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# IMPROVING STUDENT'S ATTITUDE AND LEARNING PERFORMANCE IN A BLENDED LEARNING ENVIRONMENT: APPLYING LEARNING STYLES IN THE ONLINE INSTRUCTIONAL DESIGN

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## ABSTRACT

**Objective:** This study investigated the use of student learning styles in the instructional design of an online learning environment, the attitude towards the subjects and the learning performance of both control and experimental group..

**Methods:** The Learning Styles Inventory (LSI) developed by Albert A. Canfield (1980) and published by Western Psychological Services was used to determine students' learning preferences and 16-item Attitude Scale Inventory was used to determine students' attitude towards the subject. The questionnaire was administered as pre-test and posttest to determine whether there is a significant difference in students' attitude before and after the use of blended learning approach. Five assessment activities in the form of assignments, seatworks, quizzes and major exams were conducted to determine student's learning performance in both classes.

**Results:** There is a significant difference in the learning performances of students and their attitude towards the subject in the blended learning environment than in the traditional classroom.

**Conclusion:** The positive findings with respect to the impact of the blended learning strategy provide justification of the favorable strategies employed in the online instructional design. Strategies that were highlighted in this study are the use of interactive activities like threaded discussions, feedback and interaction as seen in the maximum participation of students in the online environment. Moreover, the blended learning approach provided more additional learning opportunities for students which can be the significant reason why students performed better than from the students in the traditional classroom. This model is also seen as an effective mechanism for remediation and enrichment when time is constrained.

**Keywords:** *learning styles, online instructional design, blended learning, Canfield Learning Style, Moodle,*

## INTRODUCTION

Integrating technology in the classroom is a growing initiative that is becoming a trend among Higher Education Institutions (HEIs) in the Philippines. As stated by Marcial (2012), the use of technology in the teaching and learning process has a high level of prioritization in the Philippines. One of the approaches introduced by HEIs is the integration of online learning as a supplement in the traditional classroom. Literature describes this as a blended or hybrid learning strategy. However, Refre (2010) pointed out that while blended learning is regarded as a welcome reinvention of HEIs all over the world, this is still taking off in a very slow manner in the Philippines.

Literature studies noted that there are notable differences between classroom instruction and web-based instruction. This suggests that when one decides to use online learning as a strategy, a conscientious planning in terms of instructional design, learning activities and materials should be considered (Rakap, 2010; Galvis, McIntyre & Hsi, 2006). As asserted by some authors, online technologies are merely vehicles or medium that delivers instruction and does not directly influence student achievement. As revealed in meta-analysis studies (Means, Toyama, Murphy & Baki, 2013; Shackar & Neumann, 2010), students gained significant learning benefits in an online learning environment as opposed to traditional classroom, however, some authors argued that the reason for those benefits is not the medium of instruction but the instructional strategies built into the learning materials (Clark, 1983; Owston, 1997; Wheeler, 2007; Anohina, 2005; Roffe, 2002; Oblinger & Hawkins, 2005; Conner & Conner, 2006). Recent studies supported such idea when they assessed the quality and effectiveness of instructional design in the online learning environment (Gormley, 2014; Allen & Seaman, 2011; Guven & Ozbek, 2007; Cooze & Barbour, 2007; Siemens, 2002) and conducted inquiries regarding the effect of online learning delivery on learner outcomes (Lim and Morris, 2009; Johnson, Aragon, Shaik, 2000; Schakar & Neumann, 2010; Hughes et al., 2007). Instructional design, according to Siemens (2002) as cited by Cooze & Barbour (2007), should be a process whereby learning, not technology, is kept at the center of learning development. More simply put, adding technology without changing the pedagogy does not necessarily result in any major change to teaching and learning (Powell et al., 2015; Piccono et al., 2010; Moallem, 2003; Clark, 2001). Literature suggested, for example, that one way to ensure quality of online course design and positive student outcomes is through consideration of the relevance of student learning styles to design instructional methods (Maddux et al, 2002; Buch & Sena, 2001; Barnes, Preziosi

& Gooden, 2004; Terrel, 2005; Lane, 2005; Garland & Martin, 2005; Richmond & Cummings, 2005; Zapalska & Brozik, 2006; Cooze & Barbour, 2007; Rakap, 2010; Szabo & Schwartz, 2011; Gu, Triche, Thompson & Cao, 2012; Shih & Gamon, 2002; Maddux, Ewing-Taylor & Johnson, 2002; Cakiroglu, 2014; Dziuban, Moskal, & Hartman, 2004; Fearing & Riley, 2005).

Valenta et al (2001) asserted, "Further research is necessary to understand how learning styles contribute to the experience of online education". Consideration of this issue is founded on the perspective that students ought to be taught using methods that maximize learning effectiveness (Barnes, Preziosi & Gooden, 2004). Earlier studies indicate the relevance of learning styles in the design of online learning environment and their findings showed that learning styles have positive effect on student academic success and is an effective way to enhance teaching and learning (Garland and Martin, 2005; Muir 2001; Barnes, Preziosi & Gooden, 2004; Madux, Ewing-Taylor, & Johnson 2002; Thiele, 2003; Richmond & Cummings, 2005; Cooze & Barbour, 2007; Moallem, 2001; Magoulas, Papanikolaou, & Grigoriadou, 2003).

Moreover, as stated by Means, Toyama, Murphy & Baki (2013), further research and development on different blended learning models is warranted. Experimental research testing design principles for blending online and face-to-face instruction for different kinds of learners is needed. Hence, the challenge for educators is to utilize this technology in ways that facilitate the highest level of learning outcomes (Barnes, Preziosi, Gooden, 2004). Some authors (Dringus & Terrel, 2000; Madux, Ewing-Taylor & Johnson 2002; Thiele, 2003) noted there is a need to develop online course design around sound theoretical research. As stated by Gu et al, (2012), there are still questions regarding the effectiveness of online learning despite its growing popularity. Very few researches have focused on the relevance of learning styles to internet-based courses in higher education (Benbunan-Fich & Hiltz, 2003; Richmond & Cummings, 2005) and little attention was also given on instructional strategies that work best in an online learning environment that is appropriate to student's individual learning behaviors and characteristics (Franzoni & Assar, 2009; Gormley, 2014).

Since there are myriads of decisions involved in designing and implementing online learning, this study took into account students' individual learning styles in the design of the online learning strategy in a blended learning environment. It is seen that there is still insufficient research in this subject in the Philippines. This paper further investigated whether the use of blended learning improved student attitudes towards the subject and learning performances. This paper also extended

support in the application of Canfield Learning Style Inventory (CLSI) and Moodle Learning Management System as a platform.

The overarching research question guiding this study was: Does the consideration of students' learning styles in the online instructional design of a blended learning environment improve students' attitude towards the subject and their learning performance?

Specifically, the research questions examined were as follows:

1. What are the learning styles of the students as measured by the Canfield Learning Style Inventory?
2. What are the design considerations of the online learning strategy in order to meet the learning styles of the students in the blended learning environment?
3. Is there a significant difference in the attitude of the students towards the subject in the traditional classroom and blended learning environment?
4. Is there a significant difference in the learning performance of the students in the traditional classroom and blended learning environment?
5. What are the issues and challenges encountered in the design and implementation of the online learning strategy?

The last research question is aimed to describe issues encountered in the design and application of the online learning environment and discuss its implication for practice.

## **LITERATURE REVIEW**

### **Using Online Technology in the Teaching and Learning Process**

Educators have been expected to integrate online technology into their classrooms while retaining the essence of the curriculum. There is a frequently voiced belief that information technology (IT) will transform the educational process.

Morgan, Humphries, Goette (2006) suggested that people factor influences how and when a technology will be adopted. A successful methodology for the implementation of this technology will require approval from all persons affected by the use of that technology. With this in mind, it is important that proper care is used when deploying technologies in a school environment. The complexity of the technology can greatly influence its adoption because people relate the complexity to the ease of use (Elliot & Hall, 2003, Tabak & Nguyen, 2013).

This gives the idea that when technology is integrated in the classroom one should consider the characteristics of students in the teaching and learning process. The goal is to use tools that are appropriate to the needs of the learning experience (Gynn, 2001). There should always be good reason for including technology in the learning environment. This point out that technology can be the tool that connects the student to knowledge, the student to other students, and the student to the teacher (Gynn, 2001).

Furthermore, Jonassen (2000) argued that technologies have learners “articulate what they know, reflect on what they have learned, support the internal negotiation of meaning making, construct personal representations of meaning, and support intentional, mindful thinking”. With those technological tools, learners in online learning environments can a) interact with the content to construct knowledge in their own individual minds, b) interact with the content to construct knowledge as a group and within a group, and c) expand their individual knowledge.

Moreover, Richards (1999) suggested that it is necessary to continually reflect, evaluate, and adjust instruction when using technology. It is becoming increasingly clear that technology, in and of itself, does not directly change teaching or learning (Lukow, 2002). Rather, the critical element is how technology is incorporated into instruction. This integration of technology is so expansive across all areas of education that research is needed to explore the connections between its use and how students respond to its use in the classroom.

One key element of infrastructure that educational organizations use in the delivery of instructions is a learning management system. While there are a range of learning management systems available in the marketplace, all of them aim to deliver four main features; (i) delivery of learning content, (ii) tracking of participant performance, (iii) management of online learning and (iv) provision of tools for participant collaboration (Watson & Ahmed, 2004). Online learning advocates suggest that building the infrastructure for online learning requires that many factors be considered (Davis, 2004; Moore & Thompson, 1990; Verduin & Clark, 1991; Glenn, 2000). Learning how to integrate new technologies in an instructional setting, when to use it, and why it should be used always lags the introduction of the technology itself (Kilby, 2001). Coupled with this, the costs that can be incurred in the development of e-learning, the range of estimates vary, from small financial resources required to huge financial commitment (Mayer, 2003). The range of estimates from 50 hours to 2000 hours for developing one hour of on-line content obviously have consequences on the development and deployment of content.

## Blended Learning Environment

As cited by Whittaker (2013), blended learning in higher education has been defined as 'a combination of technology and classroom instruction in a flexible approach to learning that recognizes the benefits of delivering some training and assessment online but also uses other modes to make up a complete training program which can improve learning outcomes and/or save costs' (Banados, 2006). In the same paper, the author presented the following taxonomy of terms related to blended learning (Smith & Kurthen, 2007) as cited in Gruba & Hinkelman (2012):

Term	Definition
<b>Web-enhanced</b>	Subjects that make use of a minimal amount of online materials, such as posting a syllabus and course announcements.
<b>Blended</b>	Subjects that utilize some significant online activities in otherwise face-to-face learning, but less than 45 per cent.
<b>Hybrid</b>	Subjects in which online activities replace 45–80 per cent of face-to-face class meetings.
<b>Fully Online</b>	Subjects in which 80 per cent or more of learning materials are conducted online.

While earlier research on various forms of online learning concluded that these technologies do not differ significantly from regular classroom instruction in terms of learning outcomes (Means, Toyama, Murphy & Baki, 2013; Bernard et al., 2004; Cavanaugh, 2001; Machtmes & Asher, 2000; Zhao, Lei, Yan, & Tan, 2005), literature studies discuss that online education initiatives could be justified on the basis of cost-efficiency or the need to provide access to learners in settings where face-to-face instruction is not feasible (Florida Tax, 2007; Wise & Rothwan, 2010).

One of the findings in the meta-analysis study conducted by Means, Toyama, Murphy & Baki (2013) opposed the idea that online learning as a supplement or blended learning does not support classroom instruction. The authors argued that, in fact, it produces student learning outcomes than learning solely through face-to-face instruction as examined in various studies. However, to achieve success in its implementation, there is a need to include different kinds of learning activities where there is more learning time, additional instructional resources, and course elements that encourage interactions among learners.

Osguthorpe & Graham (2003) identified six reasons why one might choose to design or use a blended learning system: (1) pedagogical richness, (2) access to knowledge, (3) social interaction, (4) personal agency, (5) cost effectiveness, and (6) ease of revision. Rudestam & Schoenholtz (2010) further added that other reasons why online learning is adapted as a supplemental strategy include current technologies' support for interactivity, social networking, collaboration, and reflection that can enhance learning relative to normal classroom conditions.

The study of Powell et al. (2013) outlined lessons learned in their practiced of blended learning, to wit:

1. There is no single type of blended learning model.
2. The focus should be on the shift in instructional models toward student-centered learning.
3. It should create a school culture and climate dedicated to continuous improvement.
4. It should address both system and school-level barriers to implementation.

According to Means et al., (2009), there has been limited rigorous research conducted on the effectiveness of blended learning models; hence, there is a need for more rigorous research to understand the utility of blended learning to support teaching and learning (Murphy et al., 2014).

### **Online Learning Pedagogical Approaches**

A great deal of literature affirmed the use of pedagogical approach in designing online instruction. According to Galvis, Mc Intyre & Hsi (2006), different pedagogical approaches promote different learning experiences by varying the source of the learning content and the nature of the learner's activity. The same author discussed three pedagogies applicable to online learning-expository, active learning and collaborative or interactive learning. Some authors argued that online learning environment is capable of adapting active and interactive learning (Rudestam & Schoenholtz-Read, 2010; Hakkinen, 2002). This is supported by Dziuban, Moskal & Hartman (2004) and Bales (1997) where they described this as an environment that has more potential to produce a learner-centered environment through the use of interpersonal, two-way communications between the instructor and an individual student as well as among students. Roschelle et al. (2000) described four characteristics of active learning: active engagement, participation in groups, frequent interaction and feedback and connections to real-world context.



Some studies explored the use of adaptive learning approach in the design of the online learning (Powell et al., 2015; Christensen et al., 2013). This approach promotes personalized learning model where the instructional design is matched with the right student with the right content at the right time.

However, Gormley (2014) stated that while much has been written about the pedagogy and challenges of online learning, there is comparatively little research that advises how online course design competencies can be achieved, He further suggested that there is a need to evaluate online course design actual impact on practice. As contended by Boling et al (2012), literature supports the need to develop a sound pedagogical strategy for online modules, what is less clear is how that strategy can be executed.

## **Learning Styles**

Repeated studies showed that students learn in different ways or through a combination of different ways. Muir (2001) pointed out that students learn: 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they see & hear, 70% of what they say, 90% of what they say and do. Based on this theory, Muir (2001) concluded that students need (1) a variety of teaching strategies, (2) a variety of learning paths, (3) activities which they can read, visualize, hear, say and do, (4) instructional guidance leading into independence, (5) ability to work on their own with appropriate assessment methods and (6) appropriate tools and technology for independent and guided study. He further suggested that it is important to consider the characteristics of the learner as a user in instructional planning. Accordingly, user's characteristics maybe accounted to their different learning styles.

Understanding the learning styles of students has been identified as an important element for consideration in e-learning instruction, development and delivery which can lead to improved student performance (Shih & Gamon, 2002). Du & Simpson (2002) concluded that in e-learning, "it is good practice for online instructors to incorporate students' learning styles into the pedagogical design of their courses to maximize student's success". A simple awareness of differences in student learning styles is vital for educators in order to aid the learning process (Diaz & Cartnal, 1999).

There are many varying views and beliefs concerning learning styles and several theories each with their particular focus. As Hood (1995) noted, "realistically, a teacher cannot be expected to have a different lesson for every child in the

classroom, however, lessons can reflect an understanding of individual differences by appropriately incorporating strategies for a variety of learning styles.”

James & Gardner (1995) proposed that learning styles are cast within a perceptual, cognitive, and affective framework, and suggest instructional design components for distance education that conform to learner needs within those three components. Verduin & Clark (1991) argued that attention to the mode of learning preferred by students is important to the instructor who is designing distance learning experiences.

With a variety of learning style instruments in use, it is important to carefully select an instrument according to the unique requirements of the distance learning context. Three important factors to consider when selecting a learning style instrument include: considering the intended use of the data to be collected, finding an instrument and matching it to the intended use and, finally, selecting the most appropriate instrument (James & Gardner, 1995).

### **Application of Learning Styles to Online Courses**

A number of studies have been done examining the learning styles of students who enroll in distance education courses. Richmond & Cummings (2005) stressed out that effective online learning should be based on instructional design decisions that will have the most impact on student learning.

Moallem (2001) conducted similar study on applying learning styles in an online course. His study applied the literature on learning styles to develop a list of assumptions and guidelines that are further used to identify a learning style model for designing and developing a web-based course. He described the process of integrating the learning style model into the design and development of an undergraduate online course, and provides information on the effects of the course design specifications on students' learning and their attitude and satisfaction.

As cited in the study of Cooze & Barbour (2012), with the convenience and flexibility of e-learning, learners often neglect to consider the “appropriateness of online instruction for their individual learning behaviours and characteristics” (Kaminski, 2002). Notably, institutions delivering e-learning programs seldom provide surveys for potential e-learners in order to determine if e-learning is an appropriate choice. As cited in the study of Liu, Lavelle, & Adris (2002), “Recent research involving the effects of online education has emphasized dimensions

such as the learner's performance and course evaluation but has largely ignored the role of student characteristics as linked to instruction".

The study of Buerck, Malmstrom, & Peppers (2003) found out that learning styles do not affect how students interact with media and methods of instruction, but they do affect satisfaction with other learners. The study of Barnes, Preziosi & Gooden (2004) suggests that there are differences in the learning styles of students and they do indeed prefer certain online course delivery methods over others.

Butler & Pinto (2006) conducted a study on student's learning styles and their preferences for online instructional methods. The strongest preferences were noted for instructional activities emphasizing convenience, time management, and interactivity. It was found that students participate in online courses because of convenience, displayed dual learning style and favored individual assignments and threaded discussions.

### **Implementation Considerations**

Magoulas, Papanikolaou, & Grigoriadou (2003) presented approaches to designing online courses considering student's learning styles. The paper builds on theories from instructional design and learning styles to develop a design rational and guidelines for adaptive web-based learning systems that use individual differences as a basis of system's adaptation. Various examples are provided to illustrate how instructional manipulations with regard to content adaptation and presentation, and adaptive navigation support, as well as the overall degree of system adaptation, are guided by educational experiences geared towards individual differences.

Lane (2005) discussed that using multiple types of media (video, audio, and data) will also help ensure that learning styles are met and that significant methods for interaction are provided. This mix of media is available now in facilitated e-learning courses. With it, all learning styles can be reached. It also includes an important component that enables students to become self-directed learners and reduce their sense of isolation. The synergy of technologies available through e-learning based on multiple media and the Internet creates new learning opportunities for adapting learning to students intelligences and learning styles.

In example, the table below suggests some strategies that could be implemented to different types of student's learning style.

<b>If you learn best by:</b>	<b>Look for a course with:</b>
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Reading	e-books, textbooks, and other required reading (written lessons are a primary method of delivering curriculum online)
Listening	audio lectures or sound bites to explain concepts
Seeing how things are done	graphical demonstrations that illustrate new ideas
Doing	Assignments, quizzes, exams, or practical application examples
Speaking/Communicating	email, chat, or threaded discussion groups for sharing and feedback

Source: Worldwidelearn.com © 2009

The study of Conceição (2005) suggested that one teaching strategy that is commonly employed in online courses is the use of discussion forums for the purpose of fostering learners' critical thinking skills. His study proposed to explore the relationship between learning style and critical thinking in an online course that used discussion forums and concept maps as teaching strategies. Results of his study indicated that there is no relationship between learning style and critical thinking; however, study findings suggest that individual and group factors influenced the ability for students to demonstrate successful critical thinking skills in the course.

As cited by Gormley (2014), previous studies revealed that online learning experiences were focused on text-based content, little interaction with others and limited variation in instructional modes or media (Boling et al., 2012) which offered little or no opportunity for interactivity and active learning.

Moallem (2003) proposed that online learning can provide a good environment for educators to make many types of material available to students, in a wide variety of ways, thus allowing students to engage with the course in their own preferred manner, and thereby addressing a majority of student learning styles.

### **Moodle Learning Environment**

Nowadays, one of the most commonly used online learning platform is Moodle (Modular Object Oriented Developmental Learning Environment) which is a free learning management system that enables the creation of powerful, flexible and engaging online courses and experiences (Rice, 2006). Moodle (Moodle.org, 2010) is an open source Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). It

has become very popular among educators around the world as a tool for creating online dynamic web sites for their students.

Moodle's modular design makes it easy to create new courses, adding content that will engage learners. Moodle is designed to support a style of learning called social constructionist pedagogy (Rice, 2006). Moodle has a flexible array of module activities and resources to create five types of static course material (a text page, a web page, a link to anything on the Web, a view into one of the course's directories and a label that displays any text or image), six types of interactive course material (assignments, choice, journal, lesson, quiz and survey) and five kinds of activities where students interact with each other (chat, forum, glossary, wiki and workshop).

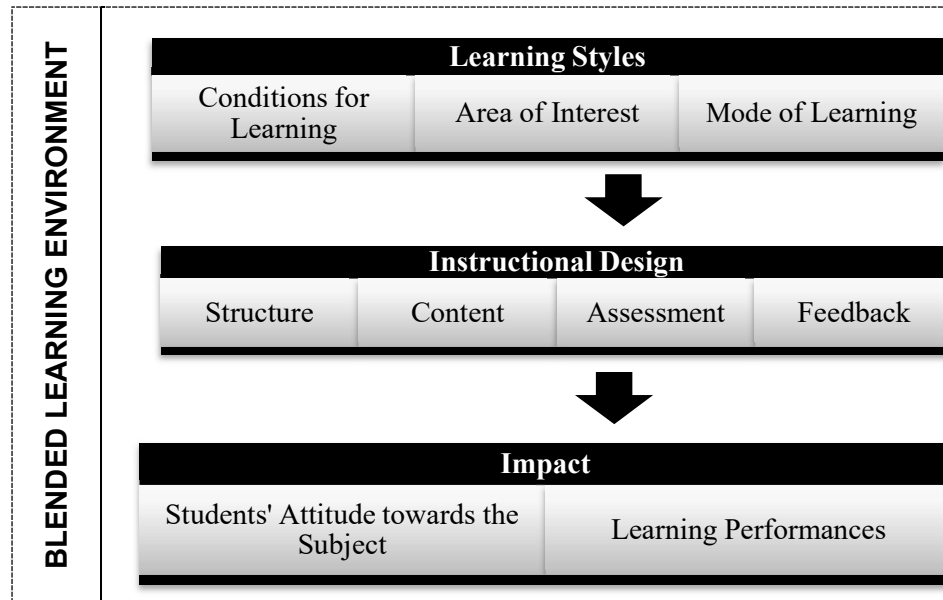
Gower and Barr (2005) found out that tutors were very positive in relation to the introduction of Moodle and the usefulness and user friendliness of the tools within Moodle that allowed them to develop and make changes to their own courses. Moreover, Miyazoe (2008) conducted a comparative study of two Learning Management Systems (Blackboard Academic Suite 7.1 and Moodle 1.7.2) in blended courses provided by the researcher in Tokyo. Two courses were used as a semi-identical instructional design and LMS usage for comparative purposes. The LMSs were used in order to make the most of synchronous oral interaction and asynchronous written interaction in the target language. A post-course questionnaire was given, focusing on students' evaluations of the blended course designs, online interaction, and LMS usability. The research supported a higher usability of Moodle over Blackboard in this course design and the correlation analysis revealed that this is related to students' participating in online interaction and appreciation of the blended course delivery over traditional learning.

### **Conceptual Framework**

The emergence of educational technology, particularly the use of online technology is transforming the process of teaching and learning in the higher education. While integrating this online technology in the curriculum, it is imperative to understand how students learn. This is especially true when considering the incorporation of a greater variety of teaching tools, as is the case when combining online and traditional classroom teaching. The principle is no single instructional strategy is best for all students. As a consequence, students will be able to achieve learning goals more efficiently when pedagogical procedures are adapted to their individual differences (Federico, 2000). Moreover, technology should adapt to fit pedagogy rather than the pedagogy being dictated

by the technology (Wyles & Udas (2004). Malloy, Jensen & Reddick (2007) claim flexibility afforded by open source software can facilitate the development of a system that supports the tradition of academic freedom.

Among other considerations, an important step in the design of instruction and its methodologies is the identification of student needs and learning preferences or in particular, student's learning styles. A review of related literature manifests that understanding learning styles can improve the planning, producing, and implementing of educational experiences, so they are more appropriately tailored to students' expectations, in order to enhance their learning, retention and retrieval (Federico, 2000).



**Figure 1.** Research Simulacrum

The above figure illustrates the underlying concept that guided this study. It suggests that when students' learning styles in the online instructional design of the blended learning environment is considered, it will improve students' attitude towards the subject and their learning performance.

## METHODS

### Research Design

This study made use of quasi post test only experimental design to determine the learning performance of both control and experimental group.

### Participants of the Study

Third year students enrolled in Software Engineering course during the summer term of 2011 were the participants of this study. One class is the control group (n=31) which is the traditional classroom while the other is the experimental group (n=38) or the blended learning environment.

### Research Instruments

**Students' Learning Styles.** The Learning Styles Inventory (LSI) developed by Albert A. Canfield (1980) and published by Western Psychological Services was used to determine students' learning preferences. The instrument has eight subscales, which represent conditions for learning (i.e., peer competition, independence), four subscales dealing with areas of interest (e.g., numeric, qualitative, people) and four modes of learning scales (e.g., listening, reading, direct experience). There are additional items for which students are asked to predict their final course grade (A, B, C, or D). The LSI excludes scales dealing with expected course grades.

Mean scores of students in the control and experimental group were identified and compared in order to determine the prevailing learning styles of the participants.

**Students' Attitude.** The 16-item questionnaire to determine students' attitude towards the subject was adapted from the Attitude Scale Inventory used from previous studies conducted in USL. Responses were scored as 5 for the *most positive* response to 1 for the *most negative* response. According to Grazino & Raulin (2000), survey method is often used to study people's feeling and thinking about specific issues. Attitudes cannot be directly observed, so to measure attitudes one can simply ask the person or use indirect methods of inferring cues to measure implicit attitudes.

The questionnaire was administered as pre-test and posttest to determine whether there is a significant difference in students' attitude before and after the use of blended learning approach. Using SPSS version 20, data was analyzed using paired sample statistics.

***Students' Learning Performance.*** This study employed posttest experimental design to determine the learning performance of both control and experimental group. Five assessment activities in the form of assignments, seatworks, quizzes and major exams were conducted to determine student's learning performance in both classes.

Mean and t-test scores were computed using SPSS to determine whether there is a significant difference in the learning performance of the control and experimental groups.

### **Research Procedure.**

The use of the blended learning strategy was employed after the midterm exam. Before the experiment, the Attitude questionnaire and Canfield Learning Style Inventory were administered to both control (traditional classroom) and experimental (blended learning) groups. After learning styles were identified, the design of the online learning strategy was conceptualized taking into consideration the learning style characteristics of the students in the experimental group. The use of Moodle LMS was employed in the blended learning environment. Students in this group were also met in the classroom using similar strategies with that of the traditional classroom.

The traditional classroom employed conventional teaching and learning strategies like teacher lectures, end-of-topic assessments and class recitations.

## **RESULTS**

The results of this study are presented in four sections: results from student learning styles, design considerations of the online learning environment, results from students' attitudes towards the subjects and students' learning performances. Issues and concerns during the implementation were also discussed.

### **Students' Learning Styles**



Mean scores for students for the 20 scales in the CLI are presented in Table 1. Results showed that there were no statistically significant differences in the most preferred learning styles between the students in the two groups as measured by Canfield Learning Style Inventory.

**Students' Learning Style Characteristics**

Table 2 & 3 below present the most and least preferred learning style characteristics of students in the traditional classroom and blended learning environment. It can be drawn from the table that both groups displayed similarities in their most preferred learning styles; however, there is a difference in their least preferred learning style except for the category Mode of Learning where both groups have least preference on Reading.

**Table 1.** Mean for Students' Learning Styles

<b>Scales</b>	<b>Control Group</b>	<b>Experimental Group</b>
<b>Conditions for Learning</b>	<b>Mean</b>	<b>Mean</b>
Peer	<b>10.40</b>	<b>10.43</b>
Organization	11.11	11.46
Goal Setting	16.28	16.40
Competition	17.62	12.06
Instructor	12.42	12.49
Detail	13.74	14.09
Independence	16.11	16.71
Authority	16.60	16.69
<b>Area of Interest</b>		
Numeric	15	14.31
Qualitative	13.31	13.34
Inanimate	<b>12.85</b>	<b>12.77</b>
People	14.62	14.83
<b>Mode of Learning</b>		
Listening	15.34	15.49
Reading	16.45	16.54
Iconic	<b>9.85</b>	<b>10.29</b>
Direct Experience	12.94	12.97
<b>Grade Expectation</b>		

Excellent	15.37	15.26
Above Average	<b>11.57</b>	<b>11.6</b>
Average	12.74	12.8
Unsatisfactory	20.11	20.31

As revealed in Table 2, the most preferred learning styles of students in the two groups are peer, inanimate and iconic. This implies that students in the traditional classroom and blended learning environment prefers learning conditions that are interactive and engaging (peer); interested more on working with things (inanimate) and have clear preference on interpreting icons or symbols like diagrams, pictures or graphs.

**Table 2.** Students' Most Preferred Learning Style

Scale	Group	Most preferred	Description
Conditions for Learning	Traditional Classroom; Blended Learning	Peer	interactions with peers, teamwork and field, or laboratory classes and values good peer relationships
Area of Interest	Traditional Classroom Blended Learning	Inanimate	working with things, as in building, repairing, designing, or operating equipment
Mode of Learning	Traditional Classroom Blended Learning	Iconic	a clear preference on interpreting diagrams, movies, pictures or graphs

**Table 3.** Students' Least Preferred Learning Style

Scale	Group	Least preferred	Description
Conditions for Learning	Traditional Classroom	Competition	dislike comparing their accomplishments with those of others
	Blended Learning	Independence	prefer not to work independently and determine their own study plan
Area of Interest	Traditional Classroom	Numeric	do not prefer learning activities involving

			numbers and their manipulation
	Blended Learning	People	do not prefer to work with people like interviewing, counseling, selling or helping
Mode of Learning	Traditional Classroom Blended Learning	Reading	not fun of reading activities

It can be gleaned from the table that students in the blended learning environment dislike working independently, do not prefer to work with people like interviewing, counseling and the like and are not fun of reading activities. On the other hand, students in the traditional classroom dislike comparing their accomplishments with those of others and do not prefer activities involving numbers and their manipulation.

Under Grade Expectation category, results showed that both groups expected to earn “Above Average” in their course. However, this category was excluded in this study since it is not relevant in the aims of the present study.

### ***Online Course Instructional Design***

Table 4 below shows the strategies and assessment methods employed to address the most preferred learning styles of the students in the blended learning environment. The LMS was designed using these approaches.

**Table 4.** Online Learning Strategies and Assessment Methods

Learning Style	Topics	Strategies	Assessment
Peer	Software Process Models	-Discussion Forums -Chat Sessions -Private Messages	Recitation Homework
Inanimate	Project Management	-Presentations -Links to Further Readings	Seatwork (Creating Work Breakdown Structure and Gant Chart)

			Quiz (Multiple Choice)
Iconic	Software Quality	-Movie Clips -Interpreting Pictures	Seatwork Quiz

The online course design also provided links of instructional resources like Powerpoint presentations, e-book and the like. Expected learning outcomes were also introduced in each topic in order to set the core competencies required in the unit lesson.

In summary, the online course format employed in this study were: 1) Learning Outcomes, 2) Instructional Resources, 3) Further Readings or Lectures, 4) Threaded Discussion, 5) Quizzes/Tests/Assessments 6) Feedback and Interaction between student and instructor.

Assessment activities were self-paced meaning students can do it in their own time but on a defined date of completion. Quizzes were also designed such that students need to complete it on a particular date but the required time of completion is set.

### ***Students' Attitude towards the Subject***

To ensure that the randomization is effective the scores in the two pretest groups were compared. As shown in the table, there is no statistically significant difference between the traditional classroom and the blended learning group in terms of their attitude towards the subject.

**Table 5.** Two-group Pretest Posttest Scores

	Group	N	Mean	t-value	p-value	Interpretation
Pretest	Traditional	31	41.23	1.269	0.209	Not Significant
	Blended	38	39.39			
Posttest	Traditional	31	42.23	0.538	0.592	Not Significant
	Blended	38	41.58			
Difference	Traditional	31	1.00	-0.830	0.409	Not Significant
	Blended	38	2.18			

**Table 6.** Paired Sample Statistics of Students' Attitude towards the Subject

Group		Mean	N	t-value	p-value	Interpretation
Traditional	Pretest	41.23	31	-0.987	0.331	Not Significant
	Posttest	42.23	31			
Blended Learning	Pretest	39.39	38	-2.210	0.033	Significant
	Posttest	41.58	38			

As seen in the table, there is statistically significant difference in the attitude of students towards the subject in the blended learning environment as indicated in the p-value equivalent to 0.033 ( $<.05$ ). This implies that students' attitude towards the subject improved at the end of the experimental design (use of online learning experience). On the other hand, there is no significant difference in students' attitude in the traditional classroom.

### ***Students' Learning Performance***

Raw scores of students enrolled in both groups were compared in order to determine whether both groups have comparable mental capability. Table 7 presents the result and shows that there is no significant difference in the raw scores of both groups. This implies that students enrolled in the two classes were of the same learning capability.

Table 7: Raw Scores comparison between the control and experimental group

Groups	N	Mean	t-value	p-value	Decision
Traditional	31	31.0645	-1.082	.283	No significant difference
Blended	38	32.5789			

After the intervention treatment, scores of students in various assessments were compared. Table 8 below illustrates the difference between the learning performance of students in the traditional classroom and blended learning environment. It can be gleaned from the table that there is a significant difference in the learning performance of students which is in favor of the blended learning environment. This suggests that online learning strategy which addressed the learning styles of students to supplement the face-to-face instruction created positive effect in the learning performance of students.

**Table 8:** Difference between the learning outcomes of control and experimental group

Variable	Group	N	Mean	t-test for independent sample	p-value	Decision
Learning Performance	Control	31	77.0323	-3.077	.003	Significant
	Experimental	38	84.0263			

### Issues and Challenges

Issues and challenges encountered in the implementation of the blended learning environment as reported in this study reflect the author's experience in delivering the online instruction. These concerns were discussed in order to provide discourse of its implication to actual practice. The author categorizes these issues as facets related to technical, student and teacher dimensions.

**Technical Dimension.** Issues related to connectivity/access; inadequate infrastructure; and inadequate technical support were noted during the implementation. One of the key features of the LMS is its ability to provide interaction with the teacher and other students. This entails, as much as possible, 24/7 availability of the online learning platform and availability of the instructor. However, the LMS server is sometimes down which caused the unavailability of the online resources. Moreover, students and the instructor have limited internet connection, hence, getting online is a challenge to them. As experienced, many students send queries through online messages to the instructor, however, these were not addressed immediately because the messages were not read promptly.

Lack of technical support was also seen as a complicating factor because the instructor has limited training and experience on the use of LMS. The unavailability of technical support to assist during setup problems on some features of the LMS was a concern.

**Teacher Dimension.** Time and effort in designing the online learning strategies and providing the online instructional resources was a great challenge to the instructor. Creating the online learning environment required more time for both online contacts and preparation of materials/activities. Hence, lack of an adequate time-frame to implement online courses will be a great issue in a blended learning

environment. As experienced during the implementation, availability for interaction with students was also needed.

Another important issue is attributed to the limited knowledge of the instructor on design techniques and content features of the online learning platform which were a restricting factor in maximizing the use of the online learning environment.

**Student Dimension.** Student's readiness, financial capability and time were issues observed from the students. The students do not have prior exposure to online learning environments; therefore, their readiness, maturity and comfort on the use of this technology were a concern.

Some students cannot afford to have internet connection too; hence, this was also an issue. Students complied in order to succeed in the course but they complained because it was an additional cost for them. Some students also expressed their feelings towards additional time required for them to do the online activities.

While there were many issues and concerns observed during the implementation of the online learning environment, there were also notable positive outcomes which are enumerated below:

1. *Assessments given online provided better access to student learning performances.* Students' performance on quizzes is automatically graded and students' scores are stored in the server which can be accessed anytime and anywhere.
2. *Use of the discussion forum and threaded discussions maximized students' participation.* Unlike in the online learning environment, students' recitation in the traditional classroom is limited. This due to lack of time to call all students to recite and because students were observed to be shy during classroom recitations. The use of threaded discussions enabled all students to share their views and opinions on a given topic. Moreover, they were able to argue and interact with their classmates during the discussion.
3. *The online learning strategy afforded more participation of students in the different assessment activities.* As noted in the class records of both groups, there were more students (n=5; f=7) in the traditional classroom who were not able to get scores in their assessment activities due to absences and/or non-submission of assignments. However, in the blended learning group where assessments were given online, there were only very few students who were not able to participate in some assessments (n=2; f=2).
4. *The Moodle online learning platform can provide varied strategies in order to accommodate diverse learning styles.* Features of the online learning

platform can be designed such that varied strategies can be employed in delivering a particular topic which can satisfy wide-ranging learning styles.

5. *The blended learning strategy provided more opportunities to complete course content.* More topics were covered and completed with the blended learning group because additional time and opportunities were given to students to learn and practice skills required in the course. Most often times, there are academic/non-academic activities or teachers are getting absent in their classes (i.e. on personal leave or official business) that disrupt classes which lessened contact hours in the traditional classroom. In those scenarios, the use of the online learning as a supplement is useful.

## DISCUSSION

According to **Diaz & Cartnal (1999)**, an inventory that should be considered in an online learning environment setting must address the impact of different social dynamics on the learning preferences of students. One of the learning style inventories investigated from previous studies that address this concern is the Canfield Learning Style Inventory (CLSI). This study extended support claimed by previous authors (**Gee, 1990; Lane, 2005**) that the CLSI demonstrated merit in online learning environment because it can measure students' preferences in environmental conditions, such as the need for affiliation with other students and instructor, and for independence or structure.

As the findings in this study indicate, traditional classroom and blended learning environment displayed similar characteristics in their preferred learning styles. This can be attributed to the fact that students were already in their third year level; hence, they were able to adapt to the learning styles of their peers. Similar results were found in the study of **Szabo & Schwartz (2011)** where there were no statistically significant differences in the learning styles and instructional preferences between senior undergraduate students in all study groups as measured by Canfield's Learning Style Inventory.

This study complemented previous research that has put emphasis on learner characteristics as an important consideration in designing the online instruction. However, the results of this study do not construe that the specific online strategies employed were effective in addressing particular learning styles of students. The findings of the study is limited to the overall impact of the instructional design of the online learning environment taking into account the different learning styles of students. As revealed in the study, this online learning strategy has significant effect in the attitude of students towards the course and in their learning



performance compared to the traditional classroom. This is supported by Rakap (2010) & Cicco (2008) where they reported the necessity of identifying individual differences of online course participants in order to optimize instructional design and strategies, maximize learning opportunities for students and address diverse needs for learning. Some authors also supported that learning styles are significant predictor of success in an online learning environment (Terrel, 2005; Muir, 2001; Lane, 2005; Cooze and Barbour, 2007; Garland and Martin, 2005; Rakap, 2010).

As revealed in the study, the prevalent learning styles of the students that were considered in the online instructional design are learning conditions that are interactive and engaging (peer); interested more on working with things (inanimate) and have clear preference on interpreting icons or symbols like diagrams, pictures or graphs (iconic). From these learners' characteristics, design strategies emphasized in this study were interactive activities, availability of instructional resources that afforded more learning time and use of varied learning resources that were not limited only to textual presentations (e.g. use of movie clips, pictures and interactive presentations). This is supported by Lane (2005) in his remark that learners need styles with relevant interpersonal interaction, significant hands-on opportunities, well-executed visual-spatial content and more self-direction of the pace and path of learning. This is consistent in the result of the meta-analysis studies of Means, Toyama, Murpy & Baki (2013) where they found out that studies using blended learning also tended to involve additional learning time, instructional resources and course elements that encourage interactions among learners.

The study of Liu (2007) showed that online students had a higher preference for peer interaction, competition, interaction with the instructor, details of the course materials, independence, authority, reading, direct experiences, and clear goal setting than their counterparts in the FtF section. Similarly, the study of Mupinga, Nora & Yaw (2006) presented the top three expectations of students in the online strategy were: communication with the professor, instructor feedback and challenging online courses. The most significant benefit cited is the interaction with the instructors. This was similarly observed in this study as seen in the messages sent by students to the instructor. However, this is also one of the weaknesses of the implementation because the instructor was not able to respond promptly to student inquiries due to some constraints.

As cited by Shih & Gamon (2002), understanding student's learning styles has been identified as an important element for online learning development, delivery and instruction, which can lead to student performance. Melis (2004) and

Stellwagen (2004) argued however, that it is possible that the learning styles may not be the most influential in learning effectiveness because there are too many other variables affecting learning effectiveness. This is supported by Galvis, McIntyre & Hsi (2006) who claimed that differences in the results can be attributed to course features and implementation practices.

Kali, Goodyear & Maskurkaite (2011) stated that there is an increasing body of research that argues that Learning Design initiatives must also take account of teachers' institutional context as pedagogical beliefs will differ in different settings. This is considered in this study as it reported issues and challenges encountered during the implementation of the online instructional design. Factors related to technology/infrastructure, teacher and students were outlined. Muir (2001) discussed the same issues as elements of online learning; however, in addition, is the curriculum or content element.

Findings on technical issues as discussed in this study were similarly reported by Murphy et al (2014) where unreliable internet connectivity, inadequate bandwidth and problems with software programs hindered many schools' ability to implement their models. On teacher dimension, Hakkinen (2002) supported the need for faculty training to successfully implement online learning strategies. He noted that existing literature suggests that there is also a need of some form of training program that covers communication and discussion with fellow instructors; provide access to examples, and facilitate good practices around the application of learning technologies. This issue was also consistent in this study as the author noted that the limited knowledge on LMS features and instructional design strategies influence successful online learning implementation.

Time and effort required to teach and develop online courses were also an important concern. Piccono et al (2010) discussed that this can pose implication in disciplines and academic departments that put a priority on research and craftsmanship. He argued that, faculty will be hesitant about spending additional time on teaching that could better be spent on scholarly activities. This is due to the fact that more time and effort are required in developing instructional resources that will be provided online and in designing the online learning environment. Additional time is also demanded for faculty members to be available for interaction in order to respond quickly to student inquiries. This was also confirmed in the findings of the study of Gormley (2014) where timely feedback was realized as an important component of the learning process. In a nutshell, as cited by Lane (2005), success in an online classroom should not only consider how students learn but also how a teacher teaches should be equally considered.

Finally, issues related to student factors cannot be ignored. Students' readiness, financial constraints and time were students' difficulties to successful online learning experience. This supports the claim of Murphy et al (2014) where teachers expressed that students' readiness for self-directed learning varies depending on their academic preparation. Factors were also reported in the study of Piccoli, Ahmad & Ives (2001) that are related to student aspects- maturity, technology comfort, technology attitudes, previous experience, computer anxiety and epistemic beliefs.

This paper also remarked observable positive outcomes in the implementation of the online strategy in the blended learning environment. Favorable outcomes noted were: assessments given online provided better access to student learning performances; use of the discussion forum and threaded discussions maximized students' participation; the blended learning strategy provided more opportunities to complete course content; and the online learning strategy afforded more participation of students in the different assessment activities.

From a practical standpoint, the use of the online instruction supplements core instruction that can provide students additional opportunities to practice their skills they had just learned for remediation and enrichment.

## **CONCLUSION**

Consideration of students' learning styles in the online learning environment where adequate support strategies are provided to accommodate these styles can be helpful in improving students' experience in the blended learning environment. While some previous studies oppose that learning styles may not be the most influential in learning because there are other variables that impact learning effectiveness, the findings in this study can be usable evidence that extends support to existing literature which promoted the application of learning styles in the online instructional design.

The positive findings with respect to the impact of the blended learning strategy provide justification of the favorable strategies employed in the online instructional design. Strategies that were highlighted in this study are the use of interactive activities like threaded discussions, feedback and interaction as seen in the maximum participation of students in the online environment. Moreover, the blended learning approach provided more additional learning opportunities for students which can be the significant reason why students performed better than

from the students in the traditional classroom. This model is also seen as an effective mechanism for remediation and enrichment when time is constrained. In order to maximize the effectiveness of the online learning strategy, other important issues related to technology/infrastructure, students' readiness and teacher factors should be equally addressed.

As there are many perceived benefits of the use of instructional design in blended learning environments, this study supports the use of pedagogical approaches that promote different learning experiences that can vary the source of the learning content and the nature of learners' activity.

### **Implications for Practice and Further Investigation**

Institutions wanting to implement blended learning should consider the following:

1. Comprehensive training program for instructors to effectively implement the blended learning environment.
2. Online instructional design should consider varied strategies that address diverse learning styles.
3. Time and effort required to teach and develop online courses was also an important issue. Academic preparations of instructors should be considered in order to give more time for faculty to provide online learning resources and design their online courses.

Future research work should consider the following:

1. Investigation of effective strategies that can address specific learning styles is needed.
2. More rigorous research is also needed to understand the utility of blended learning to support teaching and learning.
3. Further studies to address issues surrounding design implementation, in particular, the elements of online learning discussed in this study is warranted.
4. Other pedagogical approaches that can be adapted in online learning also need attention for further investigation.

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