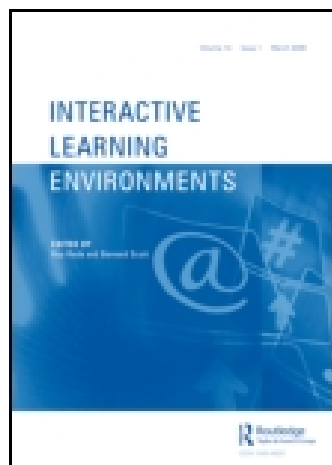


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### Learning style, sense of community and learning effectiveness in hybrid learning environment

Bryan H. Chen<sup>a</sup> & Hua-Huei Chiou<sup>ab</sup>

<sup>a</sup> Department of Business Education, National Changhua University of Education, Bao-Shan Campus, 2, Shi-Da Road, Changhua 500, Taiwan

<sup>b</sup> Department of Child Care and Education, Hung Kuang University, 34 Chung-Chi Rd. Sha-lu, Taichung City, 433, Taiwan

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## Learning style, sense of community and learning effectiveness in hybrid learning environment

Bryan H. Chen<sup>a</sup> and Hua-Huei Chiou<sup>a,b\*</sup>

<sup>a</sup>*Department of Business Education, National Changhua University of Education, Bao-Shan Campus, 2, Shi-Da Road, Changhua 500, Taiwan;* <sup>b</sup>*Department of Child Care and Education, Hung Kuang University, 34 Chung-Chi Rd. Sha-lu, Taichung City, 433, Taiwan*

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The purpose of this study is to investigate how hybrid learning instruction affects undergraduate students' learning outcome, satisfaction and sense of community. The other aim of the present study is to examine the relationship between students' learning style and learning conditions in mixed online and face-to-face courses. A quasi-experimental design was used and 140 sophomores were recruited in this study. Students' learning outcomes, satisfaction, sense of community and learning styles were measured. Results showed that students in a hybrid course had significantly higher learning scores and satisfaction than did students of the face-to-face courses. The result also indicated that students of hybrid learning classrooms felt a stronger sense of community than did students in a traditional classroom setting. Analysis of learning style indicated that learning style had significant effect on learning outcome in the study group. Accommodator learners had higher e-learning effectiveness than other style learners. Possible reasons of results were discussed.

**Keywords:** e-learning; learning style; hybrid learning environment; sense of community

### Introduction

Online learning is widely used in both higher education and industry educational training (Zhu, Valcke, Schellens, & Li, 2009). Recent National Center for Education (NCES) reports in the US demonstrate that online settings, education availability, course offerings, and enrollments have been increasing rapidly among institutions from K-12 to four-year universities since the 1990s (National Center for Education Statistics, 2003). Continued growth of e-learning in the future is expected in both the academic and industrial fields. Online learning has the potential to offer a variety-filled, rich learning environment. Online courses adjusted to the various educational and situational needs of learners are addressed through this medium. A special value of online learning for adult learners is a result of its convenience and flexibility (Billings, Connors, & Skiba, 2001).

Although some studies have compared the effectiveness of online instruction to traditional face-to-face instruction, results from these studies have been inconsistent.

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\*Corresponding author. Email: [hhchiou@sunrise.hk.edu.tw](mailto:hhchiou@sunrise.hk.edu.tw)

A majority of the published studies showed no difference in student performance and student satisfaction regardless of whether a course was taken traditionally or online. However, other research has shown advantages for online instruction or for traditional instruction. For example, McFarland and Hamilton (2006) found that there was no difference in student performance and satisfaction between students in an online or in a traditional setting. Judgments regarding online learning differ according to different findings. Zhang's (2005) study showed that the online learning students achieved better performance and higher levels of satisfaction than did those in a traditional classroom. However, some other researchers presented negative effects of online education, including the findings that students in an online learning setting were less satisfied (Rivera & McAlister, 2001). Opinions are divided among scholars regarding online learning, with reports of both positive and negative learning outcomes. Thus, more research is needed with different angles related to this topic.

When we study the effectiveness of student learning, individual characteristics and group climate are two critically influential factors. Research has long supported the notion that individual differences play an important role in learning and instruction (Moallem, 2008). One concept in particular which has provided some valuable insights in student differences is learning style. Many individuals prefer to perceive and process information in a particular way. Even if these teaching methods and materials are not completely compatible with a student's learning style or personal preference, those with motivation will continue to learn. However, if teaching materials are customized to best fit a student's learning style, the student will learn faster and easier. People need the feeling of connectedness to others and the sensation of belonging to a community. Students involved in classroom learning activities frequently feel that they are part of a group.

Many colleges offer hybrid courses, which combine traditional face-to-face with online instruction. The research showed that this combination has the potential of promoting learner-centered and active learning (Dori & Belcher, 2005). There is little research that explores the experiences with hybrid learning of preschool teachers-to-be. The purpose of this research is to investigate how hybrid learning instruction affects students' learning outcomes, satisfaction and their sense of community. The other aim of the present study is to examine the relationships among students' learning style, learning achievement, satisfaction and sense of classroom community in both hybrid and face-to-face courses.

## **Literature review**

### ***Learning style***

Learning style has been studied in different areas and there exist a variety of definitions. Campbell and his colleague define it as "a certain specified pattern of behavior according to which the individual approaches learning experience" (Campbell, Campbell, & Dickinson, 1996). Felder and Spurlin (2005) defines learning styles as the different ways students take in and process information, and Dunn DeBello, Brennan, Krinsky, and Murrain (1981) describe learning style as a way in which the individual takes in new information and develops new skills. From Information Processing perspective, Kolb (1985) defines learning style as "the process by which the individual retains new information or new skill".

Kolb's learning style model has been cited frequently by other studies or served as a starting point for experientially based learning styles, including models by

Allinson and Hayes (1996) and Honey and Mumford (2000). Kolb's learning style tool was used in 1004 studies in varying fields, including: education, management, computer studies, psychology, and medicine (Coffield, Moseley, Hall, & Ecclestone, 2004). An important belief in Kolb's theory is that learning styles are not fixed personality traits but rather one's adaptive orientation to learning. In Kolb's words (2000), a learning style is "a differential preference for learning, which changes slightly from situation to situation" (Kolb, 2000, p. 8). This opinion of the flexible nature of learning is attractive for researchers because it represents the possible influences of self adjustment and instructional design.

Kolb divided the learning process cycle into four learning modes in terms of information processing by learners: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Test participants will have a preset score of learning style inventory (LSI) in each of the four learning modes. Through a graphic profile plotted on the model, learners may be identified according to one of the following four styles: diverger, assimilator, converger, and accommodator (see Figure 1). The divergers combine the preference of CE and RO. This strength in independence and creativity in thought or action has been identified as a useful skill in generating new ideas such as in brainstorming sessions. The assimilators prefer a combination of RO and AC. They prefer to understand a situation from a theoretical or conceptual standpoint without consideration of specific examples related to it. Individuals favoring this style have been named "planners" due to their strength in creating theoretical models. The convergers are combinations of AC and AE. They prefer to understand a situation from the theoretical or conceptual perspectives without considering related examples. They tend to use hypothetical-deductive strategies to solve problems and prefer to deal with things rather than people. Accommodators prefer a combination of CE and AE. They prefer to understand a situation from concrete senses. This style of learner likes to rely on information provided by others rather than those from their own analysis.

Different students use different ways to deal with information they receive. Individuals with diverging learning style are good for their strength in imaginative

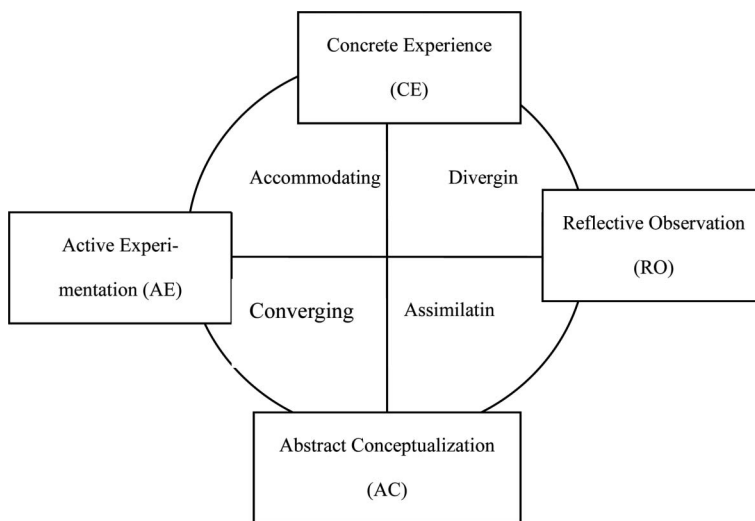


Figure 1. Kolb learning style model (Kolb & Kolb, 2005).

abilities. Diverging style learners are interested in people and cultures. Individuals with assimilating learning style prefer to understand situations from a theoretical or conceptual standpoint. They like to be observers than be actors. Assimilating style learners have strength in applying ideas in a practical way. They tended to specialize in technical and applied sciences. Learners with accommodating learning style, action is preferred over observation in the process of transforming experience into knowledge. Their natural orientation towards involve in experiences (Kolb, 2000). These individuals much more disposed to taking risks than any of the other three styles. Some students learn best by watching and listening, some learn better by reading and others by doing (i.e. in a hands-on environment). Thus, it is important to consider students' learning styles while arranging a course, whether in traditional or online settings. Students filter learning material through a set of individual lenses. Students' academic achievements were affected by their styles of learning and thinking. Previous research suggests that learners tend to retain information longer when their learning styles match with instructional style (Zhang, 2002).

Past research reports show inconsistent results regarding which learning style learner performs better with e-learning. Chou and Wang (2000) studied senior high school student e-learning effects and discovered that accommodators and convergers (AE learning style) have higher e-learning effectiveness, and that their e-learning methods and learning styles have a significant interaction. The study of Gunawardena and Boverie (1993) shows that learning style does not influence how students interact with media and methods of instruction; however, accommodators were the most satisfied and diverger subjects were the least satisfied with class activities. The relationship between the four kinds of learners and their learning effectiveness still needs further investigative research.

### *Sense of classroom community*

Education is based on communication between instructors and students as well as on peer group interaction. These interactions built the spirit and atmosphere in the course. While researchers consider the different characteristics of learning, the feeling of classroom community is another critical issue. "Sense of classroom community refers to the feeling of belonging, trust and commitment in the interaction between and among students" (Ni & Aust, 2008, p. 481). Rovai and Lucking (2000) defined the sense of classroom community as a feeling members have of belonging, a feeling that members matter to one another and to the group, that they have duties and obligations to each other and to the school, and that they possess shared expectations that members' educational needs will be met through their commitment to shared goals. Studies demonstrate that students' sense of classroom community influences their perceived cognitive learning (Rovai, 2002) and assisted learning if they believe that they belong to the community or group (Wighting, 2006).

Rovai (2002) reviewed related research and defines classroom community as consisting of two components: feelings of connectedness among community members and commonality of learning expectations and goals. Connectedness is the feeling that one person is connected with other group members. It is related to the quality of interpersonal relationships and was labeled as caring (Grant, 1988). Once learners see themselves as a part of group, they feel trust and comfort in the community. Students with feelings of connectedness are willing to involve themselves in group activities such as learning activities. The second component of classroom

community is learning. It means that knowledge is constructed, or understanding enhanced, within the community. In order for a classroom community to flourish, students have to accept and participate in the learning process; consequently, learning is the goal for classroom community.

Most of the online courses use text-based asynchronous communication methods; Holmberg's "Guided Didactic Conversation theory" explains that there are two types of conversations in the online course: the real conversation and the simulated conversation (Holmberg, 1995). Real conversation involves communication by telephone, personal contact, etc. Simulated conversation is achieved by internalized conversation in a text and the conversational style of course authors. Holmberg believes that learning occurs if dialogue is engaged in by students even in the online course. Holmberg also indicates that atmosphere, language, and friendly conversation favor feelings of a personal relationship that are important for students' learning motivation. In summary, a participant's feeling of belonging is likely to have a major impact on learning outcome and satisfaction, whether in traditional or online courses.

Samples in the present study were preschool teachers-to-be in the online and face-to-face courses. Researchers were trying to explore how different instructions affect students' sense of community and learning effectiveness, including final examination score and learning satisfaction. The other purpose of this study is to examine the relationship among students' learning style, achievement, satisfaction and sense of classroom community in the two instructional settings. Accordingly, the following research hypotheses are investigated:

Hypothesis 1: There is no difference in students' learning outcomes between the two programs

Hypothesis 2: There is no difference in students' learning satisfaction between the two programs

Hypothesis 3: There is no difference in students' sense of community between the two programs

Hypothesis 4: Students' learning styles have no effect on learning outcomes

Hypothesis 5: Students' learning styles have no effect on learning satisfaction

Hypothesis 6: Students' learning styles have no effect on sense of community

Hypothesis 7: Students' demographic variables have no effect on learning satisfaction or sense of community

## Research method

### *Participants*

A quasi-experimental design was used in this study. The sample for the study was taken from four sophomore classes that were enrolled in the course: Evaluation of Child Development, in the fall semester 2009. All students were enrolled in the Department of Child Care and Education of University in central Taiwan. Students have to pass a Child Development course in the first grade before they take the Evaluation of Child Development course.

Teachers used hybrid curriculum design in the study group and the control group was a traditional face to face design. Two classes were randomly chosen as the study group ( $n = 82$ ) and another two classes were chosen as the control group ( $n = 64$ ) at the beginning of semester.



To assess competence in regard to the curriculum, students completed a test on child development, designed by a child development teacher prior to the semester's instruction. The results of this pretest indicated that the different ability levels were not statistically significant ( $t = 0.194$ ,  $p = 0.846$ ).

Since five students dropped out during the semester, 81 students in the study group and 59 students in the control group participated in this study. The students had a mean age of 20.24 years and  $SD = 1.58$  years, with a range from 19 to 31 years. All of the students in this course were females.

### **Measurements**

- (1) Learning style inventory (LSI): learning style was assessed using the Kolb (1985, 2007) LSI, which is a 12-item self-report questionnaire. Respondents were required to rank four sentence endings corresponding to each of the four learning styles for each of the items.

Learning style inventory (LSI) represents a four-point Likert type scale and is a valid tool for construct validation widely used by many studies. In addition, Smith and Kolb (1986) reported that the reliability for LSI version 2 ( $N = 268$ ) was  $AC = 0.83$ ,  $CE = 0.82$ ,  $AE = 0.78$ , and  $RO = 0.73$ , respectively. To measure learner learning styles, this research used a Chinese version of LSI, which was translated from LSI.

When students were tested with the LSI, they received a score in each of the four learning modes: CE, RO, AC, and AE. Through a graphic profile plotted on the learning-style type grid, learners may be identified as one of the following four styles: diverger, assimilator, converger, and accommodator.

- (2) Learning outcome: the final examination score was counted as the learning outcome.
- (3) Learning satisfaction questionnaire: learning satisfaction was assessed using a questionnaire which was a modified form of Tang's (2006) research of students' rating of instruction. The modified questionnaire was a 20-item scale employing a five-point Likert type scale from 1 (strongly disagree) to 5 (strongly agree). Validity of scale was calculated using principal component analysis and four factors were extracted. The researcher defined factors such as teaching skill, instruction material, instruction evaluation and teaching attitude. Four factors accounted for 16.98, 16.63, 15.09, and 14.51% of the item variance, and representing a total of 63.21% of the data. Reliability was calculated by internal consistency estimates which were calculated for four subscales. Cronbach's coefficient  $\alpha$  was 0.86 for the teaching skill subscale, 0.82 for instruction subscale, 0.84 for instruction evaluation subscale and 0.73 for teaching attitude subscale.
- (4) Sense of classroom community scale: sense of classroom community was measured using Rovai's classroom community scale (CCS) (Rovai, 2002). This 20-item scale employed a five-point Likert type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Ten items of the 20 questions were reverse-coded in data analysis.

Scale validity was analyzed using factor analysis method. Two factors were extracted and the result was similar to that of Rovai's study (2002). Rovai's two defined factors were connectedness item and learning item. The result showed that the



connectedness factor accounted for 42.81% of the item variance and the learning factor accounted for 11.24% of the item variance. Reliability was calculated by internal consistency; estimates were calculated for each of the two subscales. Cronbach's coefficient  $\alpha$  for the connectedness subscale was 0.92 and was 0.87 for the learning subscale. Overall, Cronbach's coefficient  $\alpha$  was 0.93 for the entire CCS.

### ***Procedure***

Students in both conditions received identical instruction topics during the regularly scheduled instructional period for 100 min, once a week, through a whole semester of classes. Lessons in both conditions were taught by the same teacher.

None of the participants in the study group had previous online learning experience. Thus, system training was given at the beginning of the semester. The researcher gave a brief live demonstration to the students on the use of the e-learning system. Students were also given an opportunity to familiarize themselves with the system. No participant reported any difficulty with the system.

The e-learning system provides services such as: material posting, the ability to hand in assignments, fill out questionnaires and participate in online discussions. Teacher-student or peer group interactions are allowed to be processed in the e-learning platform.

In the first of eight weeks of instruction, teachers gave lectures to students of two groups in face-to-face classes. From the 10th week, students began to work for final assignment. All groups were asked to hand in weekly progress reports. In the study group, all discussions were held in the e-learning platform. Students used e-learning platform to share information resources and discuss ideas. Discussion process was recorded automatically by system. Students could also reflect on what each member had already completed and plan for the next week. Their progress reports were posted on the bulletin in e-learning system. In the control group, students had face-to-face meeting for their final assignment. They had to record ideas and discussion conclusion by writing and weekly progress reports were hand in by hard copy. Occasionally, the teacher visited each group to check what was going on and gave encouragement. Students had a final assignment presentation at the end of the semester.

All curriculum materials of teaching in the first eight weeks were uploaded in the e-learning system for the study group students. The e-learning system was open all day. On the other hand, all of the curriculum materials such as teaching live recording of course and teacher's powerpoints were made into CD-ROM format and were prepared for students in the control group. Students were able to borrow the CD-ROMs if they needed.

All students took the prior knowledge test in the second week and filled out a LSI in the third week. Learning satisfaction questionnaires and CCSs were filled out one week before the end of semester. All students had to attend the final examination during the last course.

### **Results**

Hypothesis 1: There is no difference in students' learning outcomes between the two programs

The first hypothesis was rejected in this study. The researcher used the *t*-test for data analysis and found that there was a significant difference of students' learning

outcomes between the study group and control group ( $t = 8.59, p = 0.000$ ). The mean of final examination score in the study group ( $M = 81.37$ ) was higher than the control group ( $M = 68.90$ ). Table 1 presents the results of the difference analysis.

Hypothesis 2: There is no difference in students' learning satisfaction between the two programs

The second hypothesis was rejected in this study. A  $t$ -test was conducted to explore the relationships between the students' learning satisfaction between the study group, and the control group. The results showed that significant differences existed between the two classroom environments ( $t = 2.49, p = 0.014$ ). Students in the hybrid learning setting ( $M = 85.13$ ) had higher levels of satisfaction than those in the traditional classroom ( $M = 81.62$ ). Table 2 summarizes the results of this analysis.

Hypothesis 3: There is no difference in students' sense of community between the two programs

The third hypothesis was rejected by the findings of the present study. Another  $t$ -test was conducted to explore the relationships between students' sense of community between the study group and the control group. Table 3 shows the summary of the analysis. The result indicates that students from the hybrid learning classroom felt a stronger sense of community ( $M = 75.26$ ) than the students of the traditional classroom ( $M = 71.17$ ). The difference between two groups was significant ( $t = 2.23, p = 0.027$ ).

Hypothesis 4: Students' learning styles have no effect on learning score

The fourth hypothesis was partially supported by the findings of the present study. The mean of the learning progress was calculated by the difference between final

Table 1.  $t$ -test for learning outcomes between two groups.

	<i>N</i>	Mean	SD	<i>t</i>	<i>p</i>
Study group	81	81.37	9.88	8.59	0.000
Control group	59	68.90	8.32		

Table 2.  $t$ -test for learning satisfaction between two groups.

	<i>N</i>	Mean	SD	<i>t</i>	<i>p</i>
Study group	81	85.13	7.94	2.49	0.014
Control group	59	81.62	9.32		

Table 3.  $t$ -test for learning satisfaction between two groups.

	<i>N</i>	Mean	SD	<i>t</i>	<i>p</i>
Study group	81	75.26	8.01	2.23	0.027
Control group	59	71.17	9.08		

exam scores and pretest scores. A one-way analysis of variance (ANOVA) was conducted to evaluate the effects of students' learning style on the degree of progress in the two classroom settings. Analysis results indicated that learning style had significant effect on learning outcome in the study group ( $F=14.98$ ,  $p=0.000$ ) but no significance was found in the control group ( $F=0.939$ ,  $p=0.428$ ) (see Table 4).

Hypothesis 5: Students' learning styles have no effect on learning satisfaction

The fifth hypothesis was supported by the finding of this study. The result showed that learning styles have no influence on the study group ( $F=0.159$ ,  $p=0.924$ ) or control group ( $F=0.604$ ,  $p=0.615$ ).

Hypothesis 6: Students' learning styles have no effect on sense of community

The sixth hypothesis was supported by the finding of this study. The result showed that learning styles have no influence on the study group ( $F=0.541$ ,  $p=0.656$ ) or control group ( $F=0.731$ ,  $p=0.538$ ).

Hypothesis 7: Students' demographic variables have no effect on learning satisfaction and sense of community

The seventh hypothesis was supported by the findings of the present study. Two regression analyses were conducted to explore the relationships of students' age, work experience, learning satisfaction and sense of community. The result of one regression model showed that neither age nor working experience were significant predictors for learning satisfaction in the study group ( $F=0.301$ ,  $p=0.741$ ) and the control group ( $F=2.548$ ,  $p=0.087$ ). Another analysis found that age and working experience were not significant predictors for sense of community in the study group ( $F=0.059$ ,  $p=0.943$ ) and control group ( $F=1.723$ ,  $p=0.188$ ).

## Discussion

This research compared students' learning effectiveness, including learning achievement, satisfaction and sense of community, in two kinds of instructional settings. In addition, this paper also presented the relationship between students' learning styles and learning effectiveness. Results found that students in hybrid course had significantly higher learning scores and satisfaction than did students of the face-to-face courses. Possible reasons for these results were that online learning provided a convenience use and enhanced students' learning motivation. Learning theory

Table 4. ANOVA analysis for predicting mean of learning progress score from learning style.

Learning style	Study group				Control group			
	<i>N</i>	Mean	<i>F</i>	<i>P</i>	<i>N</i>	Mean	<i>F</i>	<i>P</i>
Accommodator	32	9.22	14.98	0.000	19	3.68	0.939	0.428
Converger	11	7.73			9	5.00		
Assimilator	9	5.00			10	3.50		
Diverger	29	4.17			21	2.86		

suggests that learning is promoted when students are actively involved in the learning or when reflective thinking is promoted through applied and activities (Driscoll & Carliner, 2002). In the study group, students can review course material any time and any where if they wanted. According to e-learning system record, cumulative numbers of log in for curriculum review are almost 10 times for CD borrowing. Suggesting the use of technology has made learning more convenient and affordable.

The result of the present study indicated that students of hybrid learning classrooms felt a stronger sense of community than did students in a traditional classroom setting. A classroom community can be viewed as a social community of learners who share knowledge, values, and goals. Members' communities are weak if they have little interaction, mistrust or competition relations (Rovai, 2002). Students reported that they often spend more time in online discussion than teacher requested. Through voice communication, students could express their own ideas and involve weekly progress writing. Furthermore, they could connect with each other under these alternative of communication based on equal opportunities.

Two ways of writing progress reports were found in the control group. One was that group members write their own progress reports individually. Students showed what they individually did in the last week and each of them was going to do in the next week. More than half groups wrote progress reports in this way. The other way was that group members wrote reports as a group. Compared to the second method, the first method spends less time, obviously. However, lower degree of integration may affect sense of group community.

Analysis of learning style indicated that learning style had significant effect on learning outcome in the study group. Accommodators performed best in the hybrid learning instruction. This result was consistent with Ford and Chen's (2000) research. The result also found that accommodator learners had higher e-learning effectiveness. Such learners preferred to rely heavily on information provided by others and deal with things by themselves. Lots of material on e-learning platforms probably fit their learning preference. In sum, learning styles could be considered a valid predictor of success in a Web-based learning environment. However, e-learning design seemed not to be a benefit for some students if they were divergers or assimilators. Teachers might offer more examples with better illustration and detailed explanation to these two kinds of students (Kinshuk, Liu, & Graf, 2009). It might fit divergers and assimilators' needs and help with their learning. The understanding of the relationship between specific learning styles and learning effectiveness could be used in online adaptive version learning system management or in traditional curriculum design.

Future study can further investigate and consider more detailed variables related to students' behaviors between different instructional settings and different learning style preferences. The work will provide information on instruction arrangement.

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### **Notes on contributors**

Bryan H. Chen is a professor in the Department of Business Education, at the National Changhua University of Education, Taiwan.

Hua-Huei Chiou is an assistant professor in the Department of Child Care and Education at Hung Kuang University, Taiwan. Chiou is also a doctoral student in the Department of Business Education at the National Changhua University of Education.

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