TEACHING & LEARNING RESEARCH INITIATIVE
NĀU I WHATU TE KĀKAHU, HE TĀNIKO TAKU

Supporting teachers and learners of programming by understanding feedback on syntax, semantics and style.

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Project description

In this project, we investigated the issues experienced by secondary school teachers when giving feedback to senior students of computer programming in New Zealand (NZ). The NZ Ministry of Education has recently introduced *Digital Technology* into the school curriculum. This means that many teachers will be required to teach fundamental concepts in programming, with no appropriate background or qualification. Our research strategy included face-to-face discussions for deep insight, a survey to identify patterns and secondary research to explore status in relevant areas.

Aims

Our aims were to explore the following themes:

- the nature and quality of feedback delivered by existing teachers of programming;
- differences in feedback that are due to teacher subject expertise;
- teacher understanding of what students are struggling with, and what information teachers seek, to provide better feedback;
- use of secondary sources of feedback, such as automated tools; and,
- how to improve the quality and timeliness of feedback experienced by students.

Why is this research important?

New Zealand (NZ) has a shortage of skilled workers in Information Technology (IT). Skills in computer programming (for example, Software engineer, Applications programmer, Software tester, Web developer) all appear on the 2017 Long term skill shortage list published by Immigration NZ and a continued lack of ICT workers in NZ is reported in 2020. However, NZ is competing in a global market facing similar demands. Consequently, NZ cannot rely on filling its requirements from other countries. We need to develop skilled professionals domestically. This means that more teachers will be required to provide feedback on fundamental programming concepts. However, despite widespread recognition of the importance of educating programmers, many teachers in NZ have no programming experience and no formal qualification in Computer Science. Understanding the issues experienced by teachers is a first step towards providing support resources based on evidence.

Key findings

We found that many secondary school teachers are struggling with providing feedback on text-based programming to senior students. This issue has been identified in earlier research, and our investigations indicate that this remains a pressing problem. Contributing factors are:

- Many teachers lack confidence because of a lack of experience and/or relevant qualification;
- There are many resources available, but these have been created in an ad-hoc way by different individuals and groups and are fragmented and difficult to find;
- There is an inconsistent understanding of some of the terms used in the Assessment Standards;
- Teachers are 'time-poor' and do not have time to upskill or hunt for resources.

We also found that the diversity in classroom context is much larger than we expected. We found variation in teaching experience, teacher programming background, student level, class size, programming languages and technologies used, teaching philosophy and project selection strategies. The bulk of the literature relating to computer science education has focused on the university environment and so much is not relevant for such a diverse environment.

Implications for practice

Teachers have a pressing need for targeted expert guidance in the way of explicit resources to help them provide effective feedback to senior programming students. The diversity in classroom context means that there can be no 'one size fits all' approach to providing resources. For example, a teacher who has no experience of programming requires entirely different kinds of support than a teacher with a strong programming background. Our research indicates that the need is urgent.

Our partners

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