Write Now Mini-Project

Research carried out 2008/09

TITLE OF PROJECT:

Do computing students think that reflective writing practice improves their programming skills?

INSTITUTION:
London Metropolitan University

PROJECT LEADERS:
Dafna Hardbattle
Other team members: Ken Fisher, Peter Chalk

DISCIPLINE/DEPARTMENT:
Faculty of Computing

MODULE:
Introduction to Programming

YEAR/LEVEL OF STUDENTS:
First year first semester BSc and Foundation degree

NUMBERS OF STUDENTS IN MODULE:
80 students

CONTEXT

The teaching of programming, particularly at introductory level is known nationally to be a difficult task [1]. Students are expected to learn a new way of thinking and need to grasp a number of complex and abstract concepts to become proficient in a new programming language. Therefore, students' achievements and completions on first year programming modules at London Metropolitan University follow the national trend with module results well below the University recommended/expected guideline. It also appears that the quality of reflective writing of computing students in general could be greatly improved [2]. There is strong evidence from recent research [3] that computing students at London Metropolitan University generally lack reflective writing skills. This means that these students not only struggle with some of their assignments, in particular the completion of their final year project, but that this could also affect their employment opportunities.

The aim of the research is twofold. It is hoped that teaching and supporting reflective writing not only improves the students' essential writing skills, but also encourages them to engage in deep learning and develop a "reflective practice" approach to learning to help them become proficient programmers.

Research questions:

- Would the computing students engage with the reflective tasks?
- Would they think that these tasks are relevant to improving their programming skills?
- Would their writing/thinking skills be improved?

PROJECT OBJECTIVES

- To design and develop an online learning object to allow students to learn online, in their own time, about reflective practice in relation to writing about Java programming problem-solving tasks.
- To investigate the relationship between reflective writing skills and programming skills through data analysis including students' views.

METHODOLOGY

A textual analysis approach was used to measure the base line of students' level of reflective writing at the beginning of the semester as well their reflective writing ability in the middle and at the end of the semester. Students' access to the learning object was tracked through a virtual learning environment (VLE). Data relating to students' views on how they rate reflective writing as a contributor to improving their programming skills were obtained from questionnaires and short structured interviews.

DESCRIPTION OF PROJECT

A blended learning approach was adopted, incorporating a newly developed animated learning object (LO), which was designed to address the challenges of engaging programming students to think and write reflectively. To help foster reflective practice in our students, who mainly come from a non-traditional educational background, we attempted to incorporate in the design of the LO constructivist principles to promote higher order levels of thinking and problem solving, and to encourage active learning. Facing a diverse body of students, it was also important to provide several levels of scaffolding.

The data for this research was collected over five months, and based on about 80 undergraduate students on a Java programming module in the first semester of their degree, in the academic year of 2008-09. Students' reflective writing ability was measured in week 3 of the semester, before the LO was introduced to the students (in week 5) via a link in the VLE. A textual analysis approach was used, and an inter-rater comparison tool, based on Moon's categories [4] was deployed. Students' writing from Assignment 1 (submitted in week 7) and Assignment 2 (submitted in week 12) was also rated, independently of the assessment of the module. Samples of around 60 pieces of writing were used for each of the three stages of the textual analysis. Students' access to the LO was tracked through the VLE and was analysed. Further data regarding the LO was collected via an online anonymous questionnaire (33 students) and short structured interviews (17 students).

ASSESSMENT OF IMPACT OF PROJECT

The results for the 'Introduction to Programming' module, from the autumn semester of the academic year 2008-09, show a significant improvement in students' overall module marks. However, the form of the assessment on this module has changed in a number of ways since the year before, therefore, it is difficult to assess which element of the 'blend' has had the most effect. Comparison between students' achievement this year and the coursework component from previous cohorts also shows an improvement in performance.

Textual analysis of students' baseline and coursework reports indicated a dramatic increase in the average levels of reflection. This is particularly noticeable in the first report after the introduction of the Reflective Practice Learning Object. In addition to the increase in levels of reflective writing and programming performance, an increase was also observed in the level of engagement in the coursework, as reflected by the higher proportion of students who submitted the coursework.

Analysis of students' views through online anonymous questionnaires and short interviews suggests that the majority of computing students who completed the questionnaires and/or took part in the interviews accepted reflective writing as part of their practice. Although there were a few negative comments, the majority of students actually took reflective practice on board. The vast majority of

these students also indicated that the Learning Object helped them to think/write reflectively. Answers to the key question of this study, to find whether there is a relationship between students' reflective writing practice and programming skills, was also positive. Analysis of the questionnaires showed that the majority thought that reflective practice helps their programming skills.

DISSEMINATION

The team presented the project results at the University of Greenwich, the University of Hertfordshire and at the London Metropolitan University Learning and Teaching conference.

AVAILABILITY OF PROJECT OUTCOMES

Reflective Practice Learning Object for Java Programming Students
http://learning.londonmet.ac.uk/computing/java/rp/rp.html

Published Papers:
Hardbattle, D., Fisher, K. and Chalk, P. (2010) 'Reflective Practice for Programming Students: adjusting the blend to improve skills', *Investigations in university teaching & learning*, 5 (1), 75-80.

Hardbattle, D., Fisher, K. and Chalk, P. (2009). Engaging First Year Programming Students in Reflective Practice by Means of an Online Interactive Learning Object. In E.B. Terry, A.L. Jefferies, and A. Bracq (eds.), Proceedings of the 4th International Blended Learning Conference, 17th-18th June, University of Herts, 101-112.

Hardbattle, D., Fisher, K. and Chalk, P. (2009). Does Reflective Writing Improve Programming Skills? In: Graham, D. (ed.), Proceedings of "e" Teaching and Learning 2009, 2 June, University of Greenwich/HEA-ICS, 15-20.

FUTURE PLANS FOR PROMOTING PROJECT WORK/OUTCOMES

We believe that the design and use of the LO contributed to the success of the project. However, the learning object embeds examples and exercises of reflective practice in the context of Java programming and therefore is not easily reusable in other contexts. In future work we aim to investigate techniques to create a reflective practice learning object that is easy to re-purpose to suit different topics.

REFERENCES

[1] Jenkins T. (2002) On the Difficulty of Learning to Program. http://www.psy.gla.ac.uk/~steve/localed/jenkins.html [accessed 25/01/09].

[2] King, T. (2002) Development of Student Skills in Reflective Writing. In: Proceedings of the 4th World Conference of the International Consortium for Educational Development in Higher Education, ICED 2002, 3-6 July, 2002, The University of Western Australia, Perth. http://www.csd.uwa.edu.au/iced2002/publication/Terry_King.pdf [accessed 24/01/09].

[3] Chalk P. and Hardbattle D. (2007) Does Reflective Writing in the PDP Improve Science and Engineering Students' Learning? *Investigations in university teaching & learning*, volume 4 number 2 , Summer 2007 http://www.londonmet.ac.uk/capd/in-house-journal-investigations/volume-4-number-2.cfm [accessed 24/01/09].

[4] Moon, J. (2001) Reflection in Higher Education Learning, PDP Working Paper 4, LTSN Generic Centre.