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► **To cite this version:**

Hung-Chang Lin, Yao-Hua Wang. The Instructional Design of a Web-Based Self-reflective Learning Portfolio for Skill Training. James J. Park; Albert Zomaya; Sang-Soo Yeo; Sartaj Sahni. 9th International Conference on Network and Parallel Computing (NPC), Sep 2012, Gwangju, South Korea. Springer, Lecture Notes in Computer Science, LNCS-7513, pp.386-393, 2012, Network and Parallel Computing. <10.1007/978-3-642-35606-3\_45>. <hal-01551359>

**HAL Id: hal-01551359**

**<https://hal.inria.fr/hal-01551359>**

Submitted on 30 Jun 2017

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# The Instructional Design of A Web-based Self-reflective Learning Portfolio for Skill Training

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**Abstract.** Technical education mainly focuses on the development of students' motor skills. At vocational educational schools in Taiwan, technical teachers usually teach skills in a big class. Therefore, those teachers always face the problems of not realizing students' learning process and difficulties; the evaluation is also deficient in credibility and validity.

The learners' self-reflection can help teachers understand their learning process. In this study, the researchers analyze the objectives, strategies and introspection emphasis in the skill-training stages and provide recommendations for students to reflect in each phase. Then the researchers apply these recommendations as the basis of introspection to build a Web-based learning portfolio (WBLP) for skill training.

The results of this study reveal that the Moodle platform conforms to the requirements of building a Web-based self-reflective learning portfolio for technical training purpose. Besides, this paper has mapped out the Moodle Modules that provide the self-reflection features for a technical-training WBLP.

**Keywords:** Moodle, Web-based learning portfolio, Technical training, Self-reflective learning, Instructional design

## 1 Introduction

Technical education mainly focuses on the development of technical skills of students. Students are trained to gain better technical operating ability and this has become one of the main objectives of technical education. Traditionally, technical training has been taught through the demonstration and guidance of teachers and students learn skills through imitation or repetitive practices. However, teachers often face some problems in the traditional technical training courses. For instance, it is difficult for teachers to be aware of students' initial skill level; also, due to the huge number of students in a class, teachers often have difficulties realizing students' learning process and problems. Therefore, teachers are unable to provide feedbacks at the appropriate time to assist students' learning. Moreover, it is difficult for teachers to evaluate individual performance from a team work project with credibility and validity.

Self-reflection allows students to reflect on their learning process. With the reflection, teachers can further understand the students' learning process and adjust their

teaching and evaluation. Therefore, the objective of this paper is to explore the possibility of utilizing Moodle (Modular Object-Oriented Dynamic Learning Environment) to build a Web-based self-reflective learning portfolio for technical training.

## 2 Web-based Self-Reflective Portfolio

### 2.1 Self-reflection vs. Learning

Dewey [1] is the creator of the concepts to self-reflection in education. He believes that self-reflection is reflecting on knowledge through initiation, continuous thinking and careful thinking. However, Schon [2] believes self-reflection is the reconcile process of individual's past experience, actions, beliefs and convictions gained through learning. The process finally builds a knowledge and meaning that belongs only to the individual. Montgomery [3] stated that life experiences can be fully utilized through the process of self-reflection and further build on new life experiences. Repeated cycle of self-reflecting, usage of knowledge and forming new experiences can reach the effect of learning.

Keeping a reflective journal is a form of record and it has to be easily inspected by the instructors so that instructors are able to effectively judge the level of students' reflective thinking [4, 5]. Several researches have attempted to identify students' reflective thoughts and measure the depth of their reflective thinking. Bain, Ballantyne, Packer & Mills [6] suggest a framework for reflective thoughts. This framework divides reflective thoughts into 8 levels (see Table 1) and this can be a reference for evaluating the contents of students' reflective thinking.

**Table 1.** Framework of Reflective Thoughts Suggested by Bain (Bain et al., 1999)

Category	Description of the Contents of Reflective Thinking
Nonsense	Meaningless contents
Simple	Yes/No answers
Incomplete	Incomplete or lost contents
Reporting	Contents are reported with no individual opinions or views
Responding	<ol style="list-style-type: none"> <li>1. Low amount of concept involved</li> <li>2. Describes observations with no causes</li> <li>3. Describes personal emotions</li> </ol>
Relating	<ol style="list-style-type: none"> <li>1. Contents are related to personal experience</li> <li>2. Brief explanation of what happened</li> </ol>
Reasoning	<ol style="list-style-type: none"> <li>1. Has a good reasoning to what have happened</li> <li>2. In-depth discussion of the relationship between the theory and the real situation</li> </ol>
Reconstructing	<ol style="list-style-type: none"> <li>1. Students present a high level of inference</li> <li>2. Combines self-experience with reasoning and makes a systematic conclusion to the theory</li> </ol>

## **2.2 Self-reflection Learning Portfolio**

The use of learning portfolio (or called portfolio) is a new trend in education[7]. The portfolio collects the learners' projects over a period of time. The contents of the learning portfolio describe students' learning process. Each portfolio is exclusive to each student. Viewers of the portfolio can understand information such as the learner's personal information, learning process and learning attitude through the narration kept in the portfolio [8-10].

The self-reflection learning portfolio is the portfolio with self-reflection as its main purpose. It provides students opportunities for systematic and continuous reflective thinking. They can help the learners improve their understanding of their work and often provide beneficial feedbacks [5]. The self-reflection learning portfolio not only reflects on the learning transfer of the learners, but it also provides materials for students for self-reflection purposes [10].

Some information in the portfolio that is difficult to record in words (such as illustration portfolio, project process) can be recorded and saved using digital media methods. Discussion among students can also be recorded in terms of audio files, images or video recordings to provide a more realistic overview of the student's effort in the learning process [11]. E-portfolio is a combination of a learning portfolio and multimedia [12]. The contents not only include interpretation of the learning portfolio, it also incorporates with the features of multimedia. There is the addition of multimedia resources and files to enrich the contents of the portfolio.

Other than the produce portion, Barrett [13] suggests the e-portfolio should also include the process portion, which should contain how students gather multimedia materials, the production process of project works, students' reflective journals, and the interaction between students and teachers. Therefore, the learning portfolio should not only present the results of learning, but it also present evidence of the learner's growth and development in academic [14, 15].

## **3 Development of the Web-based Self-reflection Learning Portfolio for Skill Training**

Course Management System (CMS) provides a platform for students and teachers to conveniently upload and download teaching materials files. The system also provides a platform for discussion and this provides additional benefits to traditional teaching method and creates a totally new teaching environment. Barret [9] argues that the addition of adequate reflection activities and feedback mechanism on a CMS, such as reflection, learning journals, self-evaluation, peer evaluation and feedbacks, can build up a self-reflection learning portfolio.

### **3.1 Reflective Thinking in Different Stages of Technical Training**

Due to the different teaching objectives in different stages of technical training, teachers should design the appropriate self-reflection activities for each stage based on the

different teaching objectives. Table 2 lists the suggestions for resources for reflective thinking for technical training stages based on the categorization of reflection contents in an e-learning portfolio [10].

**Table 2.** Teaching Points, Teaching Strategies, Points of Reflective Thinking, and Reflection Contents in Different Stages of Technical Training

Stages of Technical Training	Teaching Points	Teaching Strategies	Points of Reflective Thinking	Reflection Contents
Stage 1: Building up cognitive knowledge	<ul style="list-style-type: none"> <li>● Introduce the objectives of the skill, functions, tools, process, principle and outcome</li> <li>● Explain the possible experiences, errors and dangers during operation</li> </ul>	<ul style="list-style-type: none"> <li>● Initiate learning motivations</li> <li>● Build up overall concepts about technical operation</li> </ul>	Enhance the learner's reflective thinking about cognitive skills.	<ul style="list-style-type: none"> <li>● Teaching objectives</li> <li>● Textbooks</li> <li>● References</li> <li>● Related websites</li> <li>● Related rules</li> <li>● Lecture notes</li> <li>● Related resources</li> <li>● Peer feedback</li> <li>● After-class reflective thoughts</li> </ul>
Stage 2: Demonstration	<ul style="list-style-type: none"> <li>● Demonstrate motor skills (How)</li> <li>● Explain When and Why to execute specific motor skills</li> <li>● Explain the key points of techniques through continuous operation</li> </ul>	<ul style="list-style-type: none"> <li>● Explanation and interpretation:               <ol style="list-style-type: none"> <li>1.Action demonstration (overall → details)</li> <li>2.Master the methods and skills</li> </ol> </li> <li>● Preliminary practice</li> </ul>	Make learners think about the procedure and reasons in order to strengthen the impression of operation.	<ul style="list-style-type: none"> <li>● Operation procedure</li> <li>● Different versions of operation demonstrations and results</li> <li>● Observation records</li> <li>● In-class photos</li> <li>● In-class videos</li> <li>● Peer feedbacks</li> <li>● Qualitative reflective journals</li> </ul>
Stage 3: Guidance and Practices	<ul style="list-style-type: none"> <li>● Allow learners to practice skills               <ol style="list-style-type: none"> <li>1.Fragment skill practice</li> <li>2.Complete skill practice</li> </ol> </li> <li>● Offer scenarios to practice skill operations</li> </ul>	<ul style="list-style-type: none"> <li>● Cooperative learning</li> <li>● Combine detailed actions into a large scale action through practices</li> <li>● Individual guidance and team guidance</li> </ul>	Allow learners to discover problems encountered during operation in order to find the key points of the practice.	<ul style="list-style-type: none"> <li>● Operation procedure</li> <li>● Semi-finished work</li> <li>● Records from design to formation stage</li> <li>● Records of practice procedure</li> <li>● Project work of all stages</li> <li>● Observation records</li> <li>● In-class photos</li> <li>● In-class videos</li> <li>● Peer feedbacks</li> <li>● Qualitative reflective journals</li> </ul>

Stage 4: Mastering the techniques	<ul style="list-style-type: none"> <li>● Offer scenarios to simulate practices</li> <li>● Offer high level practices to learners</li> <li>● Practice skills to the level of automation</li> </ul>	<ul style="list-style-type: none"> <li>● Individual guidance and team guidance</li> <li>● Learning through pondering</li> <li>● Guide learners to solve problems using the developed skills</li> </ul>	Offer learners to think how to apply basic theory to solve problems presented in scenarios	<ul style="list-style-type: none"> <li>● Final products</li> <li>● Grades</li> <li>● Reflective thoughts on final products</li> <li>● Quantitative evaluation on self-reflection</li> <li>● Peer feedbacks</li> <li>● Peer assessment</li> <li>● In-group evaluation</li> <li>● Between-group evaluation</li> <li>● Qualitative reflective journals</li> </ul>
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### 3.2 The Application of Moodle for Building the Self-reflection Learning Portfolio Mechanism

Moodle (Modular Object-Oriented Dynamic Learning Environment) is a learning management system (LMS). Moodle provides several teaching modules which allow instructors to design teaching activities for classes.

The advantage of modular programming is the instructors are able to utilize different program modules based on the needs of the class when designing teaching activities. These program modules have clear, simple and high portability features, and the modular structure is beneficial to the development of Moodle e-portfolio [16-18]. Furthermore, the standardized nature of a learning portfolio set up by Moodle allows evaluation to be more objective.

Based on the analysis of technical training stages and the discussion of designing a self-reflection learning portfolio, Table 3 shows the functional description of a self-reflection learning portfolio which is built with Moodle’s modular features.

**Table 3.** Moodle Modules that Provide Self-reflection Features for Different Stages of Technical Training

Technical Training		Moodle Modules that Provide Self-reflection Features	
Stages	Reflection Contents	Moodle Modules	Description of Moodle Modules
Stage 1: Building up cognitive knowledge	<ul style="list-style-type: none"> <li>● Teaching objectives</li> <li>● Related websites</li> <li>● Related rules</li> <li>● Lecture notes</li> <li>● Related resources</li> </ul>	<ul style="list-style-type: none"> <li>● Class documents (Provide Reflection Contents)</li> </ul>	<ul style="list-style-type: none"> <li>● Provide learning contents and related resources</li> </ul>
	<ul style="list-style-type: none"> <li>● Peer feedbacks</li> </ul>	<ul style="list-style-type: none"> <li>● Chat rooms</li> <li>● Forums</li> </ul>	<ul style="list-style-type: none"> <li>● Provide social network features</li> <li>● Provide cooperative activities and discussion records</li> </ul>

	<ul style="list-style-type: none"> <li>● Textbooks</li> <li>● References</li> <li>● Class notes</li> <li>● Reflective thoughts</li> </ul>	<ul style="list-style-type: none"> <li>● Blog</li> </ul>	<ul style="list-style-type: none"> <li>● Provide student learning process records</li> <li>● Keeping reflective journals</li> </ul>
Stage 2: Demonstration	<ul style="list-style-type: none"> <li>● Peer feedbacks</li> </ul>	<ul style="list-style-type: none"> <li>● Chat rooms</li> <li>● Forums</li> </ul>	<ul style="list-style-type: none"> <li>● Provide social network features</li> <li>● Provide cooperative activities and discussion records</li> </ul>
	<ul style="list-style-type: none"> <li>● Operation procedure</li> <li>● Demonstration and results of different versions of operations, observation records</li> <li>● In-class photos</li> <li>● In-class videos</li> <li>● Qualitative reflective journals</li> </ul>	<ul style="list-style-type: none"> <li>● Blog</li> </ul>	<ul style="list-style-type: none"> <li>● Provide student learning process records</li> <li>● Keeping reflective journals</li> </ul>
Stage 3: Guidance and practice	<ul style="list-style-type: none"> <li>● Peer feedbacks</li> </ul>	<ul style="list-style-type: none"> <li>● Chat rooms</li> <li>● Forums</li> </ul>	<ul style="list-style-type: none"> <li>● Provide social network features</li> <li>● Provide cooperative activities and discussion records</li> </ul>
	<ul style="list-style-type: none"> <li>● Periodic project work</li> </ul>	<ul style="list-style-type: none"> <li>● Assignments submission</li> <li>● Database</li> <li>● Grades</li> </ul>	<ul style="list-style-type: none"> <li>● Record cases and evidence of improvements</li> <li>● Provide peer evaluations and instructor's evaluation on student's reflective thoughts (database)</li> </ul>
	<ul style="list-style-type: none"> <li>● Operation procedure</li> <li>● Semi-finished work</li> <li>● Records from design to formation stage</li> <li>● Records of practices</li> <li>● Observation records</li> <li>● In-class photos</li> <li>● In-class videos</li> <li>● Qualitative reflective journals</li> </ul>	<ul style="list-style-type: none"> <li>● Blog</li> </ul>	<ul style="list-style-type: none"> <li>● Provide student learning process records</li> <li>● Keeping reflective journals</li> </ul>
Stage 4: Mastering the techniques	<ul style="list-style-type: none"> <li>● Peer feedbacks</li> </ul>	<ul style="list-style-type: none"> <li>● Chat rooms</li> <li>● Forums</li> </ul>	<ul style="list-style-type: none"> <li>● Provide social network features</li> <li>● Provide cooperative activities and discussion records</li> </ul>
	<ul style="list-style-type: none"> <li>● Final finished product</li> <li>● Self-reflection on the project</li> <li>● Grades</li> </ul>	<ul style="list-style-type: none"> <li>● Assignments submission</li> <li>● Database</li> <li>● Grades</li> </ul>	<ul style="list-style-type: none"> <li>● Provide course work assessment</li> <li>● Provide summative assessment</li> <li>● Instructor's evaluation and feedbacks</li> <li>● Record cases and evidence of improvements</li> <li>● Provide peer evaluations and instructor's evaluation on student's reflective thoughts (database)</li> </ul>

	<ul style="list-style-type: none"> <li>● Peer assessment</li> <li>● In-group evaluation</li> <li>● Between-group evaluation</li> </ul>	<ul style="list-style-type: none"> <li>● Workshop</li> </ul>	<ul style="list-style-type: none"> <li>● Provide feedbacks and evaluations among the learners</li> <li>● Provide evaluation and feedbacks of project works among groups</li> <li>● Provide evaluation and feedbacks within the group</li> <li>● Self-evaluation and self-feedback</li> </ul>
	<ul style="list-style-type: none"> <li>● Qualitative reflective journals</li> </ul>	<ul style="list-style-type: none"> <li>● Blog</li> </ul>	<ul style="list-style-type: none"> <li>● Provide student learning process records</li> <li>● Keeping reflective journals</li> </ul>
	<ul style="list-style-type: none"> <li>● Course comments</li> </ul>	<ul style="list-style-type: none"> <li>● Feedback form</li> </ul>	<ul style="list-style-type: none"> <li>● Provide reflections and comments for the course by students</li> </ul>

## 4 Conclusions and Suggestions

The Instruction and evaluation of motor skills have encountered several difficulties. The main cause is the instructors having problems realizing the learners' learning process. In order to improve the learner's learning efficiency and assist instructors to understand the learner's learning process, the use of a self-reflection learning portfolio is a possible solution.

Moodle provides several convenient teaching modules for instructors to easily develop teaching activities. This paper investigates the technical training procedure and points out the required reflection based on the teaching objectives of each training stage for learners. Finally, student's reflective thoughts are retained through appropriate Moodle's teaching modules to build up a complete self-reflection learning portfolio.

The design of a self-reflection learning portfolio provides students with the opportunity to self-reflect in every stage of technical learning and improve their learning. Moreover, the instructors are able to understand more about students' learning process. Based on students' learning process and reflective activities, the instructors are able to provide a more complete evaluation and feedback for the students.

**Acknowledgements.** The authors thank the National Science Council of the Republic of China, Taiwan, for financially supporting this research under Contract No. NSC 100-2511-S-003-011.

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