TRANSITION PROCESS OF TEACHING CONCEPTION AMONG NEW ENGINEERING LECTURERS TO IMPLEMENT STUDENT CENTRED LEARNING

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DEDICATION

Alhamdulillah and thank you, Almighty Allah for the guidance, strength and allow me to meet wonderful people with the supportive environment for me along this journey. This journey full of colours, variety of experiences and the most important is I become more know who am I and the contributions that I can give to the world.

This thesis I dedicate to my inspire persons and always encourage me to pursue my dreams and finish my dissertation, My Beloved Husband Engku Mohd Fhadzhil Bin Che Engku Mohd Ghazali, My Mother Ustazah Saniah Binti Mohammed Shahid and My Father Radzali Bin Marjuni

Allah gives me three children to company me along this journey. They always remind me to stay focus and retain my motivation level. This thesis is proved that you are there helping me to finish my study. They are Engku Aisyah Humaira (2012), Engku Fatimah Zahra (2016) and Engku Muhammad Al Fateh (2020).

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ABSTRACT

Studies on the transition of teaching conception commonly refer to the change of teaching conception from teacher-centred learning to student-centred learning. In engineeringeducation, there is a gap in research on teaching conception among lecturers, specifically on how it occurs in terms of changing teaching belief, intention, and action. The purpose of this study was to investigate and understand the process of teaching conception transition (teachingbelief, intention and action) from teacher-centred approach to student-centred approach among engineering lecturers. This study employed the microgenetic method as its strategy andthematic analysis (TA) to analyse the data. The respondents in this study were three engineering lecturers from various fields. The data were collected using in-depth interview and observation.Three observations and three interview sessions were conducted from the beginning to the endof the semester for each respondent. The data transcription was then analysed using the three steps of TA. The narration style was used to illustrate the findings which were divided into sevenepisodes. These episodes gave indications on the changes that the respondents underwent during the transition of the teaching conception. This study found that the transition was relatedto their experiences as students in the past and other transformation factors, which were staff development programmes (such as mentoring, community support and conducting research) aswell as education environment. Thus, based on the different experiences, a descriptive model of transition of teaching conception from teacher-centred to student-centred learning was produced. In conclusion, the transition process of teaching conception is about transforming the engineering lecturers' teaching conception from teacher-centred learning to student-centred learning. The proper support system should be provided for a successful transition of the teaching approach as this will be impactful as the engineering lecturers are making changes intheir efforts to produce more well-versed future engineers.

ABSTRAK

Kajian mengenai perubahan konsepsi pengajaran biasanya merujuk kepada perubahan konsepsi pengajaran dari pembelajaran berpusatkan guru kepada pembelajaran berpusatkan pelajar. Dalam pendidikan kejuruteraan, terdapat jurang dalam penyelidikan konsepsi pengajaran dalam kalangan pensyarah, khususnyamengenai bagaimana hal itu terjadi dari segi perubahan kepercayaan, niat dan tindakan terhadap konsepsi pengajaran. Tujuan kajian ini dijalankan adalah untuk mengkaji dan memahami proses perubahan konsepsi pengajaran (kepercayaan, niat dan tindakan terhadap pengajaran) dari pendekatan berpusatkan guru kepada berpusatkan pelajar dalam kalangan pensyarah kejuruteraan. Kajian ini menggunakan kaedah mikrogenetik sebagai strategi dan analisis tematik (TA) untuk menganalisis data. Responden dalam kajian ini adalah tiga orang pensyarah kejuruteraan dari pelbagai bidang. Data diperoleh menerusi sesi temu bual dan pemantauan. Tiga sesi temu bual dan pemerhatian dijalankan dari awal hingga akhir semester bagi setiap responden. Transkripsi data kemudian dianalisis menggunakan tiga langkah TA. Tujuh episod dijadikan untuk menggambarkan hasil dapatan data. Episod ini menekankan petunjuk bagi perubahan yang dialami oleh responden semasa perubahan konsepsi pengajaran. Kajian ini mendapati bahawa perubahan ini mempunyai kaitan dengan pengalaman mereka sebagai pelajar pada masa lalu danfaktor transformasi yang lain seperti program pembangunan staf (seperti pementoran, sokongan daripada persekitaran dan melakukan penyelidikan) serta suasana pendidikan. Oleh itu, berdasarkan pengalaman yang berbeza, model deskriptif perubahan konsepsi pengajaran dari pembelajaran berpusatkan guru ke berpusatkan pelajar dihasilkan. Kesimpulannya, proses perubahan konsepsi pengajaran adalah tentang mengubah konsepsi pengajaran pensyarah kejuruteraan dari pembelajaran berpusatkan guru kepada pembelajaran berpusatkan pelajar. Satu bentuk sokongan yang sebaiknya harus disediakan dalam memastikan perubahan ini berjaya dan memberi kesan kepada generasi jurtera yang akan datang.

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SCL	-	Student-centred Learning
TCL	-	Teacher-centred Learning
TA	-	Thematic analysis

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Focusing on producing quality Engineering graduates in relation to teaching and lecturers, especially in this century, is a critical issue to study. World Economic Forum (2020) has been discussing that by 2025, graduates nowadays should have the 21st-century skills like critical thinking and analysis, problem-solving, and self-management, which are in growing demand. These skills cannot be developed using a conventional teaching strategy. Many studies indicate the effectiveness of Student-Centred Learning (SCL) in teaching and learning (Felder and Brent, 2016; Hoidn, 2017). Aligned with the demands from the industry, environment, and the society, the community needs 21st-century engineers who can be competent in facing novel problems, rapid changes in technology, and economic globalisation (Anastassova, 2019; Commission, 2002; Lian, 2017). Thus, it is pertinent for lecturers to ensure that no student is left behind in education and that the lecturers must always follow the trend by transitioning their teaching conception from Teacher-Centred Learning (TCL) to Student-Centred Learning (SCL).

By having SCL teaching conception, quality teaching can be obtained besides embedding the SCL learning environment into the teaching and learning. The transition process from TCL to SCL can be focused on in the teaching conception. Teaching conception is known as the interpretation of the meaning of teaching and can be described through lecturers' actions and intentions in teaching (Owusu-Agyeman and Larbi-Siaw, 2017; Pauler-Kuppinger and Jucks, 2017; Pratt, 1992). However, the

lecturers may face barriers when going through the transition process (Radzali, Mohd-Yusuf and Phang, 2018) even when they have received many kinds of support system (Guskey, 2002; Matherson, and Windle, 2017). This issue was highlighted in this study. It is a critical area to be studied because academicians must ensure ample support system is provided and applicable to help them go through the transition process from TCL to SCL. Besides, this study could answer why some of the lecturers were not successful in changing their teaching conceptions even after receiving a support system (Blumberg, 2008). Thus, this study aimed to propose a descriptive model that focuses on support the transition of teaching conception from TCL to SCL among Engineering lecturers. Details of the related issues are discussed in the problem background. This study proposed three research objectives which consist of seven research questions. The conceptual frameworks used are also explained in this chapter.

1.2 Problem Background

Humans face grand challenges globally in the 21st century like rapid changes in technology, economic globalisation, and novel problems within the science and Engineering field. The world today relies on science and Engineering to solve specific grand challenges (Venter, 2013) and attract calls for new investments in STEM education (Facer, 2011). Due to these challenges, stakeholders and markets have increasingly high demand for workers with science and Engineering skills (National Science Board, 2016). In 2012, a report published by the National Academy of Engineering (National Science Board) stated that the national government from several developed countries have increased the access to science and Engineering degrees of the first university, which had reached about 6.4 million (Board, 2016). This shows the importance of education in science and Engineering to produce high-skilled workers, including lecturers and those employed in the science and Engineering field. Therefore, Engineering accreditors like Engineering Accreditation Council (EAC) under the Board of Engineers Malaysia (BEM) emphasised that the outcome of

Engineering programmes is to have high quality and skilful Engineering graduates (Accreditation Council, 2012).

Implementation of SCL is highly relevant, especially in Engineering education because of high requirements, such as the needs of the Industrial Revolution 4.0, accreditation requirements and engagement from lecturers (Gorbunova et al, 2018) to make learning environment more significant to develop knowledge and skills. Besides that, previous studies have proven the effectiveness of SCL in teaching and learning (Attard, Di Ioio and Geven, 2010; Haber-Curran and Tillapaugh, 2014), students' performance (Limited, 2015), and quality of teaching (McAleavy et al, 2016; Biggs and Tang, 2011). Correspondingly, the government of Malaysia has introduced a new programme to transform and improve the education system and attain quality education thus, becoming a developed nation by 2020 (Jabatan Perdana Menteri, 2010). The programme is the National Key Result Areas (NKRA) which caters to six areas and one of them focuses on improving students' outcome. This initiative shows how the government has taken an action to ensure Engineering graduates are of high quality and achieve global standard. The Ministry of Education Malaysia has proposed the education blueprint as a guideline to adopt SCL approach at all education levels (Kementerian Pendidikan Malaysia, 2012). According to the Quality Assurance Department, MOHE and Washington Accord have agreed to implement SCL approach in all higher education institutions, especially in the Engineering field (Accreditation Council, 2012; Education, 2006). Unfortunately, according to a report by the National Academy of Engineering (NAE) (2005), two elements are not interconnected in the system of Engineering education, which are the alignment between Engineering curricula and faculty skill sets. These need to deliver the desired curriculum in light of different students' learning styles. Professional Engineering societies are working together to solve this issue and create a better alignment as required (American Society of Civil Engineers (ASCE), 2004; IEEE, 2004). Similarly, for higher education institutions in Malaysia, Engineering accreditation bodies such as EAC (BEM) and MOHE are working together to ensure that SCL is implemented in the classroom. They have provided the platform to change the education system. However, the issue now is how lecturers can implement SCL.

The demand on quality engineering graduates makes it important to support engineering lecturers to implement SCL and support them in the transition process of teaching conception. Many studies have discussed the implementation of SCL in various educational areas and at various education levels, such as Norton et al (2005). They have then discovered the changes of teaching conception, especially in beliefs, actions, and factors of changes (Cheng et al, 2015; Santos and Miguel, 2019; Scott, 2014). The previous studies have also proven that the implementation of SCL is aligned with the teaching conception on SCL (Nadelson et al., 2014; Wang, Zhang, and Wang, 2018). Those studies have conducted from areas in Biology (Napoleon-Fanis, 2020), Science (Buldur, 2017; Wong and Luft, 2015), Language (Kelly, 2018) and not been found in the area of engineering. By an underlying assumption, this research believes that the implementation of SCL among Engineering lecturers can give a different impact on the experience of transition teaching conception compared to other lecturers.

This study specifically focuses on Engineering lecturers as respondents. Engineering lecturers have their own characteristics, such as an Engineering identity (Morelock, 2017) and Engineering practices (Sheppard et al, 2006). The Engineering identity relates to the Engineering professional role and desire, need, and strength (includes beliefs, attributes, and values) (Fleming et al, 2013; Knight, 2013). These are connected to Engineering students' perspective as they got them from the campus climate and workplace which shape the Engineering students' perspective of the Engineering identity towards their interest, performance, and recognition (Godwin and Lafayette, 2016). Of all these factors, the Engineering students' application of Engineering practices is embedded with Engineering body of knowledge. These kinds of differences are related to the phases of transformative learning (Mezirow, 2000) when the lecturers undergo the process of transition in teaching conception. By understanding deeply, the Engineering lecturers' identity, the study could investigate from their Engineering background in relation to their current teaching actions. According to Mezirow (2000), these specific transition phases which include the relationship between changes and the processes experienced by adult learners (Engineering lecturers) can be understood.

Moreover, findings indicate a moment when and what changes occur among Engineering lecturers. This has not been discovered in the phases of transformative learning theory. Radzali, Mohd-Yusof, and Phang (2018) found three main phases throughout this transition process, which are before SCL implementation, after attending SCL training workshop, and during the implementation of SCL. A timeline can be used to determine how the respondents have or have not changed their teaching conception. The phases of transition process are part of developing a new teaching experience, i.e., changing from TCL to SCL. A model of teaching conception produced by Pratt (1992, 1997) shows the ten phases of teaching conception that involve change in teaching beliefs, intentions, and actions. There are also other studies that discovered the moment or period when the changes in teaching conception occur. By using a longitudinal study with a small number of respondents could measure and deeply investigate the phenomenon. Such knowledge is important, especially for teaching training providers and higher academician institutions to prepare a kind of support system and proper scaffolding to help the new implementers undergo the transition process from TCL to SCL. Thus, this answered an issue regarding why some of the teaching trainees face difficulty in sustaining to implement the new teaching knowledge after attending a training session (Blumberg, 2008; Lander, 2017).

Engineering courses are notorious as difficult to understand compared because of the requirement abstractions and being able to translate them into practical real world applications (Drew, 2011). Furthermore, the lecturers' background also contributes to the negative effects of implementing SCL (Cranton, 2006; Cranton and Lin, 2005; Mezirow, 2000). Most of them are well trained in Engineering but lacking in pedagogical knowledge. The implementation of SCL is something new for them, especially if they have no experience with high SCL environment and have not been trained or experience SCL techniques. Teaching practices are the reflection of previous experiences as students on how they were taught (Taylor, 2003). Thus, the new experience and teaching problems faced by Engineering lecturers add to existing problems as discussed in previous studies (Saroyan et al, 2001; Weimer, 2002; Thanh-Pham, 2010). These problems are divided into internal and external problems. Internal problems focus on internal factors of the individual, such as mental and physical preparation (Maurer and Neuhold, 2012) and beliefs towards teaching and learning

(Sadler, 2012). External problems focus on external factors, such as methods of teaching (Schmidt, Rotgans and Yew, 2011), evaluation and assessment (Ryan, 2013; Wright, 2011), and culture (Frambach et al, 2012; Thanh-Pham, 2011).

Higher education institutions have initiated staff development programmes to ensure they are preparing the lecturers to teach in modern Engineering education. This initiative includes institutional policies, programmes, and procedures which facilitate and support the staff to achieve the objectives of their institution (Sleeter, 2012; Webb, 1996). The lecturers involved in the programmes attain knowledge and ideas to be more productive and creative in teaching and learning. However, there are other problems like discontinuous training, lack of support system, and unchanged traditional learning environment which discourage the implementation of SCL. The problems is, previous studies have found that some of the trainees refused to implement SCL after they attended training (Blumberg, 2008). Research that discusses and explores in detail on the implementation and transition to SCL has not been found. This subject is crucial to support Engineering lecturers and institutions prepare themselves in facing challenges and problems during the transition.

There are several frameworks or models which define learning process among adult learners. Some examples are Illeris's three-dimension learning model (Illeris, 2004) and Jarvis's learning process (Jarvis, 2006). Kember (1997) has also produced a model of teaching conception by addressing a multiple-level categorisation from TCL to SCL. There are also some theories that explained this process, such as Transformative Learning by Mezirow (Mezirow, 1978) and McClusky's theory of margin (McClusky, 1963). The literature has shown and emphasised the elements involved in the learning process, such as the surrounding factors, as well as intrinsic and extrinsic elements (discussed in Chapter 2). Most of them explained and expanded on the factors that influence the process itself. This shows that concerns during the transition phase have not been discussed, especially on the change of teaching beliefs, intentions, and actions. The change of teaching conception also involves the influential factors in obtaining a successful transition. Thus, a new model is needed to understand the transition process of teaching conception among lecturers who are new at

implementing SCL in a semester. The teaching conceptions addressed are the transition of teaching beliefs, intentions, and actions based on different personal backgrounds and teaching experiences.

1.3 Problem Statement

This study focused on the process of transition in teaching conception faced by Engineering lecturers. The transition process from TCL to SCL is important to be investigated in detail, especially among those who have different backgrounds and experiences. The present study identified three gaps that needed to be discussed.

Firstly, there is a knowledge gap with regards to the process of transition conception in the area of Engineering education. While there are many studies discussed the implementation of SCL in all education areas and at all levels (Guillermo and Humberto, 2018; Paderson, 2003). Borrego et al (2013) stressed that there is a lack of research related to the study of teaching beliefs in the context of Engineering education, and there is none found on the transition. Nevertheless, current studies have been interested to investigate deeply on the changes involved in the transition of teaching conception from the aspects of beliefs (Borrego et al, 2013; Wong and Luft, 2015), intentions, and actions (Horgan and Gardiner-Hyland, 2019; Kelly, 2018; Radzali, Mohd-Yusof, and Phang, 2018).

Secondly, in relation to the first issue is the Engineering lecturers being studies in this research as respondents. According to Mezirow, to understand the process of change in adult learner conception, it must relate with their root experience. The specialised Engineering lecturers, for instance, will be the outcome of a specific area and teaching conception will be a phenomenal area of study in the world. However, the process of change is unique and cannot be generalised because of the complicated

of human experience (Langdridge, 2007). Studies have found that the transition of teaching conception has significance with previous experience. Thus, a study on the transition of teaching conception in the Engineering education area would fill this gap.

Lastly, through the actual experiences of Engineering lecturers, moments of how and when the transition occur would be narrated directly. These had not been witnessed in the transformative learning theory and a model of teaching conception that used to investigate the transition process of the teaching conception from TCL to SCL. By observing and understanding the different experiences faced by each Engineering lecturer, these could help produce a model that supports a successful transition.

1.4 Research Objectives

The objectives of this research are:

i. To investigate the teaching conception (belief, intention, and action) among engineering lecturers who have experienced transition from TCL to SCL.

ii. To understand the changes of teaching conception (belief, intention, and action) among engineering lecturers who have experienced transition from TCL to SCL.

iii. To produce a descriptive model to explain the support needed by the engineering lecturers who are new in implementing SCL.

1.5 Research Questions

This study addressed the following research questions to achieve the above research objectives.

Objective 1: To investigate the teaching conception (belief, intention, and action) among engineering lecturers who have experienced transition from TCL to SCL.

RQ1a. What is the teaching conception (belief, intention, and action) among engineering lecturers who have experienced transition from TCL to SCL before they implement SCL?

Objective 2: To understand the changes of teaching conception (belief, intention, and action) among engineering lecturers who have experienced transition from TCL to SCL.

RQ2a. How does the transition of teaching conception (belief, intention, and action) occur after implementing SCL for a semester among engineering lecturers?

RQ2b. What are the changes of teaching conception among engineering lecturers who have experienced transition from TCL to SCL after implementing SCL for a semester?

RQ2c. What are the factors that influenced the change of teaching conception among engineering lecturers who have experienced the transition from TCL to SCL for a semester?

Objective 3: To produce a descriptive model to explain the support needed by the engineering lecturers who are new in implementing SCL.

RQ3a. What is a descriptive model necessary to support engineering lecturers especially those who are new in implementing SCL effectively in a semester?

1.6 Theoretical Framework

A theoretical framework consists of selected theories that can explain the overall research topic, concept, and definition. Traditionally, theoretical framework is developed before data collection in a qualitative research design (Grant and Osanloo, 2014). This study involved two theories which are transformative learning theory and model of teaching conception. The theories helped explain the transition of teaching conception from TCL to SCL as shown in Figure 1.1. The three components that were emphasised in this transition process provided a different story from those that had undergone this experience. The components were teaching belief, intention, and action. These components were taken from the model of teaching conception.

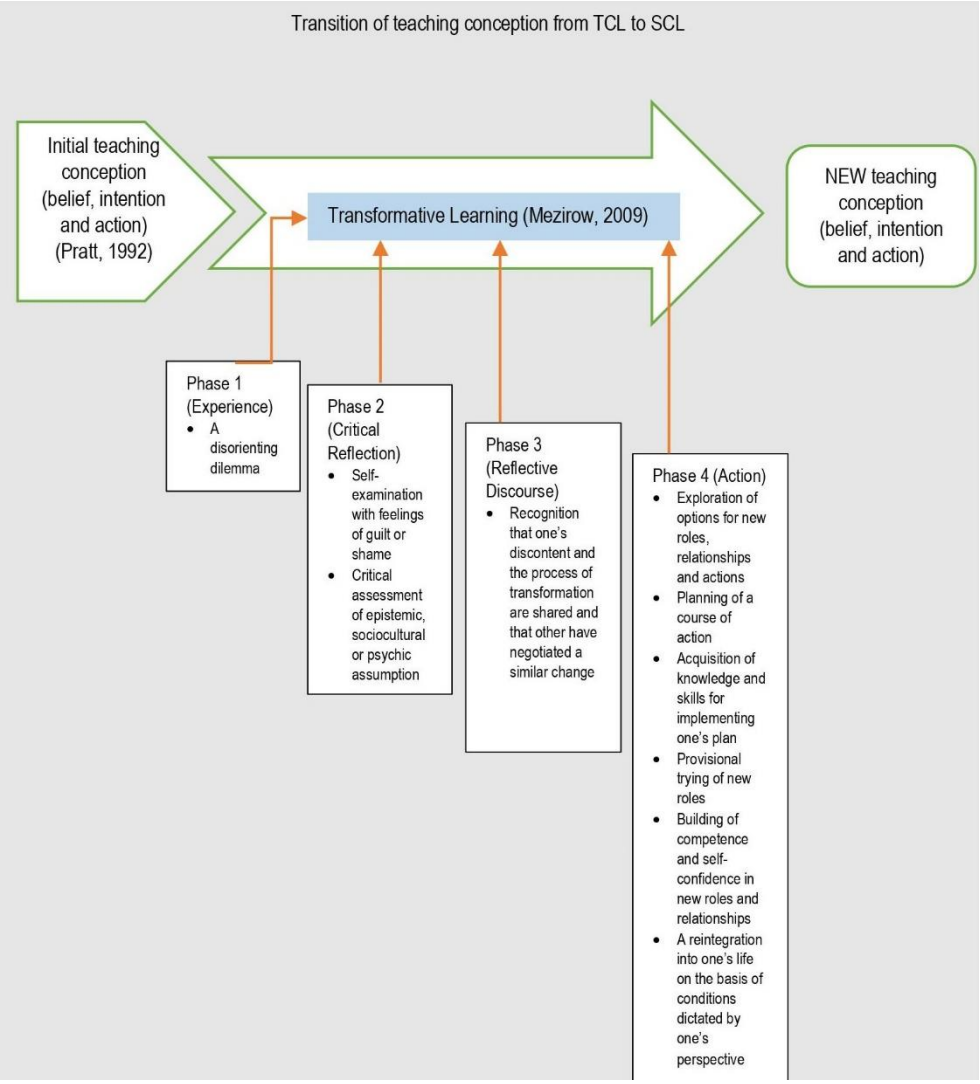

Figure 1.1 Theoretical framework

Model of Teaching Conception. Teaching conception is a set of frameworks based on the lecturer's interpretation and understanding on the meaning of teaching. According to Pratt (1992), teaching conception consists of the elements of belief, intention, and action. Devlin (2006) and Kember (1997) argued that these conceptions are expressed when the lecturer makes decisions and implements them during teaching. Some studies agreed that there are other elements such as attitudes, orientations, practical theories, and implicit or subjective theories about teaching which drive teaching practices (Ahmed, 2019; Kember and Kwan, 2002; Trigwell and Prosser, 1996).

The combination and interrelation of elements of teaching conception between belief, intention, and action were defined in Pratt (1992) as shown in Figure 1.2 (Pratt and Associates, 1998) and supported by other studies (Cheng et al, 2008; Colbeck, Cabrera and Marine, 2002; Gow and Kember, 1993; Kane, Sandretto, and Health, 2002; Norton, Richardson, Hartley, Newstead, and Mayes, 2005; Trigwell and Prosser, 1996). All of them agreed that the element of belief is the lecturers' understanding about "how to teach" and "what to teach" after which they are expressed through their intention and followed by their action in classes.

Belief can be defined as a set of thoughts and related to feeling about something that has correctness and is suitable for that individual to apply. Pajares (1992) stated that the definition of belief is aligned with attitude, value, judgement, axiom, opinion, ideology, perception, and conception. The element of belief is the most abstract. According to Pratt (1992), this element is difficult to identify because some people express differently. Previous studies commonly used belief as the single element of teaching conception (Guilfoyle, 2018; Wong and Luft, 2015).

Intention is related to goals or objectives that were set by an organisation, institution, or government to achieve their own agenda. Intention exists before a set of beliefs are developed. This is because this element consists of judgement and the decision is based on fulfilling the recent objective. Intentions are sometimes not aligned with beliefs because the orientation of developing these two elements has a different agenda. Beliefs are developed based on personal priority while intentions seek to fulfil other objectives. However, intention can easily be assessed or identified compared to belief. In the context of this study, teaching intentions were made to fulfil the course outline, which has already been set by the faculty. Modifications are sometimes made to fulfil their own satisfaction in teaching.

Action is defined as the most concrete and accessible aspect because it means doing certain things independent of what that action might accomplish. Teaching actions are based on behaviours in the class which include teaching techniques,

interaction between students and lecturers, activities, and many more. There are studies that used action as the first stage before defining teaching conception (Henderson et al, 2012; Horgan and Gardiner-Hyland, 2019; Santos and Miguel, 2019). According to Ramsden (1992) and Bowden (1989), teaching method is fundamental in changing teaching conception. This is different from Pratt's (1992) perspective where teaching conception is influenced by three main elements which are belief, intention, and action. These elements are then reflected in what the teacher defines as the meaning of teaching. Developing a new teaching conception requires change on these three elements which usually begins with teaching action and intention, whereas teaching belief requires some time to change it. Table 1.1 shows the difference between the elements in teaching conception based on the characteristics and identification.

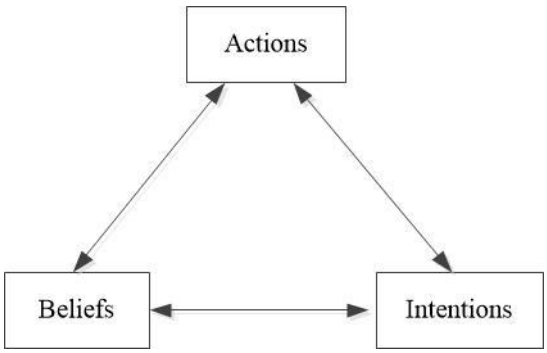

Figure 1.2 Model of teaching conception

Table 1.1 Description of elements in the teaching conception

The elements of teaching conception	Characteristic	Identification
Belief	- Normative or causal propositions with varying degrees of clarity, confidence, and centrality. - Vague and implicit. - Clear and readily explained. - Incontestable. - Cautious.	Each individual has different ways of thoughts on teaching and are based on central and dominant thinking.
Intention	Slightly more abstract, but still readily accessible.	Related to teaching objective or aim to fulfil their own agenda, faculty, institution, or government.
Action	Most concrete and accessible.	The teaching actions show the behaviour or implementation in the class. For example, teaching techniques, communication, activities, and roles.

There are many models and theories produced by experts to help lecturers achieve effective teaching by understanding their teaching conception (Bolster, 1983; Guskey, 2002; Tunç Şahin, 2020). Teaching conception is also important in developing effective teaching. In this study, changes in the teaching conception were monitored to determine which element had changed and the explanation behind it. The change in teaching conception will come from the belief system that leads to the intention of teaching and is expressed through teaching practices or vice versa. Pajares (1992) noted that *"few would argue [against the assumption] that the beliefs teachers hold influence their perceptions and judgments, which in turn, affect their behaviour in classrooms"* (p.307). This model of teaching helps the researcher in understanding

the concept of *how to teach* and *what to teach* among lecturers that have undergone the transition. This will also help the lecturers adapt to their new teaching environment.

Transformative Learning Theory. Transformative learning (TL) theory, also known as the theory of development or transition, is based on adult learners' experience. The fundamental idea of this theory is cognitive even though theorists mentioned clearly on the changes in cognition. Mezirow (1978) developed a characterisation of transformative learning in the late 70s and early 80s. Based on a constructivist assumption, he claimed that knowledge is developed based on our experiences and validated through interaction and communication with others.

The TL theory focuses on transforming the learner's meaning scheme, habit of mind, and mind-set. Meaning scheme is a set of immediate, specific belief, awareness, idea, attitude, feeling, and value judgements (Mezirow, 2000) while the habit of mind is defined as a set of broad assumptions, generalised, orienting predispositions that act as a filter for interpreting the meaning of experience. Examples of the habit of mind are moral or ethical, philosophical, psychological, and aesthetical generalised as predispositions. The meaning scheme is easier to change compared to the habit of mind because learners can easily receive and give viewpoints on certain things, such as teaching perception. However, this also depends on a few factors such as previous teaching experience and initial teaching conception. It is different when an adult learner challenges something that has already existed and built in the mind-set. According to Mezirow (2009), the process of changing our habit of mind (*meaning perspective*) may be sudden and dramatic (*epochal*) or there may be slower, incremental changes in our point of view (*meaning schemes*). The transition occurs when the adult learner interprets a new meaning from a prior assumption or expectation from experience.

The TL is related to the individual's previous experience that is the personal initial conception developed by interpreting the meaning and derive meaning based on previous experience. Knowles (1980; 1975) found that self-directed learning and self-

concept are developed throughout the process of interpreting. This interpretation develops a set of belief system, assumption, and perception. According to Mezirow (2000; 1991), previous meaning perspective would not be a guideline for future interpretation but would be used as an underlying assumption. It is such as it develops one's habitual expectation that one obtains from previous experiences.

Transformative learning theory based on Mezirow's perspective was chosen in this research. Mezirow (1978) and his team of researchers developed ten phases of transformative learning theory after he conducted a qualitative study on personal transformation. These phases were developed based on his study which involved eighty-three respondents and the aim was to investigate women re-entry college programmes. Merriam, Caffarella, and Baumgartner (2007) classified these phases into four main components of the transformative learning process which are experience, critical reflection, reflective discourse, and action. Based on these specific transition phases, the relationship between changes and the process experienced by adult learners can be understood. The transformation process begins by using experience and it is known as the adult learning process. Table 1.2 shows the ten phases and four components of TL.

Table 1.2 Mezirow's (1978) ten phases of transformative learning and the components

Phases	Transformative Classification	Components
Phase 1	A disorienting dilemma.	Experience
Phase 2	A self-examination with feelings of guilt or shame.	Critical reflection
Phase 3	A critical assessment of epistemic, sociocultural, or psychic assumptions.	
Phase 4	Recognition that one's discontent and the process of transformation are shared and that others have negotiated a similar change.	Reflective discourse

Phase 5	Exploration of options for new roles, relationships and actions	Action
Phase 6	Planning of a course of action.	
Phase 7	Acquisition of knowledge and skills for implementing one's plans.	
Phases 8	Provisional trying of new roles.	
Phase 9	Building of competence and self-confidence in new roles and relationships.	
Phase 10	A reintegration into one's life on the basis of conditions dictated by one's perspective.	

1.7 Conceptual Framework

A conceptual framework is the interconnected set of concepts, including ideas, observation, knowledge, and other experiences in order to guide, interpret data, and predict outcome. This framework can assist a study in deciding the type of data to be collected and the variables to be examined (Svincki, 2010; Miles and Huberman, 1994). This framework shows the systems of concept, assumption, and belief that supported and guided the research plan (Miles and Huberman, 1994).

Hence, this study was bounded by a conceptual framework to understand the transition of teaching conception which occurred among Engineering lecturers as shown in Figure 1.3. Hart (2009), Paderson and Miu Liu (2003), Kolmos (2002), Kember and Kwan (2000), and Pratt (1997) stressed that this transition will challenge the lecturers to change their teaching conception. Radzali, Mohd-Yusof, and Phang (2018) found three main phases throughout this transition process, which are before

SCL implementation, after attending an SCL training workshop, and during the implementation of SCL. This phase was also a timeline to determine how the respondents had or had not changed their teaching conception. The microgenetic method applied in this study in order to understand on how the transition process of teaching conception occurs among engineering lecturers. Commonly studies discussed the different this method to cross-sectional developmental studies, longitudinal studies and instructional experiments. They usually applied of examining process of learning while the microgenetic method is to illuminate in detail the process of learning as they occur. Details discussion on this method in the Chapter 3.

1) Before SCL-implementation

This phase focuses on the introduction or personal background of the respondents who have undergone teaching experience. This period describes in detail previous experiences as a student and lecturer, teaching actions, and problems faced. All these factors develop meaning scheme, habit of mind, and mindset for respondents who had experienced the transition of teaching conception before this study was conducted (Illeris, 2004; Malkki and Green, 2014). The consequences differ for each respondent's storyline based on their transition experience.

The study found a connection between previous teaching and learning environment and the initially constructed teaching conception. Teaching conception can be defined as a set of teaching orientation. Kember (1997), Kember et al (2014), and Pajares (1992) distinguished teaching orientation between two poles which are TCL and SCL. In addition, Kember (1997) and Fang (1996) believed that teaching orientation is developed based on the lecturer's experience as a student, and subsequently as a teacher. Their teaching reaction or initial teaching conception at this phase was used as a benchmark to explore and understand each phase of transition.

2) After attending SCL training

This phase required the selected respondents in this study to attend two sessions of SCL training, which were active learning and team-based learning. The training introduced and exposed the trainees to informal and formal Cooperative Learning (CL) and principles of effective learning techniques. It also included a variety of SCL techniques and educational knowledge to support SCL implementation, such as the How People Learn Framework (Biggs, 1996) and Constructive Alignment (Bransford, Brown and Cocking, 1999). In this phase, it was found that the perception on SCL and the training affected the respondents (Radzali, Mohd-Yusof, and Phang, 2013).

3) Implementation of SCL

The implementation of SCL was conducted in one semester. At this phase, the study was divided into three periods which are the beginning, middle, and end of semester. Throughout this phase, three themes emerged to reveal the new initial teaching conception, which are teaching beliefs, intentions, and actions. Referring to Pratt (1992), the interrelation between these three themes is important to understand teaching conception. There are also others themes that influenced the transition of teaching conception, such as teaching problems, conflicts, and students' feedback (Knapper, 2008; Radzali et al, 2018; Sarker et al, 2010).

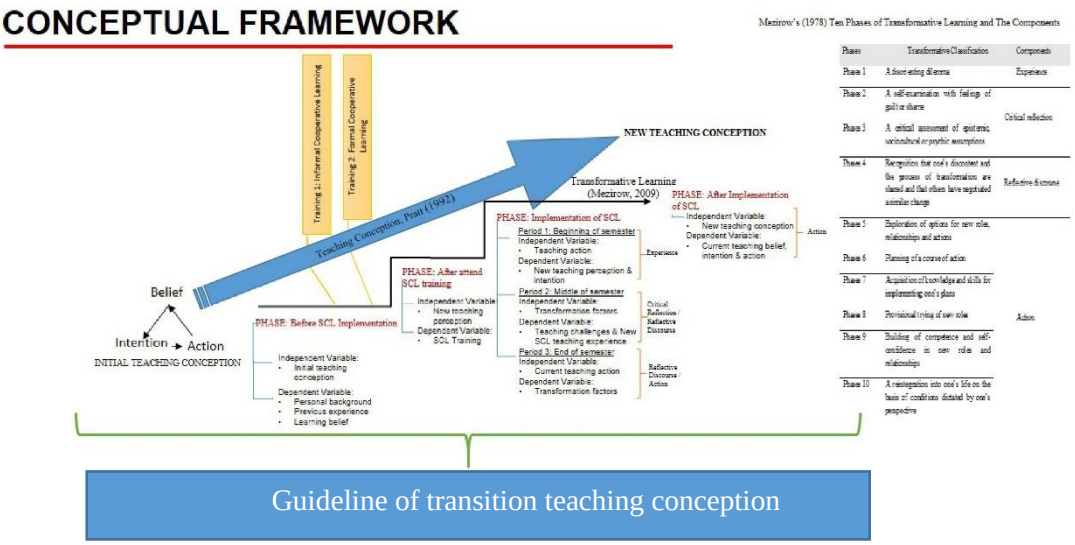

Figure 1.3 Conceptual framework

The four phases of experience guided the construction of the conceptual framework. These include the support needed during this transition phase and transformation factors that contributed to its success. The respondents had different backgrounds, problems, teaching conflicts, and influenced factors, but they were of the same experience and required the same teaching support. Thus, a guideline would help Engineering lecturers adapt and attain going through transition of teaching conception. This guideline could not be generalised as it is specifically for those who are new in implementing SCL and possess the same teaching experience.

1.8 Significance of the Research

This study explored Engineering lecturers' teaching experience during the transition of teaching conception from TCL to SCL. Based on the selected criteria of lecturers, at the end of this study, a framework that is suitable for the context of Malaysia was formulated. This research contributes towards:

1. Engineering lecturers, specifically those who are new in implementing SCL. The findings explained the transition process thus, preparing themselves for the challenges ahead (Chung and Chow, 1999; Laughridge, 2011; Thanh-Pham, 2010; Whitman, Ramos and Skinner, 2007; Winter and Lemons, 2001).

2. Training development programmes such as faculty development training and workshops on effective teaching and learning. Managers would be able to use this research as their guide to improve their programme outlines, especially for SCL. They also gain access to the information on the development process and the progression of the lecturers during the transition process (Baume and Kahn, 2004; Gibbs and Coffey, 2001; Guskey, 1986; Kolmos, 2001; UNESCO, 2006).

3. Teaching and learning centres. The findings can be used as a recommendation to the faculty, university authorities, and other stakeholders to provide

appropriate facilities to enhance the SCL environment (Khan, 2004; Kolmos, 2001; Smith, 2004).

4. Higher Education Institutions. This would serve to minimise unnecessary bottlenecks that occur in the universities to encourage lecturers to implement SCL. They can then appoint a team of experts on SCL to be mentors for those who are new, and use this research as their reference to understand the transition process (Ginkel and Dias, 2007; Sarker, Davis and Tiropanis, 2010; Thanh-Pham, 2010).

5. Ministry of Higher Education Malaysia (MOHE). This research is beneficial as it will help the ministry to produce a new generation of Engineering lecturers that implement SCL suitable for the 21st century (MOHE, 2015; 2012).

1.9 Definition of Terms

The following terms are commonly used in this research.

1. Teaching conception

Teaching conception is a set of teaching orientation which includes teaching beliefs, intentions, and actions. According to Pratt (1992), lecturers' understanding of teaching can be examined based on teaching conception. Teaching conception can be determined based on teaching practices (including teaching strategies, techniques, and approaches) and teaching intentions (including teaching goals, vision, and mission). Teaching belief is of an abstract nature and is difficult to measure, but it can be predicted based on the intentions and practices. The conception is divided into two poles which are TCL and SCL.

2. Transition of teaching conception

The transition of teaching conception is related to the changes in developing new teaching conception. In this study, the transitions occur from TCL to SCL. The focus of this study was to understand how the transition process of teaching conception occurs. According to Mezirow (2000), adult learners experience transition phases in their lives, so this study was interrelated to the lecturers' experiences when they were students and lecturers. The combination of these experiences was used to interpret their meaning of teaching and learning.

3. Belief

Belief is influenced by feelings based on trueness, correctness, or suitability of teaching and learning for lecturers to implement their teaching approach in the class. The lecturers' belief will affect their implementation of teaching and learning (Paderson and Miu Liu, 2003; Fang, 1996). Pajares (1992) pointed out that lecturers' belief guides their decisions and actions in the classroom, which in turn affects students' achievement and performance. He also stated that it is especially true for new lecturers in a new environment to implement a new teaching approach when they lack experience and knowledge. Belief, from Pratt's (1992) perspective, is divided into various aspects like normative, implicit, tentative, and dominant based on the lecturer's understanding of effective teaching. Often, belief forms intention which directs actions (the process of teaching), structure, and cognitive strategies. In short, lecturers will refer and depend on their beliefs to guide their decision-making process. Beliefs are also aligned with other terms such as attitudes, values, judgements, axioms, opinions, ideologies, perceptions, and conceptions (Pajares, 1992).

4. Intention

Intention is based on a person's goal or objective and responsibility, and what he or she is trying to accomplish, sometimes set by an organisation, sponsoring agency, or government. Pratt (1992) stated that intentions are slightly more abstract and readily accessible in most interviews. Intentions are affected by personal and/or social

agendas. In the context of this research, it played an important role in judgements, such as determining whether effective teaching had taken place.

5. *Action*

Actions in teaching practices indicate lecturers understanding of their teaching. This involves teaching activities and a repertoire of techniques. Pratt (1992) noted that actions are the most concrete and accessible aspect because teaching actions means doing certain things independent of what that action might accomplish, such as lecturing, mentoring, demonstrating, and active learning.

6. *Engineering lecturers*

Engineering lecturers refer to the lecturers from the Engineering faculty and who are newly implementing SCL. The characteristics of the lecturers are that they do not have a strong background in educational philosophy and pedagogy, lack of experience in conducting SCL, and therefore, need training by experts to implement SCL(Board, 2016; Fink et al, 2005; Godwin and Lafayette, 2016). According to Winter and Lemons (2001), new lecturers who implement SCL in the class or laboratory are inexperienced in teaching and training, or unable to produce well-developed ideas on how to conduct their classes or lab sessions.

7. *Student-Centred Learning (SCL)*

SCL is a variety of teaching approaches which aims to produce students instilled with life-long learning, a classroom environment where students interact with their peers or groups and instructors (Ambruster et al, 2009), lecturers who engage with students in the learning process, as well as an independent learning process by constructing their own goals for learning, and determining the resources and activities that can help them achieve the goals (Jonnasen, 2000). SCL can also be identified as a collection of teaching approaches. Felder and Brent characterised SCL as follows:

> *"SCL is a board teaching approach that includes substituting active learning for lecturers, holding students responsible for their learning, and using self-paced and/or cooperative (team-based) learning. Other ways to centre out teaching on students include assigning open-ended problems and those requiring critical or creative thinking, reflective writing exercise, and involving students in simulations and role-plays".*
>
> (Felder and Brent, 1996)

Some examples of SCL include case-based learning, project-based learning, goal-based scenarios, learning by design, project-based learning, and problem-based learning. The important factors in implementing SCL are teaching and learning goals, the role of the lecturers, assessment, student interaction, and student motivation (Paderson and Miu Liu, 2003).

8. Teacher-Centred Learning (TCL)

TCL is different from SCL (Hannafin et al, 1999) in terms of teaching and learning goals, role of lecturers, assessment, student interactions, and student motivation. TCL is rote learning where the learning outcome is examination-oriented. In the learning process, students are only required to memorise all information without deeply understanding the concepts and rarely use critical thinking in the class. This is because the lecturers will provide all the information. This approach will cause students to become passive, lacking in creativity, cannot apply the knowledge in real life situations, and incapable of determining their learning goals (Perkins, 1992).

9. Descriptive model of transition of teaching conception

At the end of this study, a descriptive model of transition in teaching conception was developed. The model is an explanation of the transition process from TCL to SCL and focuses on the support that should be given to Engineering lecturers

who are going through this transition. This model would benefit new lecturers who are implementing SCL to guide them in going through this new experience. It includes the changes of teaching conception (beliefs, intentions, and actions), transition phases, and transformation factors.

10. Transition of TCL to SCL

Due to the transition process from TCL to SCL in producing a new teaching conception, the new teaching conception can be changed in all three interrelated or each element (belief, intention and action) depending on the transformation factors of each individual. The transition of TCL to SCL is measured from the initial teaching conception (data taken before the individual attend SCL training) to the current teaching conception (after the individual attend that training).

A new teaching action is defined as the new teaching approach applied in the class. Commonly, the Engineering lecturers apply the new teaching approaches that they get from the SCL training, such as informal or formal Cooperative Learning approach. The consistency of implementing these teaching approaches is considered as a new teaching action.

Meanwhile, the new teaching action is connected with a new intention. Engineering lecturers are considered to choose an appropriate teaching action based on their teaching and teaching aim at that moment. The new teaching intention is always changing, but this study focused the ultimate teaching intention after the trial implementation of SCL in one semester.

The new teaching belief is the interpretation of the meaning of knowledge and teaching among Engineering lecturers at to end of the semester after implementing SCL. Some of the respondents did not clearly state their new teaching belief, but this

study would determine the new changes based on the transition process from their initial teaching conception until the end of the SCL implementation in one semester.

1.10 Summary

This chapter discusses the challenges faced by Engineering lecturers in changing their teaching approach and implementing SCL. The gap was focused on the transition process of teaching conception to SCL. The teaching conception was based on Pratt (1992) of three core elements: belief, intention, and action. This concept was adopted to produce three research objectives which led to the research questions. A conceptual framework was developed to help and guide the study to understand and explore the lecturers' experience throughout their transition process. Finally, this research contributes to all related parties. This research was based on experienced Engineering lecturers applying SCL in their classes and focused on their transition of teaching conception.

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