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Learning styles and perception of engineering students towards online learning

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Abstract

Online learning allows flexibility in learning and accessing materials according to student needs in terms of time and techniques. Similarly, compared with traditional courses, online learning provides interactive materials that allow easy access to information and feedback from others. However, not all students are interested to engage in online learning (Norwati & Zaini, 2007), especially those students who are engaged in courses that require a face-to-face learning environment, such as engineering. Diaz and Cartnal (1999) claim this situation relates to learning styles. Students with different learning styles would have different perceptions and commitment towards online learning. This article aims to identify the learning styles of engineering students, and their perceptions towards online learning. Data were collected by using a questionnaire with two domains. The first section is the learning style domain that uses the learning style inventory (Kolb, 1984). The second section includes student perceptions towards online learning, which was adapted from O'Mally and McCraw (1999). The participants of the study consisted of 136 first year engineering students studying in a public university in Malaysia. The respondents have different learning styles, and most of them were identified as assimilator learners. In addition, the respondents tend to have a positive perception towards the effectiveness and related advantages of online learning. No significant relationship was observed among the perceptions towards online learning of students with different learning styles. Thus, learning styles have no influence on the perception of engineering students towards online learning.

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1. Introduction and background of study

New technologies and advances in information technology (IT) have ushered in a new paradigm for knowledge delivery modules – online learning (OL). Almost all education institutions, particularly higher education, started using this paradigm in their teaching and learning processes. Belanger and Jordan (2000) reported three ways in which the technologies may be employed in educational organizations as they evolve through stages. The first stage is technology insertion, which happens when the organization is interested in using instructional technologies within the traditional classroom environment. The second stage is partial conversion, in which parts of courses are delivered online or through other distance-learning technologies. The third stage is total conversion, which is the

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most extensive conversion of traditional classroom training to online or other distance-learning technologies. Allen and Seaman (2005) divided courses into four categories pertaining to the percentage of content taught online. The first category refers to traditional or courses without online technologies (0%), with all content delivered in writing or orally. The second category includes web-facilitated courses that use web-based technologies, such as the Learning Management System (LMS) or web pages, to facilitate what is essentially a face-to-face course. This method delivers between 1% and 29% of course content through online means in support of the learning process. The third category consists of blended/hybrid courses that combine online and face-to-face delivery, with substantial proportion (30% to 70%) of the content delivered online. The fourth category comprises online courses where most (80% or more) or all content is delivered online. This last category typically has no face-to-face meetings.

Although online learning practices are divided into different categories, previous studies agree that the approach provides numerous advantages for the effectiveness of teaching and learning. Online learning provides flexibility in learning and accessing materials according to student needs in terms of time and techniques. Similarly, compared to traditional courses, online learning provides interactive materials that allow easy access to information and feedback from others. However, not all students are interested to engage in online learning (Norwati & Zaini, 2007), especially those who study courses that require a face-to-face environment, such as engineering. According to Junaidu (2008), the idiosyncrasies of some science and engineering-based courses limit the adoption of online education, compared with the wide usage in other fields. Despite this situation, the usage of online learning engineering education is not impossible. The online approach can still be used in certain parts of the teaching and learning process. Thus, Junaidu (2008) proclaims that for online engineering education to be accepted and utilized broadly, the quality of online courses must be comparable to or better than traditional face-to-face classroom education. In addition, Diaz and Cartnal (1999) suggest that this situation relates to learning styles. Students with different learning styles will have different perceptions and commitment towards online learning. Entwistle (1981), Honey and Mumford (1992), Kolb (1976), Schmeck (1988), and other researchers believe that students do not learn in the same way, which can lead to different styles. Learning style can also change according to experience.

A learning style refers to the preferred means the individual acquires knowledge. Different definitions of the term have been reported. Grasha (1990) defines the concept as “the preferences students have for thinking, relating to others, and particular types of classroom environments and experiences.” The definition of Cornett (1983) is “a consistent pattern of behavior but with a certain range of individual variability.” Different individuals use different learning styles, the effectiveness of which also varies among individuals (Too Shaw Warn, 2009).

According to Kolb (1984), an effective learner relies on four different learning modes, namely, concrete experience, reflective observation, abstract conceptualisation, and active experimentation. Kolb further classifies learning styles into four types, which are converger, diverger, assimilator, and accommodator. The converger learning style combines abstract conceptualisation and active experimentation to test theories in practice. Diverger refers to a combination of concrete experience and reflective observation, and then considers specific experiences from different perspectives. An imaginative individual is described someone who is interested in people and good at generating ideas. Assimilator combines reflective observation and abstract conceptualisation. These learners excel in the development of theoretical frameworks as well. Finally, accommodator combines concrete experiences and active experimentation, and uses the results of individual testing as a basis for new learning (Kolb, 1984; Too Shaw Warn, 2009).

Kolb et al. (1979), as cited by Marriott (2002), classifies various job professions into their learning styles (Table 1).

Table 1: Learning style and job profession

Learning Style	Profession
Divergers	Counsellor and personnel manager
Assimilator	Scientist and mathematician
Convergers	Engineer and accountant
Accommodators	Risk-taker (e.g., businessman and marketer)

According to Table 1, each learning style group is classified into a particular job preference group. However, does this classification apply to all students, especially the first year learners pursuing an engineering course? Does the learning experience affect their classification into particular learning style groups, although they are still first year students? Do these learning styles significantly influence student perception towards online learning? Based on these questions and previous findings, the objectives of this study are to:

- a) identify the learning styles of the respondents,
- b) determine the level of perception of the respondents towards online learning,
- c) distinguish the relationship between learning style and student perception towards the effectiveness of online learning, and
- d) describe the relationship between learning style and student perception of the advantages of online learning

2. Methodology

Data of this study were collected using a questionnaire that consisted of two domains. The first section refers to the learning style domain and uses a learning style inventory (Kolb, 1984). The second section includes the domains of student perceptions towards online learning, which was adapted from O'Mally and McCraw (1999). The sample of the study consisted of 136 first year engineering students from a public university in Malaysia.

3. Findings

a) Learning styles among respondents according to Kolb

This study measures the Kolb learning styles practiced by the respondents. Table 2 shows the majority of the respondents are categorized into assimilator learning style (44.9%), converger (34.6%), accommodator (13.2%), and diverger (7.4%).

Table 2: Kolb learning style

Kolb learning style	Frequency	Percentage (%)
Assimilator	61	44.9
Converger	47	34.6
Accommodator	18	13.2
Diverger	10	7.4
Total	136	100.0

The findings of the present study are slightly different from Kolb et al. (1979), as cited by Marriott (2002). Kolb et al. (1979) classify professional jobs based on learning styles. This classification places the engineering profession under convergers. The greatest strength of convergers is seen in their practical application of ideas. In comparison, assimilators are individuals who are highly skilled in understanding and creating theories. A person with this learning style excels in inductive reasoning as well as in synthesizing other attractions and ideas into an integrated holistic observation.

b) Levels of student perception towards online learning

All the items regarding the effectiveness and relative advantages of online learning were marked in each group to measure the level of student perception towards online learning. Then, a mean score for each group was calculated. The mean score was divided into three main scales, namely: a) 0.00–1.00 = low level of agreement; b) 1.01–2.00 = moderate level of agreement; and c) 2.01–3.00 = high level of agreement. Table 3 shows the results.

Table 3: Levels of student perception towards online learning

Items	Mean	Std
Effectiveness of online learning	2.36	.57
Relatives advantages of online learning	2.43	.50

The mean scores show that respondents have a high level of agreement on the effectiveness (mean = 2.36) and relative advantages (mean = 2.43) of online learning. Thus, online learning is effective and has its own advantages in the teaching and learning process of their courses.

c) Student perception towards the effectiveness of online learning according to learning styles

This study measured the relationship between learning style and respondent perceptions towards the effectiveness of online learning, by using cross tabulation and Pearson chi-squared test. The predetermined significance level was $p < .05$. Table 4 shows the results.

Table 4: Student perception towards the effectiveness of online learning according to their learning styles

Level of student perception	Learning styles of students				Total
	Converger	Diverger	Assimilator	Accommodator	
Low	1	1	3	1	6
Moderate	27	4	35	9	75
High	19	5	23	8	55
Total	47	10	61	18	136

Based on the results, each learning style group has different levels of perception towards the effectiveness of online learning. The majority of respondents in each learning style group have a moderate level of agreement on online learning effectiveness, followed by the high level, and then the low level. However, the Pearson chi-square test (value = 2365, $df = 6$, $p = .88$) shows no significant association exists between the levels of student learning styles and their perceptions towards the effectiveness of online learning. Thus, the level of perception of students towards the effectiveness of online learning is not related to their learning style.

d) Relationship between the learning styles of students and their perceptions towards the relative advantages of online learning

This study measures the relationship between the learning styles of students and their perceptions towards the relative advantages of online learning. Cross tabulation and Pearson chi-square test were used to meet this objective. The predetermined significance level is $p < .05$.

Table 5: Perception towards the relative advantages of online learning among respondents based on their learning styles

Levels of student perception	Learning styles of students				Total
	Converger	Diverger	Assimilator	Accommodator	
Moderate	22	7	38	11	78
High	25	3	23	7	58
Total	47	10	61	18	136

Table 5 shows that each of the learning style group has different levels of agreement towards the relative advantages of online learning. Most of the respondents in each learning style group have a moderate level of perception, followed by a high level. However, the Pearson chi-square test (value = 3:50, df = 3, p = .32) shows that no significant association exists between learning styles and the levels of their agreement towards the relative advantage of online learning. Thus, the level of respondents' perceptions towards the relative advantages of online learning is not related to their learning style.

4. Discussion and conclusion

Kolb (1984) stated that each individual practices different learning styles. In fact, he classified jobs pertaining to learning styles. However, the first year engineering students in this study practiced the assimilator style, instead of the converger style as proposed by Kolb et al. (1979), as cited by Marriott (2002). As suggested by many researchers, this result could be due to the influence of learning experiences encountered by the students (Entwistle, 1981; Honey & Mumford, 1992; Kolb, 1976; and Schmeck, 1988). As these students are in the early learning stage of their engineering course, majority of them are still influenced by their learning styles in lower school levels. This adaptation process requires time for students to change the pace of learning at the university level, especially in engineering courses.

Apart from that, majority of students in this study have a positive perception towards using online learning for the engineering course. This finding is based on the high level of agreement towards the constructs of online learning, i.e. the effectiveness and relative advantage of online learning. Thus, engineering courses can adopt online learning. Moreover, Junaidu (2008) claims the online approach can be widely accepted in this field if the method used is in accordance with the matters to be communicated. According to O'Mally and McCraw (1999), new educational technologies are often implemented without fully understanding their impact. Their study, which was conducted in a medium-sized state university shows that students perceive distance and online learning technologies as having some benefits although they are not necessarily knowledge-related.

The present study also found that student perceptions of online learning are not significantly associated with their learning styles. Junaidu (2008) explains this positive perception as the pervasive acceptance of online electronic education in colleges, universities, and corporate organizations. This acceptance is possible largely by the emergence and rapid development in worldwide information and computer communication technologies. In addition, the positive acceptance of students can bring a revolution in the engineering teaching approach, where the application of online learning can be actively implemented by using the proper methods.

Based on these findings, first year engineering students have positive perceptions towards online learning although this method is not as widely adopted in science and engineering subjects as in other fields (Junaidu, 2008). However, this perception is not significantly associated with their learning styles. This positive perception is a sign of the tendency of students to prefer online learning if properly applied in the teaching and learning processes. Based on the limitations of the present study, future research can implement a longitudinal investigation to examine the changes in student learning styles according to the classification of Kolb (1984) and student perception towards online learning. Previous researchers state that learning experiences influence changes in student learning styles and perceptions towards aspects of teaching and learning.

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