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Variances on Students' Blended Learning Perception According to Learning Style Preferences

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Abstract
Blended learning, particularly the use of online-based technologies provides teachers and learners opportunities for a more flexible teaching-learning environment based on individual learning preferences. This paper investigates on the variation of the learners' perception on blended learning in terms of their learning styles. One hundred thirteen (113) students enrolled in Statistics during the second trimester of the school year 2012-2013 participated in the study. A blended learning environment (BLE) questionnaire was designed to determine the students' blended learning perception and the Felder-Soloman Index of Learning Style (ILS) measures the students' learning styles. Additional data were gathered from interviews and focus-group discussions to record students' reactions to BLE. Using SPSS, the data from each instrument was described and analyzed. Students' views on blended learning revealed moderate to very high perception on items related to the ease-of-use and accessibility, quality of contents, usage and purpose, and general outcome. On the ILS, active-reflective dimension reported 55% active learners; sensing-intuitive dimension reported 61% preference on sensing learning; visual-verbal dimension revealed 47% visual learners and; sequential-global dimension showed 58% sequential preference. Overall, results revealed that students' perception on blended learning differ among active-reflective and visual-verbal learners whereas learners classified as sensing-intuitive and sequential-global do not significantly vary in blended learning perception. It appears that teachers should still consider students' learning style in the design, implementation and evaluation of blended learning. The study concluded with several future research directions in terms of the impact of teaching and learning styles on blended learning and evaluation of e-learning styles.
Keywords: blended learning, blended learning perception, learning styles, Felder-Soloman Index of Learning Style (ILS)

1. Introduction

Emergence of technological breakthroughs in information technologies allow teachers to modify the traditional teaching methods through which the growing educational needs are satisfied using new tools and resources that will make the teaching and learning environments more flexible. This will provide learners the best opportunities to have meaningful learning which is one of the ultimate objectives of every teacher. We would like to ensure that learners have access to educational content, learning support, open communication, flexible study and consequently better academic achievement. Learners have different ways to learn, thus, they should be provided all possible ways for them to receive their educational programme (Gulc, 2006). This is where "blended learning" comes in.

1.1 What is Blended Learning?

Literature has put forward several definitions of blended learning. Blended learning as described by Thorne (2003) is "a way of meeting the challenges of tailoring learning and development to the needs of individuals by integrating the innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning". Finn & Bucceri (2004) as cited by Akkoyunlu and Soylu (2008) mentioned that "blended learning environment integrates the advantages of e-learning method with some advantageous aspects of traditional method, such as face-to-face interaction. Blended learning brings traditional physical classes with elements of virtual education together". One definition that well fits this study is that of Singh (2003) which state that "blended learning focuses on optimizing achievement of learning objectives by applying the 'right' personal learning technologies to watch the 'right' personal learning style to transfer the 'right' skills to the 'right' person at the 'right' time." Specifically, blended learning as used in this study is the combination of traditional F2F method of teaching and the use of the university blended learning environment (BLE) (commonly known as course management system).

Blended learning provides opportunities for learners to learn anywhere and anytime. Students may learn at home, at their workplace and even while travelling. Educational programme can be tailored to useful delivery media that are suitable, expedient, user-friendly, and responds to the varied needs of each learner. The use of blended learning can offer a range of presentation methods and allows them to follow through the topics covered in class through revisiting the resources and materials provided. Gulc (2006) specifies that blended learning empowers learners and teachers as it provides provisions for individualised learning experiences, personalised learning

support, collaborative learning, virtual learning environments (VLEs), flexible study and wide access to digital resources, shared tools and information systems.

1.2 What is Learning Style?

Understanding learning styles helps improve the planning and implemention of students' learning experiences, to ensure that they are appropriately compatible with students' needs and desires, and accordingly enhance retention, retrieval and learning in general (Federico, 2000). Evaluation of students' learning styles will provide teachers knowledge and understanding about their students' individual preferences. This will provide them basis to design, develop, organize and deliver educational programme and resources that will motivate and stimulate students' acquisition, integration, and application of information and knowledge in an attempt to individualise instruction (Brown et.al., 2009).

While there is a number of learning style assessment tools and methods, two similar assessment instruments are predominant in science and engineering education – Kolb's Learning Style (LSI) and the Felder-Soloman Index of Learning Styles (ILS) (Lidia, et.al., 2007). Both instrument classifies learning preferences using an opinion survey.

The Kolb's LSI model is built upon the idea that learning styles can be described using two continuums: active–reflective and abstract–concrete. The result is four types of learners: active–abstract (Converger), active–concrete (Accommodator), reflective–abstract (Assimilator), and reflective–concrete (Diverger). (Esichaikul, et.al, 2010)

The present study utilized the ILS. Aside from the instrument being conveniently available on the Internet (Felder, 1998), it is also considered the most appropriate to be used in a computer-based educational system (Carver,1999). The Index of Learning Styles (ILS) is based on a 44-question multiple-choice instrument, which collects quantitative data on learning styles across the four learning dimensions – processing, perception, input and understanding. The processing dimension classified learners as either active or reflective. The perception dimension grouped the styles of learners as either sensing (facts) or intuitive (theories). Visual or verbal learners are the classification for input dimension while sequential or global learners are the groupings for the understanding dimension (Felder & Soloman, 1991, 1994).

Active learners learn better when they work in groups and manipulate things, whereas reflective learners learn better when they think and reflect about information that is presented to them and they work better alone. Sensitive students prefer facts, data and experimentation while intuitive students prefer principles and theories. The former are patient with details, but don't like complications while the latter get bored with details and accept complications. For the visual learners it is easy to remember things they see like diagrams, timelines, pictures, films and demonstration. The verbal learners in contrast remember what they have heard, read or said. Sequential learners follow a linear reasoning process when they solve problems and can work with a certain material once they have understood it superficially or partially. On the other hand, global learners make intuitive leaps with information and find difficulties explaining how they got a solution. They also tend to have integral vision. (Lidia, et.al., 2007)

1.3 The Need for Addressing Learning Styles in Blended Learning

Several researches on learning purport that not everyone learns in the same way. Each learner has a particular set of learning preferences and abilities. Identifying these learning styles helps both the teacher and the learner to better the teaching and learning strategies to ensure a more efficient and effective way of acquiring new knowledge and information. In the research conducted by Lidia, et.al., 2007 the challenge was to use the vast resources offered by informatics to create a suitable environment for the development of individuals with different skills. The findings of Beadles II and Lowery (2007) revealed that the learning style difference is an important determinant of students' choice of educational delivery method. Online learning along with the technological tools implemented has changed the delivery method but has not changed the fundamental goal of learning. The learning style needs of all students are afforded the opportunity to do well with today's technologies that enable teachers to use various learning environment (Gülbahar, 2005; Whiteley, 2007).

Bostrom, et. al. (2006) finds that teaching which is based on learning styles ensures an effective way to achievement and motivation of students. They argued that learning styles influences meta-cognition and adoption of appropriate learning strategies. Students' awareness of their own improvement provides them new perspectives of their learning potential. Studies related to personalization in e-learning like that of Vatcharaporn E., et. al. (2010) focuses on the use of technology and student information to tailor interactions between the teacher and individual students in a way that students achieve better learning outcomes. They presented two aspects of personalization which includes management of learning materials and information and engagement in learning activities (Vatcharaporn E., et. al., 2010; Mor & Minguillon, 2004; Sehring, Bossung, & Schmidt, 2004). It will be worth investigating, the factors that may show diversity in various learning environments since learners prefer different learning environments for different purposes (Gülbahar and Alper, 2011). Paechter and Maier (2010) revealed in their study the students' preferences about online or face-to-face learning components and the

e-learning components that are favorable for learning. Their study shows that students' preference for online learning is because of its potential to provide coherent structure of learning materials, self-regulated learning support, and efficient information distribution. On the other hand, students' preference for F2F learning is based on its ability to establish a much interpersonal relations and a shared understanding through communication.
Evidences on the relationship between learning styles and the use of blended learning remain to be contradictory. Some findings suggest that there is a strong relationship between student learning styles and attitudes to e-learning (Graff, 2003; Hong & Kinshuk, 2004; Shih & Gamon, 2002), whilst others suggest that no such relationship exists (Shaw & Marlow, 1999). Further investigation is needed to clarify this issue. These studies suggest that blended learning environments should be planned and implemented to be able to ensure that individual differences will be accommodated and there is much more research needed to clarify this phenomenon. Moreover, evaluations of the students' perceptions in learning styles and blended learning environment is a relatively new field (Akkoyunlu and Soylu, 2008), thus, documentation on the basic intent of determining the variation on students' perception of blended learning in terms of their learning style variances is not sufficient. With this in mind, this study was designed to determine the variation on students' blended learning perception in terms of their learning styles.

2. Objectives of the Study

Specifically, the study sought to answer the following research questions:

1. What are the students' learning style preferences?
2. What are the students' perceptions of blended learning?
3. Is there a significant difference in the blended learning perception of students when grouped based on their learning styles?

3. Methodology

This is a descriptive-comparative study as it aims to describe the learning style preferences and blended learning perceptions of students and compares the students' perception of blended learning with respect to their learning style.

3.1 Participants

The respondents consisted of one hundred thirteen (113) students who are enrolled in the five courses of Fundamental Statistics and Probability and Statistics during the Second Trimester of the School Year 2012-2013. 58% of the participants were male and 42% were female. The ages of the participants ranged from 19 – 36 years. The convenience sample of participants was entered into the study through their voluntary participation.

3.2 Instruments

Data required for this study were collected by the researcher through the Felder-Soloman Index of Learning Styles (ILS) and a questionnaire on blended learning perception or BLE survey.
ILS is the tool that Felder designed to evaluate a student's learning style. It consists of 44 questions where learners' personal preferences for each dimension are expressed with values that can vary from 1 to 11 per dimension. This range comes from the eleven questions that are posed for each dimension (Gomez 2007; Graf 2007). For the scoring, summing up the number of a and b responses for each dimension formed scores which range from 1-11. Lower scores are subtracted from the higher score of either a or b. Felder and Spurlin (2005) have defined a score of 1-3 to characterize a fairly well balanced preference on the two dimensions, 5-7 is characterized as having moderate preference for one of the dimensions on the scale and 9-11 as having very strong preference for one dimension on the scale. The difference between the lower score from the higher score of either a or b will determine the learning style that student has.
The BLE survey was developed by the researcher to determine the students' perception on blended learning environment. After a literature review, content validation and necessary revision was made, a total of 20 items were formulated. Five items represent the student views for each of the following categories of BLE – ease-of-use and accesibility, quality of content, frequency and purpose of use and general outcome. The survey used a five-point Likerts' scale to rate each item. A criterion which served as the basis for the interpretation of the mean ratings is as follows: 4.51 – 5.00 (strongly agree/very high); 3.51 – 4.50 (agree/high); 2.51 – 3.50 (neutral/moderate); 1.51 – 2.50 (disagree/low); 1.00 – 1.50 (strongly disagree/very low). The alpha reliability coefficient of the scale was acceptable at 0.76.

3.3 Procedures of the Study

The five sections are handled by the researcher to ensure that the course was delivered in a blended format, incorporating both traditional and online teaching. The university BLE (course management system) and the researcher's personal email was used to implement the study. The BLE was used to upload and download the learning resources for the courses like the course specifications, lecture notes, suggested readings, problem sets/practice sheets. Formative assessments like quizzes, exercises and assignments are conducted regularly via

BLE. Students are also encouraged to communicate to the teacher and each other via the chat, forum and instant messaging facility of the BLE. The facility also informs students regarding important announcements and other information through the calendar and posted messages. The gradebook allows students to be informed regarding their course performance.

ILS was administered prior to instruction or during the first two weeks of the trimester while the BLE survey was floated a week before the end of trimester. This allowed the respondent to have enough experience in the use of BLE all throughout the trimester. Additional data were gathered from interviews and focus-group discussions to record students' reactions to blended learning environment.

The data from each instrument were entered into a statistical analysis package for analysis. Statistical analyses were conducted using descriptive statistics like frequency, percentage, mean and standard deviation. Comparison was analyzed using independent t test. All statistical tests reported in this article were conducted with a significance level of 0.05.

4. Findings and Discussion

4.1 Students' learning style preferences

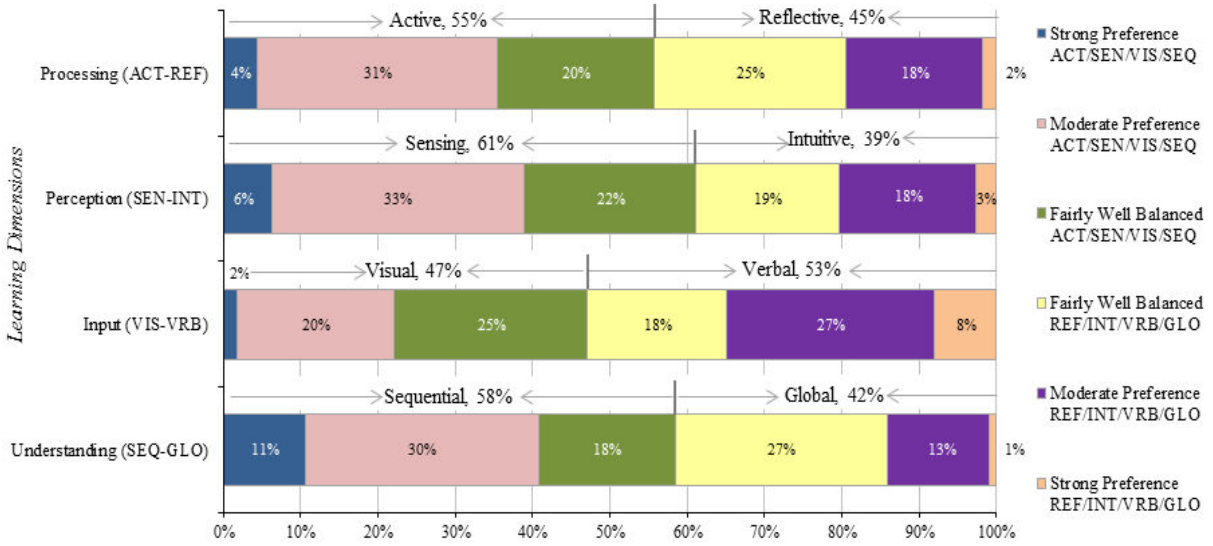

Figure 1. Students' Learning Style Preferences (n = 113)

Figure 1 shows the learning style preferences of students across the four learning dimensions. On the processing dimension, 35% of the students exhibited moderate to strong preference for active learning while 20% showed moderate to strong preference for reflective learning. Almost half of the respondents (45%) held fairly well-balanced processing dimension. Grouping students to likeliness of preference, 55% revealed more likely to be active learners while the rest of the 45% are more likely reflective learners. This is consistent with the report of Felder (2003) that university students prefer doing something active rather than just listen in class. These learners tend to retain information when they relate it with practical rather than spending time to think.

On the perception dimension, the figure shows that 61% of the students are more likely sensing learners while 39% are more likely intuitive learners. Further, the figure reveals that 41% are fairly well-balanced sensing-intuitive learners, 39% has moderate to strong sensing perception and 21% has moderate to strong intuitive perception. Studies have suggested that students interested in technology based instruction (e-learning) are independent learners who prefer a more abstract way of thinking (Grasha & Yangarber-Hicks, 2000).

In terms of the input dimension, the figure presents 47% of the students are more likely visual learners and 53% are more likely verbal. Examining the continuum, 43% is fairly well-balanced between visual and verbal learning, 22% is moderate to strong visual learners and 35% is moderate to strong verbal learners. According to Felder and Brent (2005) in most college classes very little visual information is presented: students tend to mainly listen to lectures and read material written on textbooks, handouts or chalkboards. Hence, students tend to be more verbal in terms of information assimilation.

Looking at the understanding dimension, 41% of the students have strong and moderate preference for sequential learning and 14% has strong to moderate preference for global learning. The rest of the 45% has fairly well-balanced sequential-global learning style. In summary, majority (58%) has a more likely preference for sequential learning. Felder and Brent (2005) also indicated that most college students are sequential learners as

students in universities are usually taught in a sequential manner. Technology-enhanced activities and materials are usually organized in learning in linear steps allowing students to learn from gradual and systematic steps.

4.2 Students' perceptions on blended learning

Table 1. Students' Perception on Blended Learning

Perception on Blended Learning		Items	Mean (s.d.)	D.I.	Overall Mean	D.I.
Ease of use and accessibility	1	Overall, BLE is easy to use.	4.40 (0.662)	Agree	3.51	Agree
	2	BLE is easily accessible via internet.	3.02 (0.732)	Neutral		
	3	BLE is continuously available.	2.59 (0.904)	Neutral		
	4	Online materials are available at locations suitable for me.	3.20 (0.878)	Neutral		
	5	I can find required information easily.	4.35 (0.875)	Agree		
Content Quality	6	The information provided in BLE is relevant and useful.	4.65 (0.550)	Strongly Agree	4.52	Strongly Agree
	7	Complete information is provided in the BLE.	4.46 (0.708)	Agree		
	8	The course materials in the BLE cover the content of the course.	4.59 (0.636)	Strongly Agree		
	9	The course materials are organized in an effective manner.	4.47 (0.721)	Agree		
	10	The contents of the BLE are up-to-date.	4.42 (0.952)	Agree		
Usage and Purpose	11	I use BLE frequently.	3.62 (0.698)	Agree	3.94	Agree
	12	I use BLE to communicate with my teacher and classmates.	3.46 (0.936)	Neutral		
	13	I use BLE to view announcements, read messages and discussions.	3.22 (1.147)	Neutral		
	14	I use BLE to access course materials.	4.79 (0.411)	Strongly Agree		
	15	I use BLE to view assessment tasks (like assignments and activities).	4.63 (0.503)	Strongly Agree		
General Outcome	16	I can manage my "study time" effectively by using the BLE.	4.31 (0.708)	Agree	4.00	Agree
	17	I enjoy learning using BLE.	4.25 (1.299)	Agree		
	18	The use of BLE saves time.	3.59 (1.074)	Agree		
	19	Overall, I am satisfied with the BLE.	4.32 (0.782)	Agree		
	20	I recommend the use of BLE to my friends.	3.55 (1.323)	Agree		
Overall			**4.00**		**Agree**	

Table 1 presents the students' perceptions on blended learning. As can be gleaned from the table, the students' perception on the content and quality of the blended learning is very high at 4.52. They strongly agree that the information provided in the BLE is relevant and useful and the course materials cover the content of the course. The table also revealed the respondents' high perception on BLE's general outcome (4.00) as they agreed on items pertaining to their overall satisfaction with BLE. The mean rating of 3.94 for usage and purpose shows that the students frequently use BLE for varied purposes such as to access course materials, view their assessment tasks and announcements and to communicate with the teacher and their classmates. On ease-of-use and accessibility, the mean rating of 3.51 indicates their high perception as their responses varied from neutral to agree on items related to its overall ease of use and continuous availability. Interviews revealed that students

vary in terms of experiences and skills with the use of technology specifically course management system which affected their level of comfort and perception on the use of the BLE at hand.

Table 1 also unveiled that the overall mean obtained from responses to the questionnaire is high at 4.00 based on the interpretation of the mean ratings. This result is supported by some of the comments of the students during the interview as follows: "I think the method used in this course is a good one. I have access to course materials and assignments via the Internet. Then the regular lecture sessions reinforce what I learned earlier in the web and the topics I did not understand were explained in these sessions. So, I think learned better." "I can learn anytime and anywhere I want to. I feel free. I can also catch up with what we I missed especially if I was absent. During the discussion, I understand the difficult problems and exercises." "I am pleased that our course is carried out in this way. I believe that this is better learning. I try to learn on my own and not always rely on information from my teacher. And our face-to-face sessions are of great help for me to fully understand our lessons. We learn by discussing the topics that we had not understood by studying by ourselves." "Before coming in class, we receive the information on the topic and download the lecture notes and exercises from the Internet. We get informed about the topic as we study the materials given ahead. By this way, we are already informed about the topic when we come to the course. It's easier to absorb information that way. Hence, blended learning provides a more effective learning."

It can be construed therefore that synchronous environments should coexist with asynchronous ones so that students will have more productive learning experiences. Students' satisfaction to blended learning environment adds to their interest towards learning. These e-learning developments have emphasized changing roles of students and teachers in ways which are dramatic and obvious. Face-to-face and online environments therefore can be reorganized by examining the learning styles of students in blended learning environments. (Akkoyunlu and Soylu, 2006; Burgon and Williams, 2003; and Irons, et.al, 2002)

4.3 Variances on blended learning perception of students according to their learning styles

Table 2. Differences on Students' Perception on Blended Learning According to Learning Styles

Perception on Blended Learning	ACT	REF	t (p-value)	SEN	INT	t (p-value)	VIS	VRB	t (p-value)	SEQ	GLO	t (p-value)
	n = 63	n = 50		n = 69	n = 44		n = 54	n = 59		n = 66	n = 47	
	$\overline{X}$ (s.d.)	$\overline{X}$ (s.d.)		$\overline{X}$ (s.d.)	$\overline{X}$ (s.d.)		$\overline{X}$ (s.d.)	$\overline{X}$ (s.d.)		$\overline{X}$ (s.d.)	$\overline{X}$ (s.d.)	
Ease-of-use and Accessibility	3.75 (0.469)	3.21 (0.545)	7.708 (0.006*)	3.37 (0.612)	3.73 (0.423)	16.472 (0.000*)	3.22 (0.590)	3.78 (0.398)	22.907 (0.000*)	3.46 (0.574)	3.58 (0.564)	0.458 (0.500)
Content Quality	4.54 (0.441)	4.49 (0.576)	6.984 (0.009*)	4.49 (0.529)	4.55 (0.464)	2.063 (0.154)	4.49 (0.572)	4.54 (0.435)	6.391 (0.013*)	4.49 (0.533)	4.55 (0.462)	2.122 (0.148)
Usage and Purpose	4.21 (0.352)	3.60 (0.360)	0.002 (0.965)	3.99 (0.528)	3.87 (0.343)	15.741 (0.000*)	3.89 (0.405)	3.99 (0.515)	7.856 (0.006*)	4.05 (0.391)	3.80 (0.525)	8.007 (0.006*)
General Outcome	3.76 (0.712)	4.31 (0.815)	0.769 (0.382)	3.83 (0.717)	4.27 (0.869)	3.077 (0.082)	3.84 (0.696)	4.15 (0.874)	5.145 (0.025*)	3.81 (0.727)	4.27 (0.840)	1.338 (0.250)
Overall	4.18 (0.254)	3.76 (0.415)	20.371 (0.000*)	4.03 (0.339)	3.93 (0.462)	3.720 (0.056)	3.95 (0.451)	4.03 (0.330)	4.217 (0.042*)	4.06 (0.350)	3.91 (0.433)	1.107 (0.295)

***Significant at 0.05 level of significance**

Presented in Table 2 are the differences on students' perception on blended learning according to their learning styles. As can be gleaned from the table, active-reflective learners tend to significantly differ in their overall perception on blended learning as the p-value of 0.000 is less than the level of significance of 0.05. They particularly differ on their perception on the ease of use and accessibility and content quality with p-values of 0.006 and 0.009, respectively. Active learners have higher mean ratings on their blended learning perception than reflective learners. Likewise, significant difference exists between the visual and verbal learners with all the p-values less than the significance level. Mean ratings of verbal learners are higher than the visual learners on all the subfactors of BLE. These findings post similar conclusions with the study conducted by Kanninen (2008). He articulated in his thesis that active learners would like to do something active and to learn in groups which are catered in BLE through its provisions for linear texts, chats and forums. On the other hand, verbal learners' preference on text-based materials, digital library and hypertext in learning which are made available in BLE attributed to their higher perception on blended learning.

The foregoing table also revealed that sensing and intuitive learners do not significantly differ on their perception towards blended learning. Similarly, sequential and global learners do not significantly differ on their blended learning perception. Since sensing learnings prefer to learn concrete materials, they find slideshows, hypertext and response system useful in e-learning which are made available in BLE. Likewise, learning abstract materials by providing lesson objectives, text and multimedia based slideshows, graphics, digital movies, audio objects, and linear text are also provided in the online environment for intuitive learners. The blended learning

environment therefore seems to provide a balance of learning materials and strategies for student learning which cater both groups of learners (Gomes, et.al., 2000; Carmo, et.al, 2006; Kaninen, 2008).

5. Conclusions and Recommendations

The study investigated the variation of the learners' perception on blended learning in terms of their learning styles. Results revealed students' views on blended learning which are moderate to very high perception on items related to the ease-of-use and accessibility, quality of contents, usage and purpose, and general outcome. On the ILS, active-reflective dimension reported 55% active learners; sensing-intuitive dimension reported 61% preference on sensing learning; visual-verbal dimension revealed 47% visual learners and; sequential-global dimension showed 58% sequential preference. Overall, results indicated that students' perception on blended learning differ among active-reflective and visual-verbal learners whereas learners classified as sensing-intuitive and sequential-global do not significantly vary in blended learning perception.

Since the study revealed the varied students' perception on blended learning based on their learning styles, it is important therefore to ensure that their individual learning preferences be considered for effective learning. It should be the responsibility of teachers to focus on students' awareness of learning styles and provide a rich variety of instructional components to address all learners. As emphasized by Cooze and Barbour (2007), teachers' objective should be "to design instruction which will foster and enhance learning for each student regardless of their individual differences and irrespective of the setting for learning". According to Manochehr (2006) to address all possible learning styles in terms of instructional media and materials, instructors should aim to provide a complete supportive learning activities and methods for blended learning.

It is also worth to note as according to Felder & Spurlin (2005) that the point of identifying learning styles is not to label individual students and modify instruction to fit their labels. They further discussed that for students to function effectively as professionals, they will need skills associated with both categories of each learning style dimension; if they are never given practice in their less preferred categories, they will not develop the skills that correspond to those categories. The optimal teaching style is a balanced one in which all students are sometimes taught in a manner that matches their learning style preferences, so they are not too uncomfortable to learn effectively, and sometimes in the opposite manner, so they are forced to stretch and grow in directions they might be inclined to avoid if given the option.

Realizing the different characteristics of our students in BLE and using this data to address all diverse learning styles should increase the probability of knowing our students, providing them with suitable instructional media, methods and environment, making the content easier for them to study and learn, thus increasing the success of the process and products of blended learning. So, as educators we should try to reveal the characteristics of our students and reshape our courses based on the emerging characteristics of the class (Gülbahar, 2005).

This argument suggests that the most important application of learning styles is designing effective instruction. ILS provides guidance to teachers on the diversity of learning styles within their classes and to help them design instruction that addresses the learning needs of all of their students. In particular, finding a large number of students with a specific preference whose needs are not being addressed should alert instructors to the need to make some changes in their teaching.

For future work, it is suggested that possible relationship between learning styles and blended learning implementation be investigated. Also, researches should be conducted for determining effective "e-learning styles" that will be worth taking into consideration in e-learning and blended learning environments.

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