

# Facilitating Students to Pass Certificate Tests via Blended E-Learning with Self-Regulated Learning: A Quasi-experimental Approach

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*Abstract:* - The vocational schools in Taiwan regard professional certifications as a badge of skills achievement. However, due to a national policy, pure online courses are not permitted. In this study, the authors conducted a quasi-experiment to examine the effects of applying blended learning (BL) with web-enabled self-regulated learning (SRL) to enhance students' skills of deploying database management system (DBMS). Two classes in successive semesters, with a total of 177 second-year students, were taken as two distinct groups. We took the first-year study, deploying a traditional way of teaching, as the control group. While the second year's study, deploying a teaching model of BL with SRL, functions as the treatment group. The results showed that students in the group of BL with SRL had significantly higher pass rate of certification than those in the control group, and had a positive attitude toward the teaching method of BL with SRL.

*Key Words:* - Blended Learning, Web-Enabled SRL, e-learning, Vocational Students, Computing Education

## 1 Introduction

Vocational education in Taiwan is highly competitive in that it must attract sufficient student enrollment in the face of continually decreasing birth rate and rapidly increasing number of schools. Schools, facing the high pressure of market competition, often emphasize the proportion of students awarded such certificates before they graduate. However, students in these schools tend to have lower levels of academic achievement. They spend more time on part-time jobs, and do not get involved in their schoolwork adequately. They also, care less about their grades. Teaching in such a

context, particularly teaching the curriculums of application software and target on getting certificates, is a great challenge to most educators.

The vocational education system constantly evolves to meet the needs and the new demand for highly skilled manpower, the continued progress of modern technology, the worldwide economic development, the changing industrial structure, and the social/cultural changes. The networked technology applied for education holds significant potential in advancing the interactivity between learners and tutors, in offering flexibility for the means of learning, and in providing easy, one-stop

maintenance and reusability of resources ([1], [2], [3]). However, the policy of e-learning in Taiwan is relative conservative in contrast with that in the U.S., for example, earning an academic degree entirely through online courses is not allowed. Moreover, it is also suggested by universities and the Ministry of Education that a teacher give online classes for only about fifty percent of the semester. That is, teachers have to adopt blended learning rather than pure online learning when implementing e-learning.

In web-based learning environments, the physical absence of the instructor and the increased responsibility demanded of learners to effectively engage in learning tasks may present difficulties for learners, particularly those with low self-regulatory skills [4]. It is a big challenge for teachers to help college students, who are often addicted to the Internet, engage in an online course in an environment with filled with millions of interesting websites, free online games, and online messenger. In this context, it is very important to develop students' skills of self-regulated learning (SRL) to manage their learning in web-based learning environments [5]. Implementing e-learning for students with low self-regulatory skills inevitably runs high risks.

Students in the online environment equipped with SRL competence become more responsible for their learning and more intrinsically oriented [6]. However, there has been relatively little empirical research on the effects of SRL on students' behaviors in such complex technology-based learning environments [7]. Thus, we applied SRL in this study to help students, vocational students in Taiwan in specific, concentrate on their learning, practice their schoolwork, and furthermore, take responsibility for their learning.

There are some studies comparing the effectiveness between blended learning (BL) and traditional face-to-face learning. However, it is necessary to further explore the effective online instructional methods for vocational students. In this regard, we redesigned a course in application software to integrate blended learning, innovative teaching method and learning technologies to help students learn and get the related certificate. Specifically, this study explored the effects of BL and SRL on the development of vocational students' skills in using database management system.

## 2 Methods

### 2.1 Participants

The participants in this study were 177 vocational students from two semesters taking a compulsory course titled 'Database Management System' in a university of science and technology in Taiwan. None of them majors in information or computer technology. Students at this university were expected to spend much more time and effort in mastering a variety of technological skills as compared to those in comprehensive universities in Taiwan.

### 2.2 Course Setting

The course is a semester-long, 2 credit-hour class, targeting second-year college students from different major fields of study. Students received a study task dealing with the subject of Microsoft Access. The major focus of this course was to develop students' skills in applying the functions of Microsoft Access. Moreover, the course targeted helping students to get the certificate of database application. That is, students have to take an examination for a certificate in Access at the end of semester.

### 2.3 Experimental Design and Procedure

The experimental design is BL with SRL vs. the traditional learning pretest-posttest design (see Fig. 1). There were two groups in different semesters. Students in the two groups solved the same tasks but in different learning conditions. The Blended and SRL group (G1, N=83) was the experimental group, while traditional and non-SRL group (G2, N=94) was the control group.

	Blended	Traditional
SRL	Significant effect (G1 Group)	
non-SRL		No difference (G2 Group)

Fig. 1 Expected effects of variation in teaching methods

This experiment was implemented in the course of 'Database Management System'. Students were asked to pass the examination and get the certificate of Microsoft Access. The examination for a certificate in this software was held right after the completion of teaching the course (the 16th week). The detailed schedule of the experiment is depicted in Fig. 2:

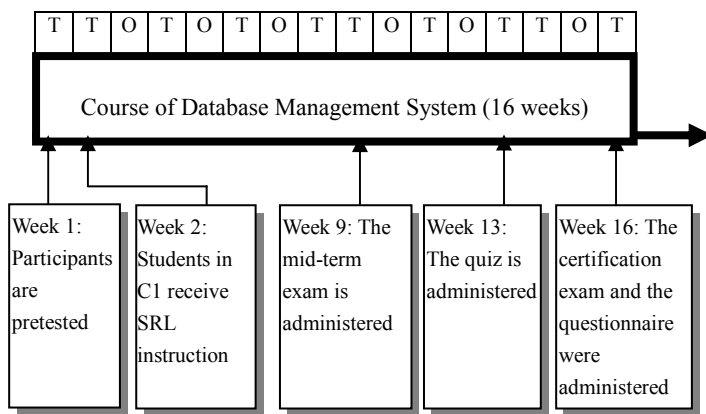


Fig. 2. The schedules of the course and skill tests in the second semester.  
(O: online classes; T: traditional classroom classes.)

**BL Treatment**

In the first week, the lecturer declared that this class section would be partially provided through Internet with innovative instructional methods as interventions, so students had the freedom to drop this class section and take another teacher’s class section, if preferred. After this declaration, 83 students continued in this class section.

In the BL environment, the popular software, Microsoft Access, was taught through this course. The teacher lectured about how to solve simulated computing problems through Internet or in the classroom. In the beginning of the course, students were encouraged to adapt to learn via a course website. The teacher audio taped every session of his lecture whether in the classroom or through Internet and later on translated lectures into HTML files with flash, video, and voice. These HTML files were then loaded into the course website. Students could preview and review the course sessions on this course website. Moreover, students had the opportunity to re-listen to the class if they faced problems at home.

In the third week, six weeks of the coursework were moved onto the website. Within the first three weeks, the teacher adjusted students’ learning gradually and smoothly. However, ten weeks of the coursework were still conducted in the traditional classroom. Besides the basic lecture, students could ask questions in the face-to-face classes. The mid-term examination, quiz, and final examination were administered within the ten face-to-face classes.

**SRL Treatment**

The two classes in the second semester were treated as SRL group. The students in SRL group received instruction in an after-school course teaching SRL strategies. The SRL group was gathered in a classroom and a two-hour lecture was delivered discussing how to manage study time and regulate their learning. The content of this SRL course was composed of the four processes addressed by Zimmerman, Bonner and Kovach, that is, self-evaluation and monitoring, goal-setting and strategy planning, strategy implementation and monitoring, and monitoring of the outcome of strategy [8]. Students were taught how to implement these four processes to become more self-regulated learners.

In addition to the two-hour lecture, students in the SRL group were required to regularly prepare and read the textbook before classes, and to review or practice the skills of using DBMS they had learned after school. They were also asked to submit their school assignments at the required time and record their learning behavior every week. The teacher assigned the schoolwork to students in Assignments and Exercises section of the course website and students had to complete the assignments by the required deadline. If a student did not submit his school assignments in the required time, the button for submission was unavailable when the time was up. Besides, data of students’ learning behavior was recorded on the course website instead of in their notebooks in order to prevent falsification of records.

**2.4 Evaluation**

A detailed evaluation of the project was conducted. The authors explored the potential effects of BL with SRL on students’ skills of using DBMS. To examine levels of change manipulated by variations in experimental conditions, we first measured students’ skills of DBMS before they entered the class. In the first week, students were asked whether they had learned or had the experience using any DBMS. In the results, none of them had learned or used DBMS. This confirms that all participants in the two groups had very little knowledge or skill in DBMS before they took this course.

After this course concluded, the examination for certificate in Access was conducted. There were two problems which each consisted of 7 to 9 sub-problems. Before testing, students were assigned random seats. All students were tested at the same time. A student’s grade came from his correctness and completeness of problem solving. A

student could get professional certification using DBMS if his grade was higher than 70.

All participants completed a questionnaire, which served as the instrument for gathering data on students' learning attitudes and experiences. We also gathered extensive tracking data provided by the course website on the students' use of the online resources. Finally, we tested the differences of the pass rate, students' skills in DBMS, and their attitudes and experiences under different conditions.

### 3 Results

We took grades on the examination for a certificate in Microsoft Access as a measure of student's computing skills. The 'independent samples t-test' was used to compare students' skills of using DBMS under different conditions. As shown in Table 2, students' grade for Access in G1 (90.07) was significantly higher than that in G2 (78.33). Therefore, it is believed that the effects of BL with SRL on students' skills of using DBMS were positive, and higher than that without.

Table 2 Independent samples t-test: Grades

Group	s	n	Mean	S. D.	SE of Mean	t-value	df	2-tailed Sig.
G <sub>1</sub>		83	90.07	13.91	1.527	2.992	175	0.003**
G <sub>2</sub>		94	78.33	33.26	3.431		5	

Note: \*\*\* $p < 0.001$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

The Chi-Square ( $\chi^2$ ) test was used to compare the different pass rate of professional certification promoted by BL with SRL and traditional teaching methods. As shown in Table 3, the pass rate in G1 (94.0%) was significantly higher than that in G2 (81.9%). Among the failed students, only 22.7% came from G1, however, 77.3% came from G2. Therefore, it is believed that the teaching method of BL with SRL contributed to enhance students' skills of deploying DBMS and helped students pass the professional certification.

Table 3 Comparison of pass rates

		Groups		Total	$\chi^2$ Sig.
		G1	G2		
Passed	n	78	77	155	.015
	% within Passed	50.	49.	100.	
	% within Groups	94.	81.	87.6	
	% of Total	44.	43.	87.6	
Failed	n	5	17	22	
	% within Failed	22.	77.	100.	
	% within Groups	6.0	18.	12.4	
	% of Total	2.8	9.6	12.4	
Total	Count	83	94	177	

In the BL course, the teacher audio taped every session of his lecture whether in the classroom or through Internet and later uploaded the audio taped files to the course website. From the login records, we found that students logged in and re-listened to the course content before tests and quizzes. In the questionnaire, students were asked what they thought about regarding the audio files and BL to learning DBMS. The results were summarized in Fig. 3, and showed that 75.31% of students regarded this was very helpful for learning DBMS. The audio taped files and BL were found to play positive roles in helping students learning DBMS. This result is similar to Yushau's study that shows the positive effect of blended e-learning on students' attitude toward computer and mathematics [9].

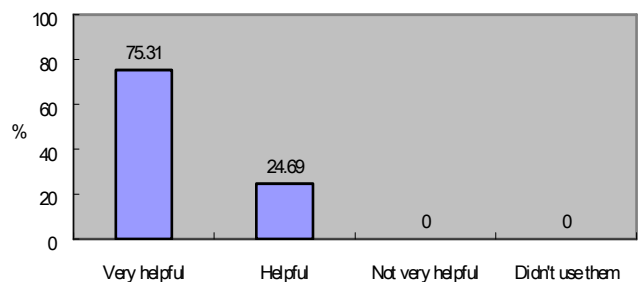


Fig. 3 Helpfulness of BL in learning DBMS

However, students in the traditional learning group did not have the chance to review or practice before their tests, and usually ignored the problem of their inexperienced skills and knowledge. Therefore, it is suggested that teachers could audio tape the course content and upload the files to course websites to provide the opportunities for students to review or practice repeatedly as they need.

In the intervention of web-enabled SRL, the teacher assigned the schoolwork to students in the course website and students had to complete and submit the assignments by the required deadline. If a student did not submit his school assignments in the required time, the button for submission became unavailable when time was up. In the questionnaire, students were asked whether the mechanism of submitting the schoolwork in the required time was helpful for learning DBMS. The results were summarized in Fig. 4, and showed that 46.9% of students thought this was very helpful, with 96.3% judging the approach as ‘helpful’ or ‘very helpful’ for learning DBMS.

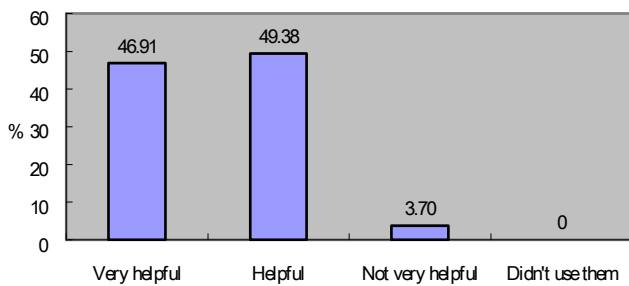


Fig. 4 Helpfulness of submitting assignments in the required time for regular learning and learning DBMS

In this study, it is found that students under the SRL intervention showed greater regularity in submitting schoolwork and attendance rate, and further had better learning effects. It is suggested that teachers could apply the technical mechanisms to help to develop students’ regularity. For example, the teacher in this study founded an “assignment board” for students to submit their schoolwork online. The teacher assigned schoolwork and set the required time weekly. Once time was up, the “submit” button was not available to be clicked. Then, students had to practice and submit the assignments before the required time. This technical mechanism could help students learn and practice regularly, and submit their assignments in the required time. It further developed students’ regular learning and contributed to their computing skills.

In this study, BL with SRL was found to play a positive role in enhancing students’ skills of DBMS. As the data in Table 2 showed, there was a very significant difference between G1 and G2 on their grades of Access ( $p = 0.003$ ). Moreover, the pass rate in G1 was also significantly higher than that in G2 ( $p = 0.015$ ). This demonstrated that BL with SRL contributed to develop students’ skills of DBMS. This result is similar to Lynch and Dembo’s study that investigates the relationship between self-regulation and online learning in a blended learning context, it is indicated that verbal ability and self-efficacy related significantly to performance, together explaining 12 percent of the variance in course grades [10]. It was suggested that traditional lecturers should shift or adapt to blended learning and help students develop regular learning habits.

Students in SRL group never had any experience in taking a web-based course. After the intervention of BL with web-enabled SRL, they were asked to compare the experience of this blended course with a traditional course. As shown in Fig.5, 72.8% of students thought this was much better, with 98.7% judging the blended course with SRL as ‘better’ or ‘much better’ than traditional courses that they took before.

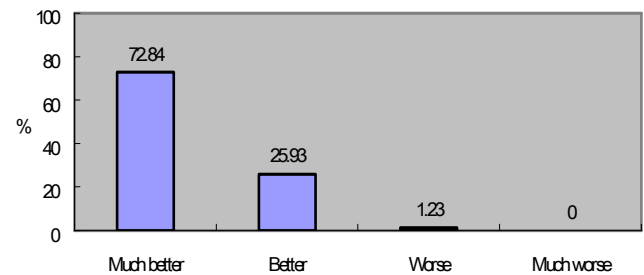


Fig.5 Comparison of this blended course with the traditional ones

Based on the effects of BL with PBL on the improvement of skills of DBMS, it is suggested that teachers should redesign their courses and then adopt new instructional methods, technical mechanisms, and audio recording technologies to fully exploit the benefits of blended learning environments, particularly for the courses targeted on getting professional certifications, and students who have to re-listen to the course content to practice repeatedly.

#### 4. Discussion and Conclusion

Teachers face tremendous challenges in implementing e-learning for relatively low academic achievers and in the setting where Internet addiction is quite common. It is not immediately clear how to concentrate students' attention and improve their learning in a web-based environment without the teacher's on-the-spot monitoring. To improve our understanding of how to solve these tough issues, we brought in and then tested rigorously a set of hypotheses between two experimental groups. According to the findings of this study, we believed that our research has made some contributions to e-learning theory in three different ways. Firstly, our research contributed to the existing literature by specifying how teachers can help students learn, practice, review, and ask students to regulate their learning by applying SRL instructional methodologies in a blended learning environment. Secondly, our study demonstrated that vocational students' computing skills and their pass rate of professional certification can be improved through BL with SRL. Thirdly, this study also demonstrated the teaching method of BL with SRL contributed to students' learning experiences, and further, had better learning performance.

Providing online courses in an environment that is full of Internet addiction from browsing shopping websites to playing online games challenges both instructors and students. Without systematic redesign and reconsideration of the learning settings, teachers and students may suffer from ineffectiveness resulting from replicating traditional instructional methods through Internet. Moreover, teachers in many nations and universities have to adopt the BL rather than pure online learning when implementing e-learning. Therefore, this study provides a specific reference in the context of vocational education addressing how to increase students' computing skills and to help students regulate their learning in the blended environment with web-enabled SRL.

Finally, this study may provide valuable insights and shed light on leading practices of blended course and web-enabled pedagogies for those schools (particularly for vocational schools) and teachers planning to implement, or currently engaged in, e-learning.

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