International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 13, Issue 7, 2020

The Relationship between Creativity Domains and Academic Environment

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An increasing awareness of the importance of fostering creativity in higher education is increasing. Universities have recognized the benefits of creativity to individuals and societies in the information age. Based on the psychometric approach and building on the creativity domains theory and the filed theory, this study developed a model to investigate the relationship between creativity domains and academic environment using structural equation modelling (SEM). The measurement model survives the validity and reliability test and the structural model has shown acceptable goodness of fit tests. The instruments were administered to 415 Malaysian undergraduate students. The study concludes that academic environments have a significant relationship with creativity domains, and can theoretically enrich the current research of creativity assessment in higher education. This is an essential skill for students to develop, with implications both for their personal futures and for society as a whole.

Keywords: *Creativity; higher education; creativity assessment; structural equation modelling*

1. Introduction

Creativity has increasingly become one of the most wanted skills of the 21st century for higher education students in the information age. Creative individuals are increasingly in high demand for higher education bodies (Littleton et al., 2010). In the last decade creativity has become a skill that is a pre-requisite for teachers, professors, and students. It is seen as a solution for many social, economic and educational problems. As a result, much research has focussed on the assessment of creativity (Said-Metwaly et al., 2017).

Becoming the key to success in the working world, creativity is at the center of the 21st century educational process (Robinson, 2011). Corporate and public sector leaders reported that creativity is the most important quality a leader must have (Vincent & Kouchaki, 2015). According to Piirto (2011), creative individuals establish a powerful aspect of facing complex changes and challenges in different sources of competition. The increasing awareness of the importance of fostering creativity in higher education is rising all the time (de Alencar & de Oliveira, 2016). However, creative initiatives in higher education are undervalued and even impeded (Watson, 2014). It is possible that the reason for this is that the complicity of creativity assessment, explaining the lack of enthusiasm regarding creative practices in higher education. For example, creativity assessment is complex and problematic (Loveless, 2006). The inclusion of creativity needs new approaches in terms of how we assess creative skills and qualities (Henriksen et al., 2016; Mishra & Henriksen, 2013).

Assessment of creativity is one of the main topics in creativity research, and it is one of the most challenging skills to measure. Typically, studies focussing on assessing the creative personality refer to the four P's model by Rhodes (1961)": creative process, product, press, and person. The study of the creative personality has established itself as a major avenue of research on creativity. A person's creativity is developed and fostered within an appropriate environment (Olatoye et al., 2010). The development of creativity is important for higher education. However, most creativity researchers argue that little is being done to promote it (Charyton et al., 2009; de Alencar & de Oliveira, 2016; Gaspar & Mabic, 2015; Manzi, 2015). Much research has been conducted on individual predictors of creativity, such as personality traits. However, the social factors concerning creativity have not often been studied (Shalley & Gilson, 2004). The level of creativity determines the level of the teaching-learning environment that in turn influences the creativity of students (Kaya & Bilen, 2016).

Henriksen, Mishra, and Fisser (2016) suggest that effective infusion of creativity and technology in education must consider assessment. Creativity is difficult to measure and assess, and the arena of assessment of creativity is rife with multiple challenges, which tend to present themselves as dichotomous tensions. The most important educational challenge facing all universities is fundamentally a developmental challenge focused on the question of how we prepare learners for the challenges they will face in their future lives (Gaspar & Mabic, 2016). The higher education sector needs to harness our imaginations and creativity to work with, adapt to and exploit the complexities in which we are continually immersed (Jackson, 2014; Jackson & Jackson, 2008).

The tensions that arise from the assessment of creative persons exist for different reasons. Can we measure creativity? What is the best approach to measure individuals' creativity? What effect does creativity have in higher education? Creativity researchers agree on one thing – that measuring creativity is hard. Assessment has been a vexing problem for creativity researchers for a long time, in part because creativity research aspires to observe and measure things that

are atypical, novel, innovative, and unusual, be they products, ideas, or people (Silvia et al., 2012).

Creative thinking and creative behaviour are affected by skills, attitudes, motivations, and personality traits. However, these factors do not exist nor develop in a vacuum (Baer, 2016a). Creativity is inseparably tied to the environment. This means we cannot nurture creativity without considering the effect of an individual's environment on their creativity. Some scholars have argued that a large part of creativity differences is based on environmental factors (Kaufman et al., 2008). According to Schepers and van den Berg (2007) environment, experience and knowledge are important conditions for creativity. The setting of the institution and college affects the development of a student's creativity. Creativity also differs from one educational subject and field to the next (Snyder, 1967).

Promoting creativity in higher education is associated with the interactions of a student with his or her environment. The scientific attitude, attentiveness and field correlate with creativity (Park et al., 2017), mainly in the sciences and humanities (de Alencar & de Oliveira, 2016; De Caroli & Sagone, 2010). Creativity is the confluence of scholarly activity, personality and environment. A person's creativity is developed and fostered when the appropriate environment is present (Garcês, Pocinho, Jesus, & Viseu, 2016; Olatoye et al., 2010).

Theories Applied

The study of the creative personality includes Lewin's *Field Theory* and the affective domain. *Field Theory* suggests that human behaviour is a function of the interaction of personality and the environment (Burnes & Cooke, 2013). The environment as demonstrated in the life space (combination of all the factors that influences a person's behaviour at any time) refers to the objective situation in which the person perceives and acts (Ray, 2017). The study of the creative personality include Field Theory (Kaufman & Baer, 2012) and, according to John Baer (2016), any study of the creative person must consider the environment (i.e., academics institutions) in which the person functions.

In addition, it considers that the affective domain that is as important to creativity as is the cognitive domain (Baer, 2016a; Helson, 1996; Kaufman & Baer, 2012). Expanding on this creativity domains theory, Kaufman (2012) developed the Kaufman Domains of Creativity Scale (K-DOCS), a five-factor of self-assessed creative behaviours: Self/Everyday, Scholarly, Performance (encompassing writing and music), Mechanical/Scientific and Artistic. The aim here is to investigate the relationship between creativity domains and the academic environment. The aim of the study serves as a guideline indicating the variables, which includes a students' development, relations with others, and school and year level. These variables are used to investigate the relationships with the five creativity domains (Self/Everyday, Scholarly, Performance, Mechanical Scientific and Artistic).

2. METHODS

2.1 Sample and data collection

In total, 415 Malaysian undergraduate students (206 male and 209 female) from Universiti Sains Malaysia took part in this study. The students' ages ranged from 18 to 23. Participants' main fields of studies were applied science, applied arts, pure arts and pure science. One school was randomly selected from each category (school of Computer Sciences, school of Educational Studies, school of Languages, Literacies and Translation, and school of Mathematical Sciences) in order to study the field of study factor. Students were also drawn from first year and final year as a way of gauging their experiences. Data was collected between October 2019 and April 2020. The data was collected by paper and via an online survey.

2.2 Instruments

2.2.1 Creativity Domains

The Kaufman Domains of Creativity Scale (K-DOCS) was used to measure the creativity domains in this study. This is a 50 item, five-point Likert scale with 1 being much less creative, and 5 being much more creative. Instructions were as follows: "Compared to people of approximately your age and life experience, how creative would you rate yourself for each of the following acts For acts that you have not specifically done, estimate your creative potential based on your performance on similar tasks." (Much Less Creative to Much More Creative) measures five domains of creativity, which are Self/Everyday, Scholarly, Performance, Mechanical/Scientific, and Artistic.

2.2.2 Academic Environment

The College Student Experiences Questionnaire (CSEQ) was developed by C. Robert Pace from the Indiana University Center for Postsecondary Research and Planning in the School of Education, and is a 150-item questionnaire (Gonyea et al., 2003). We adopted the sections describing college environments. Furthermore, a ten-item rating scale was used to assess student perceptions of the psychological climate for learning that exists on their campus. The first seven ask students to rate how strongly the campus emphasizes or promotes various aspects of student development – e.g., academic, scholarly, and intellectual qualities; aesthetic, expressive, and creative qualities; critical, evaluative, and analytical qualities. Students respond on a seven-point Likert scale, with a value of seven representing strong emphasis and a value of one representing weak emphasis. Three more items ask for the student's relationships with other students, faculty, and administrative personnel at the institution. These are rated on a seven-point Likert scale, with one end defined by such terms as competitive, rigid and remote, and the other end defined by terms such as friendly, approachable, and helpful.

2.3 Data analysis

Prior to the data analyses, the reliability of the instruments was determined in SPSS 23. For the content validity of the scale (S-CVI), the instruments were sent to a panel of two experts for comments and feedback. Next, data was analysed using SEM in SmartPLS3. To answer the study questions, data from the respondents was analysed using the structural equation modelling (SEM) technique. Structural equation modelling is a multivariate statistical analysis technique that is used to analyse structural relationships. The first step was defining the constructs and the items from the adopted instruments, then to develop the measurement model. After data collection, both measurement and the structural model were assessed before the testing of the hypothesis.

2.3.1 Composite reliability

The composite reliability was higher than 0.70 for all constructs; the creativity domains constructs range was (0.879-0.958). The academic environment constructs range was (0.958-0.969). The reliability of the constructs was accepted (Hair et al., 2014).

2.3.2 Average Variance Extracted (AVE)

The AVE was higher than 0.50 for all constructs. The creativity domains constructs range was (0.581-0.675). The academic environment constructs range was (0.675-0.818). The results indicate convergent validity (Hair et al., 2014).

2.3.3 Cross loading

The first primary methods for determining discriminant validity (the extent to which factors are distinct and uncorrelated) is to examine the pattern matrix. Variables should load significantly only on one factor. In our study, all items load strongly on their own constructs. All the loading of the indicators assigned latent variable were higher than its loading on all other latent variables indicating discriminant validity.

2.3.4 Variable correlation

The second primary methods for determining discriminant validity is to examine the constructs correlation, the average correlation extracted for a construct reneged (0.728- 0.906). The average correlation extracted for a construct was greater than the shared correlation between constructs. The correlation for each constructs was as follows: Artistic (0.770), Mechanical/ Scientific (0.762), Performance (0.783), Relations with Others (0.906), Scholarly (0.789), Self/Everyday (0.821), and Students' Development (0.904). The results of the Cross loading and Variable correlation indicate discriminant validity (Hair et al., 2014).

2.3.5 Model fit

The Coefficient of Determination R^2 for the creativity domains constructs show acceptable moderate values. Constructs values ranged from 0.342 to 0.554, Artistic (0.342), Mechanical/ Scientific (0.377), Performance (0.449), Scholarly (0.509), and Self/Everyday (0.554). These

results point to the 'goodness of the fit of the model'. The Predictive Relevance of the Model Q^2 was greater than zero for all constructs – Artistic (0.191), Mechanical/ Scientific (0.121), Performance (0.267), Scholarly (0.310), and Self/Everyday (0.369) – supporting the claim that this study model has adequate ability to predict the endogenous variables (creativity domains).

The Goodness of Fit (GoF) for the model was (0.565). The Standardized Root Mean Square Residual (SRMR) was also estimated for the Saturated Model (0.052) and Estimated Model (0.060). Both values were less than 0.10, which is considered a good fit measure for PLS-SEM. The Normed Fit Index (NFI) was 0.76 – the closer the NFI to 1, the better the fit. It can be concluded that the GoF model of this study is large enough to be considered a sufficient global PLS model validity.

3. RESULTS

We found that academic environments may influence the creative person in higher education. The environment has been investigated in studies, which have indicated that higher education students may have different creativity behaviour due to their interaction with the Academic Environment, such as personal development, personal relations, the field of study, and personal experience. The general purpose of this study was to investigate the relationship between creativity domains and academic environment. Therefore, the authors put forward the following hypotheses:

H1a: Students' Development has significant relationship with creativity domains.
H1b: Relations with Others has significant relationship with creativity domains.
H1c: School has significant relationship with creativity domains.
H1d: Year Level has significant relationship with creativity domains.

The relationship between creativity domains and academic environment was analysed using path analyses by bootstrapping in SmartPLS and using the path coefficients to determine the P values and the Original Sample (O). Results were as follows:

Table 1: Relationship between Students' Development and creativity domains

	Original Sample (O)	**P Values**
Students' Development -> Artistic	0.021	0.69
Students' Development -> Mechanical/ Scientific	0.236	0
Students' Development -> Performance	-0.388	0
Students' Development -> Scholarly	0.329	0
Students' Development -> Self/Everyday	0.341	0

Table 1 shows the relationships between the Students' Development construct and the creativity domains constructs. Students' Development was significantly correlated with Mechanical/ Scientific, Performance, Scholarly, and Self/Everyday at $P \leq 0.01$. Based on the Original Sample (O) values, Students' Development relationships with Mechanical/ Scientific, Scholarly, and Self/Everyday were positively significant, while the relationship with Performance was negative.

Table 2. Relationship between Relations with Others and creativity domains

	Original Sample (O)	P Values
Relations with Others -> Artistic	-0.108	0.005
Relations with Others -> Mechanical/ Scientific	0.057	0.091
Relations with Others -> Performance	0.513	0
Relations with Others -> Scholarly	-0.481	0
Relations with Others -> Self/Everyday	0.35	0

Table 2 shows the relationships between the Relations and Others construct with the creativity domains constructs. Relations with Others was significantly correlated with Artistic, Performance, Scholarly, and Self/Everyday at $P \leq 0.01$. Based on the Original Sample (O) values, relationships with Performance and Self/Everyday were positively significant, while the relationship with Artistic and Scholarly was negative.

Table 3. Relationship between School and creativity domains

	Original Sample (O)	P Values
school -> Artistic	-0.078	0.057
school -> Mechanical/ Scientific	0.126	0.002
school -> Performance	-0.004	0.921
school -> Scholarly	-0.006	0.861
school -> Self/Everyday	-0.035	0.324

Table 3 shows the relationships between School and the creativity domains constructs. Type of school was only significantly correlated with Mechanical/ Scientific at $P \leq 0.01$. Based on the Original Sample (O) values, the relationship was positive.

Table 4. Relationship between year and creativity domains

	Original Sample (O)	P Values
year -> Artistic	0.105	0.067
year -> Mechanical/ Scientific	0.084	0.126
year -> Performance	-0.036	0.425
year -> Scholarly	-0.042	0.366
year -> Self/Everyday	0.125	0.004

Table 4s show the relationships between Year Level with the creativity domains constructs. Year level was only significantly correlated with Self/Everyday at $P \leq 0.01$. Based on the Original Sample (O) values, the relationship was positive.

4. DISCUSSION

In the context of creativity assessment in higher education, based on the creativity domains theory and the Field Theory, this study developed a model of the relationship between creativity domains and academic environment. The empirical test of the model has been carried out, and the important conclusions are obtained. With regard to the aim of the study, we found evidence supporting the relationship between creativity domains and the academic environment. This result suggests that environment is essential in assessing the creative person.

Our findings indicate that the more students engage in the academic environment the more their creativity develops and fosters. Students with high social relations are expected to have high level problem solving skills, while students with a high level of development are expected to produce information in academic courses. Another finding is that the longer students engage in higher education, the more they express themselves originally in normal life interactions. In addition, students with the capacity to have novel-original and useful-adaptive ideas in the domain of natural and social sciences were found to in specific schools such as maths and computer students.

The above results are consistent with previous studies. Creativity is affected by the school, and colleagues (Park et al., 2017). Experience and knowledge is an important condition for creativity (Schepers & van den Berg, 2007). The institution and the college setting effect the development of creativity; students' creativity differs from one another in some educational subjects and fields of study (Snyder, 1967). The scientific attitude, attentiveness and field correlate with creativity mainly in science and the humanities (de Alencar & de Oliveira, 2016; De Caroli & Sagone, 2010).

Researchers argued that environment plays a major role in the assessment of the creative person. However, there is still a lack of empirical studies on the matter. The findings supported the theoretical framework and the hypothesis was accepted. This study has shown that

academic environment (Students' Development, Relations with Others, School, and Year Level) are significantly correlated with creativity domains (Self/Everyday, Scholarly, Performance, Mechanical Scientific and Artistic). This means that students' creativity can be developed and fostered through the environment, by increasing students' engagement with higher education activities and social relationship, and therefore their creativity would increase. In addition, the more time students engage with the environment the better their creativity development is.

Historically, assessment has played a central role in education. This study provides a new approach to identify and measure creative individuals in higher education. The result of the creativity assessment will give valuable insights into teachers' evaluation and professional development as well as the decisions and policy-making in educational reform as an indicator for future teacher recruitment. Higher education must help and enable students to develop experience and understand their own creativity (Jackson, 2006). The moral purpose of education is to make a positive difference to students' lives (Fullan, 2003). Higher education is about helping students to develop their full potential. In addition, understanding and developing their unique creativities is an important and worthwhile goal in higher education. Enabling students to be creative should be an explicit part of the higher education experience.

Moreover, this study makes a significant impact because it aims to assess the links between the creativity of the higher education student and the academic environment, the result of which helps us to understand student engagement and achievement, thus providing support for the idea of metacognition. The overarching aim is to assist students to become initiating, smart risk-taking and self-regulating learners. The study can also be used to help diagnose the state of creativity in higher education; it highlights whether a student can show creativity in their work and if the student can be a significant professional contributor to a domain of work (Hallman et al., 2014).

In recent decades we've seen a tremendous rise in entrepreneurship education at universities around the globe. Many organizations are under increasing pressure to recruit and retain creative individuals as a core asset in the emerging knowledge economy. In universities, these people are often academics who focus on high impact, innovative and interdisciplinary research. Yet, many of these academics face challenges in developing and fostering creativity in their students (Kandiko, 2012). Creativity assessment offers feedback to both faculty and policymakers in universities; it also provides information on how changes can be made to the classroom environment to facilitate creativity. The result from the assessment can provide important insights for the professional development of creativity in higher education, as well as decision-making in educational reform (Charyton et al., 2009; Littleton et al., 2010). Also, macro-environmental challenges are changing the role of universities from classical research universities into entrepreneurial universities (Gaspar & Mabic, 2016).

5. Research limitations and future research

Using a self-scale report approach is an important limitation in this study because students or respondents offered answers that are perceived as socially acceptable. The problem with self-scale report instruments is that the researchers have no other choice but to rely on the honesty of participant responses. Students may have the tendency to agree (or disagree) with items regardless of their content. This is a threat to the validity of the instrument. However, building on this approach, many researchers have developed new and reliable instruments using self-report scales. Silvia, Wigert, Reiter-Palmon, and Kaufman (2012) review the recent developments in the assessment of creativity using the self-scale report. Based on their work the state of self-scale report is much better than researchers have previously thought it to be. Researchers still must strive to ensure participant cooperation and willingness to participate. In addition, the practical limitation of time and cost meant that the sample group was limited to students in one higher education institution in Malaysia. Based on the literature and the results of this study, further research should be conducted to develop a valid and reliable creativity assessment model for students in higher education institutions using SEM to assess the relationships between academic environment, and creativity domains. Aiming to identify other significant factors that affect creativity and to clarify the relationship between these factors is another area for future study. There is evidence of gender differences in creativity measurements, particularly in self-scale report (John & Kaufman, 2008; Matud et al., 2007), adding gender as a moderator factor that affects the strength of the relationship. This sheds more light on the nature of the relationships, which could form the subject of any further research in this field. We argue that in order to develop and foster creativity in higher education it is not enough to measure creativity. We also need to strive to understand what makes a higher education student creative by assessing the key factors that influence the creative personality.

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