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Development of Information System Audit Syllabus with Critical Thinking Based Approaches

R Nelly Nur Apandi[1]*, Alfira Sofia[2]
[1]*universitas Pendidikan Indonesia. E-Mail: Nelly.Nna@Upi.Edu*
[2]*universitas Pendidikan Indonesia*

Abstract

Increased use of technology causes the need for information system audits to improve. Higher education requires curriculum renewal continuously to keep pace with the changing industry needs. Information system audit learning is needed that emphasizes critical thinking to respond to change. The purpose of this study is to determine the learning objectives and learning materials that are important in information systems audit courses and also to find out whether the learning of audit information systems with a critical thinking analysis approach can improve student abilities. This study uses a qualitative method. The process of collecting data through in-depth interviews with participants who have competence in the field of information systems auditing, financial statement auditing, accounting education, and corporate governance. Data analysis techniques used a thematic approach. Data validated by source triangulation and theory triangulation. The audit learning syllabus must adjust to industry needs so that graduates can contribute more. Learning material must be adapted to the achievement of cognitive, affective, and psychomotor abilities. The method of learning by doing stimulus-response to teach students to think critically is fundamental so that students can manage the risks they face when working later.

Keywords: Information System Audit Syllabus, Critical Thinking

1. Introduction

The use of information technology in many ways causes significant changes in economic and business processes (Taipaleenmäki & Ikäheimo, 2013); (Liu, Hsu, & Yen, 2018). It is rare to find large or medium scale companies that still use data processing manually (Gomaa, Markelevich, & Shaw, 2011). Requests for financial reporting information use technology-based information systems that help assist accountants in financial reporting (Ghasemi, Shafeiepour, Aslani, & Barvayeh, 2011); (Ed & Willis, 2016). However, having to ask for an information system error can result in an inaccurate presentation of financial statements. By requesting the auditor, the information system needed to give credence to the auditor who conducts an audit of financial statements, an accounting information system that uses companies that produce quality financial reports (Sneller, Bode, & Klerkx, 2016).

The information systems audit aims to secure IT components, maintaining data integrity, achieving the effectiveness and efficiency of existing information systems. To achieve the objectives of the audit, an information system auditor must have knowledge and expertise not only in the field of accounting, corporate governance, but the fundamental expertise of an information system auditor is mastery in the field of information technology (Andiola, Masters, & Norman, 2020). The growing need for information systems audit services encourages public accountants or internal auditors to be able to have other specific competencies in the field of information systems auditing (Moorthy & Seetharaman, 2011); (Merhout & Havelka, 2008)

In order to meet the market needs of financial statement audit services, the accounting study program as a printer for prospective auditors must also make efforts to develop learning materials that adapt to industry needs (Gaviria, Arango, & Valencia, 2015). The era of the industrial revolution 4.0 also triggered the need for information systems auditors who have useful competence. Information systems audit courses in accounting courses at the undergraduate level in Indonesia began to be

widely adopted in the lecture curriculum since the early 2010s and became compulsory courses the following year. However, before the 2010s, information systems audit courses in Indonesia for undergraduate programs were mostly used as elective courses. While in some graduate programs in accounting, the course is a compulsory subject. The increasing number of accounting study programs that have an information system audit course as a compulsory subject shows the harmony between the academics curriculum and industry needs.

However, due to rapid changes in information technology, efforts to pursue harmony between academic curricula and industry needs become challenging to achieve in a short time (Santouridis, 2015); (Sledgianowski, Gomaa, & Tan, 2017). Another weakness is that the learning methods provided in information system audit lectures are not enough to use exploratory approaches that explain definitions and concepts only. An increase also follows changes in information technology in crimes committed by using information technology, thus requiring academics always to think critically to identify risks arising from the use of information technology (Kuhn & Sutton, 2010).

Critical thinking in the audit process is essential because auditors are always required to be skeptical in every audit assignment. Critical thinking is an attempt at systematic analysis in responding to a thought or condition that we experience (Alessio, Avolio, & Charles, 2019). The auditor may not assume the auditee is lying, but that does not mean the auditor believes and does not question the conditions that occur in the auditee (Peytcheva, 2013). Accounting students as information system auditor candidates must have the ability to analyze auditee critical information systems (Sutton & Arnold, 2013). Therefore learning information systems audit at this time must be able to equip students these abilities (Santouridis, 2015).

Much of the knowledge, skills, and expertise of the information system auditor to be achieved will depend on the syllabus of the course itself (Sledgianowskiet al., 2017); (Andiola et al., 2020). Therefore it is crucial to do research that explains the practical syllabus and what learning methods can be faster to align with industry needs, especially related to information systems audit courses. Previous research on information systems auditing has focused more on the practice of the information system audit profession itself. As in research (Moorthy & Seetharaman, 2011); (Manita, Elommal, Baudier, & Hikkerova, 2020) who want to see economic digitalization on the role of auditors. Research conducted (Sneller et al., 2016); (Kim, Teo, & Bhattacherjee, 2017) focuses on looking at the characteristics of information systems auditors in performing their duties. While there is not much research relating to curriculum development that is relevant to industry needs. The research conducted (Andiola et al., 2020) focuses on curriculum development in the field of accounting, especially the analysis of financial statements due to the use of information technology. While the research conducted (Sledgianowski et al., 2017) focuses on developing accounting curricula to meet industry needs due to the existence of big data and information technology.

This research has a contribution because it focuses on learning objectives, learning materials, and learning methods that can increase the auditor's professional skepticism, especially related to various possible audit risks for the audit assignment of information systems that will be faced by the auditor. The purpose of this study is to determine the learning objectives and learning materials that are important in information systems audit courses and also to find out whether the learning of audit information systems with a critical thinking analysis approach can improve student abilities.

2. Literature Review

2.1. Information System Auditing

Along with the increasing use of information technology, awareness of the need for audits on the development of information systems is very much needed. Audits in the information technology environment focus on computer-based aspects of corporate information systems. Information technology audit is the process of gathering and evaluating audit evidence to determine whether the computer system used has been able to protect organizational assets, be able to maintain data integrity, can help achieve organizational goals effectively, and use resources efficiently. An information

system audit is a combination of various kinds of science including audit, management information systems, and accounting, and behavior (Utomo & Suhartono, 2018: 14)

Information system audit, according to Gondodiyoto (2007: 60), includes two things, namely (1). Information system audit carried out in the framework of auditing financial statements; is an examination of aspects of information technology in accounting information systems. The audit is carried out following the provisions of the professional standards of public accountants that the auditor must understand the system and internal control and conduct substantive tests. The computerized accounting process causes internal control tests conducted on computer programs, and substantive tests are carried out on existing files or data and (2) Information system audit conducted about information technology governance; is an operational audit (accurately) on the management of information resources regarding the effectiveness, efficiency, and economization of the functional units of information systems in an organization, data integrity, saving assets, reliability, confidentiality, availability, and security

2.2. Learning Objectives Based on Taxonomy Blooms

According to Bloom, all activities involving the brain are divided into 6 levels according to the lowest level to the highest symbolized by C (Cognitive) (In a book entitled Taxonomy of Educational Objectives. Handbook 1: Cognitive Domain published by McKey New York. Benjamin Bloom in 1956) namely: C1 (Knowledge); C2 (Comprehension); C3 (Application); C4 (Analysis); C5 (Synthesis); C6 (Evaluation). While the affective domain is divided into 5 levels, namely: A1 (Receiving / Attending); A2 (Responding); A3 (Valuing); A4 (Organization); A5 (Characterization). The psychomotor domain is divided into 4 levels: P1 (Imitating); P2 (Manipulating); P3 (Experience) and P4 (Articulation)

2.3. Social Construction Learning Theory and Auditors Understanding of Audit Evidance

The success of the teaching and learning process will be seen from the ability of students to master the material. There are various levels in the mastery of the material, the higher, the better the students in mastery. Taxonomy Blooms were first introduced in 1956 by Benjamin S Bloom who emphasized 3 (three) tenure:

1. cognitive aspects; This domain includes the ability to restate the concepts or principles that have been learned, which relate to the ability to think, competence in gaining knowledge, recognition, understanding, conceptualization, determination, and reasoning.
2. Affective Aspects: Affective domains are those that relate to attitudes, values, feelings, emotions, and the degree of acceptance or rejection of an object in teaching and learning activities.
3. Psychomotor Aspects: This domain includes the competence to do work involving members of the body as well as competencies related to physical movements (motor) consisting of reflex movements, fundamental movement skills, perceptual abilities, accuracy, complex skills, as well as expressive and interpretative.

Auditors will always face a variety of audit evidence. Each audit evidence will be linked by the auditor to produce appropriate audit conclusions. The auditor needs critical thinking of audit evidence because often, audit evidence has a meaning that is different from the actual condition with what appears on the surface. Critical thinking is defined by Scriven and Paul (1987) at The 8th Annual International Conference on Critical Thinking, and Education Reform as a mental process carried out actively and intelligently conceptualizing, applying, analyzing, and informing evidence gathered based on reading, experience, reflection, and communication with other parties (Xu, 2011). The communication process with other parties is part of an effort to think critically about the audit evidence obtained. The communication process carried out by the auditor to criticize audit evidence through a brainstorming process with the audit team.

The link between the thought process and discussion with the audit team can be explained based on learning theories of social construction and cognitive aspects (Hajhosseiny, 2012). Social construction learning theory emphasizes that reality is socially constructed. Reality is a phenomenon that exists. To ensure that it is real and has unique characteristics, humans need knowledge

(Berger & Luckmann, 1966). In the theory of social construction, Learning about mutual knowledge makes social interaction important for cognitive development (Vygotsky, 1934).

In the process of understanding the reality of audit evidence based on the theory of social construction learning developed by Vygotsky (1934), it means that auditors can understand the reality of audit evidence through the process of social interaction among audit teams. Trotman, Bauer, & Humphreys (2015) say, social interaction is the most crucial part of the cognitive process, which emphasizes that an auditor must think critically about audit evidence. Social interaction between auditors through a brainstorming process can provide a better understanding of audit evidence. The involvement of an auditor with audit team members in social interaction can open opportunities to evaluate and improve understanding because there is an interaction between the auditor's thoughts with the thoughts of others.

The auditor can give a different meaning from the available evidence, because auditor can be considered specific audit evidence, but can escape the attention of other auditors (Hoffman & Patton, 1997; Shelton, 1999). This is known as selective attention (Lane & Pearson, 1982). Therefore, the auditor needs a brainstorming process that can connect the linkages of the available evidence based on the interaction between the thoughts of an auditor with other auditors. Brainstorming is very useful, especially for novice auditors who do not have much experience in gathering and evaluating evidence (Tang & Karim, 2019).

3. Methodology

This study used qualitative research methods. This type of qualitative research used is descriptive qualitative research, where data collected in text form. The data used are primary. The data collection process is carried out by conducting in-depth interviews with informants who have expertise in the field of information systems auditing, financial statement auditing, accounting education, and corporate governance. Interview techniques using semi-structured techniques. The following is the research respondent table:

Table 1: Research participants

Participants	**Expertise**	
Participants 1	Information System Audit	Has more than five years of auditing experience and is a partner manager
Participants 2	Audit of Financial Statements	Has more than five years of auditing experience and is a senior auditor
Participants 3	Accounting education	Having experience as a teacher and researcher in the field of accounting education for more than 15 years
Participants 4	Corporate governance	Has to experience as a teacher and researcher in the field of accounting for 15 years

Data analysis techniques in this study used the Miles and Huberman models. In the data analysis process there are data reduction activities, data presentation and conclusion making. The data collected will then be tested for the credibility of the data using source

4. Results and Findings

The accounting study program is one of the study programs that have an essential role in giving birth to prospective public accountants or auditors. The development of information technology forces and encourages changes in the workings of auditors in conducting the audit process, which also follows the development of information technology. The increasing need for information systems auditors, the accounting study program must also develop a syllabus of courses that are following current industry needs. I want to explain the methods of

learning information systems audit courses that are effective in efforts to improve the quality of audit resources.

4.1. Syllabus of Information Systems Audit Course

The syllabus has an essential role in determining the success of the teaching and learning process because the syllabus is a reference used by lecturers to provide lecture material. The better and more systematic learning planning made by teaching staff, the better the quality of learning. After an in-depth interview process and then a data reduction process, an overview can be obtained as follows:

4.1.1. Learning Objectives

In the learning process of information system audit, learning achievement associated with 3 (three) learning domains developed by Blooms, namely cognitive, affective, and psychomotor. In the cognitive realm, the learning objectives will be related to the ability to restate the concepts or principles that have been learned, which relate to the ability to think, competence in gaining knowledge, recognition, understanding, conceptualization, determination, and reasoning. Whereas in the affective domain, the domain is related to attitudes, values, feelings, emotions, and the degree of acceptance or rejection of an object in teaching and learning activities. While psychomotor abilities include competence in doing work by involving limbs as well as competencies related to physical movements (motor) consisting of reflex movements, necessary movement skills, perceptual abilities, accuracy, complex skills, these three domains are then developed to set learning objectives for information systems auditing.

First,in the cognitive domain, audit learning information systems focus on understanding, analysis in planning, implementing, and reporting audits on an entity that uses information technology-based information systems. Therefore, related to cognitive domain, the objectives of audit learning are based on in-depth interviews with various informants the following descriptions are obtained: 1) An understanding of the company's business processes and internal controls on entities that use information technology-based information systems 2) Understanding of risk concepts and risk control for entities that use information technology-based systems; 3) An understanding of the use of technology and its impact on input, processes and outputs of accounting information systems; 4) Understanding of general controls and application controls on entities that use information technology-based information systems; 5) Analyze general controls and existing application controls whether they can support the entity's strategy and objectives, specifically related to accounting performance; 5) Conduct an assessment of the risks of weaknesses in general control and application control; 6) Perform an overall information system audit plan; 7) Conduct an audit process and 7) Make an audit report.

Second, in the affective domain, information system audit learning focuses on providing confidence that information system auditors have a frame of reference and a code of ethics that is the basis of every assignment. Increasing cases of fraud in financial statements involving auditors, it is necessary to be aware of the impact of fraud in strong financial statements, especially if the information system auditor is involved in the fraudulent act. Therefore, related to the affective domain, the learning objectives of the information system audit based on the results of in-depth interviews with various informants, the following descriptions are obtained: 1) Having the attitude to comply with the information system auditor's code of ethics; 2) Having an attitude of professional skepticism in carrying out his audit duties; 3) Have an attitude to comply with laws and regulations related to information technology.

Third, in the psychomotor domain, information system audit learning focuses on the mastery of computer-assisted audit techniques. Learning information system audits will certainly encourage auditors to make an in-depth understanding of the existing technical infrastructure in an entity, including understanding hardware, software, and also the brain ware involved in it. Therefore, related to the psychomotor domain, the objectives of learning information system audit based on the results of in-depth interviews with various sources will obtain the following description: 1) Able to apply one of the computer-assisted audit techniques with Generalized Audit Software, Audit Command Language.

The following is a summary table of interviews with informants about the objectives of information system audit learning (this table is presented by reducing interview results using keywords: information system audit learning objectives):

Table 2: Summary of Interview Results

Participants	**Expertise**	
Participants 1	Information System Audit	The main objective in learning information systems audit for undergraduate students majoring in accounting will certainly be different from the graduate level and for other study programs. In essence, learning objectives are adjusted to the current market needs of information systems audit services. The core of learning is related to the ability of auditors to understand the company's business processes by using information technology, understanding risk and control systems on entities using information technology, understanding information technology and its impact on financial reporting, audit planning, implementation and also reporting on information system audits
Participants 2	Audit of Financial Statements	For auditors who conduct audits of financial statements, the information system audit process is very helpful to improve the quality of financial statement audits, because by assessing the risk of controlling the information system it can be believed that the financial statements generated from the information system can be appropriate. Therefore it is important for the information system auditor to first enter the field (auditee) to conduct an audit of the information system used by the entity. So the learning objectives must be directed to see the ability of information systems both from the system life cycle, application development, input control, process control, output control, database control and communication control.
Participants 3	Accounting education	In learning theory, the development of learning can be seen from the cognitive, affective and psychomotor abilities of students. For example from cognitive abilities that have various levels, including knowing, understanding, applying, analyzing, evaluating and creating. While in affective abilities ranging from receiving, responding, assessing, managing and living. As for psychomotor from imitating, manipulating, experiencing and articulating. The learning objectives of an information system audit must be adjusted to what level the ability will be achieved, because of course the information system audit courses at the undergraduate and graduate levels will be different and also with the level of the accounting profession
Participants 4	Corporate governance	Corporate governance is an indicator of an important element in a company's success, because in general a company with good management will be able to achieve the hopes and desires of all the stakeholders in the company. One form of good corporate governance is transparency and accountability. One effort that can encourage the enforcement of the corporate governance pillar is the company's accounting information system. The more credible the system used, the better the quality of financial statements. Therefore the role of information systems auditors to see the depth of information technology-based accounting information systems owned by the company will be very important. Now, by increasing the existence of fraudulent financial statements, learning of information systems

		auditing from a corporate governance perspective must also include this in the learning of information systems auditing.

The interviews are then reduced and displayed as in table 2 above. Furthermore, the data is tested for its credibility by using source triangulation and theory triangulation. Then the data is processed using a thematic approach.

Based on the results of data processing, it is obtained an understanding that the learning outcomes of the information system audit course are associated with three things namely cognitive, affective and psychomotor aspects are illustrated in chart one below:

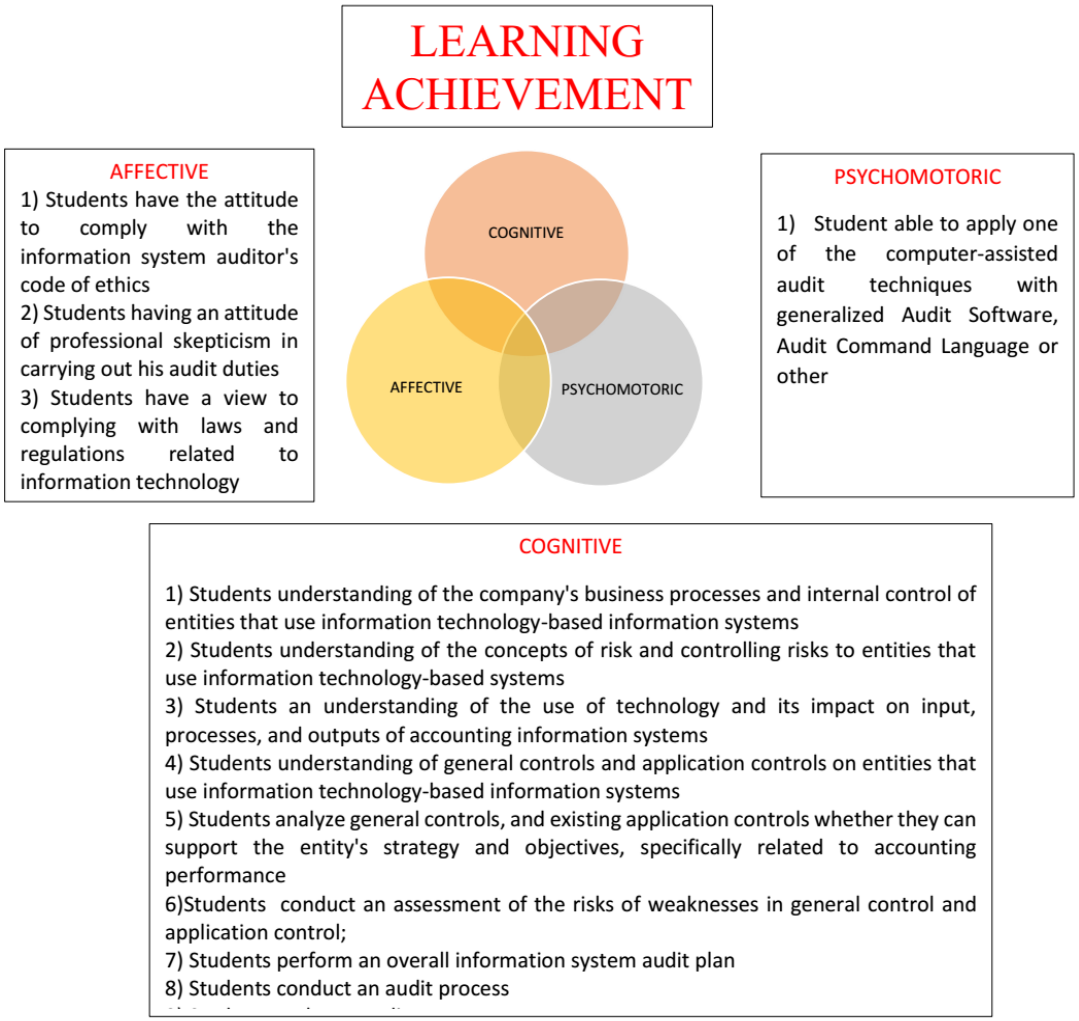

Chart 1: Learning Outcomes of the Information Systems Audit Course

4.1.2. Learning Materials

Learning material for information systems audit courses for undergraduate students in accounting studies based on national standards of higher education, namely 1) able to apply their fields of expertise and utilize science and technology in their fields in completion and be able to adapt to the situation at hand; 2) Mastering theoretical concepts in the field of knowledge in-depth, as well as being able to formulate procedural problem solving and 3) Able to make appropriate decisions based on analysis of information and data, and be able to guide in choosing alternative solutions independently and in groups; responsible for one's work and can be given responsibility for achieving organizational performance results. These three things become the basis for determining the learning achievements that have been explained in section a. Furthermore, based on these learning outcomes, in-depth interviews were conducted to find out what learning materials are needed in the information system audit course.

The following is a summary table of interviews with informants about information systems audit learning material (this table is presented by reducing interview results using keywords: information system audit learning material):

Table 3: Summary of Interview Results

Participants	**Expertise**	
Participants 1	Information System Audit	Important learning materials are the introduction of the information system auditor profession, information system audit regulations and standards, audit planning (general control risk assessment and application control risk), Systems and Infrastructure Lifecycle Management, Information Technology Service Delivery and Support, Business Continuity and Disaster Recovery, audit and reporting
Participants 2	Audit of Financial Statements	Important learning material is about the development of information technology and its impact on the company's financial statements
Participants 3	Accounting education	Important learning material in this course is emphasized on the material aspects and also the practice of the application, for example the use of information technology-based audit applications. The process of discussion and learning with a case study approach is needed to shape critical thinking skills.
Participants 4	Corporate governance	Important learning material is an effort to assess risk, which includes information technology risk related. The thing that needs to be analyzed is the probability of risk and its impact on financial reporting

Data from the interviews are then reduced and displayed as in table 3 above. Furthermore, the data is tested for its credibility by using source triangulation and theory triangulation. The results of the interviews were also compared with the syllabus issued by the organization of information systems auditors who held the CISA certification exam. Then the data was processed using a thematic approach. Based on the results of data processing, an understanding is obtained that the audit learning material information systems consist of the following material:

1. Information and audit systems
2. Information System Risk and Control
3. Technology and Impact on Financial Statements
4. Systems and Infrastructure Lifecycle Management
5. Information Technology Service Delivery and Support
6. Business Continuity and Disaster Recovery
7. Standards and Guidelines for IS Auditing
8. Information System Audit Planning
9. Information System Audit
10. Reporting

4.2. Development of Information Systems Audit Learning Methods

The right learning method will determine the success of achieving the learning objectives themselves. Learning materials that focus solely on the instructor cannot produce maximum learning outcomes. Therefore learning techniques that also focus on students are needed to achieve the stated learning goals. The auditor often faces audit assignments with a variety of different client characteristics. Therefore the auditor's ability to think critically is needed so that the auditor can precisely determine the audit conclusions.

Based on in-depth interviews, and understanding is obtained that the information system audit learning method must be able to make the auditor think critically of audit evidence. One of them is by brainstorming about an issue. The following is a summary

table of interviews with resource persons about the subject of audit learning methods (this table is presented by reducing interview results using keywords: audit learning methods):

Table 4: Summary of Interview Results

Participants	**Expertise**	
Participants 1	Information System Audit	A learning method that invites students to think critically is needed because the auditee has unique and different characteristics so that the auditor must be able to understand the business process, IT control and its impact on the financial statements appropriately
Participants 2	Audit of Financial Statements	Learning methods that invite students to have skepticism are needed. One way is to provide a case study and students are asked for opinions to solve it
Participants 3	Accounting education	Learning methods that focus on students are needed in learning information systems auditing so that there is two-way communication in assessing audit evidence
Participants 4	Corporate governance	Learning methods that emphasize the ability to be able to assess risk can be done by sharing information about the audit findings because certain audit findings can be considered by an auditor but can escape the views of other auditors

Data from the interviews are then reduced and displayed as in table 4 above. Furthermore, the data is tested for its credibility by using source triangulation and theory triangulation. Then the data is processed using a thematic approach. Based on the results of data processing, and understanding that audit learning techniques with a critical thinking approach is obtained is one way that information systems audit teachers can use. One way that can be done is by using brainstorming techniques. This technique is used to conduct polls in solving problems. Teachers can make a case study and then ask students to provide input in solving the case. Through the brainstorming process, there will be a process of social interaction to transfer knowledge between one auditor and another auditor. This is important because specific audit evidence can be seen by an auditor but can escape from the view of other auditors. Through this critical analytical discussion process, essential solutions will be obtained related to audit evidence. The brainstorming process can be applied to 1) Measuring risk 2) Prevent risk 3) Detecting risks and 4) Minimize risk if it

5. Conclusion

The audit learning syllabus must adjust to industry needs so that graduates can contribute more. Learning material must be adapted to the achievement of cognitive, affective, and psychomotor abilities. The method of learning by doing stimulus-response to teach students to think critically is fundamental so that students can manage the risks they face when working later. The contribution of this research is related to the development of information systems audit syllabus for undergraduate programs majoring in accounting. This research has limitation because it has not conducted

an analysis based on the views of information technology experts, so further research must add to the opinions of these experts to obtain a more comprehensive understanding

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