

## Exploring the Merits of Web 2.0 Application to Facilitate Constructivist

### Learning: The Participants' Perspectives

Jia-Jun WANG, Chia-Ching LIN\*, Chi-Yang WU

Graduate Institute of Science Education and Environmental Education,

National Kaohsiung Normal University, Taiwan

\* cclin.edu@gmail.com

**Abstract:** *This study aimed to explore the merits of Web 2.0 application (i.e., social bookmarking) to students' online learning through the constructivist learning perspectives. The 94 college students majoring in electronic engineering were conducted to the collective information searching activity of exploring applicable online resources for the given assignment via collective work. Before and after the activity, two versions of the Constructivist Internet-based Learning Environments questionnaires were employed to assess students' preference and experience of the Web 2.0-supported environment they were engaged in. The activity log was used to analyze the students' investment in various contributions to the activity for completing the given assignment. The Paired t-test was employed to examine the differences between the students' preference for and experience of the online learning environment. Furthermore, cluster analysis and a series of ANOVA analyses were used to explore the relation of the students' activity engagement to their awareness of the merits of the engaged learning environment.*

**Keywords:** Web 2.0, constructivism, information searching, engagement, participatory learning

### 1. Introduction

Recent studies have advocated and explored the potential of numerous Web 2.0 applications for educational purposes, since the Web 2.0-supported environments would be helpful to students' active engagements in content maintenance, meaning making and collaborative interactions for knowledge building. However, while increasingly innovative technologies have been applied to advance the Internet-based learning environments in educational contexts, a careful investigation of students' perceptions of the engaged learning environments would be valuable to its effectiveness in supporting student's learning (Tsai, 2004). Furthermore, exploring the students' perceptions may offer a profound understanding of their cognition and belief status adhering to active engagements with the learning environment, which could be viewed as an assessment alternative to the effect of the learning environment (Gijbels, Watering, Van De, & Bossche, 2006). Employing the Internet with special reference to Web 2.0 calls for a novel and alternative ways to stimulate students' active participation in content exploration and creation via a variety of newly interactive mean. The students would be engaged in a virtually interactive context for active and constructive information processing, which offers an ideal learning scenario aligned with the constructivism paradigm. Through the lens of constructivist perspectives, learning is an active process of how an individual integrates encountering information with pre-existing knowledge (e.g., von Glasersfeld, 1989, 1993), and develops knowledge base through dynamic interaction with people of the society (e.g., Cobern, 1993; Solomon, 1987). From such perspectives, learning is no longer the transmission of knowledge and skills to learners but a meaning-making process having learners actively participate instead. Students should contribute themselves to learning process in an active manner and maintain the pace of social interaction. In this regard, the Web 2.0 characteristics may enable the aforementioned ideas underlying constructivist education, and further foster the constructivist-oriented online learning environment.

## 2. Methodology

The sample of this study was 94 college students majoring in electronic engineering. The participants from three different classes were enrolled in an introductory programming course with a same teacher having more than 8-year experience of teaching electric engineering. In addition, the involved teacher has used Website and a discussion forum to support formal instruction in the courses. The instructional materials and interactions were available on the Internet in accordance with the course schedule. Since all the students of this study were enrolled in another compulsory course instructed by this teacher, before entering into the research procedure they have relevant experience of an Internet-based environment in support of their programming learning. In this study, a social bookmarking service was employed instead to support their programming learning through exploiting online resources collectively to complete the given formative assignments.

An online social bookmarking platform, WeShare, developed by Lin & Tsai (2011) was conducted to support programming learning and instruction in this study. The application of WeShare aims to assist students in managing online resources while they searched for valuable and interesting information resources on the Internet. By way of social-filtering approach to information processing, participation in collective information searching activity would be helpful to generate subsequent peer feedbacks and interactions, which result in better information resources relevant to original searching purposes (Lin & Tsai, 2011). Furthermore, students' involvement with the information searching activity itself could stimulate their exercises of higher-order skills in the process of communicating and negotiating with other community members (Lin & Tsai, 2012).

To assess the students' perceptions of the Internet-based learning environments, the Constructivist Internet-based Learning Environments (CILE) questionnaire developed by Chuang and Tsai (2005) and Tsai (2008) were adopted in this study. The CILE questionnaire consists of 45 items distributed into 9 dimensions, which aims to detect one's preferences for their expectative or desirous genres of the Internet-based learning environments. The dimensions are Ease of use, Relevance, Multiple sources, Challenge, Student negotiation, Inquiry learning, Reflective thinking, Critical judgment and Epistemological awareness, which reflects a constructivist-oriented approach to learning. Furthermore, to understand the students' perceptions of a particular learning environment supported by social bookmarking service, an actual form of the questionnaire was developed by altering the wording of all items in the original questionnaire. For example, the wording of "the Internet-based learning environments" highlighted in the original questionnaire was modified as "WeShare-supported learning environment" in the actual form of the questionnaire. The implementation of specific guidance in both questionnaires aimed to raise the students' situational awareness of what they perceived toward a particular Internet-based learning environment.

## 3. Results

Through the adaption and modification of the CILE questionnaire, both preferred and actual forms of the questionnaire were used as assessment instruments to assess the students' perceptions of ideal and actual online learning environments grounded in constructivist perspectives, as shown in Table 1. From the college students' perspectives, the descriptive statistics of preferred and actual forms of the questionnaire revealed that the college students possessed relatively advanced views on all of constructivist aspects of the Internet-based learning environments. However, there was a general situation that the students had higher preferred average scores than their actual average scores on all of dimensions in the questionnaire.

Firstly, the results of paired t-tests indicated many significant discrepancies in the preferred and actual forms in terms of the dimensions of "Ease of use," "Challenge," "Inquiry learning," "Reflective thinking," and "Epistemological awareness." From the students' perspectives, the learning environment supported by WeShare could not meet their

expectations of an online learning environment where can provide easy manipulation, challenging task and ample opportunities for extensive investigation, in-depth thinking and knowledge exploration. Such results were similar to previous studies indicating a mismatch between the students' perceptions of preferred and actual learning environments. Nonetheless, some insignificant differences between preferred and actual forms were found for the dimensions of "Relevance," "Multiple sources," "Students negotiation," and "Critical judgment." In terms of these aspects, the findings indicated the correspondences between the students' expectations of the Internet-based learning environments and perceptions of the WeShare learning environment in which they were engaged in reality. That is, the students considered that WeShare could offer them relevant and multiple information resources, as well as the chance to evaluate information resources and negotiate ideas with others.

*Table 1.* Paired t-test for the comparisons of the perceptions between preferred and actual environments (n=94).

	Perceptions of learning environment		t-value	p value
	Preferred Mean / S.D.	Actual Mean / S.D.		
Ease of use	4.43 / 0.53	3.52 / 0.68	-9.67	.00***
Relevance	4.25 / 0.56	4.16 / 0.56	-1.20	.24
Multiple sources	4.14 / 0.57	4.06 / 0.45	-1.20	.24
Challenge	3.85 / 0.48	3.51 / 0.49	-5.23	.00***
Student negotiation	3.91 / 0.58	3.82 / 0.47	-1.22	.22
Inquiry learning	4.15 / 0.56	3.91 / 0.40	-3.64	.00***
Reflective thinking	4.23 / 0.56	3.71 / 0.53	-6.89	.00***
Critical judgment	3.87 / 0.54	3.81 / 0.49	-0.80	.43
Epistemological awareness	4.04 / 0.58	3.83 / 0.52	-3.02	.00***

According to the results of cluster analyses, 94 students' participatory approaches to collective information searching activity were categorized as Unsociable, Sociable, and Balanced groups. An inspection of the dimension means for different approaches to CIS activity indicates that the students in Sociable and Balanced groups have higher scores on most of dimensions except for the dimension of inquiry learning, as shown in Table 2. Especially for the dimensions of "Relevance" and "Multiple sources," the students in both Sociable and Balanced groups expressed relatively higher scores (an average mean over 4) than those in Unsociable group.

*Table 2.* Comparisons of students' perceptions of actual learning environment among participatory approaches to collective information searching activity.

	Participatory approach			F	Scheffé test LSD
	Unsociable (n=36)	Sociable (n=25)	Balanced (n=33)		
Ease of use	3.46/0.69	3.55/0.71	3.57/0.64	0.25	
Relevance	3.96/0.60	4.19/0.52	4.36/0.48	4.79*	3>1
Multiple sources	3.91/0.44	4.12/0.35	4.19/0.48	3.99*	3>1
Challenge	3.44/0.53	3.54/0.40	3.57/0.52	0.70	
Student negotiation	3.67/0.56	3.86/0.38	3.97/0.37	3.79*	3>1
Inquiry learning	3.91/0.43	3.82/0.34	3.96/0.42	0.81	
Reflective thinking	3.61/0.63	3.73/0.42	3.81/0.48	1.32	
Critical judgment	3.69/0.51	3.80/0.36	3.95/0.52	2.46	
Epistemological awareness	3.68/0.56	3.93/0.45	3.94/0.51	2.77	

Wu, Y.-T., Chang, M., Li, B., Chan, T.-W., Kong, S. C., Lin, H.-C.-K., Chu, H.-C., Jan, M., Lee, M.-H., Dong, Y., Tse, K. H., Wong, T. L., & Li, P. (Eds.). (2016). *Conference Proceedings of the 20th Global Chinese Conference on Computers in Education 2016*. Hong Kong: The Hong Kong Institute of Education.

The ANOVA analysis was used to compare the students' perceptions of actual learning environments between different participatory approaches to the CIS activity. The results of the ANOVA analyses revealed significant differences in "Relevance" ( $F= 4.79, p< 0.05$ ), "Multiple sources" ( $F= 3.99, p< 0.05$ ), and "Student negotiation" ( $F= 3.79, p< 0.05$ ). The results of a series of post hoc tests (Scheffé tests) further indicated that the students in Balanced group had significantly higher scores than those in Unsociable group in terms of "Relevance" (4.36 v.s. 3.96), "Multiple sources" (4.19 v.s. 3.91), and "Student negotiation" (3.97 v.s. 3.67). Such results may imply that the students' participation in WeShare for performing CIS activity were critical to their deep awareness of the merits of the engaged learning environment.

#### 4. Conclusion and Discussions

Increasing studies have addressed the importance of integrating Web 2.0 applications with constructivism to offer students great opportunities of investing personal efforts to pursue constructivist learning and achieving successful learning outcomes (Enonbun, 2010). By assessing students' perspectives, the findings of this study supported the value of Web 2.0 to the development of constructivist Internet-based learning environments. Furthermore, students' active engagements in new learning environments would play an important role in developing more advanced views on different attributes of constructivist learning. Future research can employ more challenging assignments and develop specific mechanisms for facilitating social interactions on WeShare. Information from administering the CILE questionnaire could be used as a way for educators, researchers and system developers to examine the potential of WeShare environment designed for supporting constructivist learning. For example, according to the results of comparative and correlational analyses, there were some flaws in the implement of WeShare for supporting the attributes of "Ease of use," "Challenge" and "Reflective thinking" in the constructivist Internet-based learning environments, even for the students with higher engagements with WeShare activities. The huge gap between students' expectations and perceptions of the Internet-based learning environments for "Ease of use" denoted that WeShare application would be in need of reconstruction for a more user- intuitive and -friendly infrastructure. In addition, a reasonably higher level of challenging assignments should be integrated with the use of WeShare in support of learning and instruction. As these content-technical flaws are addressed for further improvement of WeShare, students could be involved with a relatively challenging learning environment which is helpful to promote reflective and metacognitive thinking (Wen, Tsai, Lin, & Chuang, 2004).

#### Acknowledgements

Funding of this paper is supported by Ministry of Science and Technology Council, Taiwan, under grant MOST 104-2511-S-017-003

#### References

- Gijbels, D., Watering, G., Van De., D. F., & Bossche, P V. D. (2006). New learning environments and constructivism: The students' perspective. *Instructional Science*, 34(3), 213-226.
- Lin, C.-C., & Tsai, C.-C. (2011). Applying social bookmarking to collective information searching (CIS): An analysis of behavioral pattern and peer interaction for co-exploring quality online resources. *Computers in Human Behavior*, 27, 1249-1257.
- Lin, C.-C., & Tsai, C.-C. (2012). Participatory learning through behavioral and cognitive engagements in an online collective information searching activity. *International Journal of Computer-Supported Collaborative Learning*, 7(4), 543-566.
- Tsai, C-C. (2004). Beyond cognitive and metacognitive tools: The use of the Internet as an 'epistemological' tool for instruction. *British Journal of Educational Technology*, 35, 525-536.