International Journal of Educational Methodology
Volume 9, Issue 3, 493 - 507.
ISSN: 2469-9632
http://www.ijem.com/

Determinant Factors of Smart Risk-Taking Behavior: An Empirical Analysis of Indonesian High School Students' Chemistry Learning

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Received: December 1, 2022 ▪ Revised: January 27, 2023 ▪ Accepted: April 23, 2023

Abstract: This article aims to identify the psychological factors of students that correlate with the smart risk-taking behavior of high school students in Indonesia. The data in this study were distributed to 227 students from 3 (three) regions in Indonesia and evaluated using the Partial Least Square Structural Equation Modeling (PLS-SEM) analysis technique. This study found that students' self-confidence was the biggest factor influencing the increase in smart risk-taking behavior, followed by the intention to learn chemistry and teacher support responses. These three factors were found to positively and significantly influence smart risk-taking behavior. However, we found that the smart risk-taking behavior of high school students in Indonesia is still poor. Therefore, it is necessary to have a learning strategy to utilize information technology in chemistry learning. We made several contributions, such as (a) developing a conceptual framework of psychological factors that can increase students' smart risk-taking behavior in chemistry learning that has not been extensively researched and developed by previous researchers; and (b) mapping out how the three psychological factors of students can be maximized to increase smart risk-taking behavior. For this reason, this research is expected to provide practical and academic contributions that can be used as a reference for bank management and further research.

Keywords: *Chemistry learning, self-confidence, smart risk-taking behavior, teacher support responses.*

To cite this article: Djago Djoa, D., Sunyono, S., & Rosidin, U. (2023). Determinant factors of smart risk-taking behavior: An empirical analysis of indonesian high school students' chemistry learning. *International Journal of Educational Methodology*, *9*(3), 493-507. https://doi.org/10.12973/ijem.9.3.493

Introduction

Risk-taking behavior is an individual's readiness to act or not in conditions where someone cannot predict the consequences and does not know the other possible options (Çakır & Yaman, 2015). Regarding risk-taking behavior, adolescents tend to behave in risky actions. Adolescents' courage to take risks follows the urge to look like a hero and not think about the consequences of their actions. In other words, teenagers take risks without intelligently thinking about the consequences. Many teens start their activities as a way to get away from stress. Some activities may seem interesting because students find their actions heroic and take risks. Risk-taking is in the behavioral category. Some people base themselves on consideration and intelligence in risk-taking behavior. Neihart divides risk-taking behavior into rational, social, temperamental, bodily, and emotional risk-taking (Neihart, 1999a). Meanwhile, Beghetto separates smart risk-taking behavior of attention to the sector of science (Interest in Science/IS), creative self-confidence (Creative Self-Efficacy/CSE), and teacher support responses (Beghetto, 2009).

Smart risk-taking behavior is a conceptual process. It contains several phases: understanding profoundly the issue, topic, or matter, concluding the problem, presenting hypotheses, rearranging hypotheses, and discussing with group members to find solutions of the problems (Bal-İncebacak et al., 2019). These studies explain the classification and factors that influence intelligent risk-taking behavior (Beghetto, 2009; Neihart, 1999a) but have not explained how well the level of intelligent risk-taking in education is carried out by students, especially in chemistry learning. Therefore, teachers must assess students' new activity toward intelligent decision-making through learning activities. The teacher needs to provide an overview of guidance to determine the physical, psychological, and social consequences of each activity that students start doing. Most students only intend to get good grades and are not yet in the direction of educational outcomes, i.e., intelligent decision-making skills. However, students still find it difficult to learn chemistry because chemistry is abstract. In addition, the materials contain difficult concepts related to chemical reactions, chemical

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calculations, and abstract concepts. Moreover, many students feel bored and tend to be passive in participating in chemistry lessons (Sunyono et al., 2009). Several previous studies have identified difficulty factors in learning chemistry and proposed new strategies and methods in learning chemistry, such as the application of cooperative learning models using problem-based learning (PBL) and Think Pair Share (TPS) and the use of interactive multi-media (Haris & Al Idrus, 2011; Ilyasa & Dwiningsih, 2020; Nugraha et al., 2013). However, these studies have not discussed much how important psychological factors are in intelligent behavior in taking risks in overcoming difficulties in learning chemistry. Thus, it is important to examine how the condition of students' skills in making intelligent risk decisions from the point of view of chemistry subjects. As educational outcomes in learning processes are not only limited to the value of knowledge (cognitive), the students need to achieve behavioral attitudes (affective) to make decisions intelligently.

This study provides clear and comprehensive information about the condition of high school students in Indonesia regarding the educational outcomes of chemistry subjects in intelligent decision-making skills. It provides comprehensive information about students' smart risk-taking behavior. The results of this study are expected to be able to provide an overview for teachers to change learning strategies, especially for chemistry subject, by knowing the psychological factors of students based on the good or bad results of the level of intelligent risk-taking behavior. As a result, cognitive achievement as the goal of the teaching and learning processes can be achieved. To achieve this goal, the researcher would like to answer the following research questions:

RQ1: How good is the smart risk-taking behavior of high school students in Indonesia?

RQ2: How does students' interest in participating in chemistry lessons contribute to smart risk-taking behavior?

RQ3: How does self-confidence contribute to smart risk-taking behavior?

RQ4: How does the teacher support response contribute to smart risk-taking behavior?

Literature Review

Smart Risk-Taking Behavior

Risk behavior implicates an option that is a stage of unpredictability concerning the factors of the probability of ruin or achievement (Reniers et al., 2016). Based on empirical facts in line with theorized about the perception of risk-taking. risk perception is a person's feelings about the risks that will occur and can come from personal experience, intuitive assessment, and analysis of subjective feelings on cognition (Zhang et al., 2017). Risk-taking behavior considers courage (Bal-İncebacak et al., 2019). So, when a person thinks he is capable is taking a risk, he will do it (Halpern-Felsher et al., 2004). Neihart divides risk-taking behavior into educated, charitable, emotive, material, and emotional risk-taking (Neihart, 1999b). However, Akdag classifies risk-taking behavior into five categories: travel, sensuality, intoxication use, sports, and education (Akdağ et al., 2017).

Smart risk-taking behavior is a definite denomination of risk-taking associated with schooling. Smart risk-taking behavior is influenced by an interest in knowledge, creative self-confidence, and teacher support responses (Beghetto, 2009). Clifford knew smart risk-taking behavior in educational contexts and stated that the educational environment will allow learners to pick up on risks in academic activities (Clifford, 1991). Likewise, Allmond said that intelligent behavior in taking risks became one of the 21st-century skills and emphasized the need to help learners apply these behaviors (Allmond et al., 2016). Radloff also monitors that risk-taking's advantages include upgraded learner contribution to knowledge learning, upward teacher faith in science instruction, and improved teacher-student relationships (Radloff et al., 2019).

Interest in Chemistry Learning

Hidi and Krapp proposed a definition of interest in education and psychology (Hidi, 2006; Krapp, 2005). Hidi states that attention is a specific mental condition that happens throughout the interaction between a person and an entity (Hidi, 2006). The theory of people's learning interests supports Hidi's proposition. It is stated that interests develop from the various relationships between people and objects in social and institutional settings. Interest represents a specific and different association between an individual and an entity. Objects can be tangible properties, topics, or fundamentals, whether just as conceptual ideas (Avargil, 2019). The main factors of interest or attractiveness are upward interest, close attention, and influence. Interest is also closely related to one's involvement in competitions and ideas because the indications of interest have several aspects that result in students being able to learn regularly at various intensities of generalizations related to different contexts, levels, and actions (Krapp & Prenzel, 2011).

In determining a career, students tend to prioritize the perception of interest in chemistry. A few learners choose a science, technology, engineering, and mathematics (STEM) career because of their primary interest (Dalgety & Coll, 2006; Rodrigues, 2007). Learners apprehend that science-based occupations are not creative and are less sociable-oriented if compared with other favorite sectors (Masnick et al., 2010; Osborne et al., 2003). Learners perceive chemistry as a sector that is helpful to the community but does not for prospective careers (Bordt et al., 2001; Fredricks & Eccles, 2002; Salta & Tzougraki, 2004).

In addition, students think that chemistry graduates tend to be teachers, making them not interested in chemistry (Jegede, 2007; Tytler & Symington, 2006). Woodrow argues that the influence of parental wishes is the dominant factor for students in Asia in determining their careers (Woodrow, 1996). Nelson et al. state that differences in the cognitive abilities of male and female students caused male students to be more interested in working in science which required reasonable logic (Nelson & Cheng, 2017). Meanwhile, female learners said that chemistry was necessary for their career, although they did not like chemistry because chemistry is a hard lesson to understand (Cousins, 2007). From the explanation above, a hypothesis can be formulated as follows:

H1. Interest in Chemistry Learning will have a positive and significant effect on Smart risk-taking behavior.

Self-Confidence

Self-confidence is the degree to which individuals are confident about task performance and their estimated performance on a particular task (Gist & Mitchell, 1992; Wood & Bandura, 1989). Top self-confidence outputs maximum achievement, mainly in the complex duty. The connection between self-efficacy and student final grades in starting chemistry courses exposed that self-confidence was the strongest predictor of learning performance (Ferrell et al., 2016). Students with a high level of self-confidence will do a job optimally to get good results even though they have low skills and metacognition (Pazicni & Bauer, 2014).

To evaluate self-confidence, a person needs to respond to, for a sample, a Likert-type scale and state whether they are competent in performing a particular duty to a few degrees. The evaluation specifies how well people think they can perform a task (Bandura, 1986; Gist & Mitchell, 1992). Self-confidence is correlated with metacognition and controlling aspects (Thomas et al., 2008). Self-confidence is an individual's belief about their effectiveness and learning outcomes (Thomas et al., 2008). Thus, a hypothesis can be formulated as follows:

H2. Self-Confidence will have a positive and significant effect on smart risk-taking behavior.

Perception of Teacher Support

According to Shuell, the method students perceive, interpret, and process information about various things that occur during lessons is a significant determinant of student educational outcomes (Shuell, 2001). In line with that, Evans and Kozhevnikova stated that learning materials do not determine what material students are studying; meanwhile, the important thing is how students and teachers could perceive the materials to influence them in learning (Evans & Kozhevnikova, 2011). den Brok et al. (2004) stated that constructivist ideas in building knowledge and students' perceptions in learning activities should be prioritized to shape students' perceptions of teacher behavior in teaching and learning activities in the classroom (den Brok et al., 2004).

The meaning of characteristically psychological promotion usually contains learners' perceptions of self-confidence, friendliness, respect, and intimacy as communication of awareness and concern from educators (De Wit et al., 2011; Langford et al., 1997; Patrick et al., 2011; Wentzel et al., 2010). Lüdtke et al. (2009) explained that students could have this characteristic because students always meet different educators and subject matter while studying at school. Hence, for the learning, we inclusive learner response as a guide of the studying atmosphere derives from the opinion that it is not their studying atmosphere that influences schoolboy studying, but how learners apprehend this studying atmosphere (Campbell et al., 2001; Evans & Kozhevnikova, 2011; Lüdtke et al., 2009).

Thus, learners' reaction to their educator's behavior can likewise be visible as a signal of what Tyler—from a syllabus teachings point of view—labels as implementation achievements. Analogous to Den Brok et al., we think that learners predict instructor's behavior that they read and analyze themselves (den Brok et al., 2004). Previous studies have indicated that learners view the learning atmosphere as secure, provocative, and helpful. Those aspects impact to study result (Cornelius-White, 2007; Kim et al., 2000). The study explains that how learners notice the educator's individualized behavior is critical to make studying suitable to create a good classroom atmosphere (Levy et al., 2003). Although interpersonal relationships between learners and the educator are not a concern of current renewal in science learning or educational reform global, right teacher-student relationships are respected as a prerequisite for proper instruction and awareness in studying to create a conducive learning atmosphere (Telli et al., 2010). As Brekelmans et al. (2011) stated, the instructor method affiliated with learners and classroom control is a significant element in clarifying the use of classrooms for learner studying. In other words, good private relationships between educators and learners in the all-learning class are very valuable. Thus, a hypothesis can be formulated as follows:

H3. Teacher Support Response will have a positive and significant effect on Smart risk-taking behavior.

Methodology

Research Design

This study uses a positivistic paradigm, which examines cause-and-effect relationships through manipulation and observation variables (Sekaran & Bougie, 2016). Positivistic research describes phenomena that can be observed directly and measured objectively. The purpose of this study is to prove the development of the conceptual model from the concept of smart risk-taking behavior. There is a lack of theory and previous literacy regarding the relationship between the variables to be tested, so clarification and development are needed before testing the empirical model. For this reason, this research is an exploratory study. Exploratory is used when the research aims to look for patterns in data with the assumption that there is little/no previous theory or literacy of the variables tested (Putra, 2022). Therefore, the researchers adopted the PLS-SEM data analysis method. One of the purposes of using PLS is to make predictions (Putra, 2022). Where in making these predictions, PLS-SEM is intended to predict the relationship between constructs.

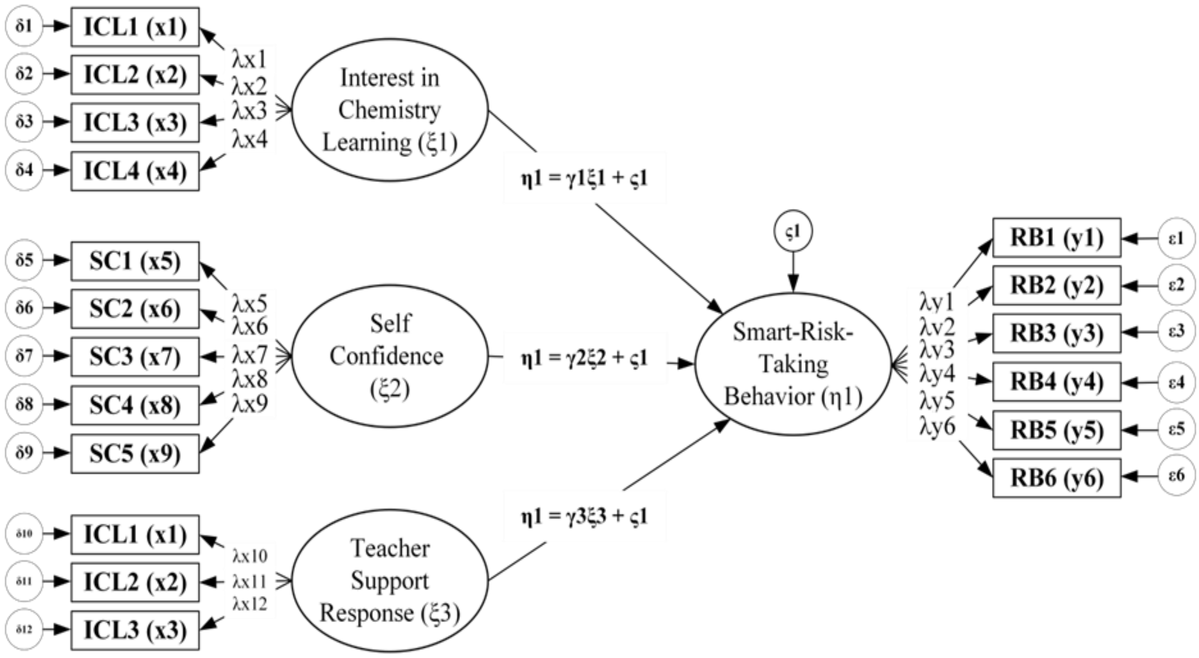

Figure. 1. Research Model (*Putra, 2022*)

Figure 1 shows our research model, and the notation (Adapted from Putra, 2022) used in this study are ξ1 (interest in chemistry learning); ξ2 (self-confidence); ξ3 (teacher support response); η1 (smart-risk taking behavior), γ (path coefficient of exogenous variables to endogenous variables); x (manifest measurement variable of a latent exogenous variable); y (manifest measurement variable of a latent endogenous variable); and ς (residual of latent endogenous variable). Thus, our proposed model of structural equations is as follows:

Equation: $\eta 1 = \gamma 1\xi 1 + \gamma 2\xi 2 + \gamma 3\xi 3 + \varsigma 1$ .... (1)

Thus, the statistical hypothesis in this study is as follows (See Fig. 1.):

H_1: $\eta 1 = \gamma 1\xi 1 + \varsigma 1$ .... (2)

H_2: $\eta 1 = \gamma 2\xi 2 + \varsigma 1$ .... (3)

H_3: $\eta 1 = \gamma 3\xi 3 + \varsigma 1$ .... (4)

Sample and Data Collection

The 227 samples in this study were obtained from 3 (three) regions in Indonesia, namely, Western Indonesia (North Sumatra and Lampung), Central Indonesia (Bali and East Kalimantan), and Eastern Indonesia (East Nusa Tenggara). We sent a questionnaire about intelligent behavior in taking risks in chemistry lesson to 227 students from across a few provinces (5) in Indonesia.

Table 1. Descriptive Analysis

Construct and Item (s)		Often	Sometimes	Seldom	Never
Interest in Chemistry Learning (ICL) – ξ1					
x1	I like studying chemistry	9.7	63.5	20.2	6.6
x2	Chemistry lesson is important to me	43.8	30.7	20.2	5.3
x3	I like to do it in chemistry lessons	28.5	47.8	19.3	4.4
x4	Chemistry is my favorite subject	5.2	38.6	36	20.2
Self-Confidence (SC) – ξ2					
x5	I dare to come up with new ideas during class learning	3.9	24.6	45.6	25.9
x6	I have a good imagination during class learning	7.4	45.2	34.2	13.2
x7	I had a great idea while studying chemistry	6.6	35.1	39	19.3
x8	I like to make my own experiments in learning chemistry	3.5	27.5	40.4	28.5
x9	I love new ways to find solutions to scientific problems	4.4	29.8	39	26.8
Teacher Support Response (TSR) – ξ3					
x10	My teacher listens to my ideas	21.2	25.4	28.9	24.6
x11	My teacher praises me for having many innovative ideas	3.5	29.4	32.9	34.2
x12	My teacher said that I am good at science	5.2	28.1	32.5	34.5
Smart risk-taking behavior (RB) – η1					
y1	While studying chemistry, I did new things through experimentation even though I wasn't very good	7.9	39.5	38.6	14
y2	While studying chemistry, I gave my idea to my friends even though I wasn't sure it was correct	3	87	82	28
y3	While studying chemistry, I did new things even though I wasn't sure how	15.8	42.1	32	10.1
y4	While studying chemistry, I came up with new ways of doing things even if they didn't work	12.7	44.3	29.4	13.6
y5	While studying chemistry, I learn new things even if I make mistakes	18.8	43.4	24.6	13.2
y6	While studying chemistry, I kept asking questions even though other students thought I was not as bright as them	11.4	32	33.8	22.8

Table 1 shows the descriptive analysis of smart risk-taking behavior. The results show that the percentage of student participation in trying new things through experimental activities was still low, i.e., 19%. It needs special attention and treatment to make most students dare to do new things. Furthermore, most students rarely dared to share ideas with their peers. The impact of chemistry learning output had yet to develop because ideas were still limited to themselves. Only 13% of students stated that they dared to share their ideas with their colleagues, even though they were unsure their thoughts were correct. After taking chemistry lessons, most students only dared to implement new things in everyday life. The situation generated a low understanding level and low knowledge skill transfer. Only the remaining 20% of participants dared to try new things, even though they needed to figure out how.

Furthermore, our results show that students did not like to attempt getting methods and were not brave to complete chemistry lessons. Only 14% of recent students are still determining if they will work. Students only dared to learn new things for fear of making mistakes. Moreover, 24% of students dare to attempt to study when there is a possibility. The teacher must appreciate the efforts made by the students even if the students' efforts still need to be corrected. It is aimed at developing knowledge transfer skills in everyday life. Table 1 shows that most students have yet to dare to ask questions when taking chemistry lessons. In addition, 14% of students dared to ask questions without fear of other students' views of mistakes in submitting statements. It means that students' courage to ask questions as part of student-teacher interaction needs to be improved. This was influenced by the confusion of students' understanding of chemistry learning material. Therefore, chemistry learning can get a good effect on learners to know chemistry topics with transfer knowledge.

Table 1 shows the descriptive interest in chemistry learning, where most students were interested in learning chemistry. Moreover, 20.2% of students stated that chemistry is not their favorite subject, while 43.8% of students stated that learning chemistry is necessary. A few students were not interested in learning chemistry because chemistry is not their favorite lesson and they do not like the things in chemistry. The students' disinterest in learning chemistry has something familiar, where just a few students take risks intelligently.

Furthermore, the results of the descriptive analysis of self-confidence show that the a few students need to increase their self-confidence level. The students' self-confidence shows that they did not dare to come up with new ideas, to make new ideas, to try new things, and to find new ways for solutions in learning chemistry. Our results show they did not dare to try new things even though they may be wrong and did not dare to ask questions for fear of the wrong answer. The students need courage to have intelligent decision-making behavior. Moreover, many students stated that the teacher's response to student support was low. On average, students answered rarely and never received from the teacher in learning chemistry. Our results have similarities regarding the low level of student confidence. The support response to students' self-confidence increases risk-taking behavior intelligently in chemistry learning.

Measurement Items

The data collection tool used is the IRT-S Questionnaire from Beghetto (2009). It contains statements about risk behavior including smart risk-taking behavior (6 indicators), interest in chemistry learning (4 indicators), self-confidence in learning chemistry (5 indicators), and teacher support responses (3 indicators). The questionnaire responses are determined in 4-Likert scales.

Findings/Results

Data Normality Distribution Checking

To test the normality of the data, we used a statistical test provided in the SmartPLS 4.0 program, i.e., the inner VIF model test. According to Hair et al. (2017), the normality assumption will only be fulfilled if the critical value (skewness) is less than ±2.00 and the kurtosis value is not more than 7. The evaluation results of this study's critical value (skewness) and kurtosis tests have met the requirements and shown that the data was free from outliers.

Convergent Validity and Reliability Construct

An evaluation of convergent validity was carried out to assess validity. The research measurement model in PLS-SEM is the outer model, consisting of relationships between indicators and latent variables (Hair et al., 2017). According to Hair et al. (2017), to assess convergent validity, the outer loading value must be more than 0.70 with a *p-value* < .05. Therefore, our decision for the loading acceptance limit in this study was 0.7, and all indicators were found to have good convergent validity. The next step in evaluating convergent validity is to see that the average variance extracted (AVE) value must be > .50, which is more recommended. This ratio implies that latent variables have accounted for more than 50% of the variance of the reflective indicator. We found that the AVE value was > .50, so all variables in this study could at least be measured by their indicator items by 50%.

Table 2. Construct Validity and Reliability

Variable(s)	Item (s)	Factors	Sig. Loadings	CA	CR (Rho_a)	CR (Rho_c)	AVE
Interest in Chemistry Learning	ICL1	.864	< .001	.873	.874	.913	.724
	ICL2	.839	< .001				
	ICL3	.861	< .001				
	ICL4	.839	< .001				
Self Confidence	SC1	.866	< .001	.933	.934	.949	.790
	SC2	.867	< .001				
	SC3	.875	< .001				
	SC4	.917	< .001				
	SC5	.917	< .001				
Teacher Support Response	TSR1	.831	< .001	.795	.800	.879	.708
	TSR2	.863	< .001				
	TSR3	.830	< .001				
	RB1	.789	< .001				
Smart risk-taking behavior	RB2	.846	< .001	.877	.881	.908	.624
	RB3	.807	< .001				
	RB4	.811	< .001				
	RB5	.839	< .001				
	RB6	.625	< .001				

After we confirmed the validity through convergence and discriminant, the reliability in this study was evaluated using construct reliability. The results show that all latent variable values had Cronbach's alpha ≥ .60 and composite reliability ≥ .70. Thus, all constructs can be accepted for reliability.

Discriminant Validity Assessments

Discriminant validity assessments can be done by testing the Fornell lacker criterion and Heterotrait-Monotrait Ratio (HTMT).

Table 3. Fornell Larcker Criterion

	ICL	SC	RB	TSR
ICL	0.851			
SC	0.545	0.889		
RB	0.755	0.611	0.790	
TSR	0.492	0.740	0.736	0.842

Table 3 shows that the AVE square root correlation value for each latent variable has the greatest value compared to the AVE square root correlation, which is associated with the values of other latent variables. This means that each latent variable has good discriminant validity. In contrast, some latent variables still have highly correlated measurements with other constructs. According to Henseler et al. (2014), the Fornell Larcker criterion approach failed to identify discriminant validity in most significant cases. For this reason, Henseler et al. (2014) suggested assessing discriminant validity using the heteroit-monotrait ratio of correlations (HTMT) inference. We obtained this value through a bootstrapping procedure with a re-sample of 5000, which was run to get the confidence interval (CI) value. This test will be accepted if the value at 2.5% and 97.5% is less than or equal to 1.00. This study found that there were no problems with discriminant validity. After confirming that there are no problems with the confidence interval (CI), we evaluated the value of the cross-loadings and found a greater correlation value between variables than the correlation between variables with the others. Therefore, we can ensure that the indicators in this study are valid and do not occur—error on discriminant validity.

Inner Model Evaluation

After the estimated model met the validity and reliability criteria, we tested the structural model. This evaluation aims to predict the relationship between latent variables. Ramayah et al. (2018) suggested looking at the Inner VIF value, coefficient of determination (R^2), model suitability, and predictive relevance (Q^2) to assess structural (inner model). We used inner VIF values to assess multicollinearity in the structural model. Our research found no perfect or significant correlation between the independent variables. The correlation value between the observed variables (VIF) was less than 10.00, as recommended by Hair et al. (2018). The method used to test the occurrence of multicollinearity can be seen from the variable correlation matrix generated through the VIF value.

The evaluation of the coefficient of determination shows that the endogenous variable of smart risk-taking behavior can be explained by its exogenous variable of 81.7% (0.817). In contrast, the rest is explained by other exogenous variables outside of this study. Moreover, we evaluated the predictive relevance (Q^2) for the structural model by measuring how well the observed values are generated. Suppose the Q^2 value is more significant than zero for certain endogenous latent variables. The PLS pathway model has predictive relevance for that construct (Hair et al., 2017). Evaluation of the fit model in this study was carried out using two test values, including standardized root mean square residual (SRMR) and normal fit index (NFI). Ramayah et al. (2018) proposed that the model will be considered to have a good fit if the standardized root means square residual (SRMR) value is below 0.10 (Hair et al., 2018).

Hypothesis Testing

The results of tests (See Fig. 2.) show that the interest in chemistry learning factor was found to influence smart risk-taking behavior. Where the influence of interest in chemistry learning on smart risk-taking behavior has a path coefficients value of 0.417 which is close to a +1 value, a *t-statistic value* of 8.454 (> 1.96), and a *p-value* of .000 (< .05). Therefore, it can be concluded that interest in chemistry learning has a positive and significant effect on smart risk-taking behavior. In this case, where the more students have a high interest in learning chemistry, the more their behavior on smart-risk-taking will increase.

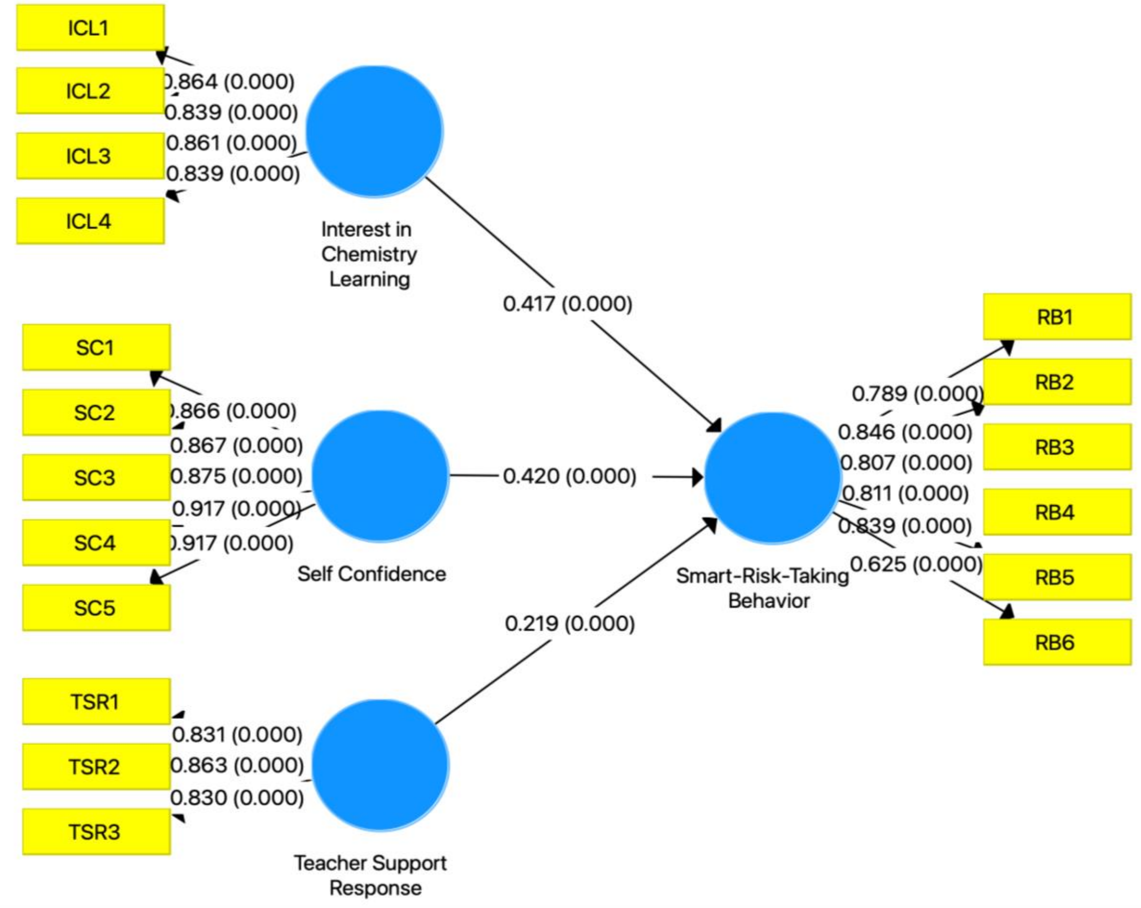

Figure 2. Hypothesis Results

Furthermore, the self-confidence factor was found to influence smart risk-taking behavior where the influence of self-confidence on smart risk-taking behavior has a path coefficient value of 0.420 which is close to +1 value, a *t-statistic value* of 10.096 (> 1.96), and a *p-value* of .000 (< .05). Therefore, it can be concluded that self-confidence has a positive and significant effect on smart risk-taking behavior. In this case, the more students have a high level of confidence to learn chemistry, the more their behavior on smart-risk-taking will increase.

Table 4. Hypothesis Results

	Original Sample (O)	t statistics (|O/STDEV|)	p values
Interest in Chemistry Learning → Smart risk-taking behavior	0.417	8.454	.000
Self Confidence → Smart risk-taking behavior	0.420	10.096	.000
Teacher Support Response → Smart risk-taking behavior	0.219	4.786	.000

The last factor was also found to influence smart risk-taking behavior, i.e., teacher support response. the influence of the teacher support response on smart risk-taking behavior has a path coefficient value of 0.219 which is close to +1, a *t-statistic value* of 4.786 (> 1.96), and a *p-value* of .000 (<.05). Therefore, it can be concluded that teacher support response has a positive and significant effect on smart risk-taking behavior. In this case, the more students get high response support from their teachers, the more their behavior on smart-risk-taking will increase.

Discussion

Smart Risk-Taking Behavior of High School Students in Indonesia

Risk behavior is an option at a stage of unpredictability concerning the factors of the probability of default or achievement (Reniers et al., 2016). Neihart divides risk-taking behavior into educated, charitable, emotive, material, and emotional risk-taking (Neihart, 1999b). Smart risk-taking behavior influences knowledge, creative self-confidence, and instructor support responses (Beghetto, 2009). The research we conducted deals with the level of smart risk-taking behavior of high school students from 5 provinces in Indonesia. The results of data processing show that the intelligent risk-taking behavior of high school students in Indonesia is in grade 1 with an interval of 8-14 means (see Table 17). This study is in line with previous studies stating that level of courage to take risks smartly in Indonesian students is still low (Sunyono & Meristin, 2022; Yuni et al., 2018). This result is understandable because Asian education system generally still emphasize cognitive (Confucianism).

Unlike the Western education system, the courage of students to explore and express opinions freely is formed in appreciation by accepting regardless of whether the student's answer is right or wrong. Some researchers state that Western education prioritizes students to argue, while Asia rote learning and memorization (Confucianism) (Aoki, 2008; Han & Scull, 2010). Such conditions need to address so that students can survive in the life of the 21st century. Furthermore, this is in line with other research which states that smart risk-taking behavior is one of the 21st-century skills (Allmond et al., 2016; Hong, 2010).

Student Interest in Chemistry Learning Contributes to Smart Risk-Taking Behavior

Interest is a specific mental condition that happens throughout an interchange among people and objects (Hidi, 2006). Interest in learning should get special attention in science education (Deci & Ryan, 2004; Krapp & Prenzel, 2011). Several previous studies have stated that there is a tendency to decrease student interest in learning chemistry in various countries around the world (Aikenhead, 2003; Cheung, 2009; Jegede, 2007; Jones et al., 2000; Krapp & Prenzel, 2011; Lyons, 2006; Miller et al., 2006; Ogunkola & Samuel, 2011; Osborne et al., 2003; Salta & Tzougraki, 2004). The outcomes of the investigation declare that student interest in learning is a reason that affects smart risk-taking behavior (Beghetto, 2009). The investigation outcome shows that learners' attentiveness in chemistry subjects was only 22% (see Table 13). The level of awareness of Indonesian students about the importance of learning chemistry is high. It is necessary to lead senior high school learners in Indonesia interested in learning chemistry through digital information technology-based learning models or methods. Per the investigation, the results claim that learning chemistry tends to be unpopular and does not attract students' interest in the revolution of industry 4.0. It is necessary to have a different approach to information technology to direct students to develop high-level cognitive skills (Aikenhead, 2003; Osborne et al., 2003; Wu et al., 2001).

The data from this study show the estimated standard regression weight and standard direct effects of 0.417. This means that the increase in smart risk-taking behavior will increase by 0.417 points for every 1-point increase in interest in chemistry learning. The low interest in learning chemistry for high school students in Indonesia will be directly proportional to smart risk-taking behavior. There needs to be a support system in the media that can increase interest in learning chemistry, directly proportional to smart risk-taking behavior. This factor was also the second most significant factor influencing smart risk-taking behavior. Therefore, if we want to improve smart risk-taking behavior, we need reliable media to bridge student interest in chemistry learning with smart risk-taking behavior as an outcome of chemistry learning.

Students' Self-Confidence Contributes to Smart Risk-Taking Behavior.

Self-confidence is the degree to which individuals themselves concerning task performance and their estimated achievement on a specific assignment (Gist & Mitchell, 1992; Wood & Bandura, 1989). Social Cognitive Theory says that self-confidence is the assessment of a person's capability to display particular behaviors or achieve yields. In this case, self-confidence is related to self-efficacy can be done (Puja Kesuma et al., 2021; Tusianah et al., 2021). In educational circumstances, self-confidence is related to students' achievement and ability to develop their expertise in attentiveness, aims, and encouragement (Brígido et al., 2013; Valentine et al., 2004). The results of our study show that the level of self-confidence of Indonesian high school students was still low. Many students did not dare to come up with new ideas, had low levels of student imagination, did not have good ideas, did not dare to new experiments, and were unwilling to find new ways of learning chemistry. The research data for the estimated standardized regression weight and standard direct effect is 0.420. This means that the increase in smart risk-taking behavior will increase by 0.420 points for every 1-point increase in student confidence in learning chemistry. This factor was also the most significant factor influencing smart risk-taking behavior.

If teachers can develop students' confidence, the smart risk-taking behavior will increase. This is in line with previous studies stating that students with low self-confidence experience negative emotional disturbances such as worry and disappointment when they can complete tasks (Cortés et al., 2016; Dávila-Acedo et al., 2022; Lawson et al., 2019). Therefore, there needs to be a learning strategy that can increase students' self-confidence. It can be a learning model that is directly proportional to the increase in smart risk-taking behavior.

Teacher Support Response Contributes to Smart Risk-Taking Behavior

Teacher support responses are interactions between educators and learners. It investigated student learning outcomes. Thus, it completes the drawing of standard instruction. However, educators are not to supply educational underpin to learners. Teachers are visible as preceptors of career and surrogate roles for students' parents (Allee-Smith et al., 2018; Schiersmann et al., 2016). It is no wonder that the capability of teachers underpins to learners can create a constructive connection with learners, which are not excluded from educators and become topics of expertise growth (Lazarová et al., 2019). The data from this study show the estimated standard regression weight and standard direct effects of 0.219. This means that the increase in smart risk-taking behavior will increase by 0.219 points for every 1-point increase in teacher support response. Students learn more about chemistry lessons because of their interest and view of the importance of chemistry lessons supporting their goals.

Moreover, teacher support responses were the smallest factor in increasing smart risk-taking behavior. Indonesian teachers have a good teacher attribution gap with teachers on the mindfulness factor (Haenilah et al., 2022). If Indonesian teachers can fill the attribution of mindfulness, it can increase students' intelligent risk-taking behavior. Students expect to benefit from teacher support (Caleon et al., 2017; Faitar & Faitar, 2013).

Conclusion

The difficulties faced by Indonesian students in learning chemistry are due to abstract chemistry, a material with the concept of a chemical reaction, and chemical calculation. Moreover, the difficulties are also affected by the psychological factors of the students in their behavior, including (a) smart risk-taking behavior of high school students in Indonesia is still very low, so there is a need for learning strategies that can utilize information technology in chemistry learning, which can be in the form of applications or IT-based learning models; (b) interest in learning chemistry for high school students in Indonesia is low at 22%, resulting in a poor smart risk-taking behavior; (c) confidence in learning chemistry for high school students in Indonesia is low at 5%, resulting in a poor smart risk-taking behavior; and (d) the teacher support response in learning chemistry for high school students in Indonesia is low at 10%, resulting in a poor smart risk-taking behavior. Therefore, there is a need for learning media to improve psychological factors in smart risk-taking behavior skills. In learning chemistry subjects which is abstract, teacher support is needed to make students have smart risk-taking behavior. Finally, the teacher must generate courage and interest in learning chemistry.

Recommendations

In learning chemistry subjects which is abstract, teacher support is needed to make students have smart-risk-taking behavior. Therefore, the teacher must generate courage and interest in learning chemistry. Further Research and Development is required to produce learning media as a platform that can increase interest in learning chemistry, self-confidence, and teacher support to increase smart risk-taking behavior. Learning media using information technology are found to be interesting and fun and able to adapt to the learning behavior of 21st-century students. It will positively impact teaching and learning activities so that the factors influencing students' smart risk-taking behavior can be improved.

Limitations

The sample in this study was limited to grade 10 of high school students. The researcher hopes that further research can take samples from all high school students who take chemistry lessons to categorize based on the class level in determining students' intelligent risk-taking behavior.

Acknowledgments

We want to thank all respondents for participating in this study. Our appreciation also extends to our colleagues who assisted in distributing our data collection instrument to the respondents. Additionally, we would like to thank the reviewers for providing constructive feedback on the earlier version of this paper. Finally, we thank Universitas Lampung for this study and the Directorate of Research and Community Services, Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for funding this research through a research grant.

Funding

The authors received financial support for research, authorship, and publication of this article from Doctoral Dissertation Research of Kemenristekdikti, No. 2147/UN26.21/PN/2022.

Authorship Contribution Statement

Djago Djoa., & Sunyono: Conceptualization, design, analysis, writing. Rosidin: Editing/reviewing, supervision.

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