

Comparison of Learning Style between Engineering and Non-Engineering Students in Vocational Education

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In some countries, there was inconsistency quality of learning outcomes and teaching input. There were others increase these in the many forms; one of the forms that used was a need to understand the learning process that focused on the learning style. It is important for the teachers to understand students' learning style so that they can implement the best practice strategy in learning activities. The learning style that commonly used was Kolb Learning Style based on the learning experiences theory. Therefore, this study aimed to describe engineering and non-engineering students' learning style. The population of this study was students of Vocational Education Program Universitas Negeri Padang. This study used a special mix method design that is using a survey approach and document analysis that concentrated on the deep systematic matrix analysis method. The result of this study described that the engineering student more dominant to adopt the accommodator learning style (feel and do), the second place, the dominant to adopt diverger learning style (feel and watch). While, the non-engineering students more dominant to adopt the accommodator learning style (feel and do), and the second place, the dominant to adopt the converger learning style (think and do).

Key words: *Kolb learning style, vocational education, engineering and non-engineering students*

Introduction

Due to the P21 framework that developed by business communication coalition, educators and policymakers in the USA (*Partnership for 21st Century Learning*) demand students to

have skills, knowledge and ability in the technology, media and information form. Learning skill, innovation and life and carrier skills, these are proof that students master an ability and production, synthesise and information evaluation process from various subject and understanding sources (Sahin, 2009; Zarobe & Yolanda, 2015). A student was offered to make have integration of core academic knowledge, critical thinking and social skill that needed to master multi-dimension knowledge in the 21st-century challenges (Osman & Marimuthu, 2010). One of the important goals in education is to improve students' ability in thinking (Tee et al., 2020). Azid et al. (2020) also stressed that critical thinking pedagogy is applied to prepare students for their future career. The 21st-century challenges have changed competency formulation concept that mastered by universities graduate. Students have to show the 3R skills that consist of *Reading, Writing and Arithmetic* and 4C that consists of *Communication, Collaboration, Critical Thinking and Creativity* (Astuti, 2019; Purnawirawan, Sudana, & Harlanu, 2019; Yahya, 2018). On the other hand, there are skills in the mastery of digital literation that be able to use information communication and technology to increase the skills and daily performance, doing learning activities individually and ability to use communication media to be able to carry out the collaboration activities easily (Makaramani, 2015). Students should be allowed to learn and connect themselves with the environment through the integration of technologies and digital (Md Yunos et al., 2020).

Students should possess 21st-century skills especially soft skills, to increase their employability and values (Azid et al., 2019). Developing of international education in the 21st-century skills formulation, the universities have to make strong the education elements to conduct learning by applying active learning process for students (Halstead & Martin, 2002). One of the supporting forms of active learning is students' learning style (Alice, Based, Systems, & Kolb, 2015). Learning style plays an important rule to make sure that the learning process was conducting effectively. The learning style that defined as a comfortable way that is able to study by students is a learning style that preferred by students, and then learning style is an integration of students' cognitive process and behaviour (Al-balhan, 2007; Barke, 2009). To make sure that all students get a mandate from the learning process, the educators have to observe and understand of the different and similarity between students and use the information to plan to learn (Laura, 2017), so that educators be able to design learning due to the students' learning style (Weselby, 2017).

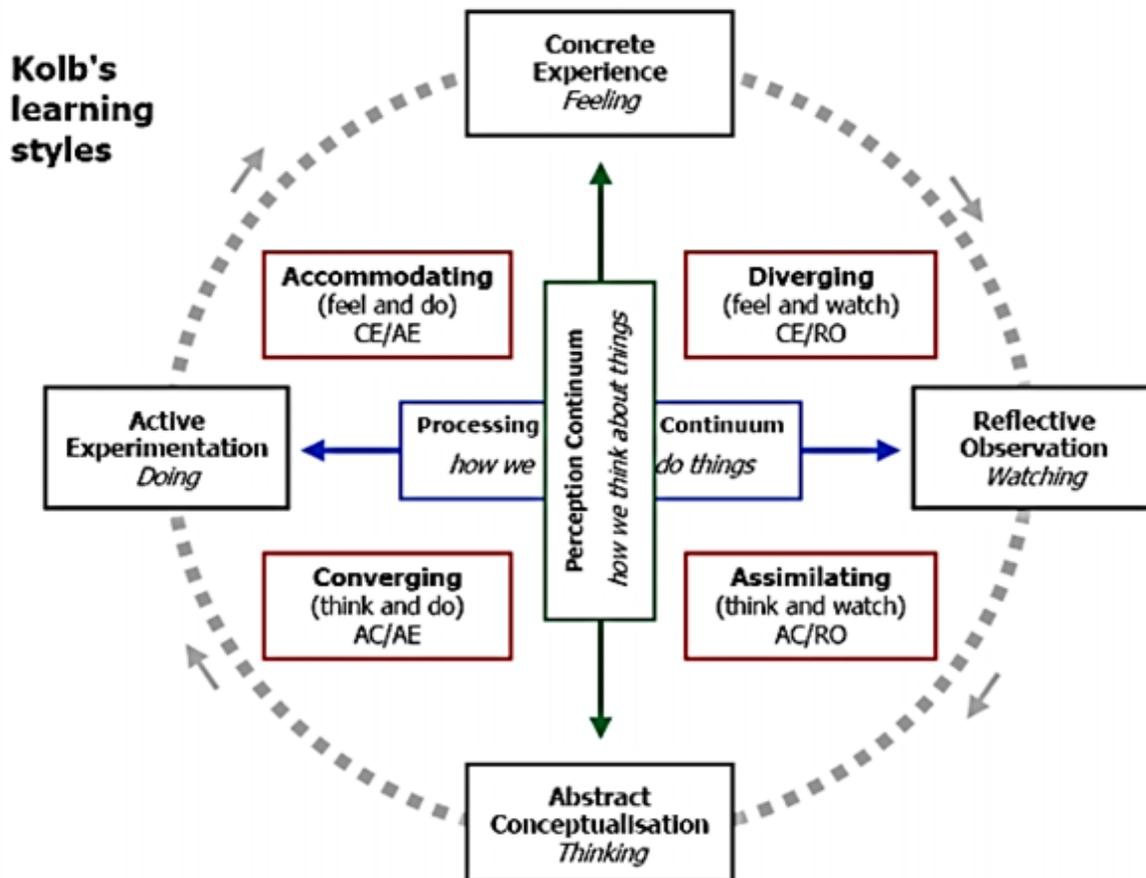
One of the tools to measure students' learning style preferential is the Kolb Learning Style Inventory (LSI). Kolb learning style or more known as Experiential Learning Theory (ELT) defines learning as a process where knowledge was creates through experience transformation (Yousafzai, Baseer, Fatima, Ali, & Shah, 2018). Experiential learning theory (ELT) was stated by American psychology that was David A. Kolb. Kolb, in his created, Experiential Learning Theory (ELT), describes how knowledge can be used to increase learning and how learning style preferential change with the changed situation. Therefore,

this study aimed to compare learning style preferential of engineering and non-engineering students in Indonesia used a measuring tool that is called Kolb Learning Style Inventory (LSI) because LSI is able to give a basic to validate the Experiential Learning Theory (Yousafzai et al., 2018).

Kolb Learning Style

Since the 1960s, many psychologists have focused on analysing learning psychology and presented many learning theories. One of the most commonly referred theories of learning is the 'Experiential learning theory (ELT)', presented by the American psychologist Kolb. Kolb (refer Figure 1) in his work has explained the Experiential Learning Theory (ELT), how this knowledge can be used to enhance learning and how the learning style preferences (refer Figure 2) change with the changing situations. ELT defines learning as 'the process whereby knowledge is created through the transformation of experience'. Kolb's Learning Style Inventory (LSI) is one tool to measure the learning style preferences of learners. The LSI provides the basis for the validation of the Experiential Learning Theory (ELT) (Yousafzai et al., 2018).

Figure 1. Kolb Learning Style



Educational leaders, classroom teachers, students and parents will agree, 21st-century teaching carries with it a complicated mix of challenges and opportunities (Eduview, 2008). Challenges include the issues of teacher turnover, accountability, changing student populations and student expectations, mounting budget pressures, and intense demand to build students' 21st-century skills. Effectively engage and teach generation Z students, teachers will help the educational system meet this requirement (Boholano, 2017). The educational systems must be outfitted with a prerequisite of fundamental in teaching and learning, and curricula must be designed to promote a collaborative learner-centred environment to which students will relate and respond.

21st-century learners must possess both self-direction and the ability to collaborate with individuals, groups, and machines (McCoog, 2008). Due to the rapid changes, complex problems are faced by educationists, policymakers, managers and teachers as well (Jan, 2017). Teachers of the 21st century have to create students of the 21st century with soft skills. The 21st-century teachers need teaching skills content mastery as well as integrating teaching with technology. Based on the International Education Advisory Board (2008), the 21st-century student share some characteristic such as they like to be in control, like choice, and think differently.

Method

Research Procedure

This study utilised mixed design, using survey, design and development methodology. Survey tools can answer the 'what' of a question, getting firm quantitative results from a large number of individuals. This design starts with the analysis of quantitative survey data, the first phase in this study comprises few processes such as collecting related background information, literature review, research design, collecting information through the archive and developing instrument. The second phase will involve the process of determining the dominant learning style of engineering and non-engineering students in Technical Universities, Indonesia. The qualitative method using survey will be applied in order to gather the information that will be needed.

Population and Sample

The population of this study was all of engineering and non- engineering lecturers and students in Universitas Negeri Padang. Sample choosing technique that used to choose research object in this study was using a stratified random sampling technique. Then, to synthesise engineering and non-engineering students' learning style in Indonesia was carried out through meta-analysis on the literature review. Research sampling in this study was 300

engineering and non-engineering students in Universitas Negeri Padang. So that, research instrument was a questionnaire form will be disseminated to 300 engineering and non-engineering students in Universitas Negeri Padang to identify the dominant learning style that they used.

Research Instrument

An instrument that used in this study was The Kolb Learning Style Inventory. It was used to identify the dominant learning style on the engineering and non-engineering students in Indonesia. Kolb Learning Style Inventory questionnaire was divided into two sections. Section A consist of three items related to demographic factors, gender, year of study and qualification. Section B consist of 18 items that related to two answer choices followed 'Yes' and 'No'.

Result

Based on the survey that had been carried out to 300 engineering and non-engineering student in Universitas Negeri Padang. So, it was gathered various learning styles of engineering and non-engineering students that divided into four learning style types that stated by Kolb, follows Diverger, Assimilator, Converger dan Accommodator learning style. The type of assimilator learning style (think and watch) is a combination of Reflective Observation (RO) and Abstract Conceptualisation (AC). The type of converger learning style (think and do) is a combination of Abstract Conceptualisation (AC) and Active Experimentation (AE). The type of accommodation learning style (feel and do) is a combination of Active Experimentation (AE) dan Concrete Experience (CE). The type of diverger learning style (feel and watch) is a combination of Concrete Experience (CE) dan Reflective Observation (RO) (A.Y. Kolb & Kolb, 2003). Table 1 shows the percentage of students' data distribution on each Kolb learning style that has been measured by using The Kolb Learning Style Inventory. It can be seen in Table 1 below.

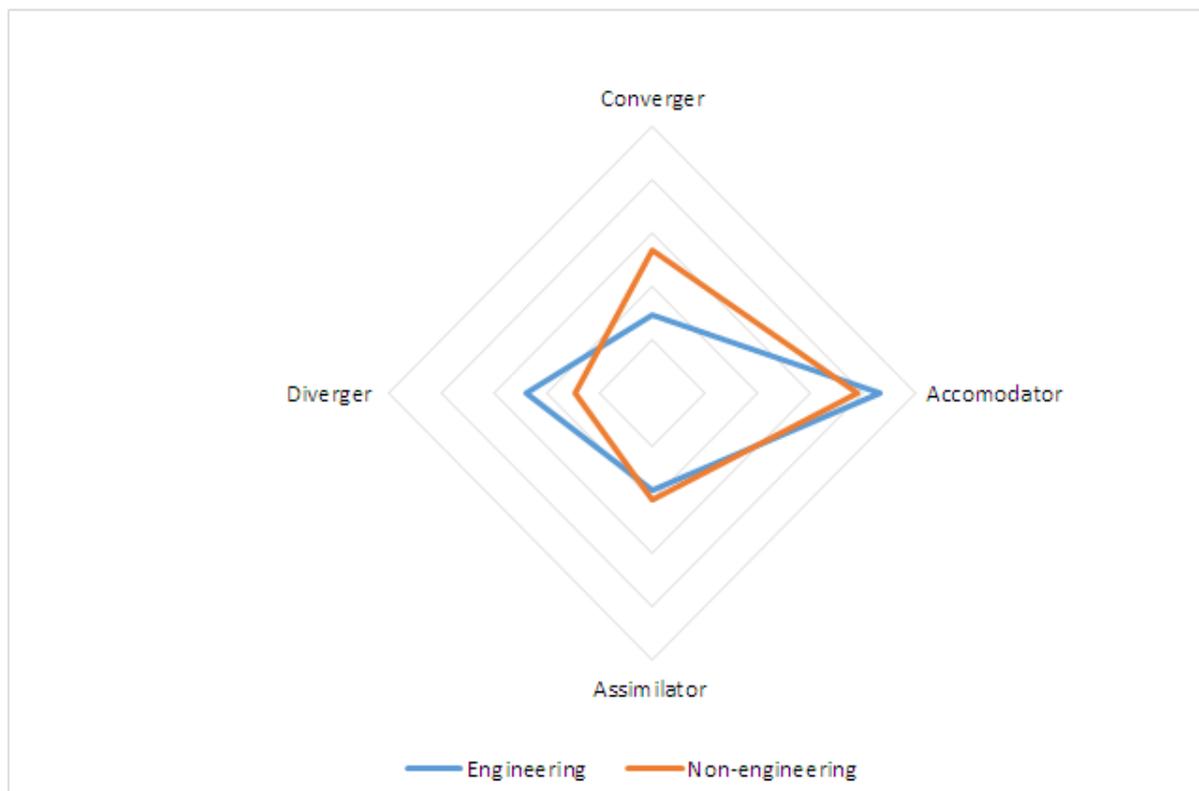
Table 1: Data Distribution of Engineering and Non-engineering students learning style

Variable	Kolb Learning Styles								Total	
	Converger		Accommodator		Assimilator		Diverger			
	f	%	f	%	f	%	f	%	f	%
Engineering	22	14,7	65	43,3	27	18	36	24	150	50
Non-Engineering	40	26,7	58	38,7	30	20	22	14,7	150	50

Distribution results of engineering and non-engineering students in Indonesia were determined through descriptive analysis data in Table 1. Analysis results of data descriptive showed that engineering students percentage in Indonesia were 43,3% (65) and more

dominant to accommodator learning style, then 34% (36) dominant to diverger learning style, followed by 24% (27) dominant to the assimilator learning style and the last 14,7% (22) dominant to converger learning style. While, non-engineering students percentage in Indonesia were 38,7% (58) more dominant to accommodator learning style, then 26,7% (40) dominant to converger learning style, followed by 20% (30) dominant to the assimilator learning style and the last 14,7% (22) dominant to divergent learning style.

Figure 2. The Percentage of Engineering and Non-Engineering students Data Distribution



In fact, most of the engineering students in Indonesia in this study more dominant to adopt accommodator learning style (feel and do), then followed by divergent learning style (feel and watch), then assimilator learning style (think and watch) and the last was converger learning style (think and do). While, on the non-engineering students in Indonesia more dominant to adopt accommodator learning style (feel and do), then followed by converger learning style (think and do), then assimilator learning style (think and watch) and the last was diverger learning style (feel and watch). While most of the engineering and non-engineering students in Indonesia in this study more dominant to adopt accommodator learning style (feel and do).

It can be explained from professional preferential of a different learning style group. The people with accommodation learning dominant tend to be in the professional field, like

education, communication technical, nursing and business. While diverger generally is more like humanity, fine arts, language, history and psychology, and converger learning style generally are more like technical, medicine and technology (A.Y. Kolb & Kolb, 2003; Yee et al., 2015). The relation of learning style between 5 behaviour levels can be explained in Table 2 below.

Table 2: The relation of learning style between 5 behaviour levels

Behaviour Level	Diverging	Assimilating	Converging	Accommodating
Personality types	Introverted Feeling	Introverted Intuition	Extraverted Thinking	Extraverted Sensation
Educational specialisation	Arts, English History Psychology	Mathematics Physical Science	Engineering Medicine	Education Communication Nursing
Professional career	Social service Arts	Sciences Research Information	Engineering Medicine Technology	Sales Social service Education
Current jobs	Personal jobs	Information jobs	Technical jobs	Executive jobs
Adaptive competencies	Valuing skills	Thinking skills	Decision skills	Action skills

Source: (A.Y. Kolb & Kolb, 2003)

Students with accommodation learning style, doing many studies from the real experient when they face the problems. The students with accommodation learning style used to solve the problem will consider the human factor so that they can get the suggestion or information and exchange ideas with the people around them (Alice Y Kolb et al., 2015). Students with a converger learning style will be active during the learning process. It is happening because there is tending to active experimentation (doing) in students, it is the same with a student who is using accommodator learning style (Alice Y Kolb et al., 2015).

A student with an assimilator learning style has the best analytical power than others, because of tending to abstract conceptualisation (thinking) in students with assimilator learning style. So, students with an assimilator learning style are able to understand various information gathered from various sources. The information is seen from various perspectives, and concluded in the form logically, clearly and shortly (Ghufron & Risnawita, 2012). Students with assimilator learning style have the observation approach, calmer, used to observe the people behaviour and uncommunicative. It is happening because of tending to reflective observation (watching) in students with assimilator learning style (Nasution, 2009).

Tending to concrete experience (feeling) dan reflective observation (watching) form a diverger learning style. It makes students with diverger learning style more excellent in seeing a concrete situation from different perspectives. Then, students with diverger learning style have the learning style power on their imagination ability (Nasution, 2009). Students with diverger learning style have a disadvantage that is they can be bored when they face long time problems to be understood, solved and created (Ghufron & Risnawita, 2012).

Due to the interest to design learning process, so educators have to consider various students' learning style. Other than that, learning method that related to each learning style is more important to maximise the effectivity of learning, because of learning method has a related with learning style (Fuad, 2015). The differentiation between the way of receive and process information was more related to the learning style that been had by students. Learning style is one of the main factors to gather the effectivity of learning (A.Y. Kolb & Kolb, 2003).

Each student, if they will carry out the learning process effectively for them, so they will have different learning style and learning way. It is happening because of tending to reflective observation (watching) and active experimentation (doing), it shows how personal approach in doing something. While, tend to concrete experience (feeling) and abstract conceptualisation (thinking) show how personal approach in thinking or feeling something (Alice Y Kolb et al., 2015; Indriana, 2011).

Conclusion

This study illustrated that the most of engineering students in Indonesia in this study more dominant to adopt accommodator learning style (feel and do), then followed by divergence learning style (feel and watch), then assimilator learning style (think and watch) and the last was converger learning style (think and do). While, on the non-engineering students in Indonesia more dominant to adopt accommodator learning style (feel and do), then followed by converger learning style (think and do), then assimilator learning style (think and watch) and the last was diverger learning style (feel and watch).

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