The Links between Role of Educators, Self-Directed Learning, Constructivist Learning Environment and Entrepreneurial Endeavor: Technology Entrepreneurship Pedagogical Approach

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Abstract. This paper presents a study relating to pedagogy approach involving the role of educators, self-directed learning, constructivist learning environment, and students' entrepreneurial endeavor. A conventional pedagogy in class would deploy educators or lecturers as main actors, and students would be on the receiving ends. Currently, many studies have been the focus on finding the best pedagogy in entrepreneurship education. This study is to explore the social constructivist approach in which is said able to encourage students to explore and create their technology business venture in the future while educators would act as mentors to guide students. The study also sought to determine how much educators' role and self-directed learning influence students' entrepreneurial endeavors through the constructivist learning environment. Students from technology entrepreneurship classes were invited to take part in the online survey. Findings had shown that the roles of educators and self-directed learning have a positive effect on an entrepreneurial endeavor. However, a constructive learning environment does not influence an entrepreneurial endeavor. Educators play an essential role in students' self-directed learning that contributes to the constructivist learning environment and their entrepreneurial endeavor. Overall, all variables have a moderate impact on the entrepreneurial endeavor. The level of the constructivist learning environment is still low but promising. Recommendation and suggestions are provided.

Keywords: social constructivist; role of educators; self-directed learning; constructivist learning environment; entrepreneurial endeavor.

1. Introduction

This paper aims to explore the social constructivist pedagogical approach in technology entrepreneurship education. Many studies have discussed the pedagogical approach to entrepreneurship education applications (Maresch et al. 2015; Ismail et al. 2018; Linton and Klinton, 2019). To date, while there have been numerous studies on entrepreneurship education pedagogy; however, no study has been carried out to document and verify the pedagogy approaches for technology entrepreneurship. Thus, it remains unknown how effective the currently practiced pedagogy is in creating good potential technology entrepreneurs among students in Malaysia. As Malaysia is determined to be an Entrepreneurial Nation by 2030, entrepreneurship education has become an important agenda. The high-technology industry has been the national focus towards becoming a high-income nation; technology entrepreneurship has been introduced actively in every level, especially in higher learning institutions. One of the key elements in technology entrepreneurship is to be able to identify and explore entrepreneurial technology opportunities. Therefore, it requires a different pedagogical approach compared to the current practices. Cheng et al. (2009), in their study, found that students' tendency to choose entrepreneurship as their career was not influenced by entrepreneurship education. Supported by a study by Yusof et al. (2015) conclude from their study that the current entrepreneurship education delivery system in Malaysia's Higher Learning Institutions is less effective and they highlighted that trainers' skills, which referred to educators, are below expectation. Entrepreneurship emerges dynamically in social interaction between people in many ways and many forms through meetings, readings, the internet, and so on (Richardson, 2003). The social constructivist pedagogy is focusing on individual students to learn ways of facilitating that learning first in individual then in-group. In a social constructivist pedagogy setting, students actively participate in creative activities where educators, lecturers, or facilitators allow and encourage students to propose their ideas, test, and justify it (Millituru et al., 2012). Students are encouraged to test the concept through a simple market survey. The objective of this study is to explore students' constructivism learning environment and the relationship between the role of educators, self-directed learning, and entrepreneurial endeavor.

2. Research Background

Entrepreneurial Endeavour

Entrepreneurial endeavor is vital for the country's economic development (Bizri et al. 2012). Park (2017) posits that entrepreneurial endeavor is the future intention in exploring entrepreneurship. The entrepreneurial endeavor of students relates to the intention of students to start a business, which comprises of entrepreneurial orientation, entrepreneurial confidence, university and ecosystem support (Pauceanu, Alpenidze, Edu & Zaharia, 2019). Many studies have been exploring the antecedents of entrepreneurial endeavor and intention among students. Recently, psychological factors such as entrepreneurial knowledge, entrepreneurial personality trait (Roy et al. 2017), attitude, subjective norms, and perceived control behavior (Al-Jubari et al. 2018) have been studied to connect to entrepreneurial endeavor as well as a career choice.

Role of Educators

The role of educators has been a focus where their professional scope has been extended from teaching general entrepreneurship to teaching technology entrepreneurship at the course of supporting the government goals. As Malaysia is focusing on high-tech industry activities (Abdullah, 2009), it has a tremendous impact on the public universities' functions, contents, and applications (Qureshi, Kazim, & Whitty, 2016). The government's focus has also affected the way they respond to the social and economic needs of society (Dhaliwal, 2016; Boocock, Frank & Warren, 2009). Teaching technology entrepreneurship differs from general entrepreneurship, as it requires a lecturer to deliver the subject by combining art and science to provide practical education to the students. Frank and Boocock (2015) explain that technology entrepreneurship education is a unique component of entrepreneurship education.

Similarly, an appropriate 'entrepreneurial' pedagogy needs to be designed to enhance entrepreneurial capacities and capabilities amongst students (Dhaliwal, 2016). The entrepreneurial pedagogy undertakes that educators have many roles, sometimes different from those related to lecture-based teaching (Profweb, 2018). These roles can be, among others are educators as motivators to foster students' commitment, as guidance which accompanies students throughout the learning process and help to refocus the students' interests on the real object of learning and as facilitators to provide access to knowledge. Nonetheless, students are empowered to construct their learning. There are two types of learning approaches that can be adopted either a teacher-centered approach or a student-centered approach (Ameliana, 2017). In a study by Ismail (2017), a teacher-centered method is more effective in Malaysia because of the system of collective culturally-based education.

Self-Directed Learning

The autonomy of the student learning process is the basis for them to develop all the competencies demanded in this new age. Learning to learn is the ability that educators need to learn in their lessons, teaching students how to learn. Various teaching methods require students to learn, such as self-directed learning (SDL). Although self-directed learning has been implemented for years, only recently it has been a center of discussion. When technology has become important for communication, the mass access to the university programs, the necessity of the professionals to work and study at the same time, the dispersion and distance of the sceneries to have access to different specialties has created a new demand. Self-directed learning allows the student to do their tasks at their own pace while doing other things. Knowles (1975), posit self-directed learning as a process where individuals have total control of their learning process from identifying their needs to achieve their learning goals. They also identify and select their resources, materials, and strategy. In self-directed learning, discipline and commitment are crucial as students bear their responsibilities and accountabilities. Self-directed learning (SDL) is a complement to problem-based learning (Loyens et al. 2008). Arslan (2019), through his study, found that it is consistent with the findings of Coşkun and Demirel (2012) on teachers' perceptions of their learning skills. Qualitative research conducted on 32 prospective teachers found that prospective teachers were more inclined to learn

on their own and more likely to be interested in the subject matter of their interest and to contribute to their professional and personal development only. A Massive Open Online Course (MOOC) used globally today to support self-learning. Zhu and Bonk (2019), in their study of delivery methods through the found method of delivery through MOOC, facilitates student self-monitoring for self-learning (SDL) where student self-monitoring with internal and external feedback can be done easily and effectively. In Malaysia, MOOC is strongly promoted to self-learning through online lectures, tutorials, quizzes, and exercises. Besides, it assists faculty assistants such as tutors and peers in providing external feedback for student self-monitoring. A study by Munasinghe et al. (2019) on Indonesian high school students have found the influence of self-learning on a future career. The quality of self-direction, which is mirrored in strategy and self-awareness, is also included in this aspect. Students set their career options based on activities, learning, and development of skills and learning experience; therefore, these areas are essential to be addressed carefully. Other studies have identified factors that also affect self-learning, which can be used by educational policymakers to change teaching patterns, academic curricula, and create more appropriate learning contexts in the university education system. All these can assist in enhancing self-directed learning students. A study by Louws et al. (2017) posits that teachers show a good command and control their learning process and paces within their work environment. By having good command, teachers determine their learning goals, set their learning engagement and activities as well as their professions (Kyndt et al., 2016; Mansfield and Beltman, 2014; Thomson and Turner, 2015). As teaching and learning is part and parcel of teachers' profession, they can set their own learning goals and strategies (Janssen et al., 2014; Shriki and Lavy, 2012). However, as teaching and learning is a long-term and continuous process, teachers are still seeking supports from others, thus creating excellence outcomes. Also, teachers have a rationale for their learning domain (Jansen in de Wal et al., 2014).

Constructivist Learning Environment
The nature of constructivism is the conviction that learners can learn by themselves with minimal guidance by (Lin, 2003) construct personal knowledge. In the constructivist-learning environment, individual students create ways on how learning can take place where knowledge is developed from communication and engagement between students and the surrounding. Today, classroom settings have been changed, such as being unrestricted in the classroom and even outside of the classroom. Variety settings are now an alternative to educators. Where they find themselves in the activity class is quite limited with limited equipment. Through this strategy, educators can implement a more attractive educational environment and facilitate learning sessions. The latest technology of using audiovisual and other technology-based resources, as well as learning through relevant natural ecosystems, can stimulate students' thinking (Nicolaou, Matsiola and Kalliris, 2019) and provoke their learning desire. The quality and features of the learning environment can be evaluated from a variety of factors such as university's policies, administration, structure, and other attributes that can also be deemed as "elements of the learning

environment." From the perspective of educators, the learning environment is one of the crucial factors that influence students' learning directly and indirectly. It includes student interaction and commitment to what educators teach and their desire for learning. For example, a natural learning environment such as a classroom outside in the sun can stimulate student mindfulness and is considered more conducive to learning than a blank space without windows or decoration. The evolution of learning has been overwhelming over the years (Fraser, 1998) to cater to national interests as well as industries' demand.

Furthermore, technology has changed students' mindsets as time goes by. Entwistle and Tait (1990) looked at students' perceptions of the learning environment of their choice depending on a more active and higher-level approach, wherein this aspect educator provided information that had been digested for "learning." Students with a more in-depth approach prefer challenging educators and encourage them to think further. Keith Trigwell and Michael Prosser (1999) emphasize teaching and learning approaches, have two components - intentions and strategies - and some educators introduce innovations aimed at improving student quality, but in practice contradict those intentions. It is a new challenge for educators to tackle students in the classroom. More studies are focusing on the learning environment to promote a different level of learning. Few studies have shown that the classroom environment plays a crucial role in learning outcomes and supersede the background of student characteristics (Dorman, 2001). The classroom environment can influence students' positive and negative perceptions and reactions (Hannah, 2013). A quality classroom not only can promote quality learning but also increase students' self-confidence and self-esteem (Popescu-Mitroia, Todorescu & Greculescu, 2015). From the literature reviews, the research framework has been developed in Figure 1.
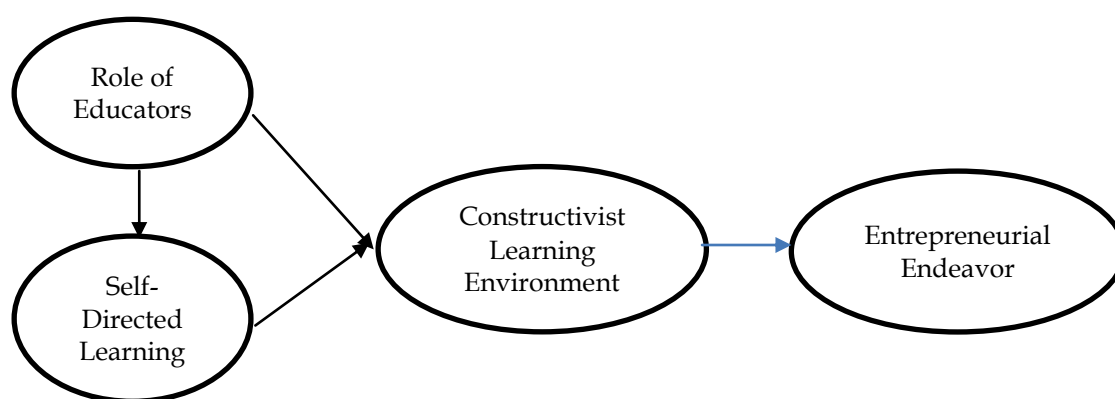

Figure 1: Research Framework

A total of eight hypotheses have been developed. In the learning environment, many factors influence learning behavior and the environment, especially in higher learning institutes (Akareem and Hossain, 2016). The interrelationship of these variables offers rich information to address current issues and to promote an alternative teaching approach. It is vital to explore all possibilities, thus left

nothing unturned. Therefore, many hypotheses will allow more tests to be carried out and provide more information to address the main objectives of the study. Furthermore, each relationship provides different outcomes that need to be challenged. Bettini et al. (2017) emphasized that "the use of multiple working hypotheses to gain strong inference is widely promoted as a means to enhance the effectiveness of the scientific investigation."

H1:   Role of Educators has a positive relationship to Entrepreneurial Endeavor
H2: Self Directed Learning has a positive relationship to Entrepreneurial Endeavor
H3: Constructivist Learning Environment has a positive relationship to Entrepreneurial Endeavor
H4: Self Directed Learning moderates the relationship between Role of Educators and Future Endeavour
H5:   Self Directed Learning moderates the relationship of Role of Educators and Constructivist Learning Environment
H6:   Constructivist Learning Environment moderates the relationship of Role of Educator and Future Endeavour
H7:   Constructivist Learning Environment moderates the relationship between Self Directed Learning and Entrepreneurial Endeavor
H8:   Constructivist Learning Environment moderates the relationship between Role of Educators and Self Directed Learning and Entrepreneurial Endeavor

3. Method

There are four variables together, namely; role of educators, self-directed learning, learning environment, and entrepreneurial endeavor. The items of the constructivist learning environment and role of educators were adapted from Taylor, Fraser & Fisher (1997). Self-directed learning is adopted from Murray Fisher, Jennifer King, and Grace Tague (2001), and an Entrepreneurial endeavor was adopted from Giones et al. 2012. Purposive random sampling was deployed through an online survey. The non-probability sampled method was chosen because of the characteristics of a population and the objective of this study. Since this study is to explore the social constructivism on students' learning style, therefore it is focused on average members of a specific student population. Students who were attended a technology entrepreneurship class were invited to take part in the survey. A total of 295 usable questionnaires were collected and used for data analysis. The majority of the respondents were in the age range of 22-24 years old. About 53.2% of respondents were male and 46.4 were female. Faculty of Mechanical had the highest number of respondents of 44.1%, followed by Faculty of Architecture (31.9%) and Faculty of Mathematics and Science Computer (11.2%). The other faculties that took part are Faculty Business and Administration (0.7%), Faculty Health Science (1%), Faculty of Electrical Engineering (0.7%), Faculty of Sports and Recreation (4.1%) and Art & Design (0.3%).

4. Results and Discussion

The structural equation modeling (SEM) technique is generally used to examine relationships between constructs based on their given indicators (Chin, 1998). In this study, the SEM technique is used to analyze the research hypotheses. In this

study, Partial Least Square (PLS) of variance-based is used to explore the interactions among variables. In this study, PLS is deemed suitable as the main purpose of this study is to explore the effects of the interaction of antecedents and entrepreneurial endeavors (Ru et al. 2018). A two-step approach for data analysis, as suggested by Hair et al. (2017) and Rigdon et al. (2017), was utilized. The first step analyzed the measurement model, and the second step assessed the relationships among principal constructs. SmartPLS software version 3.2.6 (Sarstedt et al. 2017) was used to analyze the data.

Measurement model

The measurement model can be evaluated by three measures, which are individual item reliabilities, convergent validity, and discriminant validity (Hair et al. 2017). In assessing the measurement model, convergent validity, which measures the correlation between constructs, was tested. As suggested by Hair et al. (2017), the factor loadings, composite reliability, and average variance extracted were used to assess convergence validity. Table 1 presents that the composite reliability and AVE of all variables are more than 0.5; therefore, convergent validity has been achieved. In assessing the discriminant analysis, the heterotrait-monotrait ratio of correlations (HTMT) was used. The result of HTMT was to confirm the real hypothesized structural paths. The discriminant analysis is achieved if the HTMT value is below 0.90 between two constructs (Henseler, Ringle, and Sarstedt (2015). Table 1 presents that all the value is below 0.90; therefore, discriminant validity has been established. Few items have been dropped due to low loadings.

Table 1: Construct Reliability and Validity and Discriminant Analysis

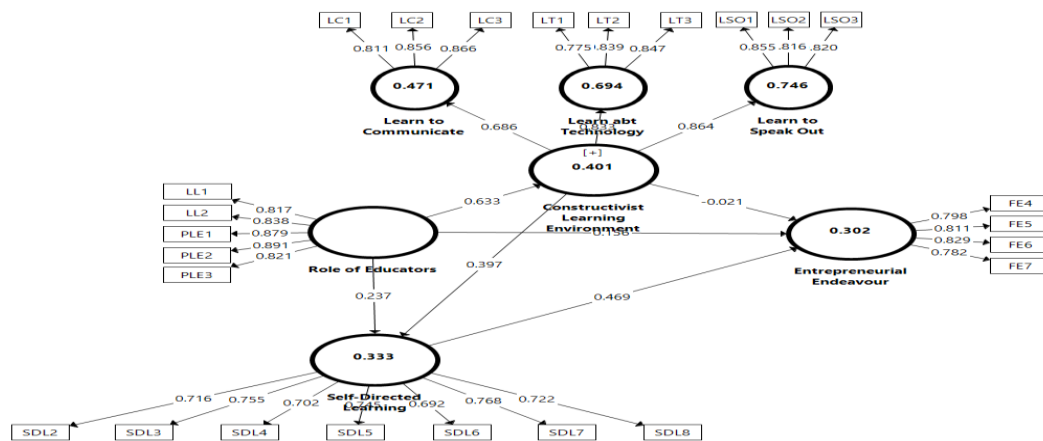|	CR	AVE	1	2	3	4	5
Entrepreneurial Endeavour	0.881	0.648					
Learn to Communicate	0.882	0.714	0.533				
Learn to Speak Out	0.869	0.690	0.391	0.721			
Learn About Technology	0.861	0.673	0.317	0.758	0.569		
Role of Educators	0.928	0.722	0.429	0.671	0.755	0.516	
Self-Directed Learning	0.888	0.532	0.634	0.760	0.560	0.576	0.551

Figure 2: Structural Model

Structural Model

Figure 2 shows the structural model of the study. The R² of Entrepreneurial endeavor is 0.302 indicates a substantial level of predictive accuracy (Hair et al. 2017). About 30.2% of variance explained in the Entrepreneurial endeavor is contributed by the exogenous variables. Except the Constructive Learning Environment (β= -.0.021, t= 0.332, p=0.740), both Role of Educators (β=0.372, t= 6.952, p=0.00) and Self-Directed Learning (β= 0.461, t= 8.490, p=0.00) has a positive and significant relationship to Entrepreneurial Endeavor. Therefore, H1 and H2 are supported, and H3 is not supported. On the same note, Constructivist Learning Environment did not mediate the relationship of the Role of Educators and Self-Directed Learning to Entrepreneurial endeavor; therefore, H6, H7, and H8 are not supported. Interestingly, H5 is supported that showed Self Directed Learning moderates the relationship of Role of Educator and Learning Environment (β= 0.153, t= 5.331, p=0.00). Table 2 shows the results of Hypotheses.

Table 2: Results of Hypotheses

Hypotheses	B	SD	t-value	P values	Remarks
H1: Role of Educators has a positive relationship to Entrepreneurial Endeavor	0.372	0.054	6.952	0.00	Supported
H2: Self Directed Learning has a positive relationship to Entrepreneurial Endeavor	0.461	0.054	8.49	0.00	Supported
H3: Constructivist Learning Environment has a positive relationship to Entrepreneurial Endeavor	-0.021	0.064	0.332	0.740	Not Supported
H4: Self Directed Learning moderates the relationship between Role of Educators and Entrepreneurial Endeavour	0.229	0.039	5.861	0.00	Supported
H5: Self Directed Learning moderates the relationship of Role of Educator and Constructivist Learning Environment	0.153	0.029	5.331	0.00	Supported

H6: Constructivist Learning Environment moderates the relationship of Role of Educator and Future Endeavour	-0.01	0.034	0.302	0.762	Not Supported
H7: Constructivist Learning Environment moderates the relationship between Self Directed Learning and Entrepreneurial endeavor	-0.007	0.022	0.308	0.758	Not Supported
H8: Constructivist Learning Environment moderates the relationship between Role of Educator and Self Directed Learning and Entrepreneurial endeavor	-0.003	0.011	0.305	0.760	Not Supported

Discussion

The findings showed mixed results as a conventional learning environment still strongly exists. Educators play an instrumental role in encouraging students toward entrepreneurial endeavors. The educator-centered approach is still preferable in Malaysia (Ismail, 2017). As students are required to complete many assignments, self-directed learning is becoming a routine element.

Nevertheless, students perceived that the role of educators and self-directed learning helped them to explore entrepreneurial endeavors. Students understand that they have to work on their own. Thus, self-directed learning influences their entrepreneurial endeavors. However, in motivating students to speak out, to communicate and learn about technology did not spark their entrepreneurial endeavor. This is, perhaps, students are still expecting educators to guide and assist them in identifying and exploring opportunities jointly. This finding is similar to the study by Cetin-Dindar (2016) found that students were not much interested and enthused to learn science in a constructivist learning environment. The role of the educator is still very instrumental in assisting learning in the classroom, especially in "provoking," the thinking to improve learning (Charlton, 2006). As technology has been used in the classroom, the presence of the educator is crucial to promote learning. However, educators should give more autonomy and responsibility of thinking to students rather than provide all information. The provocation from educators can help to create a constructive learning environment. Nasri (2019) found that creating a constructivist learning environment and promote independent, self-directed learning would be a challenge in Malaysia as many educators still believe in their traditional roles and hesitate to let go of their role of authority figures. However, to be a useful and constructive provocateur, educators need to be trained and guided. Educators should be more like a coach rather than a mentor or care-taker. Self-directed learning plays a crucial role between educators and entrepreneurial endeavors as well as between educator and constructivist learning environment. Self-directed learning has been emphasized in universities with various methods of communication using technology to encourage continuous interactions either one to one basis or in a group, thus provide a productive learning environment (Geng et al. 2019). Silén and Uhlin (2008) suggest that to create self-directed learning, it should focus both students and educators. Educators should focus on motivating and encouraging students

to explore entrepreneurial opportunities and develop students' sense of responsibility (Cirik et al. 2015).

In the context of technology entrepreneurship education, creativity and innovation are pivotal. Therefore, educators should consider using social constructivist pedagogy as it is suitable to be used in technology entrepreneurship education as it creates not only an active learning environment but also foster a positive competitive and independent learning (Jha, 2017). The social constructivist approach emphasizes that an active interaction among students would stimulate them to be more active in searching and exploring knowledge and opportunity. In a social constructivist approach, the role of educators or lecturer changed from knowledge and information contributor to mentor, facilitator, and resource person. Shih and Huang (2017) suggest that for technology-based entrepreneurship, more systematically pedagogical methods and approaches should be introduced to develop students' capabilities for reflective and action-based learning (Fayolle, 2013). This process would create independent learners that utilize their creativity and innovation in creating more ideas that benefit society through entrepreneurial endeavors (Meyer et al. 2008).

6. Conclusion

The main objective of the study is to seek to determine the level of constructivism students' desire and the relationship between the role of educators, self-directed learning, and entrepreneurial endeavor. The constructivist learning environment is still new to students, where they have to play an active role in searching, accumulating, and develop knowledge. In this course, students are expected to work independently and work in groups to develop their new product development. A constructive learning environment deemed to be an excellent new approach to encourage students towards self-directed learning, which eventually helps to create a social constructivist learning environment. This study has shown that educators are still vital in the learning process and has a substantial impact on students' entrepreneurial endeavour. However, self-directed learning and constructive learning environment should be emphasized and practiced to allow students to enjoy the exploration and exploitation of knowledge at their own pace. It is important to help educators to learn and develop the constructivist learning environment. When educators are ready, then only the implementation would be handy. There are few limitations worth to be mentioned, such as this study cannot be generalized as its only focus students of Science and Technology. Another limitation is that the study is carried out online; thus, respondents might not fully understand the questions. However, this study is its first kind in Malaysia as social constructivism is still very new. Educators have been playing an extensive and authoritative role; thus, students depend very much on the inputs from educators. It is time for educators to let go of some of their controls and encourage students to be on their own and be an independent learner. Eventually, students would improve their self-efficacy and self-confidence to be creative and innovative. Future research could include entrepreneurial confidence, trust, and cultural as technology has crossed boundaries. It is also recommended to include support from the top management to allow more

alternative teaching styles rather than confined to a structured learning environment.

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