

Medical College Students' Perceptual Learning Style Preferences on an Adaptive Computer-Assisted English Learning Website

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Abstract

An adaptive learning platform not only enables learners to absorb content efficiently and easily, and to determine the optimal approach to personal development but also compensates for deficiencies in language studies, social environment, and other elements identified in language learning theory. The aim of this study was to investigate relationship between an adaptive English-learning website and students' learning styles. The study further examined the effect of this relationship on the students' English scores by administering a questionnaire and conducting Web instruction. A total of 125 freshmen from a medical university participated in the study. The results showed that the most common learning style among the participants was the independent learning style, and that the relationship between the students' performance on an adaptive learning platform and their learning style was significant. The results showed that adaptive online learning can benefit students who prefer the individual major learning style; however, students who exhibited other learning styles did experience significant differences in their learning outcomes. In conclusion, the adaptive English-learning website has facilitated the particular style of individual English learning most effectively.

Keywords: CALL (Computer-Assisted Language Learning), English Learning Outcome, Perceptual Learning Style

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INTRODUCTION

Because of globalization, English has become a common second language worldwide, particularly influencing how people of different native languages communicate with each other. Recently, Taiwanese students were ranked last among Asian countries in terms of English ability, generating concern in Taiwan over the future of English institutions and students' language abilities. Currently in Taiwan, the greatest challenge in English teaching is that most students do not demonstrate enough intrinsic learning motivation. In addition, English is not widely used in other contexts. Students use English only in class, without opportunities after school to explore and immerse themselves in the language. Teachers make more of an effort but with only modest achievements. Language-teaching experts claim that, under such circumstances, online instruction can provide students with unique opportunities that accommodate their learning styles. In the online instruction environment, learners can engage in listening, reading, hands-on activities, and tasks that fit learners' learning styles and preferences (Bonk, Wisner, & Lee, 2003). Moreover, online learning supplies not only unrestricted learning time and space but also a diversified learning environment that is highly praised by education experts.

In general, learning websites offering skills instruction and practice improve progressively because of continual innovation in computer and multimedia technology and the maturing of the Internet. In addition, the ubiquitous quality of the Internet provides a diversified and elastic learning environment, enabling learners to augment their learning through additional materials and contexts online after interacting with teachers through learning activities in a traditional classroom. Hsu (2003) defined online-assisted instruction as teachers using materials on the Internet to offer learners

opportunities for remediation, enhancement, or assistance after class. Advantages of using online instruction include hypermedia functionality, interaction, authenticity, diversification, increased environmental protection, and low cost. Brich and Sankey (2008) stated that online, interactive multimedia tools enable students to learn in an environment that accommodates different learning styles. Combining this environment with teaching and learning applications substantially changes the teacher's role in the traditional classroom, taking the teacher from being the center of classroom instruction to being a teacher and facilitator in the classroom.

An increasing number of studies focus on students who demonstrate a perceptual learning style. When receiving information through the senses, learners use various physiological and psychological functions in specific circumstances (Oxford & Ghrman, 1993; Kroonenberg, 1995). Keefe (1979) defined a learning style as the "composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment." (p. 15). Although most people enjoy online instruction, researchers have not been able to confirm actual teaching efficiency and the effect of applications on learners' learning outcomes. Experts on second language acquisition and English teaching experts also agree that users and teachers must consider the learners' learning style, motivation, and curriculum for website resources to be beneficial; they must clearly understand how English is acquired and how e-learning applications function. However, most teaching and learning websites are developed from the perspective of programmers and website designers rather than from that of foreign language learners. Moreover, extremely few language-learning websites integrate



an online-learning environment with abundant English-teaching content to realize a complete teaching mechanism (i.e., a unified learning application). A satisfactory learning website considers students' language levels and diverse learning styles for maximizing efficiency through its design. Despite research conducted on the effectiveness of adaptive English-learning websites for learners who have a perceptual learning style, few studies have examined the relationship between learners' perceptual learning style and the online English instruction.

The study investigated the effect of English as a foreign language (EFL) learners' perceptual learning style and an adaptive English-learning website on their learning outcomes. Based on a study of students' learning styles, the researcher constructed an adaptive English-learning website that incorporated different learning modalities such as audio, reading text, and hands-on activities to accommodate learners' learning styles and evaluate the website's effect on the students' English-learning outcomes. In light of these concerns, the present study was aimed at answering the following research questions:

1. What are the major perceptual learning styles among freshmen at the medical university?
2. Is there any relationship between students' learning style and their performance on the adaptive English-learning website?
3. How do students' learning styles correlate with their English scores from an online audio presentation on the adaptive English-learning website?

I. LITERATUREREVIEW

Reid(1995) conducted an in-depth study on learning styles and cognitive styles in the mid-1980s and indicated that learning styles are regarded as intrinsic qualities that learners show in

cognizing and learning new information. She designed the PLSPQ, dividing learning styles into eight types: (1) visual major learning style preference, (2) auditory major learning style preference, (3) kinesthetic major learning style preference, (4) tactile major learning style preference, (5) group major learning style preference, (6) individual major learning style preference, (7) minor learning styles, and (8) negligible learning styles. Learners' intrinsic qualities present as different learning styles. The physiological and psychological conditions of independent learners are evident from observing differences in language ability demonstrated in their individual learning histories. Learners demonstrate different performance in learning efficiency. Some learners acquire new language through auditory function, whereas others are more affected by visual materials. In other words, learners learn language more effectively through strict responses instead of active interaction. Regarding receiving information through the senses, Oxford and Ghrman (1993) indicated that learners use particular physiological and psychological functions depending on the specific circumstances. Keefe (1979) defined learning style as the "composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment (p.15)." According to Keefe's definition, learning styles involve in three factors in terms of cognition, affection, and physiology. Therefore, if learners are strongly motivated and willing to learn spontaneously, then they should exhibit superior learning efficiency and performance. Hence, in second language teaching, teachers should offer teaching methods that correspond with learners' perceptual learning style preferences, combining English-learning abilities such as listening, speaking, reading, and writing with adaptive English-learning



system on the elastic and diverse Internet platform. Such methods improve learners' learning motivation, language performance, and learning efficiency substantially (Brown, 1994).

Most scholars stress that learning motivation is vital to successful teaching. In the article of *Training Today's Teachers for Tomorrow's Classrooms*, Warner (1999) conducted an overseas study on e-learning and proposed that the designs of online instruction should be diverse, simple, and consistent. Moreover, teachers must accommodate students' needs, respecting their natural gifts and learning styles. Ross and Schulz (1999) highly commended the effect of online instruction, indicating that hypertext features and content are suitable for sensory learners. In addition, students with visual, auditory, tactile, and kinesthetic orientations are attracted to website media. Regarding socially oriented students, teacher can fulfil these students' needs and enable them to accomplish considerable achievements in learning by using electronic bulletin boards, synchronous discussions, online chatting, and immediate responses. Regarding advanced students, introductory online construction can be simultaneously suitable for students who demonstrate linear and random learning modes. Regarding lower-achieving students, teachers can inspire them through other websites. Frizler (1995) asserted that the Internet contains the following benefits for English instruction: authentic examples of integrated knowledge, abundant resources of authentic languages and cultural materials, opportunities for cooperative tasks, instantaneous and abundant information that encourages learners, content that attracts learners who have visual and tactile learning styles, actual opportunities for writing in English, exercises for building critical thinking, practical training in distinguishing useful from useless information online, and self-publishing opportunities

for learners.

Learning styles have been used in second language instruction overseas for many years, with the application of learning styles, English-learning efficiency, and learning motivation yielding considerable results. In addition, Brown (1997), Lee (1998) and other scholars in the field of English as a second language (ESL) teaching in Asia have noted the deficiencies of larger class sizes in Asia and the phenomenon that Eastern students are shyer than Western ones. Through online instruction features such as instant messaging or e-mail, collaborative learning can improve language learning. Sankaran and Bui (2000) showed that students typically selected courses according to the suitability of teaching approaches with their learning styles. When students cannot integrate their learning styles into their classroom experiences, their learning efficiency and performance diminish considerably; however, learning strategies that fit students' own interests can reinforce learning efficiency. Wong and Nunan (2011) showed the differences between learning styles and between efficient and inefficient language learners. The 110 college students in his study were divided into efficient and inefficient learners according to their results on the Hong Kong Certificate of Education Examination; subsequently, by using an online questionnaire, he collected their learning strategy preferences and their modes of practicing and using language.

In Taiwan, Liang(2003) used e-learning to investigate junior high school students' English-learning efficiency. The results showed that the high-score group used e-learning pictures more effectively to understand essays than did the lower-score group. The high-score group could also use the pictures to increase their accuracy in reading comprehension. Tasi (2004) analyzed the efficiency of using multimedia in English listening and reading



comprehension among junior high school students, and reported that learners who used auditory and visual senses simultaneously and did not notice the subtitles in English and ultimately demonstrated superior English-listening skills. The study also showed that student learning improved when teachers used multimedia to increase students' background knowledge, thereby enhancing the students' language and cultural comprehension. Moreover, Chiu (2007) determined that computer-assisted instruction enhanced students' listening comprehension and induced positive attitudes in them. Using the PLSPQ and Strategy Inventory for Language Learning as instruments, Chen (2009) investigated the correlation between perceptual learning style preferences and language learning strategies in 390 junior high school EFL students of different grades. The results revealed a significant correlation between grade and the kinesthetic major learning style preference ($p = .001$), the tactile major learning style preference ($p = .047$), and the individual major learning style preference ($p = .02$). The results also showed that the perceptual learning styles included memory strategies ($p = .005$), cognitive strategies ($p = .02$), metacognitive strategies ($p = .000$), affective strategies ($p = .000$), and social strategies ($p = .000$). The study's implications suggest that teachers should increase their focus on learning diversity among students and ensure that the information they present in class can attract students of different learning styles.

Other related studies have independently applied cognitive learning style and learning strategies to languages; however, except for Hsu(1997), who adapted Kolb's theory of learning style and applied it to studying environments and course designs in engineering education, few studies have integrated learning styles, online teaching and learning systems, and assisted instruction in English learning. Consequently, this study examined the relationship

between an adaptive English-learning website and students' perceptual learning styles, in addition to investigating how online interaction and authenticity affect constructing an adaptive English-learning system.

1. Research Significance

The research indicated that e-learning can reinforce learner-centered education and facilitate unrestricted resource integration to achieve teaching and learning. Because of the profitability of e-learning, web-assisted instruction has become a key point of material design. By contrast, some scholars contend that e-teaching is a tactic that enterprises are using to invade the education market, thereby commercializing academia. The "spoon feeding" demonstrated by certain online instruction applications achieves learning outcomes as poor as other low-quality teaching methods. Consequently, under the stricture that education resources should not be squandered, before investing in more teaching sources, this study integrated learning styles, English acquisition skills, and the results of studies on online applications and advance assessments. The English-learning ability of students in Taiwan must be increased, and the efficient learning realized through adaptive web-based English-learning systems should be emphasized.

II. METHODOLOGY

This study was designed to implement an adaptive English-learning website for evaluating the English-learning efficiency and achievement of students with different learning styles. The study was completed on the basis of class interaction, students' responses to the questionnaire, and learning outcomes on the adaptive English-learning website.

1. Participants

The participants of this research were 125 college freshmen who were enrolled in required English



courses and were from different departments of a medical university. To ensure the homogeneity of their social backgrounds, all the participants had studied English for at least 6 years and were aged 18–19 years.

2. Instrument Perceptual Learning Style Preference Questionnaire

Learning style preference refers to how learners acquire new information and skills through personal habits and preferences. Under circumstances that do not differentiate between teaching methods and curriculums, learning styles can be divided into three types: cognitive learning styles, sensory/perceptual learning styles, and personality learning style. In this study, the instrument was the PLSPQ designed by Reid (1995), which has been widely used by English experts to distinguish learners’ perceptual learning style preferences (i.e., visual, auditory, kinesthetic, tactile, group, and individual major learning style preference) and determine course designs that support students’ need for diversified learning. The questionnaire exhibited reliability (Cronbach’s alpha = .70, split-half reliability = .71). After designing the questionnaire, the researcher uploaded it to the adaptive English-learning website, enabling the participants to complete it online.

3. Treatment

The adaptive English-learning website was constructed and comprised two sets of direct-listening and reading activities, one each corresponding to audio and visual learning styles. For the listening activity, the students were able to listen to a short business conversation online, which was followed immediately by a listening comprehension test comprising six multiple-choice items. The visual activity comprised a reading passage taken from the reading section of a Test of English for International Communication exam. After reading the passage, the students took a reading comprehension test to

demonstrate the relationship between the score and their perceptual learning style.

III. RESULTS

The results from the questionnaire and online responses of the students were used to answer the research questions regarding the beneficial effects of an adaptive English-learning website on students’ English-learning performance.

Research Question 1: What are the major perceptual learning styles among freshman ta medical university?

The major learning style among the 125 freshmen was the independent learning style, followed by the group, visual, audio, kinesthetic, and tactics learning styles. The descriptive statistics are shown in Table 1.

Table 1. Descriptive Statistics

Styles	No. of students	Percentage
Visual	24	20%
Audio	17	13%
Kinesthetic	13	10%
Tactic	4	3%
Group	32	26%
Independent	35	28%
Total	125	100%

The result of this research for the major learning style (i.e., independent) does not accord with those of previous studies (Chiu, 2007; Shiu, 2003). Most of which report the visual learning style to be the most common learning style preference among EFL students.

Research Question 2: Is there any relationship between students’ learner style and an adaptive English-learning website?



The ANOVA results showed a significant difference ($p=.002 < .05$) in students' learning styles and their English scores on the adaptive English-learning website (Table 2). The results

showed a clear relevance between the scores and learning style preference ($p = .002$), indicating that the students' scores were affected by their learning style preference.

Table 2. Students' scores and learning styles

ANOVA

VAR00002

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	30.291	5	6.058	4.057	.002
Within Groups	173.217	116	1.493		
Total	203.508	121			

The Scheffe's test, typically used with unequal sample sizes, was performed. Table 3 shows details for the various learning styles. The results indicated that both the visual and independent learning styles

($p=.006<.05$) significantly influenced the students' visual presentation scores on the adaptive English-learning website.



Table 3. Students' learning styles and students' scores on visual presentation

Multiple Comparisons

Dependent Variable: VAR00002

Scheffe

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	-.37701	.39461	.969	-1.7130	.9590
	3.00	-.77972	.42748	.650	-2.2270	.6676
	4.00	-1.31818	.66422	.561	-3.5670	.9306
	5.00	-.60850	.34065	.671	-1.7618	.5448
	6.00	-1.37532*	.33247	.006	-2.5010	-.2497
2.00	1.00	.37701	.39461	.969	-.9590	1.7130
	3.00	-.40271	.45023	.977	-1.9270	1.1216
	4.00	-.94118	.67908	.859	-3.2403	1.3579
	5.00	-.23150	.36879	.995	-1.4801	1.0171
	6.00	-.99832	.36125	.187	-2.2214	.2247
3.00	1.00	.77972	.42748	.650	-.6676	2.2270
	2.00	.40271	.45023	.977	-1.1216	1.9270
	4.00	-.53846	.69870	.988	-2.9040	1.8271
	5.00	.17122	.40378	.999	-1.1958	1.5383
	6.00	-.59560	.39690	.812	-1.9394	.7482
4.00	1.00	1.31818	.66422	.561	-.9306	3.5670
	2.00	.94118	.67908	.859	-1.3579	3.2403
	3.00	.53846	.69870	.988	-1.8271	2.9040
	5.00	.70968	.64922	.944	-1.4883	2.9077
	6.00	-.05714	.64496	1.000	-2.2408	2.1265
5.00	1.00	.60850	.34065	.671	-.5448	1.7618
	2.00	.23150	.36879	.995	-1.0171	1.4801
	3.00	-.17122	.40378	.999	-1.5383	1.1958
	4.00	-.70968	.64922	.944	-2.9077	1.4883
	6.00	-.76682	.30139	.271	-1.7872	.2536
6.00	1.00	1.37532*	.33247	.006	.2497	2.5010
	2.00	.99832	.36125	.187	-.2247	2.2214
	3.00	.59560	.39690	.812	-.7482	1.9394
	4.00	.05714	.64496	1.000	-2.1265	2.2408
	5.00	.76682	.30139	.271	-.2536	1.7872

*. The mean difference is significant at the .05 level.

1:Visual2:Audio;3:Kinesthetic;4:Tactic;5:Group; 6:Independent



Research Question 3: How do students’ learning styles correlate with their English scores for an online audio presentation on an adaptive English-learning website?

The ANOVA results showed a significant main effect on the students’ online English scores of online audio presentation (Table 4), with students’ learning styles affecting their online audio English scores.

Table 4. ANOVA -students’ learning style and students’ scores on the online audio

ANOVA

VAR00003

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	23.549	5	4.710	2.995	.014
Within Groups	185.548	118	1.572		
Total	209.097	123			

The Scheffe’s test results showed that the group scores on the adaptive English-learning website and independent learning styles ($p=.023<.05$) (Table 5) significantly affected the students’ audio presentation

Table 5. students’ learning styles and students’ scores on audio presentation

Multiple Comparisons

Dependent Variable: VAR00003
Scheffe

(I) VAR00001	(J) VAR00001	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	-.20716	.40108	.998	-1.5647	1.1503
	3.00	-.45151	.43511	.955	-1.9242	1.0212
	4.00	-.16304	.67932	1.000	-2.4623	2.1362
	5.00	.30571	.34279	.977	-.8545	1.4659
	6.00	-.82733	.33659	.310	-1.9666	.3119
2.00	1.00	.20716	.40108	.998	-1.1503	1.5647
	3.00	-.24434	.46201	.998	-1.8081	1.3194
	4.00	.04412	.69685	1.000	-2.3145	2.4027
	5.00	.51287	.37634	.867	-.7609	1.7867
	6.00	-.62017	.37071	.731	-1.8749	.6345
3.00	1.00	.45151	.43511	.955	-1.0212	1.9242
	2.00	.24434	.46201	.998	-1.3194	1.8081
	4.00	.28846	.71698	.999	-2.1383	2.7152
	5.00	.75721	.41243	.644	-.6387	2.1531
	6.00	-.37582	.40729	.973	-1.7543	1.0027
4.00	1.00	.16304	.67932	1.000	-2.1362	2.4623
	2.00	-.04412	.69685	1.000	-2.4027	2.3145
	3.00	-.28846	.71698	.999	-2.7152	2.1383
	5.00	.46875	.66502	.992	-1.7821	2.7196
	6.00	-.66429	.66184	.961	-2.9044	1.5758
5.00	1.00	-.30571	.34279	.977	-1.4659	.8545
	2.00	-.51287	.37634	.867	-1.7867	.7609
	3.00	-.75721	.41243	.644	-2.1531	.6387
	4.00	-.46875	.66502	.992	-2.7196	1.7821
	6.00	-1.13304*	.30670	.023	-2.1711	-.0950
6.00	1.00	.82733	.33659	.310	-.3119	1.9666
	2.00	.62017	.37071	.731	-.6345	1.8749
	3.00	.37582	.40729	.973	-1.0027	1.7543
	4.00	.66429	.66184	.961	-1.5758	2.9044
	5.00	1.13304*	.30670	.023	.0950	2.1711

*. The mean difference is significant at the .05 level.



IV. CONCLUSION

This study investigated the effect of an adaptive English-learning website on the English performance of students enrolled in an English class at a medical university in Taiwan. The study focused on the correlation of students' preferred learning style and their English performance. The results of a learning style questionnaire showed that the most common learning style among the participants was the independent learning style (28%). Most of the students had graduated from high school and were accustomed to studying for tests; in other words, the students applied their learning-style schema from high school, during which they preferred to study alone. By contrast, the second most common learning style among the students was the group learning style; 26% of the students preferred group learning and engaging in group activities, suggesting that a prevalent method of teacher-centered instruction in high schools is to employ group collaborative learning. In summary, the results show that 28% of the students became accustomed to the independent learning style predominant in high schools, and that 26% of the students learned how to work in teams in high school and university, preferring interaction between students to accomplish a task. The adoption of western individualism by students may also account for the independent learning style being the preferred learning style.

In addition, the study also examined the effect of the visual quality of the adaptive English-learning website on the students' learning styles. The results revealed a significant difference between the students' scores on the visual online presentation and their learning styles. In other words, the various learning styles of the students affected online visual English performance differently. Notably, the visual and independent learning styles manifested the learning style factors (i.e., cognitive, affective, and

physiological factors) that contributed to these students achieving higher visual presentation scores. At this point in the study, the students who exhibited the visual learning style outperformed those who exhibited other learning styles. Furthermore, the students who exhibited the independent learning style yielded superior scores on the online visual presentation. The tendency in learning shifted from teacher-centered to student-centered instruction. These results can shape how English teachers prepare for their classes and determine what methods they adopt in the classroom.

The results of the third analysis showed the effect of the students' learning styles on their online audio performance. The group and independent learning styles significantly affected the students' online audio performance on the adaptive English-learning website.

1. Research Limitations

The independent learning style was the learning style most commonly preferred by the EFL students in this study. Although the adaptive English-learning website was an entertaining tool for facilitating their learning, it had little influence on the various learning modalities. The designs for the different learning styles might not be applicable. However, the adaptive website in this study did not present all the activities of the different learning styles; rather, it emphasized activities that employed audio and visual learning styles. Consequently, evaluating the learning style questionnaires of the learners according to the adaptive English-learning website must be discussed thoroughly in the future. The particular activities on the adaptive English-learning website may yield new insights and further innovation.

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探討適性化電腦輔助英語學習網站與大學生知覺學習型態之關係

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摘要

適應化學習平台不僅使學習者能夠有效和容易地吸收內容，並且決定個人發展的最佳方法，而且還可以補償語言學習、社會環境和語言學習理論中所知的其他要素的缺陷。這項研究的目的是探討一個適性化學習類型網路英語輔助學習系統和學生的學習風格之間的關係。該研究設計以學生學習風格問卷調查和進行網絡教學，並進一步研究了這種關係對學生的英語分數的影響。來自醫學大學的 125 名新生學生參加了研究。結果表明，參與者中最常見的學習風格是獨立學習風格，學生透過適應化網路學習系統的成績表現和學習風格之間的呈現顯著的關係。結果表明，適應化網路學習可以使學生更喜歡個人的主要學習風格；反之，其他學習風格的學生在他們的學習成果方面經歷了顯著的差異。總結，適性化的學習類型環境來輔助語言學習之活動能有效幫助個人英文學習。

關鍵字：電腦輔助英語學習、英文學習成效、知覺學習型態

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