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Impact of a training program on the professional skepticism of auditing students: The moderating role of trait skepticism

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ABSTRACT

This study examines the effect of a training program on the professional skepticism of auditing students and investigates the moderating role of trait skepticism. A mixed-methods approach was used. In-depth interviews were conducted in two phases to refine the measurement scales and to help interpret the quantitative findings. In addition, a survey was administered to 239 auditing students at a university in Vietnam. The results show that the training program has a positive and significant effect on students' professional skepticism. The findings also reveal a moderating effect of trait skepticism. For students who already have high levels of critical thinking and inquisitiveness, the training program is still beneficial, but the additional improvement is relatively smaller. In contrast, students with lower initial levels of trait skepticism gain greater marginal benefits from the program. This study was conducted at a single university, which may limit the generalizability of the results. Moreover, the cross-sectional design does not capture changes in skepticism over time. Future research should include multiple universities and use longitudinal designs to examine how skepticism develops during both study and professional practice. Further studies could also explore the role of organizational and cultural factors in shaping skepticism in auditing practice. These findings provide useful implications for the design and improvement of auditing training programs by highlighting the importance of adapting training strategies to the different characteristics of students, thereby supporting the development of high-quality future auditing professionals.

1. Introduction

Professional skepticism (PS) is a core and indispensable competency for auditors, playing a crucial role in making sound judgments, especially in the context of detecting fraud and misstatements in financial statements (Ramadhany et al., 2025). The International Auditing and Assurance Standards Board in 2009 emphasized the importance of this attitude, considering it the foundation for ensuring the quality and reliability of the auditing process. Reports by the International Forum of Independent Audit Regulators also indicate that a lack of PS is the main cause of serious audit deficiencies. However, in practice, the effective application of PS still faces many challenges, creating an urgent need to identify factors that promote its development

One of the factors expected to significantly improve PS is the training and development of auditing human resources. Many international studies have shown a positive link between training and PS (Nelson, 2009; Hurtt et al., 2013; Rodgers et al., 2017; Carpenter et al., 2011). However, most of these studies focus on the context of developed countries or transitional economies. In Vietnam, the number of empirical studies on the specific role of undergraduate auditing training programs on PS remains very limited. Specifically, there is a lack of research evaluating the effectiveness of university training programs in developing PS and a lack of empirical data from the learners themselves to determine the alignment between training content and practical needs (Ta et al., 2022). In addition to the training factor, research also suggests that the personal characteristics of auditors, also known as trait skepticism, play an important role in shaping PS (Hurtt, 2010). This raises the question of the interactive relationship between the training

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program and trait skepticism of students. Stemming from the research gaps, this study is conducted to:

- Assess the impact of the training program on the PS of auditing students at The Vietnam University.
- Examine the moderating role of trait skepticism in the relationship between training programs and PS.

The study is expected to contribute to the development of PS theory in the context of Vietnamese higher education, while also providing practical implications for building and improving training programs, thereby helping to enhance the quality of future auditing human resources.

2. Literature review

PS is a cornerstone of audit quality; a lack of PS is a primary cause of audit failures. Consequently, identifying factors that effectively foster PS, especially at the foundational level of auditor education, has become a critical research stream. Among these factors, training is widely acknowledged as a pivotal mechanism for developing PS. A substantial body of international research has established a positive link between various forms of training and the enhancement of skeptical attitudes and behaviors. Seminal work by Nelson (2009) provided a theoretical model outlining how training impacts PS through channels such as highlighting error patterns, fraud indicators, and improving negotiation skills. Similarly, Hurtt et al. (2013) emphasized the role of training in mitigating cognitive biases and strengthening critical thinking capabilities. These foundational studies paved the way for empirical investigations.

Subsequent experimental research has yielded robust evidence supporting the efficacy of targeted training. For instance, Carpenter et al. (2011) demonstrated that a forensic accounting course offered superior benefits in enhancing fraud risk assessment and PS compared to standard audit training. Rasso (2015) found that high-level constraining instructions significantly boosted auditors' skepticism when evaluating complex estimates. Further reinforcing this, Rodgers et al. (2017) highlighted the importance of knowledge transfer and practical experience in fostering PS during audit planning. Beyond technical skills, Liu (2018) provided evidence from China that ethics education can also play a significant role in developing the questioning mindset and search for knowledge inherent to PS. Table 1 provides a summary of key international studies on training and PS.

While literature unanimously affirms the importance of training, two significant gaps remain. First, most of these studies are situated in the contexts of developed Western countries or specific transitional economies like China. There is a notable scarcity of empirical research evaluating the effectiveness of undergraduate auditing training programs in developing PS within the Vietnamese higher education context. This leaves a critical question unanswered: How do structured university programs in such environments contribute to building this essential competency?

Second, and more crucially, existing studies often treat the effectiveness of training as a universal given, primarily examining its direct effects. The potential interactive effect between training and students' inherent personal characteristics remains underexplored. While Hurtt's (2010) concept of trait skepticism as an innate, multi-dimensional personality trait is recognized as a key influencer of PS, its role as a moderator in the relationship between formal training and the development of PS is not well understood. The predominant, often implicit, assumption is that trait skepticism enhances training effectiveness; in other words, students with higher innate skepticism benefit more from training. However, this linear enhancement hypothesis lacks robust empirical testing and may oversimplify a more complex relationship. Is it possible that for students who already possess high levels of critical thinking and inquisitiveness, the marginal gains from a standardized training program are different from those of their peers?

Table 1: Summary of international studies on PS and training

Reference	Method	Key findings related to training	Limitations/context
Nelson (2009)	Qualitative/ theory	Training enhances PS through knowledge of errors, fraud risk, and professional judgment.	Lacked empirical testing; theoretical model.
Hurtt et al. (2013)	Literature review	Training is crucial for addressing cognitive biases and promoting critical thinking.	Focused on synthesis; did not test long-term efficacy.
Carpenter et al. (2011)	Experimental	Forensic accounting training improves PS and fraud risk assessment more effectively than standard courses.	Context limited to a specific course; student participants.
Rasso (2015)	Experimental	Detailed, high-level instructions increase PS in complex judgment tasks.	Did not account for the moderating role of individual traits.
Rodgers et al. (2017)	Survey/ experimental	Knowledge transfer and experience are key drivers of PS in audit planning.	Limited generalizability to different national contexts.
Liu (2018)	Experimental	Ethics education can improve PS more effectively than traditional accounting education.	Context-specific to China; student participants.

This study aims to address these gaps by investigating the impact of a university training program on the PS of auditing students in Vietnam. More importantly, it moves beyond the conventional direct-effect model to empirically examine the moderating role of Trait Skepticism. By testing whether trait skepticism strengthens, weakens, or creates a more nuanced effect on the training-PS

relationship, this research seeks to provide a deeper, more contextualized understanding of how PS is developed, thereby offering significant theoretical and practical implications for auditing education.

3. Theoretical framework and hypothesis development

PS plays a crucial role in enhancing audit quality (Popova, 2012). Definitions of PS are often built upon a neutral view, a presumptive doubt view, or a combination of both. From a neutral perspective, the International Auditing and Assurance Standards Board in 2009 defined PS as "an attitude that includes a questioning mind, being alert to conditions that may indicate possible misstatement due to error or fraud, and a critical assessment of audit evidence." Hurtt (2010) also defined PS as "a multi-dimensional construct characterized by an individual's propensity to suspend judgment until appropriate evidence for an alternative solution or explanation is available." According to this view, auditors maintain an objective, unbiased attitude, focusing on questioning and critically evaluating evidence (Nelson, 2009; Glover and Prawitt, 2014).

From a presumptive doubt perspective, Nelson (2009) also referred to this view, whereby auditors need to have a skeptical mindset and question whether a material misstatement exists, assuming that there is a possibility of error or fraud unless convincing evidence proves otherwise. The level of skepticism is higher than in the neutral view.

Many studies support a combination of neutral and presumptive doubt perspectives. Nolder and Kadous (2018) expand the concept of PS into two main components: Skeptical mind (cognitive processes for evaluating information) and skeptical attitude (an evaluative reaction to audit information, including risk beliefs and a feeling of doubt). This combination creates a comprehensive PS, affecting both judgment and skeptical actions.

In this study, the context of higher education focuses on building a foundation of skeptical thinking for students, a process that is not immediately at the level of presumptive doubt. Therefore, the study adopts the definition from a neutral perspective. PS is defined as an attitude that includes a questioning mind, a critical assessment of evidence, and a tendency to investigate information without immediate acceptance or rejection (Hurtt, 2010).

The training program is considered a crucial factor in developing PS, especially for auditing students who lack practical experience (Nelson, 2009). Nelson (2009) proposed that training affects PS through three main aspects:

- Professional knowledge: Providing a theoretical foundation in auditing, risk assessment, evidence gathering, and professional ethics (Messier et al., 2019).
- Practical skills: Training in financial analysis, critical thinking, and practical evidence gathering through hands-on exercises (Nelson, 2009; Hurtt et al., 2013).
- Risk awareness: Emphasizing the ability to recognize the importance of risk, maintain a skeptical mindset when faced with anomalies, and adjust audit plans accordingly.

Studies by Nelson (2009) indicated that training is most effective when it focuses on highlighting errors and signs of fraud. Hurtt et al. (2013) added that training can enhance PS by increasing awareness of biases and training critical thinking (Peecher et al., 2013). Carpenter et al. (2011) provided empirical evidence on the effectiveness of specialized training (forensic accounting) in improving fraud risk assessment abilities. Trotman et al. (2015) "disconfirmation" approach has also been shown to enhance skeptical attitudes.

Trait skepticism is an inherent personal trait that influences the ability to develop and apply PS. Hurtt (2010) developed the Hurtt Professional Skepticism Scale (HPSS), which includes 30 questions assessing six aspects: Questioning, suspension of judgment, search for knowledge, interpersonal communication, self-confidence, and self-determination. Students with high trait skepticism tend to exhibit stronger PS when faced with complex auditing situations (Hurtt, 2010).

Trait skepticism is also considered a moderating factor in the relationship between training programs and PS. Quadackers et al. (2014) pointed out that individuals with high trait skepticism are often more sensitive to risk information and more likely to apply learned skeptical skills. Robinson et al. (2018) also found that students with high trait skepticism have a stronger motivation to learn and are more receptive to content related to risk identification or critical thinking.

Trait skepticism acts as a moderating variable in the relationship between training programs and PS. Hurtt et al. (2013) suggested that students with high trait skepticism tend to absorb training content related to risk awareness and critical thinking more effectively, thereby developing stronger PS. Conversely, students with low skepticism may find it difficult to apply skeptical skills even when the training program is well-designed.

Quadackers et al. (2014) and Robinson et al. (2018) have verified this moderating role. They found that when trained on fraud indicators, auditors with high trait skepticism tended to ask more questions and request additional evidence. Similarly, students with high trait skepticism have a stronger motivation to learn and more readily apply learned skills to simulated situations, improving their PS more quickly.

This study is based on three foundational theories to explain the relationship between training programs, trait skepticism, and PS:

Kolb's (1984) experiential learning theory: This theory emphasizes that effective learning occurs through a four-stage cycle: Concrete experience, reflective observation, abstract conceptualization,

and active experimentation. In auditing education, integrating practical activities (audit simulations, case analysis) helps students develop critical thinking and PS (Bonner and Walker, 1994; Carpenter et al., 2011). This theory supports the consideration of training program components such as practical skills and risk awareness.

Ajzen's (1991) theory of planned behavior: This theory explains that behavior is determined by behavioral intention, which is influenced by attitude toward behavior, subjective norms, and perceived behavioral control. In this study, the theory helps to understand how the training program affects PS (as a precursor to skeptical behaviors). If training helps students develop a belief about the risk of misstatement (attitude), they will tend to perform skeptical actions. Nelson (2009) and Peecher et al. (2013) have applied this theory in auditing, emphasizing the importance of self-confidence in applying skeptical skills.

Bandura's (1997) self-efficacy theory: An individual's belief in their ability to perform a specific task affects their motivation, effort, and success. Hurtt et al. (2013) linked this theory to PS, arguing that students with high self-efficacy in detecting misstatements will be more motivated to learn and apply skeptical skills. Robinson et al. (2018) also showed that students who believe in their critical thinking abilities exhibit stronger PS when trained. This theory helps explain how training programs, by enhancing self-efficacy, improve PS and how trait skepticism can influence this self-efficacy.

Based on the theoretical framework and published studies, the following hypotheses and research model are proposed.

Training programs provide professional knowledge, practical skills, and risk awareness, which are important factors that help students develop PS (Nolder and Kadous, 2018).

- Professional knowledge (PK): Provides an understanding of auditing standards, auditing processes, and professional ethics, helping students recognize the role of PS (Messier et al., 2019).
- Practical skills (PR): Develops the ability to analyze, think critically, and practice auditing, thereby promoting PS (Nelson, 2009; Hurtt et al., 2013).
- Risk awareness (RA): Enhances the ability to identify risks and maintain a skeptical mindset when encountering anomalies, thereby improving PS (Carpenter et al., 2011).

It is expected that students who participate in a training program with better professional knowledge (PK), practical skills (PR), and risk awareness (RA) will have higher PS, demonstrated through their ability to question, request evidence, and evaluate motives in auditing situations.

H1: Training program (including professional knowledge, practical skills, and risk awareness has a positive impact on the PS of auditing students.

Trait skepticism (TS) is an inherent personal trait that influences how students receive and apply knowledge and skills from the Training Program to real-world situations (Hurtt, 2010). Students with high trait skepticism (e.g., a tendency to question, seek knowledge, and be self-confident) will better leverage the elements of the training program (PK, PR, RA) to develop PS, compared to students with low trait skepticism (Quadackers et al., 2014; Robinson et al., 2018). It is expected that the relationship between training programs and PS will be stronger among students with high trait skepticism, as demonstrated by a more pronounced improvement in their ability to question, request evidence, and evaluate motives in auditing situations.

H2: Trait skepticism moderates the relationship between the current training program and the PS of auditing students.

The proposed research model (Fig. 1) aims to examine the relationship between the training program (TP), which includes three components: professional knowledge (PK), practical skills (PR), and risk awareness (RA), and the PS of auditing students at The University in Vietnam, with the moderating role of trait skepticism (TS).

Independent variable, training program (TP) includes professional knowledge (PK), practical skills (PR), and risk awareness (RA). Professional knowledge (PK) is measured by theoretical knowledge of risk assessment, evidence gathering, and professional ethics. Practical skills (PR) are measured by the ability to analyze, think critically, and perform auditing tasks. Risk awareness (RA) is measured by the ability to recognize and respond to risks in auditing.

Dependent variable, PS is measured through hypothetical auditing situations (Nelson, 2009; Hurtt, 2010; Carpenter et al., 2011) that simulate real-world auditing issues, focusing on three aspects: Questioning ability (doubt that financial information may be inaccurate); Requesting evidence (awareness of the need for additional evidence to verify information); And evaluating motives (identifying potential motives of management).

Moderating variable trait skepticism (TS) is measured using Hurtt's (2010) HPSS scale. Papers must be written in English.

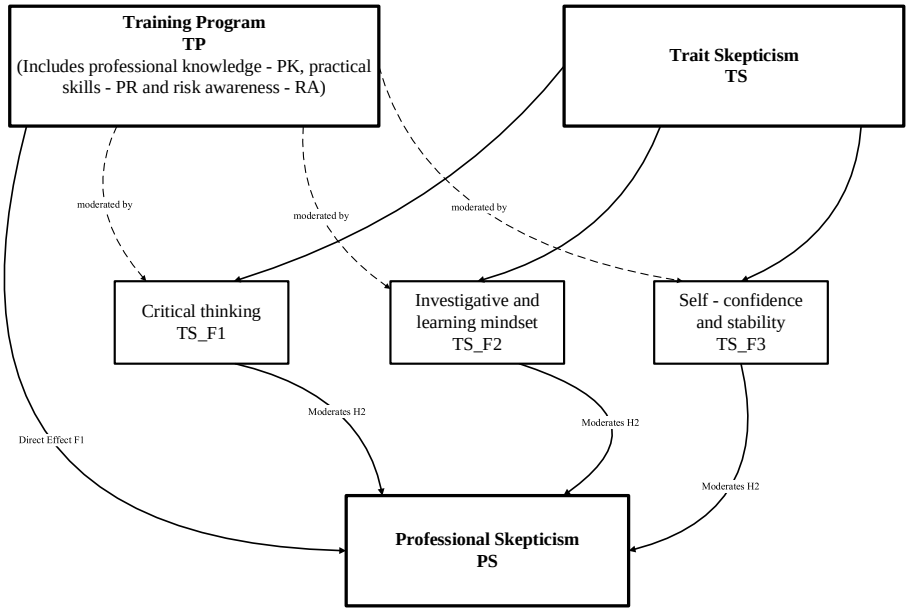

Fig. 1: Research model of the training program's impact on professional skepticism

4. Research methodology

This study employs a mixed-methods approach, combining qualitative and quantitative research sequentially and interactively, to comprehensively evaluate the impact of the training program on the PS of auditing students at a university in Vietnam, while also considering the moderating role of trait skepticism. This method allows for the collection of comprehensive data, combining statistical figures with in-depth insights from interviews, thereby providing a holistic view of the research problem. The qualitative method includes an in-depth literature review and interviews, conducted in two phases: an initial phase to build the theoretical framework, adjust and validate the measurement instruments; and a later phase to deepen and explain complex quantitative findings.

This study employed a cross-sectional mixed-methods design, integrating qualitative and quantitative stages. The research began with qualitative stage 1, which involved a comprehensive literature review to establish the theoretical foundation and initial measurement scales. This was followed by in-depth interviews with students and lecturers. The primary goal of this stage was to refine and validate the survey questionnaire, ensuring its relevance and clarity for the Vietnamese context before the quantitative phase.

Next, the quantitative stage involved administering the finalized survey to a representative sample of auditing students. The collected data were statistically analyzed to test the hypotheses, specifically examining the impact of the training program on PS and the moderating role of trait skepticism.

Finally, qualitative stage 2 was conducted after the quantitative analysis. Supplementary in-depth interviews were held to provide detailed explanations for the complex statistical relationships uncovered, particularly the moderating effects. This stage aimed to capture the nuances behind the numbers and generate practical recommendations for improving the training program.

The qualitative research began with a comprehensive literature review from sources like Google Scholar and JSTOR to establish the theoretical foundation, identify research gaps, and design the initial measurement scale. In-depth interviews were then conducted in two crucial phases. The first phase involved 5 students and 3 lecturers to refine the survey questionnaire, ensuring its relevance and clarity for the Vietnamese context. A second, supplementary phase with 10 students and 3 lecturers was conducted after the quantitative analysis to provide deeper explanations for the complex statistical results and gather recommendations for improving the training program. All interviews were recorded, transcribed, and conducted confidentially.

The quantitative research employed a cross-sectional survey to test the hypotheses. The final questionnaire, developed from established scales and refined through the qualitative interviews, used a 6-point Likert scale. It measured the independent variable training program (TP) with 15 items, the dependent variable PS with 9 items, and the moderating variable trait skepticism (TS) with 30 items from the HPSS scale. A pilot survey with 20 students confirmed the questionnaire's clarity and preliminary reliability. The official survey was distributed to 250 students, yielding 239 valid responses—a 95.6% response rate. This sample size is statistically robust for the analysis, ensuring the findings' reliability and representativeness.

The survey instrument utilized a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). This choice was deliberate, primarily to eliminate the neutral midpoint often present in 5- or 7-point scales. By forcing respondents to express a position of agreement or disagreement, the 6-point scale encourages higher

discrimination and reduces the tendency for respondents to choose the central, non-committal option, thereby potentially improving the variance and predictive power of the constructs (Chang, 1994; Weijters et al., 2010). The data analysis method includes literature review, interview data analysis, and quantitative analysis.

- Literature review: Content analysis of existing research and theories to build the theoretical framework, measurement scales, and guide the quantitative data analysis.
- In-depth Interviews: Interview responses were coded thematically and organized in Excel. The interview results were compared with quantitative data to explain trends or anomalies.
- Quantitative data analysis: Descriptive statistics, reliability analysis of the scale, exploratory factor analysis (EFA), correlation analysis, and regression analysis.

5. Results and discussion

The literature review phase helped identify the research gap regarding PS in the context of auditing students at the Vietnam University. The concepts of PS, trait skepticism, and training program were clearly defined based on Nelson (2009), Hurtt (2010), and Nolder and Kadous (2018), providing a basis for the measurement scale and hypotheses. During the scale adjustment phase, in-depth interviews revealed that most students highly rated the theoretical subjects but noted that the number of practical exercises was limited. Lecturers also agreed that the training program was still theory-heavy. This feedback helped adjust the survey questionnaire to be more suitable.

The study surveyed 239 auditing students. Descriptive statistics for the key variables, all measured on a 6-point scale, are presented in Table 2.

Table 2: Descriptive statistics of study variables (N = 239)

Statistic	PK	PR	RA	PS	TS
Mean	4.9389	4.6946	4.9046	4.9005	4.2180
Median	5.2000	5.0000	5.0000	5.1111	4.3000
Mode	6.00	6.00	6.00	6.00	4.67
SD	1.26655	1.24344	1.17764	1.15758	.63250
Minimum	1.00	1.00	1.00	1.00	1.73
Maximum	6.00	6.00	6.00	6.00	5.60

Overall, students rated the training program highly across all dimensions influencing PS. The mean scores for professional knowledge (PK), risk awareness (RA), and PS were all approximately 4.90, indicating a strong positive perception. Practical skills (PR) were also rated positively, though slightly lower (M = 4.69). Notably, trait skepticism (TS) had the lowest mean score (M = 4.22) and the smallest standard deviation (SD = 0.63), suggesting it is a more inherent and stable characteristic that is less influenced by the training program compared to the other constructs

Table 3 presents the reliability statistics for all measurement scales. The results show that all final scales demonstrated excellent internal consistency, with Cronbach's Alpha values significantly exceeding the recommended threshold of 0.7. Specifically, the Alpha values ranged from 0.962 to 0.976 for the core training program (PK, PR, RA) and PS.

For the trait skepticism (TS) scale, the original Trait Skepticism (TS) scale contained 30 items and showed good initial reliability (Cronbach's Alpha = 0.888). However, a detailed analysis of the Item-Total Statistics revealed eight items (TS1, TS10, TS11, TS16, TS17, TS19, TS25, TS26) with low or negative Corrected Item-Total Correlations. All eight removed items were reverse-scored items. Although intended to measure the reverse aspects of trait skepticism (such as gullibility or compliance), their performance in the Vietnamese cultural context was poor. Respondents exhibited a strong acquiescence bias, leading to unreliable responses for these negatively worded items. Theoretically, their removal was essential to eliminate the confounding effect of cultural response style and ensure that the remaining items consistently and accurately measure the intended construct of dispositional skepticism. After removal, reliability significantly improved (Cronbach's Alpha = 0.963 with 22 items).

Table 3: Reliability statistics

	Cronbach's alpha	N
PK	0.976	5
PR	0.962	5
RA	0.965	5
PS	0.969	9
TS (30 questions)	0.888	30
TS (22 questions after removing 8 questions)	0.963	22

Exploratory Factor Analysis (EFA) was employed to assess the construct validity of the measurement scales, examining their convergent and discriminant validity, and to identify the underlying factor structure. The analysis utilized Principal Component Analysis as the extraction method with Varimax rotation. The criteria for factor retention were Eigenvalue greater than 1, a factor loading of 0.5 or higher, and satisfactory results from the KMO (Kaiser-Meyer-Olkin) measure of sampling adequacy (KMO > 0.6) and Bartlett's Test of Sphericity (Significance < 0.05).

First, EFA was conducted on the items representing the independent variable, Training Program (TP), which comprised three dimensions: professional knowledge (PK), practical skills (PR), and risk awareness (RA). The analysis yielded a KMO value of 0.964, classified as 'excellent,' and Bartlett's Test was significant ($\chi^2 \approx 5677.455$, df = 105, p <

0.001), confirming the factorability of the data. A single factor with an Eigenvalue of 12.372 was extracted, explaining 82.482% of the total variance. This empirical finding suggests that, from the perspective of the respondents, these three dimensions are not distinct but collectively measure one overarching construct: the overall quality and comprehensiveness of the Training Program (TP). To reconcile the theoretical model with the empirical EFA results and to mitigate the issue of severe multicollinearity observed among the individual variables ($r > 0.87$), PK, PR, and RA were collapsed into a single, aggregated independent variable, Training Program (TP), computed as the mean score of their respective items. This step ensures methodological rigors for all subsequent analyses, including the simple and moderated regression models.

Second, EFA was performed on the dependent variable, PS. The data were suitable for factor analysis, with a KMO value of 0.951 and a significant Bartlett's Test ($\chi^2 \approx 2531.859$, df = 36, $p < 0.001$). A single factor with an Eigenvalue of 7.251 was extracted, accounting for 80.563% of the variance. Like the TP scale, rotation was not performed. This confirms the unidimensionality of the PS scale, supporting its use as the dependent variable.

Finally, EFA was applied to the trait skepticism (TS) scale. The remaining 22 items were subjected to Exploratory Factor Analysis using Principal Component Analysis and Varimax rotation with Kaiser normalization.

In the first EFA run, the sample adequacy was excellent (KMO = 0.958, $p < 0.001$). Three factors were extracted (Eigenvalues > 1), collectively explaining 68.662% of the variance. The factors were provisionally named based on item content: Factor 1 (e.g., Critical Mindset), Factor 2 (e.g., Inquisitiveness and Caution), and Factor 3 (e.g., Self-Confidence and Steadiness). However, examination of the Rotated Factor Matrix revealed issues with cross-loading, particularly for items TS3, TS15, and TS23. These items did not load cleanly onto a single factor (loading > 0.4) but instead showed distributed loadings (cross-loadings) across multiple factors. This indicates that their phrasing was ambiguous or that they failed to measure a distinct underlying dimension, thereby weakening the theoretical clarity of the factor structure.

Regarding the final removal and the second EFA run (19 Items), to achieve a parsimonious and theoretically clean factor structure, the three cross-loading items (TS3, TS15, and TS23) were removed, leaving 19 items for the final EFA. The second EFA run confirmed excellent sample adequacy (KMO = 0.954, $p < 0.001$). Again, three factors were extracted, explaining a slightly improved cumulative variance of 69.139%. The final Rotated Factor Matrix (Table 4) confirmed a clean factor structure, with all remaining 19 items loading unambiguously (loading > 0.4) onto only one of the three factors, eliminating cross-loading concerns. This refined 19-item scale was deemed suitable for subsequent analysis. The three final factors were interpreted and named as:

- Factor 1 (Critical thinking – TS_F1): Consists of 11 questions (TS12, TS13, TS14, TS18, TS20, TS21, TS22, TS24, TS27, TS28, TS29, TS30).
- Factor 2 (Investigative and learning mindset – TS_F2): Consists of 4 questions (TS4, TS5, TS8, TS9).
- Factor 3 (Self-confidence and stability – TS_F3): Consists of 3 questions (TS2, TS6, TS7).

This three-factor structure demonstrates that the refined 19-item trait skepticism scale possesses a robust and interpretable factor solution, confirming its validity for further analyses.

Table 4: Rotated component matrix

Item	Component		
	1	2	3
TS4	0.270	0.881	0.214
TS5	0.372	0.755	0.276
TS6	0.352	0.302	0.747
TS8	0.360	0.829	0.190
TS9	0.386	0.795	0.211
TS12	0.596	0.257	0.477
TS13	0.601	0.190	0.502
TS14	0.739	0.281	0.174
TS18	0.710	0.134	0.302
TS20	0.588	0.332	0.159
TS21	0.618	0.306	0.379
TS22	0.716	0.329	0.178
TS24	0.705	0.423	0.213
TS27	0.645	0.420	0.198
TS28	0.722	0.463	0.166
TS29	0.500	0.377	0.367
TS30	0.746	0.327	0.195
TS7	0.409	0.128	0.625
TS2	0.032	0.184	0.854

Extraction method: Principal component analysis; Rotation method: Varimax with Kaiser normalization;

Based on the EFA results, the individual components (PK, PR, RA) were aggregated into the Training Program (TP) construct to resolve severe multicollinearity concerns. Prior diagnostic checks of the initial regression model (using PS as the dependent variable) revealed clear evidence of heteroscedasticity between risk awareness (RA) and PS, visible as a funnel-shaped pattern in the residual scatterplot (Fig. 2). To correct this violation of regression assumptions and maintain model robustness, the dependent variable (PS) was transformed using a base-10 logarithm, resulting in the variable log_PS. Post-transformation diagnostic checks confirmed that the assumption of homoscedasticity was satisfactorily met (Fig. 3), with the residuals now demonstrating a random and even scatter. The main hypothesis regarding the direct impact of the training program on PS (H1) was subsequently tested using a single simple linear regression model with TP as the independent variable and log_PS as the dependent variable.

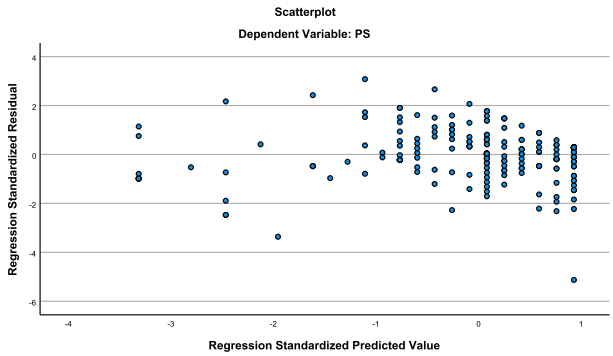

Fig. 2: Residual scatterplot (dependent variable: PS), showing heteroscedasticity (funnel shape)

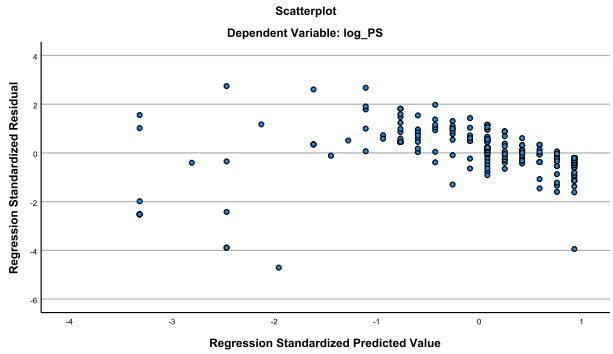

Fig. 3: Residual scatterplot (dependent variable: log_PS), confirming homoscedasticity (random scatter)

Following the transformation of the dependent variable to log_PS and the aggregation of independent components into TP, the assumptions of the Ordinary Least Squares model were rigorously checked to ensure the statistical validity of the final regression analysis. The scatterplot for the corrected model using the log_PS variable indicates that the initial violation has been successfully resolved. The data points are distributed randomly and evenly around the zero line, with no evident systematic patterns (Fig. 4). This confirms that the assumptions of homoscedasticity and linearity have been satisfactorily met. Examination of the Histogram and the Normal P-P Plot for the standardized residuals revealed that the data points closely follow the expected normal distribution. The Histogram showed a distribution that approximated a bell-shaped curve, and the Normal P-P Plot demonstrated that the observed cumulative probabilities aligned closely with the expected cumulative probabilities, indicating that the residuals are approximately normally distributed. Furthermore, the meaning of the residuals was virtually zero (1.37E-15), which is consistent with the Ordinary Least Squares requirements. Given the cross-sectional nature of the data and the random scatter of residuals observed in the homoscedastic plot, the assumption of independence of errors is considered met. In conclusion, the diagnostic checks confirm that the transformed regression model (with TP as the predictor and log_PS as the outcome) meets all critical Ordinary Least Squares assumptions, establishing the foundation for reliable and unbiased inference from the regression results.

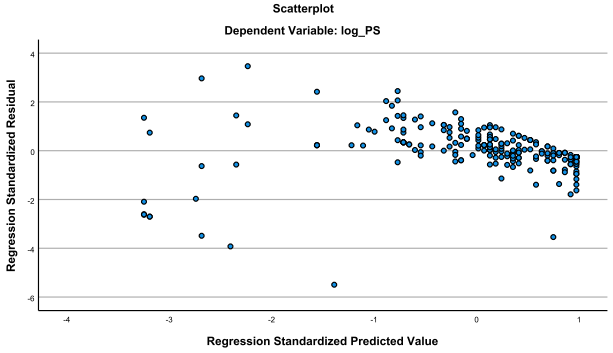

Fig. 4: Corrected log_PS residuals

The Pearson correlation analysis shows a strong linear relationship between TP and the log-transformed PS (log_PS). The Pearson correlation coefficient (R) is 0.841, indicating a very strong positive correlation. The coefficient of determination (R^2) is 0.707, meaning that the Training Program (TP) accounts for 70.7% of the variance in PS (log_PS). This indicates a high explanatory power for the model, suggesting TP is a highly effective predictor of PS.

The model is highly significant (F = 571.716, p < 0.001). This confirms that the linear regression model provides a significantly better fit to the data than a null model, and that TP is a statistically valid predictor of log_PS.

The results for testing the hypothesis H1 show that the unstandardized coefficient (B) for TP is 0.114, which is highly statistically significant (t = 23.911, p < 0.001). The positive coefficient (B = 0.114) indicates that a one-unit increase in the quality of the training program (TP) leads to an increase of 0.114 units in the log_PS score. The standardized coefficient (β) is 0.841. The relationship can be expressed as:

$$log\_PS = 0.114 + 0.114 \times TP \quad (1)$$

In conclusion, given the positive sign and the high level of statistical significance, Hypothesis H1 is strongly supported. The results confirm that the quality and comprehensiveness of the training program (TP) have a substantial positive impact on students' PS.

Based on the EFA results, composite variables were constructed for subsequent analysis. The scales for professional knowledge (PK), practical skills (PR), and risk awareness (RA) were combined into a single aggregate variable, Training Program (TP), computed as the mean of their respective items. This approach simplified the model and mitigated multicollinearity concerns identified in prior analysis. Similarly, based on the EFA for trait skepticism (TS), three distinct factors were derived: Critical thinking (TS_F1), investigative and learning mindset (TS_F2), and self-confidence and stability (TS_F3), each represented by the meaning of their constituent items. The dependent variable, log_PS, was retained to correct for heteroscedasticity.

A Pearson correlation analysis was conducted to examine the relationships among the key variables (Table 5). All variables demonstrated positive and statistically significant correlations with log_PS (p < .001). The training program (TP) exhibited the strongest correlation (r = 0.841). Among the trait skepticism factors, investigative and learning mindset (TS_F2) showed the strongest association with log_PS (r = 0.837), followed by critical thinking (TS_F1; r = 0.724) and self-confidence and stability (TS_F3; r = 0.442).

To test the moderating effects, a moderated regression analysis was performed. The independent variables (TP, TS_F1, TS_F2, TS_F3) were meant to reduce multicollinearity arising from the interaction terms, creating the variables TP_c, TS_F1_c, TS_F2_c, and TS_F3_c. The interaction terms were then computed as the product of each mean-centered trait skepticism factor and TP_c (e.g., TP_TS_F1 = TP_c ×TS_F1_c).

Table 5: Correlations (N = 239)

Variable	log_PS	TS_F1	TS_F2	TS_F3	TP
log_PS	1				
TS_F1	0.724**	1			
TS_F2	0.837**	0.760**	1		
TS_F3	0.442**	0.667**	0.546**	1	
TP	0.841**	0.737**	0.811**	0.462**	1

**: p < .01 (2-tailed)

Three separate hierarchical regression models were estimated to test the moderating role of each trait skepticism factor:

Model 1 (TP × TS_F1):

$$log\_PS = \beta 0 + \beta 1 \times TP\_c + \beta 2 \times TS\_F1\_c + \beta 3 \times (TP\_c \times TS\_F1\_c) + \epsilon \quad (2)$$

Model 2 (TP × TS_F2):

$$log\_PS = \beta 0 + \beta 1 \times TP\_c + \beta 2 \times TS\_F2\_c + \beta 3 \times (TP\_c \times TS\_F2\_c) + \epsilon \quad (3)$$

Model 3 (TP × TS_F3):

$$log\_PS = \beta 0 + \beta 1 \times TP\_c + \beta 2 \times TS\_F3\_c + \beta 3 \times (TP\_c \times TS\_F3\_c) + \epsilon \quad (4)$$

Prior to interpreting the results, diagnostic checks—including analysis of histograms, P-P plots, and scatterplots of residuals—were conducted and confirmed that the assumptions of normality, linearity, and homoscedasticity were met for all models.

The overall fit and significance of the three moderated regression models are summarized in Table 6. All models were statistically significant (p < 0.001), explaining a substantial proportion of the variance in PS. The model incorporating the investigative and learning mindset (TS_F2) as a moderator demonstrated the strongest explanatory power (R^2 = 0.864), followed by the models with critical thinking (TS_F1; R^2 = 0.812) and self-confidence and stability (TS_F3; R^2 = 0.794) as moderators.

Table 6: Summary of moderated regression analysis for predicting professional skepticism

Model	R	R^2	Adj. R^2	SE	ANOVA	df	Sig.	Sum of squares
1: TP × TS_F1	0.901	0.812	0.810	0.07025	F = 339.351	(3, 235)	< 0.001	Regression: 5.024 Residual: 1.160 Total: 6.184
2: TP × TS_F2	0.929	0.864	0.862	0.05991	F = 495.907	(3, 235)	< 0.001	Regression: 5.340 Residual: 0.844 Total: 6.184
3: TP × TS_F3	0.891	0.794	0.791	0.07367	F = 301.504	(3, 235)	< 0.001	Regression: 4.909 Residual: 1.275 Total: 6.184

The detailed results of the regression analyses, including the coefficients for the main and interaction effects, are presented in Table 7. Variance Inflation Factor (VIF) values for all predictors were well below the threshold of 10, indicating that multicollinearity was not a concern.

Table 7: Results of moderated regression analysis

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
		B	SE	Beta			Tolerance	VIF
1	(Constant)	0.692	0.005		135.868	0.000		
	TP_c	0.065	0.006	0.477	10.366	0.000	0.377	2.655
	TS_F1_c	0.028	0.007	0.161	3.803	0.000	0.446	2.242
	TP_TS_F1	-0.029	0.003	-0.379	-10.121	0.000	0.568	1.760
2	(Constant)	0.696	0.004		155.576	0.000		
	TP_c	0.037	0.006	0.270	6.074	0.000	0.294	3.400
	TS_F2_c	0.044	0.006	0.315	7.375	0.000	0.318	3.142
	TP_TS_F2	-0.025	0.002	-0.439	-12.195	0.000	0.449	2.229
3	(Constant)	0.687	0.005		134.188	0.000		
	TP_c	0.084	0.005	0.618	15.932	0.000	0.584	1.712
	TS_F3_c	0.016	0.005	0.103	3.078	0.002	0.778	1.286
	TP_TS_F3	-0.032	0.003	-0.339	-9.734	0.000	0.724	1.382

As shown in Table 7, the training program (TP) demonstrated a significant positive main effect on PS across all three models. The facets of trait skepticism also showed significant positive direct effects, with the investigative and learning mindset (TS_F2; β = 0.315) and critical thinking (TS_F1; β = 0.161) having stronger independent influences than self-confidence and stability (TS_F3; β = 0.103). Crucially, the interaction terms between the training program and each trait skepticism factor were all negative and statistically significant. This consistent pattern of negative moderation indicates that the positive relationship between the training program and PS is attenuated for students with higher pre-existing levels of these inherent traits. In other words, the beneficial effect of the formal training program is most potent for students who begin with lower levels of critical thinking, investigative mindset, or self-confidence and stability. In summary, the analysis confirms that the training program is a key driver of PS. Furthermore, the results reveal a complex moderating role of trait skepticism. All three facets of trait skepticism (critical thinking, investigative and learning mindset, and self-confidence and stability) significantly moderate the relationship between the training program and PS. The consistently negative interaction effects across all models suggest that the efficacy of the training program is contingent upon students' pre-existing skeptical traits; its positive impact is most pronounced for students who begin with lower levels of these inherent characteristics.

5.1. The direct impact of the training program (H1)

The finding that the Training Program (TP) has a strong positive and highly significant impact on PS (β = 0.841, $p < 0.001$) is consistent with an extensive body of international literature (Nelson, 2009; Hurtt et al., 2013). This result confirms the foundational role of formal education in developing this crucial competency, particularly within the context of Vietnamese higher education. The high R^2 of 0.707 underscores TP as the single most potent predictor of a student's PS level. This quantitative finding is strongly corroborated by the interview data. Participants consistently highlighted the pivotal role of core auditing subjects. As one lecturer noted, *"In our Auditing Practice course, we use detailed case studies that simulate real client dilemmas. Students cannot simply apply standards mechanically; they are forced to question the evidence, assess management's motives, and justify their judgments."* This pedagogical approach, which immerses students in realistic scenarios, directly fosters the questioning mind and critical assessment of evidence, aligning with the findings of Nelson (2009) and Carpenter et al. (2011) on the efficacy of experiential learning.

5.2. Counter-intuitive moderation effect of trait skepticism (H2)

The study's most significant and theoretically challenging finding is the rejection of the implicit conventional assumption regarding the interaction between dispositional traits and formal training. The analysis confirms Hypothesis H2: All three facets of Trait Skepticism (TS) exhibited a statistically significant negative interaction effect with TP (e.g., the strongest interaction was TP x TS_F2, β = -0.439, $p < 0.001$).

Conventional theory often posits a synergistic effect, if high TS (e.g., high Critical Thinking) would amplify the benefits of professional training. Our results explicitly contrast with this conventional assumption. The consistent negative interaction term demonstrates a "diminishing returns" effect: the positive relationship between TP and PS is attenuated (weakened) for students with higher pre-existing levels of TS.

The qualitative data were instrumental in elucidating the underlying mechanism of these diminishing returns, revealing three key theoretical implications:

- Ceiling effect and saturation: The diminishing returns suggest a saturation point or ceiling effect for the PS construct. Lecturers' insights suggested that students with high inherent traits already

operate close to the maximum possible level of observable PS. For them, the training primarily serves to reinforce and channel their existing skepticism, resulting in limited marginal capacity for further incremental gains.

- Differential conversion efficiency: The interviews confirmed that for students with lower initial levels of these traits, the structured training program is transformative. One student commented, *"Before the auditing courses, I just accepted information at face value. The exercises... completely changed how I think."* For this group, the training acts as a crucial catalyst, effectively "pulling them up" by providing foundational tools they lack. This highlights that training is more *efficient* in converting effort into PS gains for individuals with low TS.
- Potential for maladaptive skepticism (resistance): The finding suggests that at very high levels, TS might transition from an adaptive trait to a maladaptive barrier (resistance). This innate skepticism, or high TS acting as a defense mechanism against formal methods, inadvertently attenuates the magnitude of the training's positive influence on students' professional output.

This study thus makes a crucial contribution by demonstrating that the interaction between dispositional traits and professional interventions is not universally synergistic. Instead, it suggests a more complex relationship where very high levels of a beneficial trait encounter decreasing marginal returns.

6. Conclusions

This study provided a comprehensive assessment of the impact of the university training program (TP) on the PS of auditing students in Vietnam, while simultaneously uncovering the complex moderating role of trait skepticism (TS). The findings lead to three primary substantive conclusions:

- Training is the primary driver: The university training program emerged as the most potent and robust predictor of students' PS. The quantitative results ($R^2 = 0.707$), enriched by qualitative insights, strongly confirm that practical, scenario-based learning embedded in core auditing subjects is instrumental in cultivating the questioning mindset and critical evaluation of evidence that underpin PS.
- Trait skepticism's direct contribution: The facets of trait skepticism, particularly an investigative and learning mindset and critical thinking, demonstrated significant positive direct effects on PS. This underscores that inherent personal characteristics are substantial contributors to the development of this professional competence, functioning as the foundational "seed."
- Complex moderation dynamic (counter-intuitive finding): Most significantly, this study reveals a complex, counter-intuitive moderation dynamic. All three TS factors were found to negatively moderate the TP → PS relationship. This result is crucial as it explicitly challenges the conventional assumption of a synergistic benefit, instead demonstrating a diminishing marginal returns effect. Specifically, the positive effect of the training program is most pronounced for students who begin with lower levels of inherent skepticism, acting as a crucial developmental catalyst (a finding strongly supported by qualitative insights). Conversely, for students already possessing high levels of TS, the training program serves more to reinforce and structure their existing tendencies, resulting in a diminished incremental benefit (suggesting a ceiling effect).

The findings carry significant implications for both theory and practice in auditing education. This research makes two primary theoretical contributions to the literature. First, it provides contextual validation and extension by offering robust empirical evidence from the under-researched context of a developing country, Vietnam. This confirms the critical role structured university programs play in fostering PS, thereby validating and contextualizing international findings within a new educational landscape. Second, and more profoundly, the study significantly advances the theory of PS. It moves beyond simplistic direct-effect models by empirically demonstrating and qualitatively explaining the negative moderating effect of trait skepticism. The discovery of decreasing marginal returns for high-trait individuals introduces a novel theoretical mechanism for understanding individual differences in response to training, providing a more sophisticated person-situation interactionist perspective to the discourse. This new perspective argues that the effectiveness of professional interventions is fundamentally contingent on the recipient's dispositional starting point, thereby deepening the theoretical understanding of how PS is developed.

For auditing educators and curriculum designers, the findings offer actionable guidance for enhancing program effectiveness, centering on the necessity of moving beyond a uniform, standardized model. A central recommendation is the adoption of a differentiated instructional approach to optimize outcomes based on students' pre-existing traits.

- Specifically, for students with high trait skepticism, the curriculum should offer advanced challenges, such as complex, ambiguous cases and independent research, to prevent stagnation and foster continued critical growth.
- Conversely, for students with lower initial skepticism, the instructional focus must be on building foundational competencies through scaffolded practical exercises, ample feedback, and a supportive classroom environment that explicitly encourages questioning and critical thinking.

Furthermore, the strong link between practical application and the development of PS necessitates a continued expansion of experiential learning across the curriculum. This involves a strategic increase in the use of real-world auditing scenarios, detailed case studies, and immersive simulations that require students to apply skeptical judgment in realistic contexts. Finally, efforts to foster PS must be holistic, entailing the systematic integration of foundational skills development from the early stages of the academic program. Essential soft skills such as critical thinking, problem-solving, and self-directed learning, which constitute the core elements of trait skepticism (TS), should be intentionally woven into the fabric of the curriculum, ensuring students develop both the necessary knowledge and the inherent mindset required for skeptical professional practice.

Despite its substantial contributions, this study is subject to several limitations that present avenues for future research. Generalizability is limited by the fact that the data were collected from a single university; therefore, future studies should aim to replicate this research across multiple institutions in Vietnam or other developing economies. Furthermore, the reliance on self-reported data for measuring trait skepticism and PS introduces the potential for common method bias. Addressing these methodological concerns would require future research to employ more objective measures, such as behavioral assessments or evaluations from instructors, to strengthen the results. Regarding research design, the current cross-sectional approach captures only a snapshot in time; thus, a longitudinal study tracking students from their entry into the program through their early professional careers would provide invaluable insights into the evolution and sustainability of PS. Finally, future research could expand the scope to external factors, investigating the interplay between educational interventions and subsequent organizational or cultural factors in the workplace that ultimately influence the application and maintenance of skeptical judgment.

List of abbreviations

Adj.	Adjusted
ANOVA	Analysis of variance
B	Unstandardized regression coefficient
df	Degrees of freedom
EFA	Exploratory factor analysis
HPSS	Hurtt's professional skepticism scale
KMO	Kaiser–Meyer–Olkin measure of sampling adequacy
N	Sample size
p	Significance level (probability value)
PK	Professional knowledge
P-P plot	Probability–probability plot
PR	Practical skills
PS	Professional skepticism
RA	Risk awareness
R	Correlation coefficient
R^2	Coefficient of determination
SD	Standard deviation
SE	Standard error
TP	Training program
TP_c	Mean-centered training program variable
TP_TS_F1	Interaction term between TP and TS_F1
TP_TS_F2	Interaction term between TP and TS_F2
TP_TS_F3	Interaction term between TP and TS_F3
TS	Trait skepticism
TS_F1	Trait skepticism factor 1 (critical thinking)
TS_F1_c	Mean-centered trait skepticism factor 1
TS_F2	Trait skepticism factor 2 (investigative and learning mindset)
TS_F2_c	Mean-centered trait skepticism factor 2
TS_F3	Trait skepticism factor 3 (self-confidence and stability)
TS_F3_c	Mean-centered trait skepticism factor 3
VIF	Variance inflation factor
β (Beta)	Standardized regression coefficient

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Compliance with ethical standards

Ethical considerations

This study was conducted in compliance with ethical standards. All participants provided informed consent prior to participation, and their privacy and confidentiality were protected throughout the study.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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