The Design of Scaffolding in Online Peer Assessment System for Learning Programming

Qingchun Hu, Nancy Law
The University of Hong Kong
qingchun@hkusua.hku.hk

Abstract: The study proposes an approach to support students' debugging exercise named scaffolding online peer assessment built upon the scaffolding theory. The scaffolding mechanism in this approach includes two aspects. One is that the system provides error tips to aid students in finding errors in their assignments. The other mechanism is the peer's comment itself which is viewed as a kind of scaffolding. To explore the value of this approach, a scaffolding online peer assessment system is developed. The study proposes a way to implement computer-assisted scaffolding in online peer assessment. It can likewise provide guidelines for other educators to engage in a similar endeavor.

Keywords: Online peer assessment, Scaffolding

1. Introduction

Many literatures have reported that learning programming is permanent difficulty [1]. One problem in learning programming is debugging difficulty [2]. The debugging has been known to account for more than 50% of the time and efforts spend in programming [3]. Peer assessment has been shown as a positive pedagogical strategy in programming course [4] [5]. One benefit of peer assessment is motivating deeper reflective learning and producing better learning outcomes [6]. Although peer assessment is helpful to foster students' reflection, how to provide scaffolding to facilitate students' reflection to improve students' debugging ability also evokes technical and pedagogical challenges.

2. A Scaffolding Framework of the System

Built on previous studies, a process of online peer assessment is put forward in the study. There are three steps in online peer assessment, in which two kinds of scaffolding are provided --- Error Scaffolding and Peer Scaffolding. (See Table 1, Figure 1).

Table1. The Task Design and Peer Interaction Design in Online Peer Assessment

	Step1. Pre -Peer assessment	**Step2. Peer assessment**	**Step3.Post-Peer assessment**
Scaffolding	Error Scaffolding	Peer Scaffolding	
Task design	Run Exercises with errors by self	Accomplish & review Assignments with rubrics in a group	Reflect by self
	Rule1: The tutor agent presents exercises with different levels for students to select. **Adaptive Instruction1:** Based on the marks from assignments, the tutor		**Rule5:** The tutor agent shows learners' learning records.

	agent give suggestions for students to select exercises.		
Peer interaction design		**Rule2:** Grouping randomly. **Rule3:** Posting Comments. **Adaptive Instruction2:** The tutor agent provides suggestions for students' posting comments **Rule4:** The tutor agent presents rubrics. **Adaptive Instruction3:** The tutor agent shows errors types related to assignments if students don not post errors.	

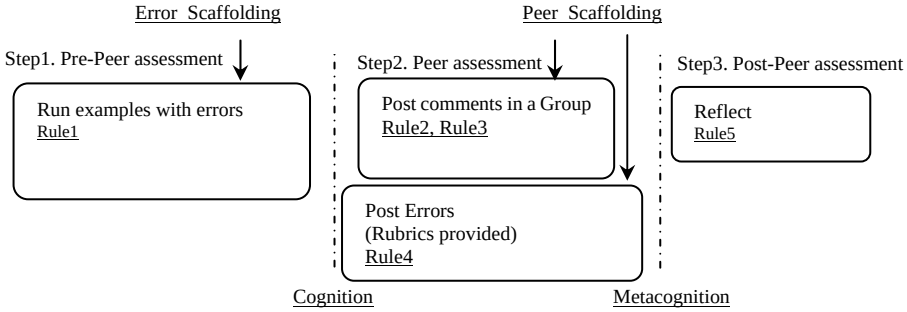

Figure 1. A Scaffolding Framework in Online Peer Assessment

The two scaffolding are detailed into five rules respectively. The detail on the design framework and architecture are present in another paper [7].

3. The Initial Observations

The project is underway. We find students prefer to use their way to discuss problems, although teachers design online community for students to discuss. It is very surprised that all 11 students who take part in the testing discuss questions through using OICQ (an online community used widely by undergraduate in China) rather than using the online forum provided by teachers in the system. So in the future work, we will integrate this online community into the online peer assessment activity. We also find that some students have difficulties to reflect errors by themselves. For example, in the survey, one student said that he was confused by the meaning of reflection in the third step. It is necessary to provide some guidelines to encourage them to reflect. In our next design, students will be asked to write down what they have learned from their errors in their assignments.

References

[1] Milne, I., & Rowe, G. (2002). Difficulties in Learning and Teaching Programming—Views of Students and Tutors Education and Information Technologies, 7(1).
[2] Winslow, L. E. (1996). Programming Pedagogy -- A Psychological Overview. ACM SIGCSE Bulletin, 28(3).
[3] Ward, R. (1988). Beyond design: The discipline of debugging. Computer Language, 5(4), 37-40.
[4] Gehringer, E., Ehresman, L., Conger, S. G., & Wagle, P. (2007). Reusable Learning Objects Through Peer Review: The Expertiza Approach. Journal of Online Education, 3(5).
[5] Muller, M. M. (2005). Two controlled experiments concerning the comparison of pair programming to peer review. Journal of Systems and Software, 78(2), 166-179.
[6] Williams, E. (1992). Student attitudes towards approaches to learning and assessment. Assessment and Evaluation in Higher Education, 17, 45-58.
[7] Qingchun.Hu and N. Law (2008). Designing Online Peer Assessment System in Learning Programming: an Adaptive Scaffolding Framework and Architecture World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA 2008), Vienna, Austria.