Is Online Goal Setting Mechanisms Effective in Facilitating Self-Regulated Learning for Computer Course? Web-based Portfolio vis. Paper-based Portfolio

Chi-Cheng Chang[a];Yueh-May Liao[b]

Department of Technology Application and HRD, National Taiwan Normal University,Taiwan[a]
Department of Data Processing,Yifan Senior High School,Taiwan[b]
Corresponding Author Email: samchang@ntnu.edu.tw

BACKGROUND
Goal setting is one of the essential activities in the procedure of web-based portfolio assessment (WBPA). In order to achieve self-set goals, students regulate their own learning as time goes by. Accordingly, goal-setting facilitates self-regulated learning (SRL) and is an important factor that affects SRL. Some studies confirmed that SRL is facilitated by goal setting. Actually, the portfolio itself shares features with SRL. Portfolios guide students during a learning process, and continuous self regulation is performed based on self-set goals. An e-portfolio is helpful to SRL. Consequently, goal setting mechanisms are obviously crucial. In addition, Therefore, how online goal setting mechanisms can be implemented with the advantages of the Internet to enhance students' SRL is an important issue.

PURPOSE
The purpose of the present study was to construct goal setting mechanisms in a web-based portfolio assessment system (WBPAS), based on the self-regulated learning (SRL) process proposed by Zimmerman, and to examine effects of these mechanisms on SRL.

DESIGN/METHOD
The participants were two classes of 11th graders taking the "Digital Data Processing" class in a vocational high school. The participants were assigned randomly to either an experimental group (n=40) learning with a WBPAS or a control group (n=41) learning with a paper-based portfolio. The pretest-posttest controlled group design, an approach of quasi-experimental research design, was conducted in the present study.

RESULTS
Both groups were significantly different in learning motivation, self-efficacy and subject value, and the experimental group had significantly higher scores in these three aspects than the control group, meaning that the effect of WBPAS on SRL was greater than the effect of paper-based portfolio. Both groups were significantly different in self-judgment (F=4.371, p<0.05), and the experimental group had significantly higher scores in overall self-judgment and self-judgment comparing with teacher criteria than the control group did, meaning that the effect of WBPAS on self-judgment was greater than the effect of paper-based portfolio.

CONCLUSIONS
The result revealed that the students setting learning goals with the WBPAS demonstrated significantly better SRL than students setting learning goals with the paper-based portfolio. The goal setting mechanisms in the WBPAS were appropriate to curricula that require students to submit computerized works. Hence, in order to avoid a bias generalization, curricular property, instructional situation, participants and students' background should be taken into consideration, if the study results were applied. This is exactly the limitation of the study.

KEYWORDS
Goal setting, Self-regulated learning, Portfolio, Portfolio Assessmen

Introduction

A.Goal-Setting in Web-Based Portfolio Assessment and Self-Regulated Learning

Goal setting is one of the essential activities in the procedure of web-based portfolio assessment (WBPA) (Chang, Tseng, Chou & Chan, 2011). In order to achieve self-set goals, students regulate their own learning as time goes by. Accordingly, goal-setting facilitates self-regulated learning (SRL) and is an important factor that affects SRL. Some studies confirmed that SRL is facilitated by goal setting (Latham & Locke, 1991; Zimmerman, 2008). Actually, the portfolio itself shares features with SRL. For example, during the development of portfolios, students improve themselves through reflections which are often performed based on self-set goals. Portfolios guide students during a learning process, and continuous self regulation is performed based on self-set goals (Heo, 2000). Abrami, Wade, Pillay, Aslan, Bures, and Bentley (2008), Carneiro, Lefrere, Steffens and Underwood (2011) argued that an e-portfolio is helpful to SRL. Consequently, goal setting mechanisms are obviously crucial. In addition, Riedinger (2004) pointed out advantages of a web-based portfolio, including that: a) it is not restricted by time and space; b) it is convenient to be browsed by peers; c) it is easy for peers to share with one another and to give feedback; and d) it is convenient for peers to view others' learning goals. Therefore, how online goal setting mechanisms can be implemented with the advantages of the Internet to enhance students' SRL is an important issue.

B.Online Goal-Setting Mechanisms

Since goal setting facilitates SRL, goal-setting mechanisms in a web-based portfolio assessment system (WBPAS) are apparently crucial. There is a lack of relevant studies about goal-setting mechanisms that facilitate students' SRL. However, recent studies about formative assessment systems or SRL systems can be the reference for researchers. Wang (2011) enhanced students' SRL and learning performance by review and feedback mechanisms in a formative assessment system. Arsal (2010) adopted a diary as a tool of SRL for pre-service science teachers. The attributes of the diary are similar to the portfolio. Both the diary and the portfolio allow students to review their learning progress. Actually, the diary is appropriate for keeping track of students' development of SRL (Neber&Schommer-Aikins, 2002; Schmitz &Wiese, 2006). A WBPAS can facilitate SRL more because it features the attributes of diary and formative assessment. Hwang, Chu, Chen, Wang, Tseng and Hwang (2007) enhanced students' learning performance through SRL mechanisms in an online SRL system and online learning activities. Their study results revealed that most students believed that SRL process was helpful to their learning. Hence, the system did facilitate students' SRL and learning performance.

C.Research Objectives and Questions

However, are the online goal setting mechanisms mentioned above appropriate to be implemented in a WBPAS? Are they enough for a WBPAS? What goal setting mechanisms should be included in a WBPAS? Are these goal-setting mechanisms helpful to students' SRL? Do students learning with goal setting mechanisms in a WBPAS perform better than students learning with paper-based portfolio? What aspects of SRL can be enhanced? As Azevedo (2005) and Kollar and Fischer (2006) argued that environment is beneficial to SRL. According to the background above, the purpose of the present study was to construct online

goal setting mechanisms in a WBPAS and to examine its effects on SRL. The research questions are the following:

- What is the level of student satisfaction about the online goal setting mechanisms in the WBPAS
- Are there any significant differences on SRL between students learning with the WBPAS and students learning with paper-based portfolio?

Research Method

A.Participants

Participants in the present study were two classes of 11th graders taking a "Digital Data Processing" class at a vocational high school in Taiwan. The participants were randomly assigned to either an experimental group learning with a WBPAS (40 participants) or a control group learning with paper-based portfolio (41 participants). There were a total of 81 participants, with 36 males and 45 females. The content of the course was primarily webpage design. It was a hands-on computer course which required students to complete and submit works via computer and to set goals, so it was appropriate to be implemented with the WBPAS. The main similar between WBPAS and paper-based portfolio is that the items in both types of portfolios are the same. The mail differences are that the presentation and organization formats of the items in both types of portfolios are quite different.

B.Research framework

The pretest-posttest controlled group design, anapproach of quasi-experimental research design, was conducted in the present study, as shown in Table 1. The effect of goal setting mechanisms in the WBPAS on SRL was examined in the present study.

Table 1: Experimental design

Group	Pretest	Treatment	Posttest
Experimental	Grades in last semester, SRL	set learning goals by WBPAS	SRL
Control	Grades in last semester, SRL	set learning goals by paper-basedportfolio	SRL

C.Variables

The independent variable was goal setting method, while the dependent variable was SRL. There were four aspects in SRL, including learning motivation (e.g., self-efficacy, subject value, and learning anxiety), self-observation, self-judgment (e.g., peer model, criteria, self-set goal), and self-reaction (e.g., adaptive and defensive).

- Learning motivation: Learners' learning willingness and ambition.
  - Self-efficacy: A learner's belief about whether his performance satisfies the preset goal.
  - Subject value: A learner's belief about the importance of learning a subject or task.
  - Learning anxiety: A learner's level of anxiety and pressure toward a subject test.
- Self-observation: Learners' records and monitor status about their achievement of preset goals.

- Self-judgment: Learners' belief about whether they achievepreset goals based on work of peers, criteria set by teachers, and goals set by themselves.
    - Peer model: Learners beliefs about whether they achieved preset goals based on work of peers.
    - Teacher criteria: Learners beliefs about whether they achieved preset goals based on criteria set by teachers.
    - Self-set goals: Learners beliefs about whether they achieved preset goals based on goals set themselves.
- Self-reaction: Learners' feelings toward their progress on goal achievement.
    - Adaptive self-reaction: Learners' positive feelings and acceptance toward their progress on goal achievement.
    - Defensive self-reaction: Learners' negative feelings and resist toward their progress on goal achievement.

D.Experimental procedure

The experiment lasted for ten weeks and there were two hours per week. Learning activities for each week are described as the following.

- First week

The teacher explained general ideas of the WBPAS and the meaning of goal setting to experimental group in the class. For the experimental group to have a better understanding of goal setting mechanisms in the WBPAS, the teacher provided the course information, demonstratedthe use of goal setting mechanisms in the system and skills of goal setting, and allowed students to practice the basic techniques of using the WBPAS. For the control group, the teacher provided the course information and explained goal setting skills of paper-based portfolio to students. The questionnaire on SRL was administered as the pretest to both groups in the first week.

- Second to fourth weeks

For both groups, the teacher gave lectures in the class. Students' performance on goal setting was assessed by the teacher and teacher assistant each week. For the experimental group, students engaged in each learning activity, such as goal setting, goal review and feedback, goal revision, work uploading, self-assessment on achievement of learning goal in the previous week, and anonymous peer assessment, with the WBPAS. For the control group, students engaged in each learning activity, such as goal setting, work collection, self-assessment on the achievement of learning goal in the previous week, and peer assessment, with paper-based portfolio. The class schedule for both groups was the same.

- Fifth week

For the experimental group, students engaged in online work review and online portfolio assessment (e.g., teacher assessment, student self-assessment and peer assessment and feedback), and the questionnaire toward the satisfaction of goal setting mechanisms was administered. For the control group, students engaged in work review and paper-based portfolio assessment (e.g., teacher assessment, student self-assessment and peer assessment and feedback). Those activities are requirement after the class for both groups. Both groups have the same assessment activities but different performing ways (online versus non-online). Moreover, both groups have the same course content and teaching schedule.

- Sixth to tenth weeks

The course content from the sixth to the tenth weeks was different from the course content from second to fifth week. Both groups were required to repeat the learning tasks they performed from second to fifth week. In the tenth week, both groups engaged in the second time of work review and portfolio assessment, and the questionnaire for SRL was administered as the posttest.

E.SRL measurement

Wu's (2005) SRL questionnaire was employed in the present study. His questionnaire was developed based on the framework of SRL proposed by Bandura (1986), Pintrich, Smith, Garcia and McKeachie (1991, 1993), Schunk (2005), and Zimmerman (2002). Most SRL questionnaires, such as Motivated Strategies for Learning Questionnaire (MSLQ) of Pintrich et al., included two main aspects, which were learning motivation and learning strategy. Zimmerman's (2002) self-regulated learning included motivation, self-control, self-observation, self-judgmentand self-reaction process. Schunk's (2005) self-regulated learning included self-observation, self-judgmentand self-reaction process. In addition to learning motivation, the questionnaire in the present study included self-observation, self-judgment, and self-reaction. The validity and reliability of the questionnaire were analyzed by factor analysis.

The questionnaire contained four aspects, which were learning motivation (sub-aspects: self-efficacy, subject value and learning anxiety), self-observation, self-judgment (sub-aspects: peer model, criteria and self-set goal) and self-reaction (sub-aspect: adaptive and defensive). There were a total of 50 items in the questionnaire. The participants were required to rate themselves on a 7-point Likert-type scale with response options from 1 (extremely disagree) to 7 (extremely agree).

The reliability coefficients of the aspects and sub-aspectswerehigher than .86, as measured by Cronbach's α, suggesting that the items had relatively high internal consistency.

Online Goal Setting Mechanism in WBPAS

Online goal setting mechanisms were embedded in the WBPAS. Functions for the system included: a) a guideline for creating a portfolio; b) an area for creating a portfolio with functions of adding new goals (setting due date for achieving goals, check point for the goal progress, and outline for goal setting guideline), adding new works, and adding new reflection (searching tools, outline for reflection guideline, and reflection prompts); c) an area for reviewing portfolio with functions of reviewing goals, reviewing reflections and reviewing works; d) an area for review of peer portfolios with functions of observing peer reflections, observing peer goals, and observing peer works; and e) an area for portfolio assessment with functions of checking grades of assessment, self-assessment and peer assessment.

A.Online goal setting and editing

A goal setting table with functions of writing and editing goals was designed and developed in the WBPAS in the present study for assisting students to set personal learning goals. Students set their learning goals and due dates based on their own pace, and then planned to achieve goals before the due dates, as shown in Figure 1. The system also provided an online instant revising function, which allowed students to adjust their learning goals based on their learning progress.

In addition, the system also provided an outline for setting learning goals (including the scope and emphasis of learning goals), which arrows students to easily writing learning goals.

B. Online learning goal review and feedback

Students would be able to improve their learning goals and progress by observing others' learning goals and progress via online learning goal review mechanism. Students could exchange ideas toward learning goals with one another and encourage one another through the feedback mechanism. Peer review and feedback facilitated students' goal identification, maintained students' learning motivations, and enhanced students' continuance to achieve their learning goals.

C. Online learning goal assessment mechanism

Online learning goal assessment mechanisms included self assessment and peer assessment. To stimulate continuance learning, students could judge their status of achieving learning goals based on their learning performance. The learning goal performance scale in the WBPA proposed by Chang et al. (2011) was embedded as web pages in the system, which could be filled online by students and be checked instantly for statistics results. The reliability and validity of the goal performance scale were verified by an experiment research and were highly adequate.

In order to understand students' regulated progress of learning goals, the system kept goal setting and editing in record for teachers and students to review their status of goal setting and editing.

Results

As shown in Table 2 and 3, both groups were significantly different in learning motivation, self-efficacy and subject value, and the experimental group had significantly higher scores in these three aspects than the control group, meaning that the effect of WBPAS on SRL was greater than the effect of paper-based portfolio.

Table 2: The mean and standard deviation of self-regulated learning for both groups

Aspect	Experimental group		Control group	
	M	SD	M	SD
Learning motivation	83.77	13.46	75.83	10.13
Self-efficacy	37.43	4.66	33.79	5.01
Subject value	25.90	0.88	22.85	0.88
Learning anxiety	19.87	1.06	19.18	1.08
Self-observation	24.59	1.06	23.30	1.03
Self-judgment	53.11	1.44	48.12	1.72
Peer model	16.21	0.82	15.19	0.91
Teacher criteria	17.39	0.60	15.43	0.68
Self-set goal	18.88	0.55	18.67	0.62
Self-reaction	31.17	1.09	30.01	1.09
Adaptive	18.48	0.89	17.64	0.94
Defensive	12.93	1.16	12.71	1.38
Overall SRL	190.99	4.66	177.51	5.019

Table 3 shows that there was no significant difference in self-observation between the two groups. This implied that the WBPAS had no significant effect on self-observation. Both groups were significantly different in self-judgment ($F=4.371$, $p<0.05$), and the experimental group had significantly higher scores in overall self-judgment and self-judgment comparing with teacher criteria than the control group did, meaning that the effect of WBPAS on self-judgment was greater than the effect of paper-based portfolio. There was no significant difference in self-reaction between the two groups, which revealed that the WBPAS had no significant effect on self-reaction.

Both groups were significantly different in overall SRL ($F=7.025$, $p<0.05$), revealing that students learning with the WBPAS significantly outperformed students learning with paper-based portfolio in SRL.

Table 3: The difference in SRL between both groups using ANCOVA

Aspect	Source of variation	*F*	Sig.	Effect size
Learningmotivation	Academic grade	0.209	0.649	0.003
	Pretest	12.699	0.001	0.161
	Group	7.810	0.007**	0.106
Self-efficacy	Academic grade	0.411	0.524	0.006
	Pretest	8.836	0.004	0.118
	Group	4.192	0.045*	0.060
Subject value	Academic grade	0.351	0.556	0.005
	Pretest	30.463	0.000	0.316
	Group	7.837	0.007**	0.106
Learning anxiety	Academic grade	1.583	0.213	0.023
	Pretest	21.586	0.000	0.246
	Group	.696	0.407	0.010
Self-observation	Academic grade	0.782	0.380	0.012
	Pretest	15.330	0.000	0.188
	Group	1.192	0.279	0.018
Self-judgment	Academic grade	0.532	0.468	0.008
	Pretest	80.315	0.000	0.549
	Group	4.371	0.040*	0.062
Peer model	Academic grade	0.124	0.725	0.002
	Pretest	67.463	0.000	0.505
	Group	0.330	0.567	0.005
Teacher criteria	Academic grade	1.711	0.195	0.025
	Pretest	21.242	0.000	0.243
	Group	5.787	0.019*	0.081
Self-set goal	Academic grade	0.255	0.615	0.004
	Pretest	38.350	0.000	0.368
	Group	0.793	0.377	0.012
Self-reaction	Academic grade	6.738	0.012	0.093
	Pretest	1.881	0.175	0.028
	Group	0.173	0.679	0.003
Adaptive	Academic grade	5.291	0.025	0.074
	Pretest	4.147	0.046	0.059
	Group	0.686	0.411	0.010
Defensive	Academic grade	0.373	0.543	0.006
	Pretest	9.535	0.003	0.126
	Group	0.698	0.406	0.010
Overall SRL	Academic grade	0.301	0.585	0.005
	Pretest	25.560	0.003	0.279
	Group	7.025	0.010*	0.096

Note: Academic grade for last semester and pretest are the co-variances; *p<0.05 ,**p<0.01

Discussion and Conclusion

Students using WBPAS to set goals outperformed students using paper-based portfolio to set goals in overall SRL and several related aspects. This showed that the online goal setting mechanisms in the WBPAS were more effective. The study results were consistent with the study results by Arsal (2010) and Wang (2011). The instruments employed by the present study and the studies of Arsal and Wang belonged to the formative assessment. Arsal asked pre-service science teachers to use a diary for 14 weeks, and the result showed that teachers using a diary outperformed teachers without using a diary in SRL. The study by Wang revealed that students using web-based formative assessment outperformed students using traditional assessment in SRL. However, the educational intervention in Wang's study was Peer-Driven Assessment Module of the Web-based Assessment and Test Analysis System (PDAM-WATAS), and participants were seventh graders, which were different from theintervention and participants in the present study. There were also studies confirming that learning motivation and performance could be facilitated and enhanced by SRL with a technology enhanced environment (Greene &Azevedo, 2007; Greene, Costa, Robertson, Pan, &Deekens, 2010; Kramarski&Gutman, 2006; Santhanam, Sasidharan, & Webster, 2008; Wang, 2011).Therefore, technology-assisted goal setting plays an important role in enhancing learning performance.

The goal setting mechanisms in the WBPAS were appropriate to curricula that require students to submit computerized works. Hence, in order to avoid a bias generalization, curricular property, instructional situation, participants and students' background should be taken into consideration, if the study results were applied. This is exactly the limitation of the study. Moreover, the sample size may be bigger for getting a reliable result. Dabbagh and Kitsantas (2011) proposed that a personal learning environment established by social media can facilitate students' SRL. Carneiro et al. (2011) also mentioned that a blog is probably more helpful to SRL than e-portfolio because a blog not only possesses the features of diary but also provides a chance to students to share and give feedback. With these theories, blog-based portfolio or micro-blog-based portfolio can be employed as an educational intervention in the future studies for facilitating SRL behavior.

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