行政院國家科學委員會專題研究計畫 成果報告

線上參與對於學習風格與學習成效間中介效果之探討
研究成果報告(精簡版)

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摘要

學習風格對學習成效的預測能力曾經是心理、教育領域的一個研究焦點，但是很少研究著重於找出二者之間的中介和調節效果。因此本研究延伸過去之文獻，提出並檢驗涵蓋中介和調節效果的模式，用以探討線上學習的議題。研究結果指出，感官型/直覺型面向的學習風格經由線上參與的中介效果，間接地影響線上學習成效。也就是說，學習風格傾向感官型的學生展現出較高層度的線上參與，而學習風格傾向直覺型的學生展現出較低層度的線上參與。但是其他面向的學習風格並不會影響線上參與。此外，先備知識為線上參與與線上學習成效之間的調節變數。這個研究是在軟體使用教學的情境之下執行的，研究結果是根據 219 位大學生線上學習個案的資料分析。

目錄

一、報告內容

1. 前言

隨著網際網路的技術與應用日益普及，校園的線上學習課程已經成為傳統教室教學法之外的補充教學方式(Zhang et al., 2004)，然而，線上學習仍然受到系統的互動性以及激勵因素的限制。隨著網際網路技術的不斷演進，系統互動性已經逐漸受到改善，但是仍舊無法達到傳統教室的互動效果，因此了解網際網路技術對於線上學習成效的影響是相當重要的課題。

混合式的教學環境(mixed mode environment)是指以傳統教室為主，線上學習環境為輔的教學環境，同時整合了傳統教室與線上學習的方式，已經成為改善學習效率的最佳方式。首先，在課程開始之初，教師可以在教室裡協助學生操作線上學習平台，並協同擬訂整學期的學習策略以獲取較高的學習成效，其次，教師可以扮演激勵者的角色，與學生互動並鼓勵學生運用線上學習平台上的工具進行溝通，例如電子郵件、佈告欄和討論區等(Benbunan-Fich, & Hiltz, 2003; Shih, Ingebritsen, & Flickinger, 1998)，這是完全的線上教學(Totally Web-based Environment)環境所無法達到的境界，因為它無法時常提醒學生來使用線上教學平台。最後，Tiene's (2000)認為學生寧可選擇面對面的教學環境更勝於線上討論，因此線上討論可以被視為是傳統教室教學環境的一種輔助，而非替代品(Zhang, Zhao, Zhou, & Nunamaker, 2004)。

基本電腦軟體的操作包括文書處理軟體、試算表、影像處理和網頁設計等應用軟體對於企業在日常作業的運作是相當重要的，這些基礎課程在校園的需求也與日俱增，許多學校紛紛將這些原先在傳統教室課程轉換成線上學習的方式，經濟上的考量當然是主要的因素，因為如此將可大大降低教師反覆在不同班級進行相同課程教學的負擔，然而線上教學環境還是有許多限制，像是無法提供互動式的立即回饋，或是給予學生必要的協助與激勵等，因此混合式的教學環境提供了傳統教學中老師須要重複操作以教導學生的基礎電腦軟體操作課程一個最佳的

解決方案。

學生對於線上學習環境的適應程度與接受程度不盡相同(Lee, 2001)。Goldstein (1998)相信在評量學生的線上學習成效之前，有必要先衡量學生的學習風格，有許多學者已經證實學生的學習風格有助於了解學生的學習成效(Furnham, Monsen, & Ahmetoglu, 2009; Gadzella, Ginther, & Bryant, 1997; Jackson, Baguma, & Furnham, 2009; Liu, Magjuka, & Lee, 2008)，因此學習風格的衡量可以用來作為線上教學是否合宜的判斷標準。然而有部分探討學習風格與學習成效關係的研究，只採用二分法的學習風格可能較不合適作為這類關係的深度探討，例如 Witkin (1949)與其他後續研究(Day et al., 1998; Shih et al., 1998; Lu et al., 2003)所採用的學習風格僅僅兩種分類，即 field dependence and field independence，這樣的學習風格分類提供後續研究對學習風格的基本認知，不過還是存在著改善的空間，因此 Day et al.(1998)、 Shih et al.(1998)及 Lu et al.(2003)認為這種分類方式太過簡化以致於無法驗證其效度，因此本計畫採用分類較為詳盡且較多文獻採用的 Felder-Solomon Index of Learning Styles (ILS)量表 (Felder & Soloman, 1997)來探討學生的學習風格對於線上學習環境的影響，本研究相信 ILS 是一個學習風格分類完善的工具，因此相當適合本研究作為學生學習風格的衡量。

網際網路是傳統教室學習環境的一種相當有用的輔助工具，但是大多數有關線上學習的研究都是純粹線上學習的環境，僅有少數探討混合式環境的學習成效(Jackson, Baguma, & Furnham, 2009)。本研究蒐集線上學習與傳統教室的實證資料，以調查線上參與的前因及其影響，樣本對象都是修習軟體應用課程的大學部學生，共計四個班級，他們也都同時參與教室與線上的教學，教室教學的部分包括教師課堂的授課與各類軟體的示範教學，而線上教學的部分則包括筆記、課堂講義及軟體示範影片。

線上參與是指學生閱讀線上教材或操作線上系統功能的投入程度，如果課程的教材或教學內容只能從線上環境才能夠學習，包括混合式學習環境，那麼學生

就必須透過線上參與才能學習的到這些內容。線上參與的定義似乎類似於 Shih et al. (1998)所提到的學習模式(learning patterns)，Shih et al. (1998) 與 Liu and Reed (1994)發現具有 field-dependent 學習風格的學生會花比較多的時間於線上學習及閱讀線上教材，但他們發現 field-dependent 和 field-independent 這兩類學習風格對於學習成效並沒有顯著的差異。

然而 Shih et al. (1998) and Lu et al. (2003)認為學習模式(Shih et al.的定義與本研究中所指的線上參與相近)或是學習風格都對學習成效沒有顯著的影響。這個結果可能是因為他們對於學習風格的分類太過簡單所導致，因此有必要採用較多樣化且較具深度的學習風格的分類方式，以衡量對於線上學習成效的影響。

2. 研究目的

基於以上的文獻探討，本研究計畫的目的為：

(1) 對學習風格進行較完整的衡量，以期有效地衡量學習風格之影響

(2) 釐清文獻中在線上學習領域不一致的研究結論

(3) 檢驗線上參與的中介效果和先備知識調節效果

因此本計畫欲探討的研究問題如下：

(1) 學生的線上參與程度愈高，是否會展現出較高的學習成效？而哪一種學習風格會透過線上參與影響學習成效？

(2) 學生對於該課程的先備知識(prior knowledge)是否會影響線上參與和線上學習成效間的關係？

3. 文獻探討

Graf and Kinshuk (2006)分析學習風格與學生參與線上課程行為間之關係，認為具有不同類型學習風格的學生對於線上課程的行為表現截然不同，而且他們上網與停留網站瀏覽資料的模式也不相同。其他研究也指出不同類型學習風格的學生其學習方式也不相同(Meng & Patty, 1991; Stansfield & Hansen, 1983; Garcia, Amandi, Schiaffino, & Campo, 2007)。本研究的「線上參與」是指學生對於線上

課程的投入程度，由於線上學習環境大多是多媒體導向，包括影片、文字及投影片等，因此學生參與線上學習系統互動的方式，會透過點選或讀取這些教材、或在討論區與聊天室發表意見來進行。因此，線上學習環境的重要設計目標就是改善協同學習的成效。本計畫認為學習風格能夠預測不同程度的線上參與，因此提出以下假說：

假說 1: 學習風格與線上參與的關係呈現正向相關。

由於 ILS (Felder & Soloman, 1997) 包括四個構面：active/reflective, sensory/intuitive, visual/verbal, and sequential/global，因此假說 1 可進一步延伸為：

假說 1a: Active/reflective 的學習風格與線上參與的關係呈現正向相關。

假說 1b: Sensory/intuitive 的學習風格與線上參與的關係呈現正向相關。

假說 1c: Visual/verbal 的學習風格與線上參與的關係呈現正向相關。

假說 1d: Sequential/global 的學習風格與線上參與的關係呈現正向相關。

許多研究已經證實線上參與跟線上學習成效的關係，認為線上參與能夠增進學生的投入程度並進一步改善他們的學習成效(Zhang, Zhou, Briggs, & Nunamaker, 2006)，也有研究認為學習成效不好的學生可能是因為他們較少參與線上環境的學習(Davies & Graff, 2005)，絕大多數的人都認同線上學習環境所帶來的好處，首先，線上協同學習環境能夠鼓勵學生更廣泛的參與，像是線上討論能夠讓一些內向的學生有機會勇於表達自己的意見(Citera, 1988)，其次，線上環境較沒有時間上的壓力，並且學生的學習成效會顯著受到社群同儕的影響(Cho, Gay, Davidson, & Ingraffea, 2007)，是因為線上參與的影響所致，因此，學生的線上參與會增加他們的投入程度並且改善他們討論的品質。雖然這一個關係已經在完全線上教學環境的相關研究中證實，在混合式的教學環境中卻還沒有進行檢驗，因此本研究再提出以下假說：

假說 2: 線上參與與線上學習成效的關係呈現正向相關。

部分研究認為個體差異會顯著影響線上學習的成效，但最相關的層面則是個

體的先備知識(prior knowledge)，先備知識是指學生在尚未上課前對於特定科目就已經所具備的知識，因此本研究提出下列假說：

假說 3: 先備知識愈多，線上參與與線上學習成效的關係會愈強烈。

基於文獻探討，圖 1 為本計畫的研究架構，其基本的論述為：學習風格會影響線上參與，並進一步影響到線上學習成效(Felder & Silverman, 1988; Felder & Soloman, 1997)。本計畫將著重在學習風格上，包括 Active/Reflective, Sensory/Intuitive, Visual/Verbal and Sequential/Global 四個構面，並認為學生的先備知識會影響線上參與與線上學習成效的關係。

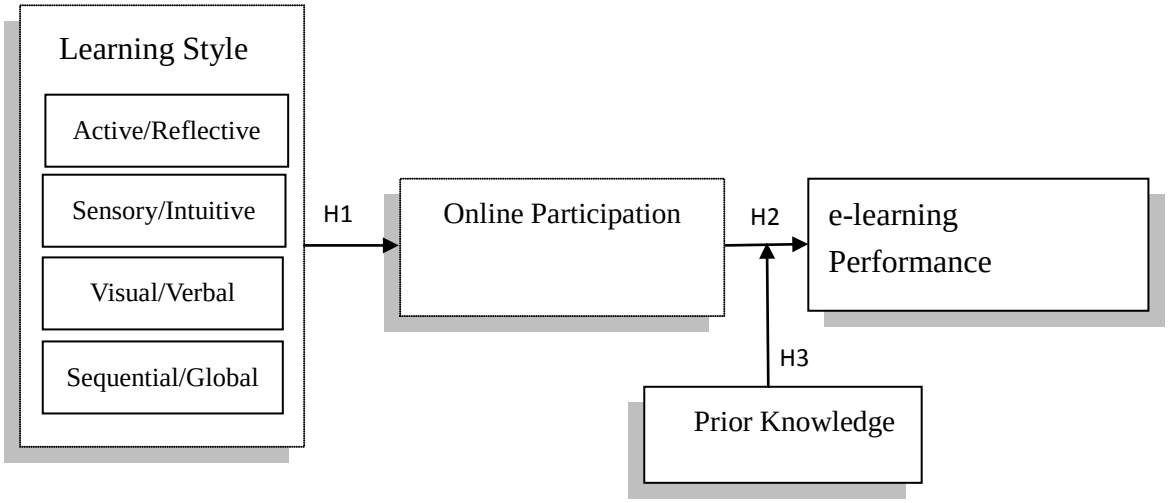

圖 1　本研究的研究架構

4. 研究方法

本計劃的研究模式中學習風格是獨立變數，以 ILS 量表進行衡量 (Felder & Soloman, 1997)。而學生的線上參與紀錄則是從線上教學網站的紀錄中擷取出來，本研究的應變數為學生的線上學習成效，主要是透過課堂上多次的上機考試成績來衡量。詳細的說明如下：

學習風格(Learning Style)：本研究採用由 ILS 量表來衡量學生的學習風格，這份量表共有 44 個問項，測量四個構面的學習風格，分別為 active/reflective, sensory/intuitive, visual/verbal, and sequential/global，每一個構面都有 11 個問項。

ILS 量表已經廣泛地被許多 e-learning 的研究所採用並驗證其可行性(Viola, Graf, Kinshuk, & Leo, 2007; Zywno, 2003)。

線上參與(Online participation)：線上參與的資料是來自於學生在線上教學網站上的紀錄，這些紀錄包含許多可供分析的指標，例如討論區的發言次數、線上教材的瀏覽次數(包括影片與教學投影片)、上網停留時間及閱讀線上教材的總頁數等。這些指標由於計算的單位不同，所以無法加總成為一個指標，因此透過 EFA(exploratory factor analysis)進行構面萃取，結果得到兩個因子，可解釋變異為 63.5%，每一個因子的負載量都超過.50，Cronbach's α 分別為 0.79 與 0.81。在第一個因子上負荷較重的問項涵蓋了教學網平台的各類活動參與的次數，因此稱為參與頻率(access frequency)，衡量學生在討論區發表文章與瀏覽線上教材的總次數；在第二個因子上負荷較重的問項涵蓋了教學網平台的各類活動參與時間長短，因此稱為參與時間(access duration)，衡量學生停留在線上的時間與瀏覽線上教材的總頁數。

學習成效(Learning Performance)：學生的學習成效是透過電腦教室的上機考試成績來衡量，考試的內容是軟體工具的操作，例如 Microsoft Excel and Access 等。

先備知識(Prior knowledge)：學生對於所學習科目的先備知識的衡量是透過詢問他們在上課之前，對於 Microsoft Excel 與 Access 的熟悉程度，共計四個問項的 Cronbach's α 為.83。

控制變數(Control Variable)：本研究的三個控制變數分別為性別(gender)、電腦的使用經驗(computer experience)及網際網路的使用經驗(Internet experience)。這些變數並不是本研究所要探討的，卻有些許可能會影響到本研究所欲觀察的變數之間的關係，因此，這些控制變數與其他主要變數之間的相關性將被計算與分析，以便控制他們潛在的影響。本研究相信這些控制變數並不會影響本研究的觀察，因為本研究的受測者，也就是現階段的大部份的大學生對電腦與網際網路的使用都很熟悉，而性別的影響似乎已隨著電腦與網路應用的普及而降低。

5. 結果與討論

本計畫使用 SEM 分析來驗證研究架構與假說，本研究模式合適度為 χ^2 (3, N=219) = 12.013; GFI=.987, AGFI=.947, RMSEA=.039，其結果如下圖所示，圖中虛線與實線構成本研究的研究模式，以虛線代表沒有通過統計上的顯著性檢測，包括 Active/Reflective, Visual/Verbal, Sequential/Global 分別對於參與次數(access frequency)及參與時間(access duration)的關係都是不顯著的，其 β 係數和 P 值分別為 β=.04, β=.06, β=.01, p>.05; and β=.02, β=-.02, β=.11, p>.05。

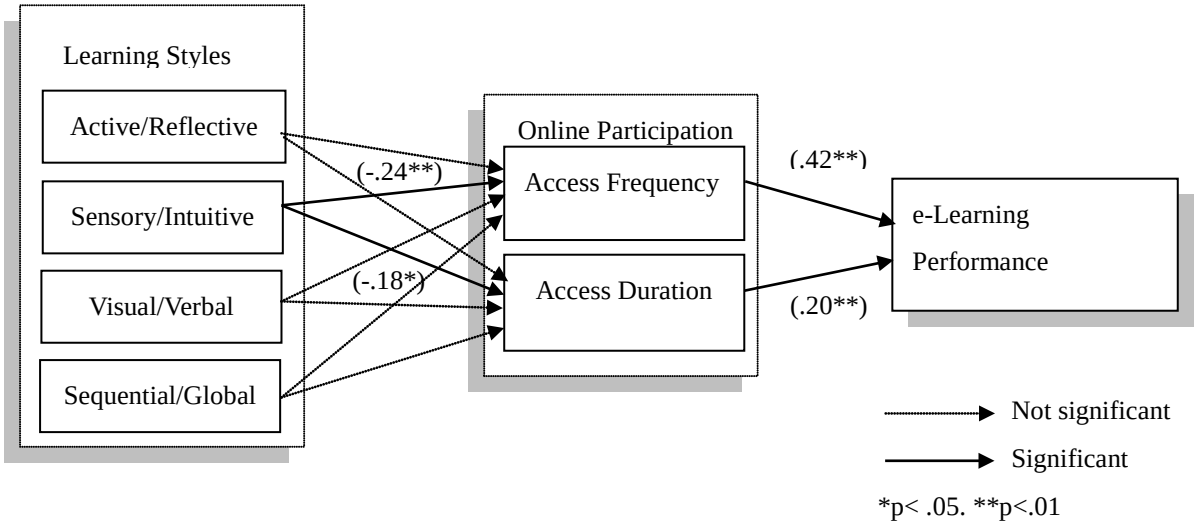

圖 2　本研究模式之標準化路徑係數

由於線上參與(online participation)經過因素分析萃取出兩個因子，分別為參與次數(access frequency)及參與時間(access duration)，因此假說 2 進一步延伸為：

假說 2a: 參與次數與線上學習成效呈現正相關的關係。

假說 2b: 停留時間與線上學習成效呈現正相關的關係。

根據 SEM 分析結果顯示，假說 1b、2a 和 2b(β= -.24, -.18, .42, .20, p<.05)成立，而假說 1a、1c 和 1d 則不成立。由於學習風格 Sensory 和 Intuitive 是在同一個衡量構面的兩端，因此這個構面的分數越高，就代表 Intuitive 的學習風格傾向越強烈。根據分析結果顯示 Sensory/Intuitive 與線上參與(online participation)呈現負相關，因此學習者的 sensory 學習風格傾向愈強烈，就會展現出愈高的線上參與。

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附件一：論文發表成果

Huang, E. Y., Lin, S. W., & Huang, T. K. (2010). Does online participation mediate the effect of learning style on learning performance? *Proceedings of 41st Annual Meeting of the Decision Sciences Institute (DSI),* San Diego, USA. **(*Distinguished Paper Award*)**

DOES ONLINE PARTICIPATION MEDIATE THE EFFECT OF LEARNING STYLE ON LEARNING PERFORMANCE?

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ABSTRACT

Learning style has been established in previous literature as a consistent predictor of learning performance. This study extends previous research by proposing and then testing a model of the mediating processes underlying the relationship between learning style and learning performance, as well as the moderating effects of prior knowledge. The results show that online participation mediates the relationship between a sensory learning style and learning performance. In addition, prior knowledge moderates the relationship between online participation and learning performance.
Keywords: E-learning, learning styles, online participation, learning performance.

INTRODUCTION

With the rapid increase in Internet use, online instruction has become more popular. An online learning environment provides flexibility for students in different locations and time zones to learn together, allows for self-paced learning, and enhances learning performance according to different types of individual learning styles [2][9]. Online courses have been embraced by undergraduate students and are regarded as common, easy-to-use learning tools.

Approximately 90% of universities report that they offer online courses using asynchronous computer-based instruction [13]. Survey results show that online courses are more and more popular and frequently used on campuses. One such type of instruction is totally Web-based education (TWE), in which there are no face-to-face classes and little instructor contact, such as courses taught entirely via e-mail [10]. As internet access has increased, the use of TWE has also increased. However, many people worry that learning performance decreases through TWE.

Understanding the effects of online courses on student learning is essential because it can help in the modification of curriculum and instructional design. With the evolution in distance education via TWE courses, concerns have been raised about its effectiveness [1][12]. For instance, Phoha [12] reported a survey that using only e-mail was not appropriate for high-quality education. Other technologies are needed to fill this gap. Therefore, the selection of TWE or a mixed-mode (online learning based on a traditional classroom environment) is an important issue for online instruction.

The Internet is an attractive supplement for classroom instruction, but few studies have investigated the learning performance in mixed-mode education, including both

online learning and traditional classroom learning meanwhile. This study is designed to investigate the impact of learning style on learning performance in an online/classroom mixed-mode learning environment over the course of a semester. The classroom instruction portion of the course included lectures and demonstrations of software tools, whereas the online instruction part of the course consisted of lecture notes, viewgraphs, and videos with step-by-step demonstrations of software tools.

Luk [11] confirmed the effect of how learning styles and patterns affect learning performance in distance education. However, we do not know the extent to which online participation mediates the causal relationship between learning style and online learning performance. Given that learning style influences online participation, we aim to investigate if online participation subsequently affects learning performance. In addition, we examined if prior knowledge in the course subject influenced the relationship between online participation and online learning performance.

LITERATURE REVIEW

When designing education courses, whether online or traditional, we should pay attention not only to the diversification of course content but also to the ability of students to master such content, taking into consideration that their learning performance is closely linked to their learning style.

Learning Styles and Online Participation

The Felder-Silverman Learning Style Model (FSLSM) was proposed by Felder and Silverman [5]. It includes four dimensions: active/reflective, sensing/intuitive, visual/verbal, and sequential/global. The model posits that active students learn by experimenting and working with others, whereas reflective students prefer to think things through and work alone. Sensing students are practical and facts- and procedures-oriented, whereas intuitive students are more conceptual, innovative, and oriented towards theories and meanings. In addition, visual students prefer visual representations of material, such as pictures, diagrams, or flow charts, whereas verbal students prefer written and spoken explanations. Lastly, sequential students tend to follow linear and orderly reasoning processes, whereas global students prefer to learn in intuitive leaps.

Felder and Soloman [6] developed another measure of learning styles, the Index of Learning Styles (ILS), that was based on the FSLSM. The ILS is a 44-item questionnaire consisting of four scales related to learning style preferences (specifically, active-reflective, sensing-intuitive, visual-verbal, and sequential-global). Each scale contains 11 items. Although Felder discussed a fifth dimension, inductive/deductive, the ILS does not have items to measure this dimension. The reliability and validity of the instrument have been verified by a review of studies analyzing ILS response data [7]. Topics such as the relationship among learning styles and the existence of latent dimensions have been investigated [8].

In the present study, “participation” is defined as the behavior of students during an online course integrating multimedia instructional material, including video lectures, PowerPoint slides, and lecture notes. Types of participation include reading online materials and posting opinions on online forums and in chat rooms; these types of participation enhance online collaborative learning and discussion. This study proposes that online participation influences the relationship between learning style and learning performance. Specific hypotheses are articulated below.

Hypothesis 1: An individual’s learning style is positively related to online participation.

The ILS is comprised of four dimensions: active/reflective, sensory/intuitive, visual/verbal, and sequential/global; hence, hypothesis 1 is expanded as follows.

Hypothesis 1a: An individual's active/reflective learning style is positively related to online participation.
Hypothesis 1b: An individual's sensory/intuitive learning style is positively related to online participation.
Hypothesis 1c: An individual's visual/verbal learning style is positively related to online participation.
Hypothesis 1d: An individual's sequential/global learning style is positively related to online participation.

Online Participation and Learning Performance

Previous research has demonstrated a relationship between online participation and learning performance. There are two possible explanations for this finding. First, online collaborative environments have been shown to encourage broader student participation, as online discussions encourage more reticent students to participate to a greater extent [4]. Second, in a computer-supported collaborative learning (CSCL) community, learners' performance was significantly influenced by the social networks that emerged from the experience [3], which could be regarded as part of online participation. These benefits seem to imply that students' online participation increases their involvement and improves the quality of discussion. However, whether online participation has any tangible benefits, such as improved student achievement, remains to be determined. Based on the previously articulated rationale, the following hypothesis is proposed.

Hypothesis 2: An individual's online participation is positively related to his or her learning performance.

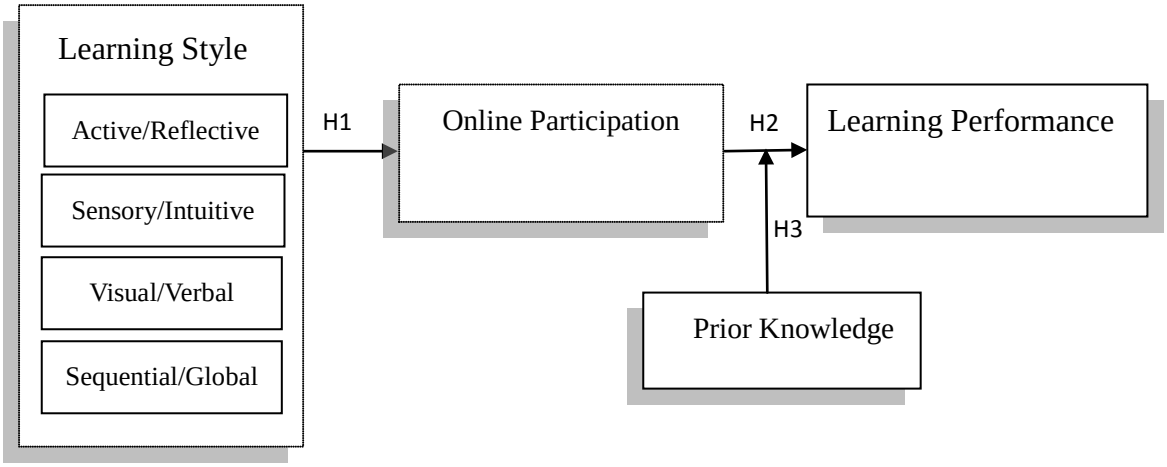

Figure 1. Research Conceptual Model.

Moderating Role of Prior Knowledge

Prior knowledge is a measure of the degree of previous understanding of the subject matter. In this study, the subject matter relates to the content and use of software tools but does not necessarily include the specific software program being taught in the course. We expect that individuals with greater prior knowledge of the subject matter will absorb online information more readily and, as a result, will demonstrate a higher degree of learning performance; this reasoning leads to the following hypothesis.

Hypothesis 3: The greater the prior knowledge an individual has, the stronger the relationship between his or her online participation and learning performance will be.

METHOD

There were 224 participants; they were undergraduate students in three sections of the same class. Each class was taught by the same instructor, using the same teaching materials, and in the same learning environment. In addition, the course had been offered for the past seven consecutive years; therefore, the online teaching material is relative mature and stable for experiment.

The class featured face-to-face lectures in a computer lab and employed online learning as a supplement. The classroom work focused on hands-on teaching of software use, including Excel, Office VBA (Visual Basic for Applications), and Access, whereas the online component focused on self-learning materials, such as videos showing step-by-step software use and PowerPoint slides. Face-to-face teaching was arranged to give students an overview of the basic concepts and then to teach them the main functions of the software. There were also frequent assignments to help students master the skills learned and become familiar with the content.

The evaluation section consisted of myriad quizzes and online tests. The information section contained the course syllabus, grades, rankings of level of participation, and a student e-mail directory. Finally, the personal section contained each student's online trail; students can track their own online participation accordingly. In addition, there was one teaching assistant for each class section. This teaching assistant answered questions both in the lab and online. The following constructs were assessed: learning style, online participation, learning performance, and prior knowledge. In addition, three variables were included in analyses as control variables: gender, computer experience, and Internet experience. The measurement of each construct is described below.

Learning Style. In this study, Felder and Soloman's [6] ILS scale was used to evaluate students' learning styles. This questionnaire consists of 44 items and was used to assess each student's learning style along four dimensions: active/reflective, sensory/intuitive, visual/verbal, and sequential/global. Each item had two possible response options

Online participation. The measure of online participation was obtained by extracting data from the records of student online trails, a function offered by the e-learning Web site. Online participation was evaluated by several indicators, including the number of discussion board posts, number of times viewing the files (videos, PowerPoint slides), session duration in browsing material pages, and total number of pages read. These indicators could not be summed up as one factor because they come in different measurement units. Hence, exploratory factor analysis was used to condense these four indicators. The results suggested a two-factor solution that explained 63.5% of the variance with all loadings over .50. The Cronbach's α for the two factors was 0.79 and 0.81, respectively. Items of the first factor, collectively labeled "Access Frequency," assessed how frequently individuals posted on the discussion board and viewed the files. Items of the second factor, labeled "Access Duration," assessed the time duration or number of page views.

Learning Performance. Students' learning performance was measured by lab hands-on test scores in using software tools taught in the class (i.e., Microsoft Excel--including Office VBA--and Access).

Prior knowledge. Students' prior knowledge of the subject matter was assessed using a self-report measure asking students how familiar they were with Excel and Access before they took the course. The Cronbach's α for this four-item measure was .83.

Control variables. Three control variables were used: gender, computer experience, and Internet experience. They were not variables of interest but were included in

analyses because they could potentially affect the observation of the relationship.

RESULTS

We assessed the proposed model with maximum likelihood estimation using AMOS 7.0. All calculations were based on the covariance matrix of the variables. Of the 224 students who participated in this class, 219 completed questionnaires. The response rate was 97%. The participant sample was fairly well-balanced in terms of gender (43% = male, 57% = female). The analysis indicates that the model fits the data well; specifically, $\chi 2(9, N=219)=7.781$, GFI=.986, AGFI=.931, and RMSEA=.085. After the factor analysis, online participation was divided into two dimensions: access frequency and access duration. Thus, Hypothesis 2 was expanded in the following way.

Hypothesis 2a: An individual's access frequency is positively related to his or her learning performance.

Hypothesis 2b: An individual's access duration is positively related to his or her learning performance.

Only the standardized path coefficients of sensory/intuitive, shown in Figure 2, were statistically significant and in the predicted directions. Therefore, the model provided confirming evidence for hypotheses 1b, 2a, and 2b but provided disconfirming evidence for hypotheses 1a, 1c, and 1d. For the Sensory and Intuitive scale, higher scores indicate stronger Intuitive scores. Therefore, the negative coefficient between Sensory/Intuitive and online participation indicates that a Sensory learning style positively influences online participation.

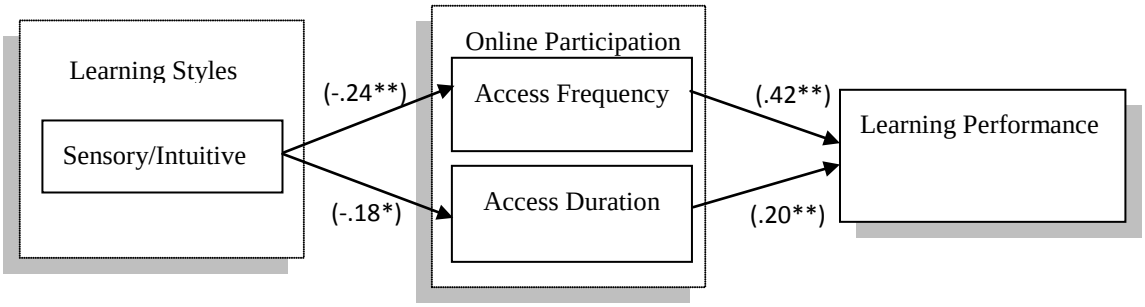

Figure 2. Standardized Path Coefficients of Model
(Note. *p< .05. **p<.01)

The possible mediating effect of online participation (access frequency and access duration) on the relationship between learning style (e.g., Sensory/Intuitive) and learning performance was examined via a Sobel test. Results showed that online participation did mediate the relationship between a Sensory learning style and learning performance ($z = 2.807$, $p<.01$; $z =2.032$, $p<.05$).

Moderating Effects on Learning Performance

This study adopted SEM to analyze the possible moderating effect of prior knowledge on the relationship between online participation and learning performance. The prior knowledge score was divided into higher and lower score groups, using a dummy variable (0: Lower, 1: Higher). Because online participation was divided into access frequency and access duration, hypothesis 3 was expanded as follows.

Hypothesis 3a: The greater the prior knowledge of an individual, the stronger the

relationship between his or her access frequency and learning performance will be.

Hypothesis 3b: The greater the prior knowledge of an individual, the stronger the relationship between his or her access duration and learning performance will be.

The results showed that the moderating effect of prior knowledge on the relationship between individual participation and learning performance was significant for access duration but not significant for access frequency ($\chi 2$ (5, N=219) = 5.601; GFI=.99, AGFI=.96, RMSEA=.023). As a strong positive effect of online participation for individuals with prior software knowledge was found only for access duration, as suggested in hypothesis 3b.

The model supported the hypothesis that the main effects of access frequency, access duration, and prior knowledge significantly predicted learning performance. In addition, prior knowledge moderated the relationship between access duration and learning performance but not between access frequency and learning performance, thereby supporting hypothesis 3b but disconfirming hypothesis 3a.

DISCUSSION

This study empirically examined how learning styles affect students' learning performance. Results confirmed the mediating effect of online participation. Specifically, the results showed that students who have a sensory learning style have higher online learning performance and that this relationship is explained by higher online participation in terms of access frequency and access duration. This finding may stem from the fact that sensing learners tend to like learning facts, solving problems by well-established methods, and are more practical and careful than intuitive learners [5]. Therefore, they may be more motivated to participate in online courses that consist of concrete steps and easy-to-follow instructions. Additionally, prior knowledge moderated the relationship between online participation and learning performance, but only in terms of access duration. When prior knowledge was high, individuals' access duration was positively related to learning performance.

A very important practical implication is the possibility of increasing students' learning performance by improving students' online participation. It is very difficult for students to adjust their different levels of learning style, therefore, universities should take actions to enhance students' online participation in Web-based instruction. In addition, universities could administer tests of learning style for students before they take online courses. Then, the students who are best-suited to this type of learning are encouraged to take online courses to increase their learning performance, whereas, the education system should alert students if their learning style does not seem to be able to benefit from online learning.

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DSI 2010 Annual Meeting Conference 心得報告

管郁君
國立政治大學資訊管理學系特聘教授

發表論文：

Does online participation mediate the effect of learning style on learning performance? **(Distinguished Paper Award)**

擔任 Session Chair：

Research in Learning Style, Learning Effect and Learning Performance
Saturday, Nov. 20, 2010, 10:30-noon

DSI (Decision Sciences Institute Annual Meeting) 研討會迄今已四十一屆，是一個歷史悠久的研討會，也是 information system (IS) 領域之主流研討會之一 ，今年於美國加州的 San Diego 舉辦，研討會地點爲 San Diego Marriott Hotel & Marina，主辦單位是 Decision Sciences Institute，舉辦時間爲十一月二十至二十三日。此研討會是 DSI 的年會，規模很大，參與的人數眾多。

非常榮幸地，本人之論文在眾多論文中脫穎而出，獲得了 Distinguished Paper Award，爲來自台灣地區唯一獲獎的論文、亞洲地區唯二的獲獎論文（另一爲中國交大、香港中文大學與美國的學者共同著作）。因此該場次出席的人數很多，提問和討論也相當地踴躍。對本人的論文所提出的討論，包括

1. 本研究是針對 mixed-mode 的探討，若爲 totally web-based 環境，結果是否會有所不同？
2. 學生過去的 GPA 應對學習成效有影響，是否應納爲 independent variable?
3. Learning style 衡量的選擇之解釋。
4. Online participation 經因素分析得到兩個構面 access duration 和 access frequency，是否太簡化了？
5. 年齡的差距是否也應考慮？

針對上列問題，本人之回答簡要摘錄如下：

1. 軟體工具的學習，較爲適合 mixed-mode，而在文獻中也討論了 mixed-mode 相較於 totally web-based 之優勢
2. GPA 或許對紙筆考試有直接的影響，但對於軟體工具的學習，GPA 之影響有限，而且本研究中的績效衡量並不包括課堂中的紙筆考試部分，而只是衡量上機操作之學習成效

3. 進一步略述文獻之來龍去脈，會中另一位作者接著 backed up 本研究之選擇
4. 可能在相關領域從事研究者都希望能粹取出更細部之構面，但在 online tracking system 記錄的資料中，有各種不同的尺度，不容易直接分析，必須仰賴因素分析，而因素分析的結果清楚地指出只有兩個構面。
5. 在軟體工具學習，或其他知識的學習，年齡可能是一個影響因素，但因本研究的對象爲大學生，freshmen 至 seniors 約爲三年，年齡差距不大。但後續研究值得在其他情境中在對本研究結果做驗證。

此次 2010 年是本人第五次參加 DSI 年會研討會，今年看到這個研討會有明顯的各項改變措施，都對鼓勵投稿、促進參與度、嚴選論文品質，有很大的幫助，例如：

1. 過去一年徵詢對 DSI 之建議，包括網頁的改進
2. Call for Papers 主題明確
3. 會前的時程掌握有節奏，並不斷以 e-mail 傳達訊息，數量約爲往年的三倍
4. 研討會進行中，每天以 e-newsletters 對第二天的 schedule 做 highlight，使參與者一目了然，很容易選擇參與的場次
5. 給予 session chair 明確的指示，要求絕對準時，並確實掌握互動，填寫出席狀況。
6. 新增不同的 session 形式，除了傳統的簡報方式，增加了圓桌討論方式。

對於 DSI 這個具有指標性的大型、重要的研討會，因爲上述的改變措施，本人對它未來的發展有新的期待。

國科會補助計畫衍生研發成果推廣資料表

日期:2011/02/21

國科會補助計畫	計畫名稱: 線上參與對於學習風格與學習成效間中介效果之探討
	計畫主持人: 管郁君
	計畫編號: 98-2410-H-004-015- 學門領域: 資訊管理

無研發成果推廣資料

98 年度專題研究計畫研究成果彙整表

計畫主持人：管郁君	計畫編號：98-2410-H-004-015-
計畫名稱：線上參與對於學習風格與學習成效間中介效果之探討	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	0	0	100%	篇	
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%		
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	0	0	100%	人次	
		博士生	2	0	70%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	1	65%	篇	
		研究報告/技術報告	0	1	100%		國科會專題計畫研究成果報告
		研討會論文	1	0	80%		發表於第四十一屆 DSI(Decision Sciences Institute) 年會，並獲得「卓越論文獎」(Distinguished Paper Award)
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		

其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)	初步研究成果發表於第四十一屆 DSI(Decision Sciences Institute)年會，並獲得「卓越論文獎」(Distinguished Paper Award)。

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：□已發表 ■未發表之文稿 □撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：(以 100 字為限)

期刊論文已投稿於 Computers &amp； Education。

研討會論文已出版於 41st Annual Meeting of the Decision Sciences Institute (DSI)，並獲得 Distinguished Paper Award。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）(以 500 字為限)

本計畫的初步成果已經發表於第四十一屆的 DSI(Decision Sciences Institute)年會，並獲得「卓越論文獎」(Distinguished Paper Award)之殊榮。此外，本計畫的後續成果也相當適合發表於學術期刊。本計畫進一步的具體成果之論文名稱為’’ What type of learning style leads to online participation in the mixed-mode e-learning environment? A study of software usage instruction’’ ，已於 2010 年 11 月投稿於 Computers &amp； Education 期刊，目前該論文正在審稿階段，相信本計畫的研究發現一定能夠符合該期刊的屬性，並且能夠進一步引發 Computers &amp； Education 讀者的興趣。