Using e-portfolios to elevate knowledge amassment among university students

Chi-Cheng Chang a,*, Chaoyun Liang b, Kuo-Hung Tseng c, Ju-Shih Tseng a

a Department of Technology Application & Human Resource Development, National Taiwan Normal University, No. 162, He-Ping E. Road, Section 1, Taipei 106, Taiwan
b Department of Bio-Industry Communication and Development, National Taiwan University, No. 1, Sec. 4, Roosevelt Road, Taipei 10617, Taiwan
c Graduate Institute of Business and Management, Meiho University, No.23, Pingguang Rd., Neipu, Pingtung, Taiwan

ABSTRACT

The study aimed to explore the effect of e-portfolios on knowledge amassment. Participants were juniors majoring in multimedia design and taking the course Analysis on Digital Game Industry at a university. They were randomly selected and assigned to an experimental group with 43 students or to a control group with 45 students. Students in the experimental group created their personal e-portfolios by using blogs, whereas students in the control group did not. The experiment lasted nine weeks, and took 3 h per week. The study results showed that the experimental group had significantly higher knowledge amassment after using e-portfolios than before. The experimental group had significantly better knowledge amassment than the control group did. This indicated that the effects of blog-based portfolios on knowledge amassment was significantly positive.

1. Introduction

E-portfolios are digitalized tools for collecting and presenting students' learning processes and outcomes systematically. In the process of creating paper-based portfolios, the critical problems are inquiries, revisions, storages, and management. However, e-portfolios cover these problems (Barrett, 2011). The process for creating e-portfolios is related to data collection, acquisition, revision, organization, presentation, storage, and accumulation. The process for using e-portfolios must involve information inquiry, application, sharing, and management. Contents for e-portfolios are all-inclusive, such as learning objectives, learning plans, projects, assignments, reflections, handouts, notes, journals, group discussions, tests and answers. Furthermore, results for self-assessment, peer assessment and feedback, and teacher assessment and feedback are also included (Barrett, 2010; Chang & Tseng, 2011; Fernandez & Illera, 2009). The information is not only general data, but also is useful information, such as handouts, notes, tests, and answers, which are worthy knowledge. Although projects, assignments, reflections, group discussions, peer assessment and feedback, and teacher assessment and feedback can only be general data and information, after a systematical management, reorganization, and accumulation, they can probably become useful knowledge.

Based on the explanations above, since e-portfolios may contain useful knowledge, processes for creating and using e-portfolios may of course involve acquisition, organization, storage, accumulation, inquiry, application, sharing, innovation, and management of knowledge. However, this is only a reasonable hypothesis, which has not yet been proved by empirical research. Although there is some literature suggesting that processes of creating and using e-portfolios have positive effects on knowledge-management behavior (Bozhko & Heinrich, 2011; Lorenzo & Ittelson, 2005; Palmer, Holt, Hall, & Ferguson, 2009; Tochel et al., 2009), the literature is based on theories, which has not been proven by empirical research and is not discussed with constructs of knowledge management including knowledge acquisition, integration, storage, accumulation, application, sharing, and innovation. Among these constructs, knowledge acquisition, integration, storage, and accumulation are highly related to e-portfolios. However, this is only a reasonable hypothesis that has not yet been proved by empirical research, so it is worth studying and is one of the motivations for the present study.

* Corresponding author. Tel.: +886 2 77343423; fax: +886 2 23921015.
E-mail addresses: samchang@ntnu.edu.tw, samchichengchang@ntnu.edu.tw (C.-C. Chang), cliang@ntu.edu.tw (C. Liang), gohome8515@gmail.com (K.-H. Tseng), jstseng@ntnu.edu.tw (J.-S. Tseng).

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Most studies about knowledge management have focused on knowledge acquisition, application, sharing, and innovation (Kimber, Pillay, & Richards, 2007), and few studies have focused on knowledge amassment. Knowledge amassment is a common name for knowledge storage and accumulation, which means that new acquired knowledge is integrated with existing knowledge, and further stored and accumulated (Franco & Mariano, 2007; Lee, Lee, & Kang, 2005; Lin & Wu, 2010; Plessis & Toit, 2006). According to the process of using e-portfolios, knowledge amassment integrates new acquired knowledge with existing knowledge and then stores it into a form that can be comprehended easily and retrieved in the future. Learners can reserve knowledge for applications in the future by the process of knowledge acquisition, integration, storage, and accumulation. The four constructs of knowledge amassment can probably be experienced during the use of e-portfolios. Berrill and Addison (2010) mentioned that knowledge can be more complete with reflections and thinking processes in e-portfolios. Although a study done by Peet et al. (2011) proved that e-portfolios possess functions of presentation and integration of knowledge, the study was based on the perspective of integrative learning, not the perspective of knowledge management. Do e-portfolios contain the positive effects of knowledge amassment mentioned above? Can e-portfolios facilitate the four constructs mentioned above? These two questions are issues that are worth studying, but they have not yet been proven by any empirical research. Therefore, the purpose of the present study is to examine the effect of e-portfolios on students’ knowledge amassment. The research questions are listed as follows:

1) Are students’ (experimental group) knowledge amassment (acquisition, integration, storage, accumulation, and the overall) after using e-portfolios significantly better than before?
2) Do students in the experimental group have significantly better knowledge amassment (acquisition, integration, storage, accumulation, and the overall) than students in the control group?

### 2. Literature review

#### 2.1. Knowledge amassment

There are many constructs of knowledge management. The most common constructs are knowledge acquisition, application, storage, accumulation, transferring, sharing, and innovation (Alavi & Tiwana, 2003; Award & Ghaziri, 2004; Artail, 2006; Franco & Mariano, 2007; Lee et al., 2005; Liebowitz, 2012). Among these constructs, knowledge storage and accumulation are related to each other, and are considered knowledge amassment. In general, knowledge must proceed with storage and accumulation in order to be effectively transferred to long-term memory. Lin and Wu (2010) pointed out that knowledge accumulation is to select useful knowledge from inner and outer, to integrate new acquired knowledge with existing knowledge, and to save and accumulate. Plessis and Toit (2006) also stated that knowledge amassment is to integrate and store new acquired knowledge with existing knowledge and then to accumulate all of the knowledge as complete knowledge. Other researchers suggested similar viewpoints that knowledge amassment includes accumulation and application of knowledge after purposely acquiring knowledge and integrating and storing it with existing knowledge (Donate & Guadamillas, 2010; Fong & Choi, 2009; Franco & Mariano, 2007). Thus, with a wide range, constructs of knowledge amassment contain knowledge acquisition, integration, storage, accumulation, and application. With a narrow range, constructs of knowledge amassment include knowledge acquisition, integration, storage, and accumulation. With a more narrow range, knowledge amassment only includes knowledge storage and accumulation.

#### 2.2. E-portfolios and knowledge amassing

Traditional paper-based portfolios cost too much time and manpower in data search, editing, saving, and management, especially could not be saved in each type of media, such as audio and video. Barrett (2010) suggested that e-portfolios can cover the disadvantages of storage in traditional paper-based portfolios. With advanced technology, students’ portfolios can be recorded and stored by the Internet and cloud storage. E-portfolios are to purposely collect students’ learning performance in order to understand their learning processes and outcomes. This collected information includes reflections, assignments, projects, artifacts, discussion records, lecture notes, test contents, learning thoughts, peer assessment and feedback, teacher assessment and feedback, and other evidence that can represent learning processes and outcomes. The collections and organizations of these are relevant to knowledge management behavior (Berrill & Addison, 2010; Bozhko & Heinrich, 2011; Lorenzo & Ittelson, 2005; Palmer et al., 2009; Tochel et al., 2009). Palmer et al. (2009) also indicated that students’ e-portfolios are tools for collecting documents, presenting learning performance, and writing reflections, which are related to knowledge storage and accumulation. E-portfolios are also a digital space for storing and accumulating students’ projects or artifacts as the functions of knowledge storage and accumulation.

Options for contents and knowledge organization in e-portfolios are customized and selective. E-portfolios enable learners to review their learning processes and outcomes by self-reflection and assessments from others, and they enhance learners’ knowledge management ability through the way of information presented (Palmer et al., 2009). Based on students’ reflections in e-portfolios, knowledge can be accumulated as whole knowledge by reflecting and thinking (Berrill & Addison, 2010). The use of portfolios can support learners’ reflecting process, formative and summative assessments, and knowledge management behavior (Tochel et al., 2009). While using e-portfolios, learners can further organize and systematize information in order to produce useful knowledge and improve self-management-knowledge behavior by collecting and presenting information with goals. According to integrated learning, Peet et al. (2011) confirmed that e-portfolios enable learners to present and integrate knowledge from the perspective of integrated learning. In summary, using e-portfolios enables learners to acquire, integrate, store, and accumulate knowledge.

### 3. Research method

#### 3.1. Participants

Participants were juniors majoring in multimedia design and taking the course Analysis on Digital Game Industry in a university. They were randomly selected and assigned to an experimental group with 43 students or to a control group with 45 students. There were a total
of 88 students, with 48 males and 40 females. Students in the experimental group created their personal e-portfolios by using a blog, whereas students in the control group did not. The experiment lasted nine weeks, and 3 h per week. Both groups had the same teaching schedule, curricular contents, and instructor.

3.2. Research framework

The pretest-posttest control-group design of quasi-experimental research was employed in the present study. Both groups were administered a scale of knowledge amassment before and after the experiment, as shown in Table 1. The t-test was employed to examine students’ differences in knowledge amassment, including knowledge acquisition, integration, storage, and accumulation, before and after using e-portfolios. Moreover, multivariate analysis of covariance (MANCOVA) with the pretest of knowledge amassment as covariance was applied for examining both groups’ differences in knowledge amassment. Finally, students’ reflections in the experimental group were analyzed and compared with the statistical results. The research framework is shown in Fig. 1.

3.3. Scale of knowledge amassment

The scale of knowledge amassment employed in the present study was developed and modified based on the scale provided by Lee et al. (2005), Franco and Mariano (2007), Loew, Kuemmel, Ruprecht, Bleimann, and Walsh (2007), Fong and Choi (2009), and Mansingh, Osei-Bryson, and Reichgelt (2009) with features of e-portfolios. The scale was firstly reviewed by the authors and instructors in order to ensure its appropriateness and readability and to establish its face validity. Afterward, the scale was reviewed by several experts in order to verify its intention of measuring knowledge amassment, check that the items’ are professional and accuracy, and establish its expert and content validity. These experts are professionals in the field of e-portfolios or knowledge management.

The scale includes four constructs: knowledge selection, knowledge extraction, knowledge storage, and knowledge retrieval. The measurement is based on the Likert 5-point scale. The higher the point, the more the participants agree with the item. Each construct contains five items, so there are a total of 20 items in the scale. The summary of each construct is shown as the following:

1. Knowledge acquisition: To acquire new knowledge through various methods.
2. Knowledge integration: To reorganize new knowledge with existing knowledge for useful knowledge.
3. Knowledge storage: To store new knowledge, existing knowledge, and integrated knowledge.
4. Knowledge accumulation: To re-store knowledge that has been accumulated and reorganized over and over again.

3.4. Blog-based portfolios

Students in the experimental group used blogs as a tool for creating e-portfolios. They created and presented their blogs on Station of Wretch provided by Yahoo. They also presented their learning goals, reflections, and projects on their blogs. Blogs help students write individual reflections as well as save projects, learning processes, and outcomes, and provide students the functions of automatic saving and searching, which enable students to organize and manage knowledge effectively. Furthermore, blogs can enhance interactions among students and make it convenient for students to create portfolios and search for knowledge (Lu, 2007). An example of one student’s blog-based portfolio is shown in Fig. 2.

3.5. Experimental procedure

The instructor integrated e-portfolios into the instruction. The instructional activities included the design of projects, reflective teaching, observation of projects, and peer feedback. The experimental group used blogs to create personal e-portfolios, but the control group did not. The experiment lasted nine weeks. There were three stages for the research procedure, which were preparation, implementation, and oral presentation and scale administering, as shown in Table 2.

3.6. Reliability and validity of the scale

3.6.1. Item analysis

The participants were categorized into high score and low score based on their scores of the pretest of knowledge amassment (Kelley, 1939). The t-test was conducted to examine if there are significant differences in each item between the high-score group and the low-score group. The results showed that the t value (Critical Ratio, CR) for all of the items were significant ($p < .05$), which implied that the discrimination for each item in the scale was good enough. Pearson’s correlation was also conducted for examining the relationship between the scores of each item and the scale. The result revealed that correlation coefficients were significant, which meant that each item was consistent with the whole scale. Thus, all the items were retained, as shown in Table 3.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>The pretest-posttest control-group design of quasi-experimental research.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Pretest</td>
</tr>
<tr>
<td></td>
<td>Knowledge amassment</td>
</tr>
<tr>
<td>Control</td>
<td>Knowledge amassment</td>
</tr>
</tbody>
</table>


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3.6.2. Factor analysis

If the conception of a construct is clear, stratified factor analysis can be conducted (Bryman & Cramer, 2011). As shown in Table 4, Bartlett’s test of sphericity was significant for each construct and the overall knowledge amassment, and Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was greater than .8, which was appropriate for factor analysis (Gravetter & Wallnau, 2008).

Principal components analysis with varimax rotation of orthogonal rotation was conducted for the factor analysis, so the information among factors would not overlap, and factor loadings were easy to explain (Howell, 2010). As shown in Table 5, since the factor loading for each item was greater than .5, none of the items in the scale had to be deleted (Hair, Black, Babin, & Anderson, 2010). The eigenvalue for each construct was greater than 1, so the existence of each construct was reasonable. The explained variance for each aspect was greater than 45%, implying that the validity of each construct was good.

3.6.3. Reliability

The reliability coefficients for the four constructs were greater than .8 and for the overall scale was greater than .965, as measured by Cronbach’s α, suggesting that the scale had a relatively high consistency.

4. Result and discussion

4.1. Differences in knowledge amassment of the experimental group between pretest and posttest

A paired-sample t-test was performed to examine the differences in the knowledge amassment between pretest and posttest results among students in the experimental group using e-portfolios. As shown in Table 6, they were significantly different in the overall knowledge amassment and the four constructs before and after the experiment. Students’ overall knowledge amassment and the four constructs after
creating e-portfolios were significantly better than before, which showed that the use of e-portfolios had a positive effect on students’ knowledge amassment.

4.2. Differences in knowledge amassment between two groups

Levene’s test of equality of covariance was insignificant for both groups’ knowledge amassment and four constructs, meaning that the homogeneity assumption was sustained, so analysis of variance (ANOVA) can be performed. The regression slope appeared insignificant for both groups’ knowledge amassment and four constructs, suggesting that the homogeneity assumption was sustained; therefore, multivariate analysis of covariance (MANCOVA) can be performed.

As shown in Table 7, both groups were significantly different in knowledge amassment and four constructs. As shown in Table 8, students in the experimental group had significantly better knowledge amassment and the four constructs than students in the control group had, indicating that the use of e-portfolios had a positive effect on knowledge amassment which significantly enhanced students’ knowledge amassment.

4.3. Analysis on contents of reflections

4.3.1. Advantages of using blogs as a platform of e-portfolios and knowledge amassment

The students in the experimental group were found to have significantly better knowledge amassment and four constructs than the students in the control group, showing that blog-based portfolios can be a platform for knowledge amassment. Students in the experimental group mentioned it in their reflections in e-portfolios:

S7: “After this course, I think the course is really helpful to my knowledge storage because I can post all the materials I have learned on the blog. The information posted on the blog will not be lost, so the course contents will be kept completely.”

S10: “Since virtual space on the Internet is very large, the information can be put on the blog and lots of useful pictures and data can also be stored. The data contains lots of valuable information and knowledge.”

4.3.2. Knowledge-acquisition behavior

During the process of using e-portfolios, students were expected to acquire and accumulate knowledge through reflections toward learning, achievement of learning goals, and projects. Students can also improve their own projects by observing and learning peers’ projects. Students in the experimental group expressed their thought about it in their reflections in e-portfolios:

S7: “When searching information or doing homework, referring to peers’ resources is relatively helpful. Sometimes, I can find information that is amazing.”

S16: “Observing peers’ projects can provide us various thoughts and give us chances to learn mutually. Besides reflections and reviews, we can also ask ourselves whether we have improved.”

4.3.3. Knowledge-integration behavior

Knowledge integration is reorganizing existing knowledge and new knowledge into useful knowledge. A student pointed out how to obtain useful knowledge by absorption, reorganization, and integration:
"When writing blogs, my brain recalled the knowledge that was acquired before. After management and reorganization, the knowledge became useful knowledge. The useful knowledge can be retrieved whenever I need it, which is convenient for me to absorb and accumulate knowledge. Thus, there is lots of knowledge that have been stored and accumulated on the blog."

Furthermore, there was a student suggesting that the process of integration made the learning become effective because he is able to compare new knowledge with existing knowledge:

"Using blogs to store knowledge can help a student understand his learning status by comparing existing knowledge with new acquired knowledge. This way helps me store and manage knowledge efficiently in my learning."

4.3.4. Knowledge-storage behavior

In the process of using e-portfolios, students were expected to obtain and store more knowledge by reflecting on and revising their own projects as well as observing and learning peers’ projects. Some students mentioned that a blog can make up for a deficiency of memory because it has a feature of storing knowledge in their reflections:

"There are many sources for knowledge, such as reflections and revisions toward our own projects, teacher assessments, and peer observation. These sources enable us to store more knowledge."

"Since human brains have limited memory sizes, a person cannot record all knowledge. However, blog-based portfolios can help us record and store knowledge that is acquired in classes."

4.3.5. Knowledge-accumulation behavior

The purpose of knowledge accumulation is to store knowledge over and over again while existing knowledge accumulates and re-organizes continuously. Students use blog-based portfolios to record acquired knowledge because it has a function of accumulation for the knowledge database. It acts as notes for students to accumulate and review acquired knowledge in any time. Some students’ reflections are the following:

"Writing blogs is to take notes on acquired knowledge, which is helpful to knowledge review."

"Writing blogs is to create a project, which will not be forgotten easily. To accumulate over a long period will be beneficial to knowledge accumulation."

"After writing blogs, blogs can enhance memory and act as knowledge database which can accumulate and broaden knowledge in any time."

4.4. Discussion

The study result revealed that e-portfolios had a significantly positive effect on students’ knowledge amassment. This result reminds teachers that e-portfolios can be integrated into their instructions and enhance students’ abilities on knowledge amassment. Students in the experimental group had significantly better knowledge amassment and four constructs after using e-portfolios than before. Students using e-portfolios had significantly better knowledge amassment and four constructs than students without using e-portfolios, which was
consistent with some studies stating that “portfolios are a facilitator for knowledge-management behavior” (Bozhko & Heinrich, 2011; Budak & Budak, 2011; Lorenzo & Ittelson, 2005; Palmer et al., 2009; Tochel et al., 2009). However, constructs of knowledge management were not discussed in these studies, whereas empirical research was applied in the present study for confirming the construct of knowledge management - knowledge amassment.

The study results were also consistent with the study done by Berrill and Addison (2010) suggesting that reflecting and thinking in the e-portfolios enables knowledge to be accumulated into complete knowledge, and the study done by Peet et al. (2011) confirming that knowledge can be presented and integrated in e-portfolios. However, only theories and knowledge accumulation were discussed in the study done by Berrill and Addison, and only effects of integrative learning, not knowledge management, were discussed in the study of Peet et al. Empirical research was applied in the present study for confirming the four constructs of knowledge amassment (i.e. knowledge acquisition, integration, storage, and accumulation). This result showed that knowledge amassment can be an indicator of the effects of using e-portfolios for teachers and students. In the past, most studies about e-portfolios focused on learning performance or learning

### Table 5
Factor analysis.

<table>
<thead>
<tr>
<th>Knowledge amassment</th>
<th>Item</th>
<th>Factor loading</th>
<th>Eigenvalue</th>
<th>Explained variance</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge acquisition</td>
<td>5.</td>
<td>.702</td>
<td>3.663</td>
<td>45.783</td>
<td>.877</td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td>.700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td>.697</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td>.693</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td>.626</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge integration</td>
<td>4.</td>
<td>.790</td>
<td>3.778</td>
<td>47.221</td>
<td>.876</td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td>.775</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td>.743</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.</td>
<td>.730</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge storage</td>
<td>1.</td>
<td>.842</td>
<td>4.227</td>
<td>46.962</td>
<td>.890</td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td>.755</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td>.720</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td>.701</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>5.</td>
<td>.597</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge accumulation</td>
<td>5.</td>
<td>.779</td>
<td>4.286</td>
<td>47.627</td>
<td>.886</td>
</tr>
<tr>
<td></td>
<td>1.</td>
<td>.746</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.</td>
<td>.697</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.</td>
<td>.651</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.</td>
<td>.642</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.965</td>
</tr>
</tbody>
</table>

### Table 6
A summary of t-test for the differences in knowledge amassment of the experimental group between pretest and posttest.

<table>
<thead>
<tr>
<th>Knowledge amassment</th>
<th>Pretest</th>
<th>Posttest</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Acquisition</td>
<td>31.137</td>
<td>.423</td>
<td>33.655</td>
<td>.430</td>
</tr>
<tr>
<td>Integration</td>
<td>31.407</td>
<td>.485</td>
<td>33.615</td>
<td>.478</td>
</tr>
<tr>
<td>Storage</td>
<td>34.182</td>
<td>.593</td>
<td>38.452</td>
<td>.572</td>
</tr>
<tr>
<td>Accumulation</td>
<td>34.927</td>
<td>.536</td>
<td>37.941</td>
<td>.525</td>
</tr>
<tr>
<td>Overall</td>
<td>132.638</td>
<td>1.5264</td>
<td>143.663</td>
<td>1.63</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01.

### Table 7
MANCOVA on both groups’ knowledge amassment.

<table>
<thead>
<tr>
<th>Source</th>
<th>Knowledge amassment</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>Sig.</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariance (Pretest)</td>
<td>Knowledge acquisition</td>
<td>539.471</td>
<td>1</td>
<td>539.471</td>
<td>55.100</td>
<td>.000***</td>
<td>.359</td>
</tr>
<tr>
<td></td>
<td>Knowledge integration</td>
<td>507.738</td>
<td>1</td>
<td>507.738</td>
<td>64.210</td>
<td>.000***</td>
<td>.382</td>
</tr>
<tr>
<td></td>
<td>Knowledge storage</td>
<td>739.007</td>
<td>1</td>
<td>739.007</td>
<td>62.669</td>
<td>.000***</td>
<td>.376</td>
</tr>
<tr>
<td></td>
<td>Knowledge accumulation</td>
<td>756.027</td>
<td>1</td>
<td>756.027</td>
<td>53.927</td>
<td>.000***</td>
<td>.353</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>10,051.193</td>
<td>1</td>
<td>10,051.193</td>
<td>109.369</td>
<td>.000***</td>
<td>.563</td>
</tr>
<tr>
<td>Between-group</td>
<td>Knowledge acquisition</td>
<td>151.386</td>
<td>1</td>
<td>151.386</td>
<td>19.145</td>
<td>.000***</td>
<td>.186</td>
</tr>
<tr>
<td></td>
<td>Knowledge integration</td>
<td>118.900</td>
<td>1</td>
<td>118.900</td>
<td>12.144</td>
<td>.001**</td>
<td>.126</td>
</tr>
<tr>
<td></td>
<td>Knowledge storage</td>
<td>395.562</td>
<td>1</td>
<td>395.562</td>
<td>28.215</td>
<td>.000***</td>
<td>.251</td>
</tr>
<tr>
<td></td>
<td>Knowledge accumulation</td>
<td>285.084</td>
<td>1</td>
<td>285.084</td>
<td>24.176</td>
<td>.000***</td>
<td>.223</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>3587.244</td>
<td>1</td>
<td>3587.244</td>
<td>39.033</td>
<td>.000***</td>
<td>.315</td>
</tr>
<tr>
<td>Within-group</td>
<td>Knowledge acquisition</td>
<td>822.421</td>
<td>84</td>
<td>9.791</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knowledge integration</td>
<td>664.225</td>
<td>84</td>
<td>7.907</td>
<td></td>
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<tr>
<td></td>
<td>Knowledge storage</td>
<td>990.550</td>
<td>84</td>
<td>11.792</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Knowledge accumulation</td>
<td>1177.626</td>
<td>84</td>
<td>14.019</td>
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<td></td>
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<tr>
<td></td>
<td>Overall</td>
<td>7811.664</td>
<td>84</td>
<td>91.902</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**p < .01, ***p < .001.
strategies (Alexander & Golja, 2007; Chuang, 2010; Hernandez-Patnode & Lee, 2009; Tochel et al., 2009). Currently, there is a lack of studies examining effects of e-portfolios on knowledge amassment, so the present study is considerable important. The study results in the present study can be a reference for people who promote e-portfolios.

Among the four constructs, knowledge storage had the greatest effect followed by knowledge accumulation, and knowledge integration had the smallest effect. This outcome showed that blog-based portfolios had a significant effect on knowledge of storage and accumulation but less effect on knowledge integration probably because knowledge amassment is a combination of knowledge storage and accumulation, and knowledge is essentially difficult to be integrated. Therefore, these outcomes are rational. The results can inform teachers and students focusing on knowledge storage and accumulation when using blog-based portfolios in the future can enhance that students’ knowledge amassment. Moreover, teachers should enhance activities of knowledge integration in order to facilitate the effect of e-portfolios on knowledge integration.

According to the reflection contents from the students in the experimental group, students expressed that blog-based portfolios with a function of knowledge accumulation were beneficial to their knowledge acquisition, integration, storage, and accumulation. However, there were students mentioning the problem of blogs posted on the Internet. The prescription of effectiveness of knowledge may be lost because its long-time post or they close the blog. Hence, those teachers or students who want to use blog-based portfolios need to pay attention to the prescription or effectiveness of blogs on the Internet in order to confirm the effect of knowledge amassment. Furthermore, a function of search is also needed for knowledge storage, so those designers who want to design blogs or knowledge databases also need to pay attention to functions for categorizing and searching for information. Categorization and search must be concise and rational for users to search for knowledge conveniently.

5. Conclusion and implication

Due to the limitation of the number of the participants, the researcher in the present study could only assign them into two groups. For future experiment, a third group using paper-based portfolios can be formed for comparison. Students in the experimental group used blogs to create e-portfolios. However, there are many other types of tools for creating e-portfolios, such as FrontPage, Facebook, Plurk, Twitter, and Wiki. Therefore, one of the limitations is that the study results may not be generalized to other types of e-portfolios. Can these different types of e-portfolios also enhance knowledge amassment? The differences in knowledge amassment among different types of e-portfolios can be compared in future studies. For instance, Wiki contains a strong function for editing, which allows users to write and edit jointly. Do wiki-based portfolios have a better effect on learners’ knowledge amassment and knowledge management? This should be further examined. Additionally, effects of e-portfolios on other constructs of knowledge management, such as knowledge sharing and knowledge innovation, can be examined because knowledge sharing and innovation are crucial constructs of knowledge management and have similar features with e-portfolios.

References


