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WHAT DO READING MATERIALS AND LEARNING STYLES TELL ABOUT CREATIVE POTENTIAL?

Hafizoah Kassim
Zarina Mohd Ali
Zuraina Ali
Noor Raha Mohd Radzuan
Nor Yazi Khamis

Center for Modern Languages and Human Sciences
Universiti Malaysia Pahang

Abstract

The value of creativity in any disciplines is becoming essentially important, and most importantly, the synergy between disciplines to create multi-skilled creative students (Cropley, Priest & Cropley, 1997) is deemed crucial. Concepts such as creative thinking, creative behaviour, creative agent and sources of creativity have been the focal interests of research in understanding creativity, which have left researchers with more questions than answers. This study attempted to investigate whether students' choice of reading materials as creative agent could enhance their creativity. Since individuals are uniquely different in terms of personality or characteristic, the researchers also looked at students' learning styles. Thus, by looking at the correlation between learning styles and choice of reading materials, and how this relationship could enhance creativity can be discovered. The respondents of the study were engineering students of Universiti Malaysia Pahang (UMP) randomly selected from five engineering faculties. Torrence Test of Creative Thinking – Figural (TTCT-F) (Torrance, 1998), Learning Style Index (ILS) (Felder & Silverman, 1988) and self-developed Reading Materials Questionnaire (ReMaQ) were the instruments used. This study assisted the students to realize their creative potential, and helped the faculty and university in selecting appropriate reading materials for syllabus and materials development to help students improve their creativity.

Keywords:
Creativity, Creative Thinking, Learning Styles, Reading Materials

Introduction

The rapid change and swift transformation of technology make certain that a new creation today becomes an old invention the next day. Consequently, people are competing not only against each other but also against time in order to create and produce up-to-the-minute inventions and ideas. Unusual, new and original ideas and inventions are necessitated for individual and organizational survival. Therefore, the need to investigate on how to develop and enhance skills like creativity among students and employees is very important.

Creativity is an added value skill which can enhance a person's problem solving skills, decision making skills, technical skills and even communication skills. In engineering field, engineers are required to have problem solving skills, commonly, to answer and explain many technical problems. More often than not, there is only one answer to all engineering problems, but with creativity, engineers may have more than two acceptable solutions for one problem. In educational setting, Felder in Adams et. al. (2007) suggests that creativity can be inculcated in students through relevant exercises and suitable environment. In other

words, creativity-related skills can be taught in the classroom so that this essential skill can be developed and improved in students (Cropley, 2001; Felder 1998), but which engineering educators fail to notice.

On the other hand, in its opening remark on the issue of selection of reading materials, the International Reading Association (IRA) released a resolution initially in May 1994 and later reaffirmed in May 1997 stating that students should be allowed to have access to reading materials that could benefit their education because such access could develop their creativity. This enables them to keep an open mind to new and innovative ideas and keen interest in learning as learning autonomy increases. Hence, to understand more about students' creativity, it is imperative that research in this area examines students' choice of reading materials and their learning styles prior to determining their level of creativity.

Defining Creativity

Creativity is a bit like pornography; it is hard to define, but we think we know it when we see it.

Mitchell et. al. 2003:7

Studies on creativity dated back to the 50s which was pioneered by J. P. Guilford (1950) whose interest in intelligence led him to explore creativity. Many of the research that follow were rooted in psychology and cognitive science; yet, of recent years, disciplines such as business, management, education, and engineering began to put more weight on creativity. Numerous concepts such as creative process, creative thinking, creative behaviour, creative environment, creative agent and sources of creativity have been the focal interests of research in understanding creativity, which have left researchers with more questions than answers.

Reviewing the literature on creativity in search of its definition is like finding a needle in a haystack. There is no definite definition of creativity. This indetermination arises because creativity is mostly defined in relation to other concepts such as intelligence, cognition, personality and giftedness. Commonly, creativity is defined and discussed as concepts in terms of creative person, creative process and creative product (Amabile, 1998; Heerwagen, 2002). Michael (2001) defines creative products as "a physical representation of a person's true creative ability encapsulating both creative person and creative process". Creativity in creative products is seen as the generation of ideas, alternatives, possibilities or outcomes which are novel, unusual and appropriate. Creativity in creative process is the ability to see, utilize and communicate one's own idea and an opposing idea as well as manipulation of old ideas and new ideas, and as famously postulated by De Bono (1990), the ability to think laterally – to think outside the box.

Nonetheless, among the many definitions provided by researchers, there are common views shared by these researchers on what is creativity which can be found in the following description provided by The United Kingdom National Advisory Committee for the Department for Education (DfEE, 1999: p.29):

> *First, they always involve thinking or behaving imaginatively. Second, overall this imaginative activity is purposeful: that is, it is directed to achieving an objective. Third, these processes must generate something original. Fourth, the outcome must be of value in relation to the objective.*

A creative person needs to demonstrate creativity-related thinking and cognitive skills in purposeful activities which will lead to a production of ideas, products and outcomes which are unusual, original, new and practical to the common users.

On the other hand, apart from demonstrating creativity-related thinking skills, Amabile (1983) states that each individual is affected or influenced by three factors that can help in the process of creativity development. The three creativity components essential in influencing an individual are:

1. expertise – technical, procedural and intellectual knowledge
2. creative thinking skills – flexibility and imagination in accomplishing a task or approaching a problem
3. motivation – intrinsic (that comes from within such as interest, desire, drive or passion) and extrinsic (external rewards in the form of monetary gains or other benefits)

Although creativity can be taught and trained (Cropley & Cropley, 1998; Cropley, 2001), an individual relies more on these three components in order to be creative, and each of these components can be further developed if appropriate creative agent is provided. Creative agents are the factors or elements that exist in the environment that could affect an individual's creativity directly or indirectly. Positive agent acts as stimulant or the component that could further enhance creativity, while negative agents are the components that could impede the development of creativity. Among the components of resources that could be the agent of creativity are materials, information, general resources, tools and equipment that are used when working (Amabile, 1996).

Creativity and Reading

As simple as it sounds, reading is actually a complex activity that requires cognitive and meta-cognitive efforts (He, 2007). For reading activities to bear fruit, constituents such as intrinsic motivation together with accurate reading strategy, appropriate materials and the representations of information is important for students. Therefore, the types of reading materials provided to students, how information is designed and presented in the textbooks, and how these reading materials are approached by the students are important components and strategies to help them in their mental processing towards understanding. Furthermore, these appropriate constituents and strategies are also essential to assist in the development of cognitive skills such creative thinking skills, critical thinking skills and strategic thinking skills (Amabile, 1996; He, 2007).

Reading materials then can be creative agents, and they can be a positive or a negative creative agent. Too much reading assignment from textbook might hamper students' creativity while free reading of students' own choice of reading materials might enhance creativity. As creative agents, there are a few aspects of reading materials that can be

considered as influence to creativity which include 1) subject matter, 2) medium, 3) layout and design, and 4) language use. Therefore, it is important for teachers to identify and provide the correct and suitable reading materials so that they too can be positive creative sources or agents for the development of creativity.

Creativity and Learning Styles

It is a fact that each person is unique and different from one another. As such, it is safe to state that there are people who are more creative than the others. Apart from environmental factors that could influence creativity, there are also individual differences that could directly or indirectly promote or inhibit creativity namely personality, interest, behaviour and level of knowledge. Although these aspects are shaped by social and environmental factors namely family background or work environment, they have become an individual notion themselves.

In the context of education, students' diversity can be depicted through learning styles – ways of taking in and processing information. Felder and Brent (2005) claim that students indeed have different levels of motivation, different attitudes and responses towards learning. Therefore, do the differences and uniqueness in students can further affect students' choice of reading input? How this can direct students to appropriately choose the correct reading materials in order to be able to produce creative products?

Many studies have been conducted to develop learning styles, for instance, Myers-Briggs Type Indicator (MBTI), Kolb's Experiential Learning Model and The Felder-Silverman Learning Model. According to The Felder-Silverman Learning Model, a student's learning may be defined by 1) the type of information they prefer, 2) the type of sensory information which the effectively perceived, 3) the ways they prefer to process the information, and 4) the ways the students prefer to progress towards understanding (Felder & Brent, 2005). Felder and Silverman (1988) point out that most engineering students are visual learners, learners whose modality of receiving information include pictures, diagrams, flow charts and time lines. From the learning styles perspective, information presented in as visual and graphical texts is found to be the most suitable for engineering students.

The Study

As creativity issues are discussed in length, the question of how learners become creative emerged. What are the factors? What causes a person to be potentially creative? The researchers believe that reading materials can also be one of the sources that could enhance an individual's creativity. This study, therefore, attempted to investigate whether students' choice of reading materials as creative agent could enhance creativity. Since individuals are uniquely different in terms of personality, the researchers also looked at students' learning styles. In this study, the researchers employed mixed methods to investigate students' choice of reading materials and later determine their learning styles (Felder & Silverman, 1988) as well as their creativity index (Torrance, 1998). This was done in order to explore correlations between:

1. students' choice of reading materials and their learning styles,
2. students' learning styles and their creativity index.

3. students' choice of reading materials and their learning styles in relation to their level of creativity.

Although quantitative method of investigation was of primary concern in both students' choice of reading materials and their learning styles, researchers also adopted qualitative method of inquiry by means of non-probability sampling, and qualitative analysis of students' responses in the answer sheets in the creativity test, before quantitative measures were applied, all of which were done based on Torrance (1998).

Sample

The sample in this study were 72 engineering students across five engineering faculties at UMP which were 1) Faculty of Civil Engineering and Environmental (FKASA), 2) Faculty of Electric and Electronics Engineering (FKEE), 3) Faculty of Chemical Engineering and Natural Resources (FKKSA), 4) Faculty of Mechanical Engineering (FKM), and 5) Faculty of Computer Science and Software Engineering (FSKKP). Non-probability sampling was employed as subjects were recruited on voluntary basis.

Table 1 illustrates the distribution of samples by faculty and gender. The following table shows that the number of female students is lesser compared to the male students except for FKASA and FSKKP students in which the gender distribution is almost equal.

Table 1: Distribution of Samples by Faculty and Gender

Faculty	Male	Female	Total
Chemical & Natural Resources (FKKSA)	10	5	15
Civil & Environmental (FKASA)	8	6	14
Electrical & Electronic (FKEE)	11	5	16
Mechanical (FKM)	14	0	14
Software & Computer Systems (FSKKP)	8	5	13
Total	**51**	**21**	**72**

Instrumentation

Three instruments were used in this study, namely 1) The Reading Materials Questionnaire (ReMaQ) developed by the researchers, 2) The Index of Learning Styles® (ILS), and 3) Torrance Tests of Creative Thinking-Figural (TTCT-F).

The Reading Materials Questionnaire (ReMaQ)

The purpose of ReMaQ was basically to identify students' interest in reading, what they read, what influenced them to read, and how often they read. Since ReMaQ contained exploratory and ranking items, only internal expert opinions were obtained without any testing on its validity and reliability. Basically, ReMaQ was developed with limited reference to literature, and hence, further review and testing need to be done in the future to ensure validity and reliability, and that measurement of data collected could provide accurate scoring.

The Index of Learning Styles® (ILS)

The Index of Learning Styles® (ILS), which was developed by Richard Felder and Barbara Soloman in 1991, consisted of 44 items of forced-choice answers. ILS was developed based on Felder-Silverman Model of learning which is to assess the four scales of learning styles dimensions of engineering students (Felder & Silverman, 1988), which are:

- *Active/Reflective Learners*
  This refers to how the student processes the information. Active learners prefer active experimentation and group work and express opinions freely. Reflective learners prefer reflective observation and work independently.
- *Sensing/Intuitive Learners*
  This refers to what kind of information the student prefers to perceive. Sensing learners observe, like facts, experimentation and detailed information. Intuitive learners use speculations and imagination, prefer theories, complications and innovations.
- *Visual/Verbal Learners*
  This refers to through which sensory channel, student effectively perceive external information. Visual learners prefer pictorial representation whilst verbal learners prefer words and sound.
- *Sequential/Global Learners*
  This refers to how student progress towards understanding. Sequential learners progress in continual steps while global learners take holistically.

For the purpose of this study, the researchers only looked at Sensing/Intuitive Learners and Visual/Verbal Learners dimensions.

Torrance Tests of Creative Thinking-Figural® (TTCT-F)

Torrance Tests of Creative Thinking-Figural® (TTCT-F) was developed by E. Paul Torrance and his associates in 1966, and they have been renormed four times (Cramond & Kim, 2002). Torrance (1966, 1974) in Cramond & Kim (2002) suggested the following uses of the test:

1. To understand the human mind and its functioning and development.
2. To discover effective bases for individualizing instruction.
3. To provide clues for remedial and psychotherapeutic programs.
4. To evaluate the effects of educational programs, materials, curricula, and teaching procedures.
5. To be aware of latent potentialities.

The researchers used the 1998 version of TTCT-Figural form B. The test contained three 10-minute activities which required respondents to draw an object or a picture to the provided figures, or incomplete figures. There are five major elements of creativity in which the scoring of the test is measured (Torrance, 1998; and Cramond & Kim, 2002), which are:

1. Fluency – the number of interpretable, meaningful, and relevant responses to the stimulus
2. Originality – responses which are unexpected, unusual, unique or statistically rare
3. Elaboration – the addition of pertinent details to each picture or object
4. Abstractness of titles – the ability to provide unusual titles to the drawings
5. Resistance to premature closure

Findings and Discussion

Reading Materials Questionnaire (ReMaQ) Results

The followings are the results of the data collected from ReMaQ on respondents' reading habit.

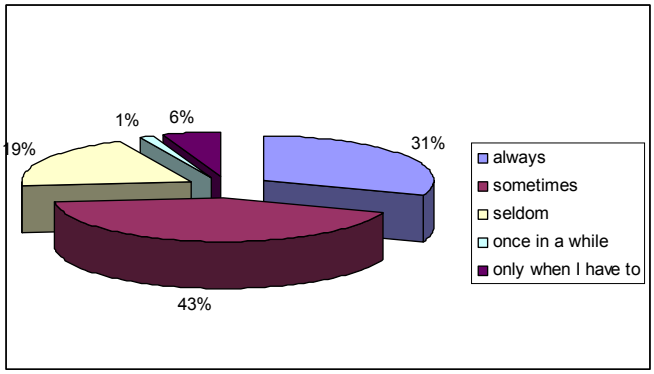

Figure 1: Frequency of Respondents' Reading Habit

Figure 1 illustrates the results of respondents' frequency of reading habit. Figure 1 indicates that 31% of the respondents frequently read, and based on the analysis, most FKKSA students love to read compared to students from the other faculties. Among the reasons provided were to be up-dated with information, to gain new knowledge, to improve language skills and to enrich the vocabulary. 43% of the respondents sometimes read, and they gave both positive and negative reasons. Some of the students' perception to the inability to read frequently was expressed negatively namely due to the fact that they were busy with assignments and study that it prevented them from reading. A total of 26% of the respondents provided negative answers to the habit of reading, and almost all of them attributed this answer to boredom and busy study schedule. Consequently, there is a need to encourage and motivate reading habit among UMP engineering students. Data collected also shows that a number of students perceive reading as something burdening; thus, effort needs to be done to change this perspective.

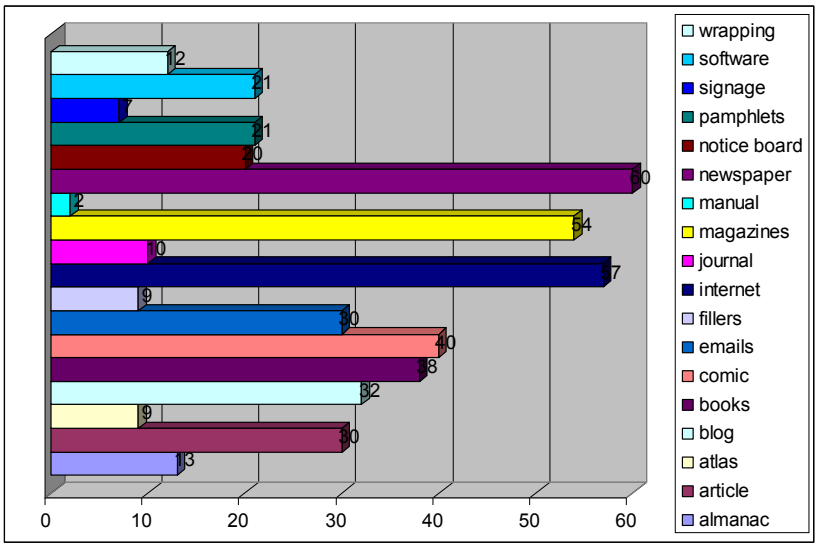

Figure 2: Respondents' Preference of Type of Reading Materials

Figure 2 shows respondents' preference for types of reading materials. The figure indicates that newspaper, magazines and internet are the types of reading materials the respondents preferred to read. Based on the definition provided in ReMaQ, it can be considered that atlas, blogs, comic, fillers, internet, magazines, notice board, pamphlets, signage, software and wrapping are among the reading materials that mostly contained visuals and graphics. However, the bar graph illustrates that only blogs, comic, the internet and magazines were mostly preferred by the respondents. This finding is generally predictable as the materials were commonly available and affordable. However, it is significant to ascertain whether these reading materials have helped the students to become more creative.

The Index of Learning Styles® (ILS) Results

The result of ILS is scored based on the following scales:

- Scale 1: If the score on a scale is 1-3, the student is fairly well balanced on the two dimensions of that scale.
- Scale 2: If the score on a scale is 5-7, the student has a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favours that dimension.
- Scale 3: If the score on a scale is 9-11, the student has a very strong preference for one dimension of the scale. He or she may have real difficulty learning in an environment which does not support that preference.

Based on the scoring scale of the ILS result, a distinct difference of one learning style from the other is shown only through the second and third scale whereas the first scale indicates that the student has a well balanced learning style of both ends of the dimension. Therefore, for the purpose of this study, the correlation between learning styles and the two main variables were based on respondents' score of the second and third scale only.

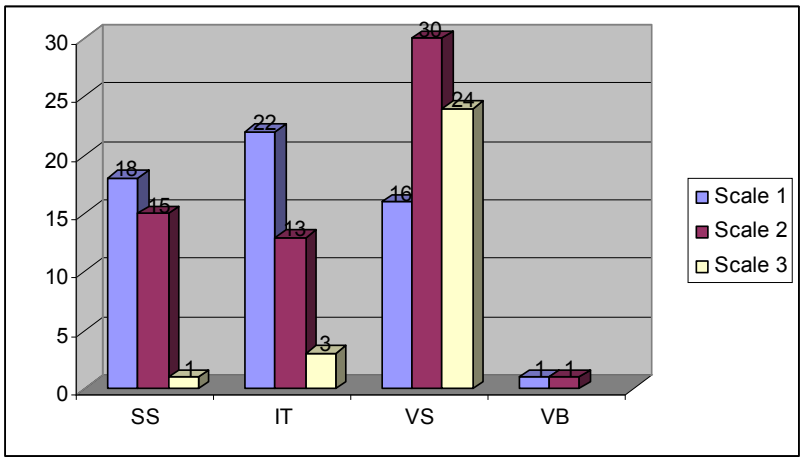

Figure 3: Respondents' Learning Styles Score

Figure 3 depicts the respondents' learning styles score for Sensing/Intuitive Learners and Visual/Verbal Learners dimensions based on the three scales stated earlier. The acronyms in Figure 3 are defined as follows: SS – sensing learners; IT – intuitive learners; VS – verbal learners, and VB – verbal learners. The figure indicates that for the total score of scale 2 and 3, there is an equal number of sensing and intuitive learners, but it can be safely generalized that almost all UMP engineering students are visual learners.

Torrance Tests of Creative Thinking-Figural® (TTCT-F) Results

To analyze respondents' creativity, the researchers have categorized the creativity index into three ratio scales. The categorization, however, did not rank one student's creativity, but mainly for the purpose of correlating respondents' creativity index to their reading habit and learning styles.

- Category A: 121 – 160
- Category B: 81 – 120
- Category C: 40 – 80

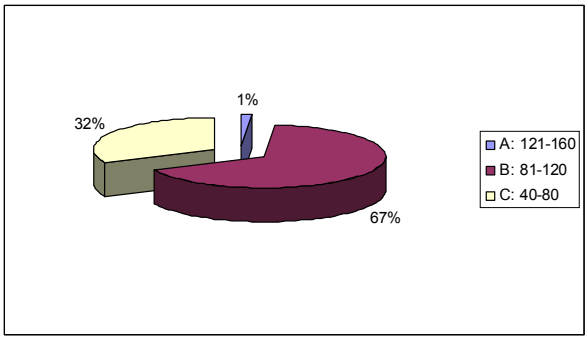

Figure 4: Respondents' Creativity Index According to Category

Figure 4 displays respondents' creativity index according to the category. The figure demonstrates that two third of the respondents is categorised in Category B in which their level of creativity can be considered as moderate. Only 1% of the respondents are in Category A whilst the remaining 32% of the respondents are in Category C.

Appropriate Reading Materials + Individual Learning Styles = Enhanced Creativity?

Correlating Creativity and Reading Materials

Finding the relationship between creativity and reading materials is important because it helps to relate whether reading materials can be a creative agent for engineering students in UMP. Furthermore, this explains whether a certain type of reading materials or its subject matter does have an impact on students' creativity.

Based on the analysis, Table 3 presents the correlation coefficient between types of reading materials and creativity. Due to the nature of the data being rank, nonparametric method was employed. In this respect, *Kendall Tau Rank Correlation Coefficient* was used to measure the strength of the association between reading materials and creativity.

Table 3: Correlation Score between Types of Reading Materials and Creativity

Types of Reading Materials	Correlation	Types of Reading Materials	Correlation
Almanac	-.066	Journal	.151
Article	.070	Magazine	.137
Atlas	.005	Manual	-.035
Blog	-.167	Newspaper	.140
Book	.058	Notice Board	-.008

Comic	.020	Pamphlet	-.154
e-mails	.180	Signage	-.052
Fillers	-.105	Software	.011
Internet	.105	Wrapping	-.196

Table 3 points out that among the types of reading materials, interestingly, email has the highest strength of association with creativity with the correlation score of .180. The difference between this score and the correlation score for journal, newspaper, magazine and the Internet is rather slight. Based on *Kendall Tau Rank Correlation Coefficient*, the scores indicate that in educational studies, there is an association between the reading materials and creativity even though it is not significant. On the other hand, for visual-based reading materials that contain the most visual, the Internet, magazine and newspaper indicate a weak positive correlation with creativity. Nevertheless, since there is a positive correlation between journals, emails, the Internet, magazine, newspaper and creativity, lecturers should include these kinds of reading materials in their classes or include in students' reading assignment.

The researchers also looked at whether the amount of information read by the students might also affect their creativity. In ReMaQ, there were about 34 topics of interest listed in which respondents were free to choose unlimited number of subjects that they liked to read. Based on the list, respondents' number of choices ranged from 2 - 28. For correlation purposes, the researchers grouped the number of subjects read into three groups regardless of the topics of subject:

- Group A: 21 – 30 subjects of interest read
- Group B: 11 – 20 subjects of interest read
- Group C: 0 – 10 subjects of interest read

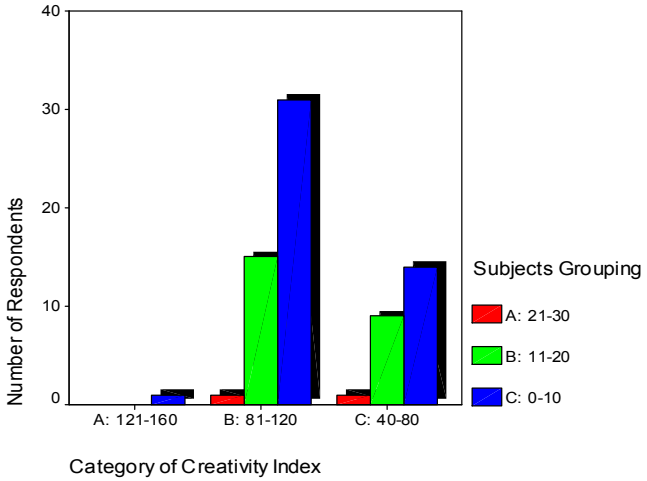

Figure 5: The Number of Subject of Interest Read According to Category of Creativity Index

Figure 5 demonstrates that the only respondent in Category A of creativity index read less than 10 different subjects of interest. About 25% of Category B respondents have 11 – 20 subjects of interest while about 30% is in Category C. There is only one respondent each in

Category B and C whose number of subject of interest is the most (Group A). This indicates that higher amount of interest in reading subjects does not assure higher creativity index.

It is interesting to note that on a separate individual correlation testing using *Kendall's Tau Correlation Coefficient*, there are three subjects which correlation scores with creativity show significant correlation at 0.05 level (2-tailed). The subjects are engineering with a score of .301, followed by geography at .281 and history with .234 correlation score. It is understandable for engineering subject the get a significant score; however, it can be assumed that geography and history also show significant scores because of visuals such as maps, photos and pictures of places of interest, monuments, historical events and places that can be found in geography and historical books.

Table 4: Correlation Score between Creativity Index and the Number of Subjects Read

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-b	-.097	.115	-.833	.405
	Kendall's tau-c	-.068	.082	-.833	.405
	Gamma	-.202	.233	-.833	.405
N of Valid Cases		72			

On the contrary, Table 4 depicts the correlation score of creativity index and the number of subjects of interest read by the students. The correlation score of -.068 shows that there is a negative association between the two variables. It can be concluded that the extensiveness and the amount of reading do not determine one's creativity. Yet again, since there is only one respondent in Category A, it might not give a true picture of the sample; thus, the correlation score might be inaccurate. Hence, the need to find more respondents who can obtain higher scores in TTCT-F might help in providing significant correlation score.

Correlating Creativity and Learning Styles

To achieve the aim of the study, the correlation between creativity and learning styles was based only on the Visual/Verbal and Sensing/Intuitive Learners dimensions of the ILS because the two dimensions have the closest relationship with reading materials. The correlation between learning styles and creativity was also based only on ILS Scale 2 and Scale 3 since the distinction between one learning styles from the other in its dimension is shown only through these two scales.

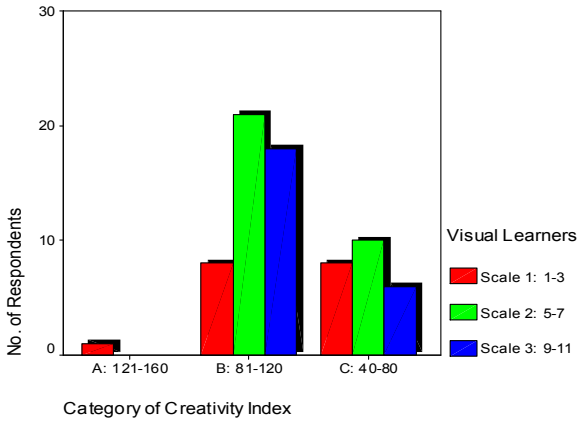

Figure 6: Scales of Visual Learners According to Category of Creativity Index

Figure 6 presents the number of visual learners in each scale against the three categories of the creativity index scores. This result suggests the relationship between visual learners and creativity since there were only two verbal learners among the respondents. The figure clearly indicates that more visual learners (VS) were categorized as moderate scorer in their creativity test. It is probable that being visual learners might assist engineering students to be more creative.

However, the correlation score of -.106 depicted in Table 5 reveals that there is a negative association between the respondents' trait of being visual learners and their creativity index scores. Again, these contrasting results (Figure 6 and Table 5) might be the results that there were lesser respondents who had high score for their creativity test since the correlation test depended on category A of the TTCT-F results. Thus, more respondents who could obtain higher scores of the creativity test are needed for further study to ensure an accurate correlation score between creativity and learning styles.

Table 5: Correlation Score between Creativity Index and Visual Learning Style

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-b	-.129	.116	-1.118	.264
	Kendall's tau-c	-.106	.095	-1.118	.264
	Gamma	-.228	.202	-1.118	.264
N of Valid Cases		72			

The Sensing/Intuitive Learners dimension of the learning styles index is very much related to what kind of information students would prefer to read in their reading materials. Felder and Silverman (1988) suggest that engineering students are sensing learners because sensing learners prefer experimentation, data and factual information.

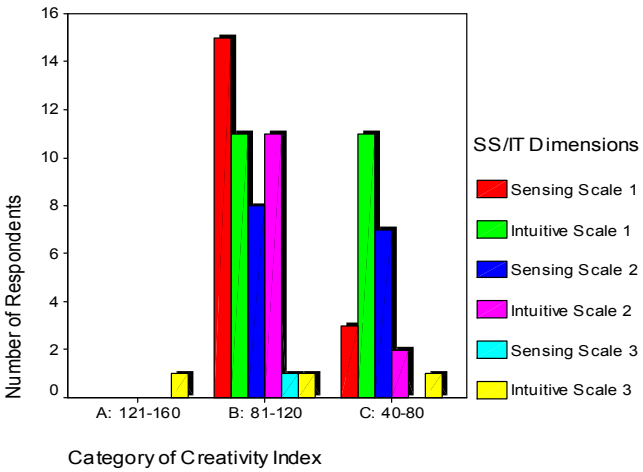

Figure 7: Scales of Sensing/Intuitive Learners Dimension According to Category of Creativity Index

Figure 7 displays the results of respondents' ILS score of sensing/intuitive learners dimension against the category of the creativity index. A very interesting result is depicted above where the only respondent in Category A of the TTCT-F score is in a scale 3 of intuitive learner. Moreover, there is more scale 2 and scale 3 intuitive learners in Category B as compared to sensing learners, and lesser scale 2 and 3 intuitive learners in Category C in contrast to sensing learners. Although Felder and Silverman (1988) stated that engineering students are sensing learners, figure 7 indicates that engineering students who are intuitive learners, that is students who use imaginations and hunches, are more creative compared to engineering students who are sensing learners. This, however, corresponds with what creativity experts have generally agreed that one of the important components of being creative is the ability to think, behave, accomplish a task or approach a problem imaginatively (Amabile, 1983; DfEE, 1999). Hence, as a suggestion, the lecturers should conduct or provide reading materials that would require the students to use this ability in order to maximize learning ability.

Table 6: Correlation Score between Creativity Index and Intuitive Learners Score

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Ordinal by Ordinal	Kendall's tau-b	-.037	.113	-.328	.743
	Kendall's tau-c	-.031	.094	-.328	.743
	Gamma	-.065	.198	-.328	.743
N of Valid Cases		72			

Table 6 illustrates the correlation score between the creativity index score and only the score for intuitive learners. This is done because more intuitive learners were found to be creative. On the contrary to the result shown in Figure 7, the correlation score of -.031 depicted in Table 6 indicates that there is a negative association between respondents' trait of being intuitive learners and their creativity index scores. This shows that the result in

Table 6 does not correspond with the results in Figure 7. Further study needs to be conducted in order to determine the inconsistencies between these results.

Conclusion

Creativity is a rich and wide area of research that can be analysed from many perspectives. The theoretical approach alone does not provide a sufficient description of creativity. In fact, creativity exists in various forms, subject to individual learner's experiences. Though an amazingly complex subject due to various interpretations, Standler (1998), believes that, it is the personality traits that distinguish creative from non-creative people. Creative students have an inner need to express their creativity (Standler, 1998). Standler (1998) further comments that these students were unable to retain their new ideas and would like to share it with others. To them, their ideas need to be born and a sin to keep them personally in their thoughts.

Therefore, there is a need to look into students' social context. Analysis on students' socialisation needs to be determined for the sake of finding whether their acquaintances may be the factor in contributing to their creativity. This is an imperative measure since Cropley and Cropley (1998) argue that creativity can actually be taught and trained by getting involved with people whose mental abilities are able to retain and reproduce information, that are different from those brought into play in recombining original impressions to produce new wholes (Burnham, 1992). Therefore, case studies to examine creativity in particular contexts for instance exploring the creativeness among engineering students who are visual learners should be conducted.

In conclusion, a lot more can be done in determining creativity among engineering students. However, focus need to be more on understanding their personality traits that contribute to their creativeness in doing a task. Educators need to revisit their approaches in giving a task to students as there is no one right way of approaching a material (Standler, 1998) or even one correct answer for a problem. Creativity relies very much on the interpretation at the moment an individual needs to become creative. Thus, it depends on the context whether the production of creativity depends on task motivation or acquiring new skills and many others (Amabile, 1996; Bowen, 2000).

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About the Authors

Hafizoah Kassim is a lecturer at Universiti Malaysia Pahang. She is currently pursuing her doctoral study at La Trobe University, Melbourne, Australia. Her research interests include creativity, multimedia instructional materials, engineering education, technology in language teaching, and learning styles.

Zarina Mohd Ali

Zuraina Ali

Noor Raha Mohd Radzuan

Nor Yazi Khamis