furthermore, Wahyuni et al. (2024) examined student perceptions of the educational game Snakes and Ladders in science learning. Recent research conducted by Tsalsabillah & Wulandari (2025) stated that there is an influence of Student Perceptions in Socio-Scientific Learning Issues on Elementary School Students on learning outcomes. Understanding the relationship between student perceptions significantly influences student actions and learning outcomes. In this study, student perceptions will be a predictor of intention to act as a fundamental aspect or student intention to learn. This research is considered very important for improving the quality of learning and is therefore necessary. Through a quantitative approach with path analysis, this study is expected to provide an empirical picture of the contribution of perceptions to student readiness to engage in scientific activities. The results of this study can also serve as recommendations for teachers in designing more effective science learning and motivating students to play an active role in scientific activities.

METHOD

This study employed a causal survey method. Path analysis was employed to analyze the relationship patterns between variables, with the aim of determining the direct and indirect influence of exogenous and endogenous variables. This study examined the influence of

perceptions on science learning and students' intention to act. The subjects were students a Private Senior High School in Serang, Indonesia, selected using random sampling to ensure all students had an equal opportunity to participate. A total of 76 students were selected randomly.

The research instrument used was a questionnaire. The perceptions instrument for science learning used was modification from Kurniawan et al. (2019) which was compile based on indicators such as interest in science, relevance of science to life, perceptions of science learning methods, and self-efficacy in science. Meanwhile, the intention to act instrument was modification from Harahap & Harahap (2024) based on the intention to engage in scientific activities, readiness to face scientific challenges, courage to make evidence-based decisions, and active involvement in science learning. The questionnaire statements consist of positive and negative statements measured using a likert scale with five response categories, namely: strongly agree (SS), agree (S), somewhat agree (CS), disagree (TS), and strongly disagree (STS) (Sugiyono, 2016). For negative statements, the scoring is reversed to be consistent with the measurement principles (Table 1).

Table 1. Scoring Provisions for Positive and Negative Statements

Criteria	Positive Statement	Negative Statement
Strongly agree (SS)	5	1
Agree	4	2
Somewhat agree	3	3
Disagre	2	4
Strongly disagree	1	5

(Sugiyono, 2016)

Data collection was conducted online through Google Forms to facilitate questionnaire distribution, increase data collection effectiveness, and minimize input errors. The collected data were then analyzed using SPSS statistical software. Normality and homogeneity tests were performed as prerequisites, followed by path analysis to calculate path coefficients and the significance of the variable's influence.

RESULTS AND DISCUSSION

The normality test results showed that the student perception variable in science learning had a normal distribution ($p = 0.084 > 0.050$). Meanwhile, the desire to act in learning variable had a normal distribution ($p = 0.094 > 0.050$). Next, a statistical test was conducted using path analysis (Table 2).

The significance test for the correlation coefficient was obtained from the correlation coefficients of X1 and X2 (r12) = 0.805 with F count = 13.479 (p-value = 0.001) 0.001 <0.05, thus H0 was rejected. Therefore, the correlation coefficient was significant. Furthermore, the

determination (R2) value was obtained as R2 = 0.648 (Table 2). This means that 64.8% of the intention to act variable (X2) can be influenced by the student's perception of science learning (X1), so the standard error (ε) = 1 - R2 = 1 - 0.648 = 0.35.

Next, the significance of the regression equation was tested. F count = 136.479 db1 = 1 db2 = 74, with a p-value of 0.001 <0.05, thus rejecting H0. Thus, the regression of X2 on X1 is significant, meaning that the student's perception of science learning (X1) influences the intention to act variable (X2).

Table 2. Path Coefficient Test

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	-3.861	4.201		-.919	.361			
	X1	1.043	.089	.805	11.682	.001	.805	.805	.805

a. Dependent Variable: X2

Next, the path coefficients are obtained. Based on the results of the SPSS analysis in the table above, the path coefficients are obtained in the Beta column (Standard Coefficients), namely the path coefficient X1 to X2 (p21) = 0.805. From the coefficients table, the price of t0 = 11.682 and p-value = 0.001/2 = 0.0005 <0.05 so that H0 is rejected (Table 4). Thus, the variable of student perception of science learning (X1) influences the variable of desire to act (X2). The structure of empirical model 1 is presented in Figure 1.

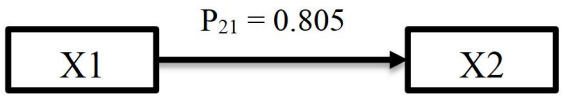

Figure 1. Empirical Path Analysis Model of Student Perceptions of Science Learning and Intention to Act in Learning

The results of the path analysis indicate that student perceptions of science learning (X1) significantly influence intention to act (X2), indicated by a path coefficient of β = 0.805, t-value = 11.682, and p-value = 0.0005. This finding confirms that student perceptions of science learning experiences will shape intentions for scientific action in learning.

Perception can influence the desire to act because it is the access point for the formation of attitudes, value judgments, and self-efficacy beliefs. Positive perceptions of science learning in this study were interpreted through interest in science, science's relevance to life, enthusiasm for science learning methods, and confidence that students are confident in solving science problems. When students are interested in science learning, perceive it as relevant, enjoyable, easy to understand, and use a variety of methods and provide quality learning

experiences, students tend to develop positive attitudes that form the basis for the emergence of intention to act. Theoretically, these results are in line with the Theory of Planned Behavior (TPB), which states that an individual's attitude or perception towards an activity is a major determinant in forming intention to act (Ajzen, 2020). Furthermore, these findings are also consistent with the MARS (Motivation–Ability–Role Perception–Situational Factors) Model framework, which places perception as one of the main determinants of behavior. In this model, individual perception is one of the determinants of the formation of motivation and role perception, which then shape behavioral intentions and actual behavior (McShane & Von Glinow, 2021).

Students' positive perceptions of learning will strengthen their behavioral intentions while learning. These perceptions will foster affective drives that strengthen intrinsic motivation, thus encouraging students to engage in scientific activities. Mackenzie et al. (2024) and Wang (2023) also show that strong perceptions of the quality of science learning play a significant role in building interest, motivation, and readiness to act. Furthermore, research by Dillon & Osborne (2022) confirms that positive perceptions of science can increase participation, curiosity, and a willingness to try new things in the learning process.

Student perceptions of science learning are not merely passive responses; they are key determinants influencing motivational processes and the formation of intention to act. Students' desire to act fosters responsible behavior in learning. Intention to act significantly influences behavior (Lestari et al., 2020). If students have a positive intention to act, their responsibility in learning will improve (Firmansyah et al., 2023; Rahmani, 2023). Thus, the findings of this study confirm that perception is a factor in facilitating the formation of students' desire to act, which ultimately has an impact on increasing their participation and involvement in science learning activities.

Based on the research results, as practical suggestions and implications of the research results, there are several reinforcements related to perception and intention to act, including: teachers as facilitators can design learning modules or learning content that demonstrate real benefits, linking them to relevant everyday problems so that they create applicable and relatable experiences to encourage intention to act. Contextual content can foster motivation in learning (Melinda, 2020). Furthermore, using a variety of learning methods, models and strategies, for example STEM education that can develop problem-solving skills, creative spaces for students to discuss and explore so that the learning experience feels dynamic and interesting. In addition, teachers can also provide positive feedback to build student confidence (self-efficacy). This is important because self-efficacy contributes to students'

interest, motivation, and sustainable performance in school (Panadero et al., 2017; García-Martín & García-Sánchez, 2020), as well as learning outcomes (Code, 2020). Furthermore, teachers can facilitate reflection after learning activities. Reflection helps strengthen positive perceptions and build more stable intentions to act.

CONCLUSION

The results of the study indicate that students' perceptions of science learning significantly influence their intention to act in learning activities with a path analysis coefficient of p21 = 0.805, t-value = 11.682, and p-value = 0.0005, indicating that students' perceptions determine whether they undertake scientific actions in learning. Positive perceptions include interest in science, relevance of learning to life, enjoyable learning experiences, and self-confidence in facing science problems. Theoretically, these results are in line with the Theory of Planned Behavior and the MARS Model, which place perception as the primary determinant of intention and behavior formation. Thus, perception plays a role as a driver of motivational processes that encourage active student involvement. Therefore, strengthening positive perceptions through contextual learning, varied methods, self-efficacy support, and reflective activities are important steps to increase students' intention to act in science learning.

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