

K YV!6 UgYX' bglfi W]cbž @Ufb]b[' 9 ZYW]j YbYgg'UbX' @Ufb]b['6 Y Uj]cf. ' H\ Y' a dUWicZF Y UHYXbYgg

Ó@R}Á@Á
Ó@ *Á' } *Á@Á ÁY á^!•á ÉVCKY CP
ÁÁÁ
Yá *ÁÁ Áá áÁÁ[} *Á~ Á
P~ á á ÁY á^!•á ÉOP QÁ

Ü^&ááÁí Á á&@CFHL&^] ááÁí Á' ^ÁCFH
Published on 20 November 2013

APA style referencing for this article: Shieh, C.-J., Liao, Y. & Hu, R. (2013). Web-Based Instruction, Learning Effectiveness and Learning Behavior: The Impact of Relatedness. *Eurasia Journal of Mathematics, Science & Technology Education*, 9(4), 949-962.

Linking to this article: DOI: 10.12973/eurasia.2013.949a

URL: <http://dx.doi.org/10.12973/eurasia.2013.949a>

Terms and conditions for use: By downloading this article from the EURASIA Journal website you agree that it can be used for the following purposes only: educational, instructional, scholarly research, personal use. You also agree that it cannot be redistributed (including emailing to a list-serve or such large groups), reproduced in any form, or published on a website for free or for a fee.

Disclaimer: Publication of any material submitted by authors to the EURASIA Journal does not necessarily mean that the journal, publisher, editors, any of the editorial board members, or those who serve as reviewers approve, endorse or suggest the content. Publishing decisions are based and given only on scholarly evaluations. Apart from that, decisions and responsibility for adopting or using partly or in whole any of the methods, ideas or the like presented in EURASIA Journal pages solely depend on the readers' own judgment.

© 2013 by iSER, International Society of Educational Research. All Rights Reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission from iSER.

ISSN: 1305-8223 (electronic) 1305-8215 (paper)

The article starts with the next page.

Web-Based Instruction, Learning Effectiveness and Learning Behavior: The Impact of Relatedness

Chich-Jen Shieh
Chang Jung Christian University, TAIWAN

Ying Liao and Ridong Hu
Huaqiao University, CHINA

Received 07 March 2013; accepted 27 June 2013

This study aims to discuss the effects of Web-based Instruction and Learning Behavior on Learning Effectiveness. Web-based Instruction contains the dimensions of Active Learning, Simulation-based Learning, Interactive Learning, and Accumulative Learning; and, Learning Behavior covers Learning Approach, Learning Habit, and Learning Attitude. The directors of Web-based Instruction Centers and the students in ten universities in Taiwan and China are selected as the research subjects for on-site questionnaire distribution and collection. Within the 500 copies distributed, total 382 valid ones are retrieved, with the retrieval rate 76%. The research findings show the partially significant correlations between Web-based Instruction and Learning Behavior, between Learning Behavior and Learning Effectiveness, and between Web-based Instruction and Learning Effectiveness. At the end, several suggestions are proposed for the practice of Web-based Instruction.

Keywords: Web-Based Instruction, Learning Effectiveness, Learning Behavior

INTRODUCTION

The ubiquitous network has broken the teaching and learning model in traditional education and created a different educational model in the information era. In such a Web-based Instruction era, the roles of teachers have been largely changed that the learning attitudes and behaviors of students also need adjustment.

Web-based Instruction has broken through the restriction on people, time, and places in traditional instruction that anyone intending to learning receives equal opportunities being instructed. Besides, the

collaboration between schools and enterprises or the interaction between schools and communities and among learning communities could knock down the wall between schools and societies so as to activate the interaction in between. Nowadays, none of a university with so-called excellence does not utilize computer network for instruction that Web-based Instruction, as a new trend domestically or internationally, has become the major trend and star of education in the world. Present instruction is indeed richer than traditional instruction. Web-based Instruction is a convenient learning approach, as it breaks through the restriction of time and space and achieves ubiquitous learning.

It is wondered whether the effectiveness of Web-based Instruction would be automatically generated because of the adoption of computer network, or both instructors and learners should present favorable instructional strategies and learning behaviors. For this

Correspondence to: Ridong Hu, Dean and Professor,
College of Economics and Finance, Huaqiao
University, Quanzhou City, Fujian Province, PRC
E-mail: j_rdhu@hqu.edu.cn
DOI: 10.12973/eurasia.2013.949a

State of the literature

- Scientific models have been recognized as a valuable teaching tool that changes alternative conceptions into scientific conceptions.
- Current researches focused on classifying students' perception and understanding of the scientific models into different levels.
- Conceptions of lunar phases have been a central focus for various studies from different countries and various misconceptions with regard to this has been reported.

Contribution of this paper to the literature

- Regarding the university with web-based instruction, the directors of education promotion centers and the students in ten public and private universities in southern Taiwan are studied.
- It tends to provide educational sectors with web-based instruction related information.
- The outcomes are therefore concluded for the following practical suggestions. 1. Interactive Learning 2. Simulation-based Learning 3. Improvement of interface for learning environment.

reason, this study tends to discuss if Web-based Instruction is the key factor in students' Learning Effectiveness.

DEVELOPMENT OF CONCEPTUAL FRAMEWORK**I. Web-based Instruction**

Khan presented the most complete definition on Web-based Instruction (WBI) that his ideas were commonly quoted (Li & Ling, 2009; Lo, 2009). Khan (1998) regarded WBI as the hypermedia-based instruction in which web-based instruction was combined with the network characteristics of openness, interaction, convenience, and diversity, applied various multimedia or the instructional sources of text, graph, digital sound, animation, and digital image on the Internet, and broke the real wall and the obstruction of time and space to practice instruction synchronously and asynchronously. Different from traditional instruction, Web-based Instruction presents the advantages of rich database, breaking through the restrictions of time, space, peers, and instructors, collaborative learning, inducing learning motivation, and assisting in learners' expression, integration and knowledge construction through instructional activities that it could benefit the promotion of remote education and lifelong learning (Chen & Hung, 2010; Li & Shu, 2010).

With the popularization of network, students could collaboratively learn the lessons through web-based real-time interaction and complete the objective of collaborative learning. Li & Shu (2010) concluded four characteristics of Web-based Instruction as the dimensions of Web-based Instruction. (1) Active Learning did not simply request students to listen to and memorize knowledge, but to develop concepts and skills of subjects for thinking, analysis, comment, and further application. (2) Simulation-based Learning allowed learners operating the trainings and learning in secure, low-cost, but similar to real situation and environment. (3) Interactive Learning emphasized the guidance of collaborative learning and assisted in the establishment of learning communities via network so as to achieve the interaction among the students. (4) Accumulative Learning utilized the characteristics of network and information technology for constantly accumulating and retaining the learning process and results for review or revision.

II. Learning Behavior

Lu et al. (2009) defined Learning as the deduction or process of behavioral change, meaning that learning was a deduction as it could not be observed, but behaviors or performance could be observed and continuously changed. Chang (2010) regarded learning as the process when individuals constantly change the behaviors through practice that learning covered the concepts of 1.learning as a process and 2.practice resulting in behavioral change. Huang (2009) indicated that learning activities should start from students' perception, and teachers should instruct students to establish correct self-concept for properly understanding the affairs in the environments and to absorb and create experiences with active attitudes and accurate approaches so that individual perception could be constructively changed by learning activities. Chu (2010) considered learning as a permanent change of individual knowledge or behaviors through experiences or practice. Cognitive psychology indicates that behaviors would be changed with changing knowledge. Behavioral psychologists emphasize the extrinsic behaviors of learning and pay attention to the effects of environmental factors on individuals. Wang (2009) pointed out the factors in learning as environment, emotion, psychology, and society. Chang (2010) studied the learning behaviors of elementary school pupils from the dimensions of Academic Achievement, Learning Motivation, Learning Attitude, and Teachers' Comments on pupils' behaviors. In the research on junior high school students' learning behaviors, Chang (2010) divided them into Learning Approach, Learning Habit, and Learning Attitude. Hsieh (2009) studied business students' learning

behaviors, containing the dimensions of Learning Motivation and Learning Attitude.

III. Learning Effectiveness

Hung (2010) considered the similarity of Web-based Instruction and other instruction approaches that the instructional effectiveness should be evaluated from normal curriculum and potential curriculum. To evaluate the learning performance with Web-based Instruction, the system design and instructional practice should correspond to the requirements of Web-based Instruction ruled by Ministry of Education in order to ensure the teaching quality, passively reduce the shortcomings of Web-based Instruction (such as interpersonal interaction and cheat), and actively proceed various effective learning activities with specific Learning Effectiveness, including 1.Learning Effect, containing test results, completion schedule, and term results and 2.Learning Gain, covering learning satisfaction, achievement, and preference.

As a consequence, learning performance, learning effects, or instructional evaluation aim to understand the instructional effectiveness of teachers and the learning condition of students toward the learning objective. In this study, they are concluded as Learning Effectiveness. Web-based Instruction reveals different approaches to understand Learning Effectiveness from traditional instruction. Chou (2009) indicated that the instructional evaluation in web-based learning environment should be different from traditional face-to-face learning and classified it into 1.Learning Effect, 2.Learning Satisfaction, 3.Group Learning Environment, and 4.Individualized Learning Model. The evaluation of Learning Effectiveness therefore should focus on the process, rather than the results.

IV. Conceptual framework for this study

Summing up the above literatures, the conceptual framework is drawn for this study (Fig. 1) to discuss the relations between Web-based Instruction and Learning Effectiveness. Furthermore, other possible factors in Web-based Instruction and Learning Effectiveness, including gender and age, are controlled in order to actually test the relations among variables.

Establishment of research hypothesis and design of empirical research method

I. Research hypothesis

(1) *Web-based Instruction and Learning Behavior*

Tsao (2010) indicated that applying the characteristics of electronic information to the instructional technology had gradually turned to web-based technology since the Internet became the trend. Such networking and electronic instruction changed students' learning behaviors, as it was not restricted in time and space that anyone could learning and deliver knowledge on the web. Wen & Shih (2009) considered Web-based Instruction utilized the Internet as the major instructional medium for learners and instructors repeatedly using the two-way communicative interactive learning materials at different time and space that the instructional model and the learning behaviors were changed. Chou (2010) mentioned that learners could enhance the learning by acquiring knowledge and concept inspiration from the instructors without being restricted in time and space and further complete

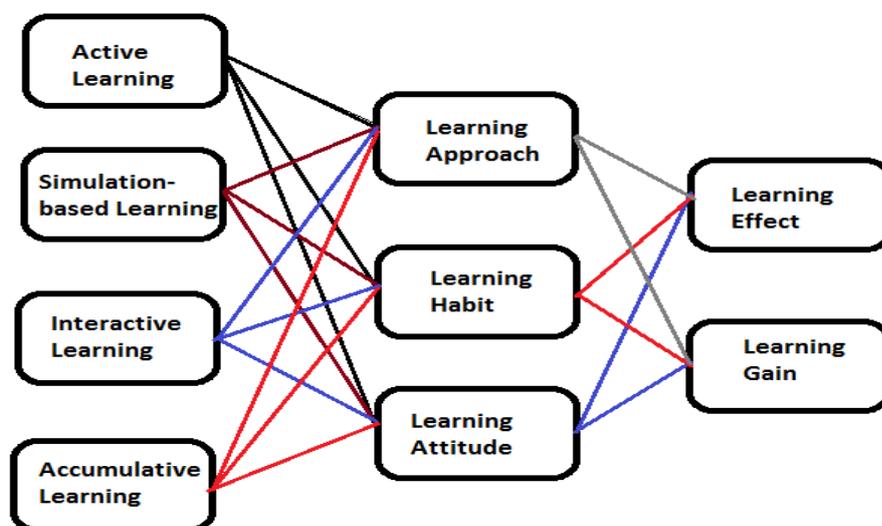


Figure 1. Conceptual framework

knowledge absorption, reservation, and management with such learning behaviors. The following hypothesis is therefore proposed.

H1: Web-based Instruction appears significant correlations with Learning Behavior.

(2) Learning Behavior and Learning Effectiveness

A lot of researchers discussed the effects of individual characters or Learning Behavior on Learning Performance. For instance, Wang (2009) studied the effects of Training Approach, Computer Self-efficacy, and Learning Style on Learning Performance and found that learners preferring abstract concepts appeared higher Learning Performance. In the research on the effects of asynchronous instruction on Learning Effect, Shu (2010) discovered the remarkably positive relations between students' learning behaviors of posting articles on instructional websites and the learning results that Learning Performance would indeed be affected by individual Learning Behavior. Moreover, several researchers pointed out the relations between Learning Motivation and Learning Performance. For example, Hick (1984) found the correlations between Motivation and Learning Performance; Noe (1986) pointed out the direct effects of Learning Behavior on Learning Performance; and, Singer (1990) regarded the effectiveness of Learning Performance depending on favorable Learning Behavior of trainees. The following hypothesis is therefore established.

H2: Learning Behavior shows notable correlations with Learning Effectiveness.

(3) Web-based Instruction and Learning Effectiveness

Since the promotion of Information Technology Integrated Instruction in Grade 1-9 curriculum, a lot of empirical research proved the positive effects of Information Technology on Learning Satisfaction, Learning Attitude, and Learning Effectiveness (Yin & Liu, 2011). In regard to Social Studies, research also presented the benefits of Web-based Instruction on Learning Effectiveness (Yeh, 2010; Liu, 2011). The following hypothesis is then proposed.

H3: Web-based Instruction appears outstanding correlations with Learning Effectiveness.

(4) Control variable

Aiming at 18,000 online learners in Charles Sturt University, Australia, Burr (2002) discovered that gender

and age could affect Web-based Instruction, Learning Behavior, and Learning Effectiveness (Armstrong, 2001; Burr, 2002).

II. Operational definitions of variables and the measurement

(1) Web-based Instruction

Referring to Li & Shu's (2010) scale, Web-based Instruction is classified into Active Learning, Simulation-based Learning, Interactive Learning, and Accumulative Learning. With Likert's seven-point scale, the number 1 stands for Extremely Disagree and 7 for Extremely Agree. The overall reliability of Active Learning appears 0.83, Simulation-based Learning 0.85, Interactive Learning 0.80, and Accumulative Learning 0.86.

(2) Learning Behavior

Referring to Chang's (2010) scale, Learning Behavior is divided into Learning Approach, Learning Habit, and Learning Attitude. With Likert's seven-scale, the number 1 stands for Extremely Disagree and 7 for Extremely Agree. The overall reliability of Learning Approach reveals 0.87, Learning Habit 0.81, and Learning Attitude 0.84.

(3) Learning Effectiveness

Referring to Hung's (2010) scale, Learning Effectiveness contains the dimensions of Learning Effect and Learning Gain. With Likert's seven-point scale, the number 1 stands for Extremely Disagree and 7 for Extremely Agree. The overall reliability of Learning Effect shows 0.90 and Learning Gain 0.88.

III. Research subject

Based on 2012 top ten preferable private and public universities investigated by Global Views Monthly, the directors of education promotion centers and the students are selected as the research subjects. Total 500 copies of questionnaires are distributed and collected on-site, and 382 valid ones are retrieved, with the retrieval rate 76%. The students from ten universities in Taiwan and China are 1.National Cheng Kung University, 2.National Taiwan University, 3.National Chiao Tung University, 4.National Tsing Hua University, 5.National Chengchi University, 6.Nanjing auditing university, 7. Xi'an Jiaotong University, 8. Kaifeng University, 9.Shanghai Business School and 10. Sun Yat-sen University.

IV. Analysis method

Regression Analysis is utilized for understanding the relations among students' personal traits, web-based instruction, learning behaviors, and learning effectiveness.

V. Verification of reliability and validity analyses

The reliability of the dimensions in this study achieves 0.7, showing the high reliability. The construct validity of the scale is analyzed with Confirmatory Factor Analysis, Table 1, from which both convergent validity and construct validity are favorable.

Analysis result

I. Correlation Analysis

From Table 2, Web-based instruction, Learning behaviors, and Learning effectiveness appear significant correlations, where Learning effectiveness shows the highest. The result presents that multicollinearity could possibly appear between dimensions. Niehoff and Moorman (1993) suggested Nested-Model Analysis to solve such a problem. Moreover, the remarkable correlations between dimensions also reveal the correspondent results with the hypotheses.

II. Theoretical model discussion

The following figure shows the overall research result. Path coefficients achieving the significance are shown with solid lines, while the ones not reaching the significance are displayed with dotted lines. Apparently, the path coefficients of the variables achieve the significance, showing that such coefficients reach convergent validity and correspond to the basic requirement of the model. From the fitness of the theoretical model, GFI=0.928, AGFI=0.903, RMSEA=0.02, and CFI=0.976, the fitness of the model is confirmed, presenting the model corresponding to the theory and being valid.

III. Hypothesis discussion

Three hypotheses are proposed in this study that three nested-models are established. Chi-square test of difference is utilized, as each nested-model appears a difference in the degree of freedom. When the difference between the chi-squares of nested-model and theoretical model achieves the significance, the 0 setting of path coefficient is significant. In this study, the research result shows models 1, 2, 3 achieving the significance. The analysis of nested-model is shown in Table 3, and the verification of hypotheses in Table 4.

DISCUSSION

This study academically contributes to the applications of Web-Based Instruction to campus teaching to understand the learning performance with learning behaviors. The results verify the appropriateness of such a research structure that the empirical study on e-learning is further reinforced.

According to the past research, there are other factors in the learning performance of Web-Based Instruction. When the solutions are proposed for such factors, the learning performance of integrating e-learning into campus teaching would be enhanced. For this reason, Learning Behavior, as the moderator, is included in e-learning, which used to be widely applied to the research on learning performance but has not been discussed the relations with learning behaviors. Some researchers discovered that students with more knowledge or resources about Web-Based Instruction appeared higher acceptance of Web-Based Instruction and better learning performance.

According to the verification analysis of the moderating effects of learning behaviors, Web-Based Instruction shows 81.3% variance explained, which is much higher than the past research result (60%). It is also verified that learners do not follow fixed learning schedule as traditional curricula, but could learn with individual learning schedule, complete the learning contents with less learning time, and effectively utilized the rest learning time for other learning activities. This study presents the great differences from the past research that Web-Based Instruction changes the learning behaviors, largely promotes the learning effectiveness, and enhances the learning intention and attitudes of learners.

CONCLUSION AND SUGGESTIONS

According to the research outcomes, remarkable correlations appear between Web-based Instruction and Learning Behavior, between Learning Behavior and Learning Effectiveness, and between Web-based Instruction and Learning Effectiveness. The outcomes are therefore concluded for the following practical suggestions.

1. Interactive Learning. Learning Effect in interactive environments presents better condition than it in one party accepting information. Unlike real lessons with face-to-face communications, the system for the right of speech or the publication with text input allows the communications between teachers and students or among peers. The enhancement of interaction could be improved by synchronous instruction platform with the interface of multi-video conference, which provides students with the feeling of real lessons but not losing the meaning of Web-based Instruction, that the

interaction between teachers and students could be more active.

2. Simulation-based Learning. Instruction with Simulation-based Learning could include some news discussions, as they could induce students' learning interests. Besides, the integration with instruction could enhance the effects and promote students' intention to Active Learning so that they could remain high learning interests in the learning environment without supervision.

3. Improvement of interface for learning environment. Interface for Web-based learning environments should approach simple and understandable design with easy operation; search for lessons or problem discussions and information publication should be definite and easy to reach; and, congenial things should not be placed at different places or searched with several levels so that the users could proceed learning activities anytime anywhere.

Acknowledgements

Financial support from the Central government special Fund for Quantitative Economics Key Discipline of China (Project No.12C14093) MOE (Ministry of Education in China) Project of Humanities and Social Sciences (Project No. 11YJA790048), Soft Science Research Project of Fujian Province, China (Project No. 2012R0058)

REFERENCES

Armstrong, M.L. (2001). Distance education: using technology to learn. In V.K. Saba,& K.A. McCormick (Eds.), *Essentials of Computer for Nurses: Informatics for the new millennium*, (3rd Ed.) 123-139, New York: McGraw-Hill.

Burr, L. (2002). Research challenges popular on-line beliefs. Online news of Australia Charles study university. Retrieved

Chang, C.-H.. (2010). Sex Differences of Children in School Learning as Related to Sex Differences of Teachers. *Bulletin of Educational Psychology*, 9, 1-19.

Chang, H.-R. (2010). A Study on Learning Behavior of Junior High School Students. *Bulletin of Educational Research*, 25, 35-44.

Chen, N.-H. & Hung, H.-F. (2010). K12 E-school: e-Learning fundamentals and applications. Kaohsiung: Shih-lu.

Chou, L.-S. (2010). A study on web-based instruction of social studies for junior high schools. *Management Review*, 4(2), 32-56.

Chou, S.-W. (2009). The Use of IT to Enhance Electronic Classroom- A Theoretical Review. *Chinese Management Review*, 3, 89-96.

Chu, C.-H. (2010). *Educational Psychology: Instruction Approach*. Taipei City: Wunan.

Hick W.D.(1984).The process of entering training programs and its effects on training outcomes, *Dissertation Abstracts*, 44,3564.

Huang, K.- H.(2009). *Introduction to Education*, Taipei City: Shihda Bookstore.

Hung, M.-C. (2010). Evolution of teaching principle and technique for universities—A case study on Web-based Instruction and Learning Effect. *NTU Management Review*, 13, 47-61.

Hsieh, S.-H. (2009). The Influence of Cognitive Traits and Learning Behavior to The Testing Effect of Accounting Skills for The Commercial High School Students. *Management Review*, 3(1), 123-201.

Khan, B.H. (1998). Web-Based Instruction (WBI): An Introduction. *Educational Media International*, 35(2), 63-71.

Li, S.-C. & Ling, H.-Y. (2009). Designing Strategies for Web-based Courseware--Use "Educational Communication and Technology" for Example. *Audio-Visual Education*, 45(5), 17~27.

Li, S.-C. & Shu, Y.-L. (2010). Design and Development of Interactive User Interface of Web-based Learning in Discussion Teaching Strategy. *Journal of Educational Media & Library Sciences*, 41(3), 389-404.

Liu, L.-Y. (2011). A study on the application of digital archives for history instruction. *The I-Lan Journal of History*, 42, 47-76.

Lo, L.-H. (2009). *Multimedia and Web-based Instruction—Theory, Practice, and Research*. Taipei: DrMaster, first edition.

Wu, J.- J., Wang, H.- C. & Zeng, Z. -L. (2009). *Educational Psychology*. Taipei City: Great China.

Noe R. A. (1986). Trainees_ Attributes and Attitudes, Neglected Influences on Training Effectiveness, *Academy of Management Review*, 11(4), 736-749.

Shu, C.-B. (2010). Effects of Web-based Asynchronous Instruction on Learning Effect. *Bulletin on Hungkuang Institute of Technology*, 37, 61-66.

Singer, M.G.(1990). *Human Resource Management*, PWS-KENT.

Tsao, S.-L. (2010). Framework of sustainable e-learning—A study based on learning organization. *Information and Education special edition*, 63-79.

Wang, P.-L. (2009). Brief Introduction of Learning. *Tests and counseling*, 90, 1751.

Wang, T.-P. (2009). Effects of training approach, computer self-efficacy, and learning style on learning performance. *Journal of National Education* (8), 53-71.

Wen, C.-J. & Shih, W.-L. (2009). Teachers' strategies for technological change from the aspect of web-based learning theory. *Information and Education*, 91, 90-99.

Yeh, B.-Y. (2010). Utilization of Web-based Instruction Resources for History Instruction in Senior High Schools. *Journal of National Hualien University of Education*, 21, 99~118.

Yin, M.-C. & Liu, S.-H. (2011). A Study of the Influence Factors about Integrating Technology into Instruction, *Contemporary Educational Research*, 13(2), 43-68.

