University of Glasgow
Department of Computing Science
Accelerator Course Case Study Report

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Overview

Traditionally, students on the University of Glasgow Computing Science course who obtained a C pass or above at level 1 progressed to level 2 while those with a D pass or below were not admitted to the level 2 programme. Over time this policy was revised in order to allow the D pass students to progress in the same way as those obtaining a C.

Drivers for Change

It became apparent that these students tended to struggle in their second year with 89% of D pass students failing to progress to level 3. In a bid to combat these low progression rates, facilitator led sessions were introduced in 2005 for students who had failed to achieve a C pass or who had obtained it but still felt that they required assistance with the programming component of the course. Sessions were divided into friendly and informal or strict and formal formats and were facilitated by more experienced higher year students. Although success was partially achieved for some students, particularly in the stricter regime, attendance was poor although it was unclear why this was the case. Only 8 'at risk' students attended at least half of the sessions along with 6 higher performing students, while 10 students identified as being at risk failed to achieve a reasonable attendance. Limited data analysis suggested that higher average grades were correlated with higher course attendance. Thus it appears that grades and progression can be increased by the accelerator course intervention, but only for regular attendees.

Aims of Phase 1 intervention (2006-7:Semester 1)

Accelerator 2

The level 2 Computing Science Accelerator Course was designed to support students who had been identified as being 'at risk' following their first year performance. Based on the outcomes from the early pilot outcomes, the aim of this year's intervention was to increase attendance, performance and progression in addition to self-regulation and student time on task.

Method

- **Follow up phone calls** will be made by the course lecturer on a regular basis to students who fail to attend sessions without explanation, in order to improve attendance. Although the sessions are not compulsory, they are presented in the initial information session in a way that suggests to students that they are expected to attend them if they fall within the at risk category, although all students are welcome to attend if they wish to.
- **'Expert' advice and scaffolded support** through facilitator discussion including individual and generic formative feedback on conceptual understanding and assessments with gradual withdrawal of assistance in relation to structured exercises. The previous year's dual session style option will be replaced with a more uniform approach in both groups.
- **Formative feedback through peer discussion and paired study**
- **Enhancement of self-regulation** through the provision of reflective learning diaries **[Appendix (i): Programming Logs 2],** designed to promote goal orientation and increase student monitoring of strategies to aide concept attainment.

Aims of Phase 1 intervention (2006-7:Semester 2)

Accelerator 1

Based on the positive outcomes gained from the level 2 accelerator course, a decision was made to offer it to level 1 students (Accelerator 1) who have already been identified as being at risk. A log book was developed for the facilitators to report on and keep a running track of goals, changes and outcomes in the next course. The student log books were adapted **[Appendix (ii): Programming Logs 1]** in light of the student feedback, with the middle section cut out in favour of a greater focus on goal orientation. Weekly facilitator meetings continued as they were considered to be extremely valuable, particularly for the ability to discuss individual student development. The attendance monitoring was continues with other staff taking over the duties of regularly making follow-up phone calls to non-attendees. An MSN on-line forum was also created for additional peer/tutor dialogue.

Evaluation Methodology

Qualitative analysis was gained through facilitator and student mid and post measures interviews and exam grades were compares to the appropriate year average.

Course redesign in relation to David Nicol's 7 Principles of good feedback practice & Gibbs & Simpson's first 4 conditions of good assessment practice

Principle 1: Helps clarify what good performance is (goals, criteria, expected standards)

Explicit criteria

Students were provided with specific learning criteria through the provision of set exercise packs and verbal instruction from the facilitators. This served as a guide to navigate them through the course learning objectives in a more in-depth and structured manner than would previously have been available on the course. One difficulty identified in the pre-course motivation session feedback was the way in which students could easily become overwhelmed by their failure to keep up with the sequence of learning for various reasons. The requirement to follow a progressive programme of learning activity, with an in-built opportunity to catch-up by being able to progress at different paces, was identified by students in their weekly diaries as being very effective.

Goal formation

Students were encouraged to set their own learning goals with the help of the learning diaries. The dual purpose aim was that this would serve as a planning tool, while providing students with an opportunity to reflect on their goal progress, time on task and acquired skills. Time on task was highlighted while study and programming skills were the focus.

Expected standards

The learning activities in the course supported the students' general level two coursework by reinforcing learning objectives and concepts on a daily basis. This seemed to provide some of them with increased confidence in offering responses to questions in lectures and a greater idea of the expected standards of their performance.

Principle 2: Facilitates the development of self-assessment (reflection in learning)

It was intended that students would have an opportunity for reflection on their learning through recording and reviewing their goal progress and achievements in the learning logs. They would also be required to self-assess their ability by rating the tasks in terms of their level of perceived difficulty. In addition, they would be able to justify the opinions that they had generated through general discussion and in explaining their practice exam answers. However mid and post-measures revealed that the planned opportunities did not fully achieve their intended outcomes. Midway through the course, the students were informally interviewed about their reflections on their learning.

The discussion revealed that the log books designed to encourage reflection and goal setting were valued solely for the latter and that even this aspect was being utilised poorly. They were somewhat useful in terms of helping students to think about their goals and what helps them to learn best but because they were left to fill them out independently, they often neglected them or filled them in an inadequate fashion. Thus reflection was not facilitated as much as it potentially could have been. It was concluded that it may have been beneficial to have facilitators prompt the students in formulating their goals more specifically and in reflecting through discussion on what they have learned from using their diaries and from the week's sessions. Post measure student interviews revealed that the students had been particularly unhappy with the structured opportunities for reflection contained in the learning logs as it was perceived to be time consuming, fussy and frustrating. Thus the opportunity for reflection was not utilised.

Students were provided with further opportunities for reflection after receiving their exam results by way of peer discussion, although less so in group B than in group A. A chance to grade their own practice exams after week 6 (2006-7) was also provided, although they appeared to find this exercise quite difficult. In practice, it may have been less effective than the potential benefits would have suggested. This may have been due to the low participant numbers, time constraints, or a lack of instruction. Although no formal opportunities for self-assessment have been available, whiteboard use for discussions, where students had to explain and illustrate their answers to their peers provided a rich opportunity for self-generated feedback.

An additional form of self-assessment involved evaluation of student's confidence in their performance, knowledge or understanding. Although students did indicate an awareness of their confidence levels with respect to various aspects of the course, they showed little initiative regarding planning how to address their weak areas. This could be attributed to the observation that practice really seemed to help more than anything else and this may have decreased their motivation to pay attention to strategic planning. Group B had weekly discussions with the students about the development of their confidence with regard to the problems set for them. Group A also conducted similar discussions but noted that the verbalised student confidence ratings often failed to match performance. Students may have overestimated their ability or may have been unwilling to share their concerns with the facilitators. One problem that may have underpinned this mismatch was the potential for peer dependency to interfere with students' ability in solo performance. This issue was addressed by introducing the solo exam practice opportunities in week 6.

Principle 3: Delivers high quality information to students about their learning

Tutor feedback on main coursework assignments was provided by written grade or written formative feedback but the accelerator sessions provided an opportunity for generic verbal formative feedback through discussion of common mistakes and challenges. Individual tutor formative feedback was also made available on request. Once again, this is over and above the regular feedback opportunities offered to level 2 students. Students appeared to have no

problems in understanding the feedback they received in sessions and often noted down feedback comments from tutors or peers, presumably in order to reflect upon them at a later time. The immediacy of the feedback during discussions in the sessions also has an instant impact on student understanding.

Student perspective

Responses from the Accelerator 2 student focus group suggested that for at least some of the students who had maintained their attendance at the course had done so because they felt that the immediate feedback was beneficial to their learning, prompting them to revise their old first year notes and one particular student noted that it is more comfortable to ask a student facilitator for help than to approach a lecturer.

Accelerator 1 Revisions

An additional opportunity for peer/tutor dialogue was created through the provision of an on-line forum via MSN. This provided an opportunity for students to gain feedback on their exercises at any time on or off campus.

Principle 4: Encourages teacher and peer dialogue around learning

Peer Feedback

Students had substantial opportunities to engage in peer and tutor feedback. Daily discussions formed a key part of the scheme. Students discussed concepts before, during and after working on assignments or practice exercises. They also worked together to problem solve in pairs or groups. Mid measure qualitative evaluation data revealed that, while working in groups was popular among the students and had apparently increased concept understanding, it became apparent that the students were still struggling to cope with the pressures of exams and this was reflected in their class test grades. Thus the decision was made to build into the course regular opportunities for students to complete exam-style questions in solo 'exam-like' conditions in the hope that they might gain confidence in the practical application of their concept attainment. It was also decided that they would have an opportunity to grade their own and each other's papers in a bid to increase self-assessment of their confidence in their ability to complete the task well and increase their autonomy. Of particular interest at this stage was to assess whether performance appeared to be correlated with engagement and understanding or alternatively to increased practice in congruent learning/testing conditions.

Post-measure evaluations found that as planned, facilitators had started to shape the sessions by allowing more solo practice on past papers, with less focus on concepts since this was more appropriate to the level 1 work covered in the first 6 weeks of the course. However in light of practical time constraints and poor insight into the objectives of the exercise, the idea of students marking each others' work was abandoned in favour of general discussions after solo past paper completion.

Notwithstanding the aforementioned side-effects, peer formative feedback was a clear aim of the course and did appear to have beneficial outcomes. In group B, tables were arranged in groups to create a social context. Students were asked to work in pairs in the sessions, explaining their answers as they did so. This resulted in a natural progression to enhanced peer discussion both in and out of the sessions. Facilitators encouraged students to share e-mails and use the library for study sessions, or to meet in the lab to study prior to the session.

Principle 5: Encourages positive motivational beliefs and self esteem

Self Regulation

Facilitators provided a scaffolding approach to learning by gradually encouraging students to become more self-regulated in their work. However, there were some notable differences in the way that groups A and B structured their activities. Group B were considerably more structured in their de-scaffolding process than group A, by introducing gradual removal of their presence. Students were also provided with an opportunity to shape the course content, through both their responses in the learning logs and in the course of group discussions. In group B, the facilitators set the structure but the students set their own content and focus by picking their own exercises as a class and in doing so, they were afforded a higher ownership of the course than previous level 2 'at risk' students would have had. Question packs were provided for the first two weeks. In contrast, group A had more of an open agenda in that the students could pick whatever they wanted to work on, and this may have in effect given them too much choice, reducing the feeling of security that the structure in group B provided.

As the course progressed, group B gradually withdrew scaffolding by setting tasks and telling the students that they would leave them to work on their own for a while (30 minutes) before returning to check how they were getting on, so that they built up more experience of this way of working in each session. However, there was a feeling that Group A had removed the scaffolding too quickly by suddenly removing the question packs after week 2 and in only vaguely discussing concepts. As a result, students may have struggled to see the point in the sessions in light of the relative lack of agenda. Students may also have felt insecure by the sudden lack of facilitator support that was announced at the end of the preceding day. In contrast, group B continued to offer structured support long after the other group had ceased this type of activity. Following the class test, facilitators introduced the students to a third exercise pack so that only this group stayed on the instructional exercises. Importantly, group B students were also provided with daily post session reminders to bring the required materials for the next session, which provided opportunities to both maximise preparation and to keep their mind engaged about the task.

Engagement & Motivation

Students appeared to engage much more with facilitators and lecturers than they would previously with staff. There was significantly more peer interaction than was generally available in the traditional format with regular discussions and social seating arrangements. Student engagement with the course content also appeared to be enhanced by being reinforced in the exercise packs and through discussion, which promoted a deeper level of understanding. The regular attendees seemed to enjoy the sessions at least to some extent although there was a feeling among the facilitators that some of the students may have been attending the sessions through habit. It is unclear whether it has made any real difference to their enjoyment of lectures.

Motivation appears to have increased for some of them, due primarily to a feeling of camaraderie but this was only the case for students who had satisfactory attendance. The others apparently remained significantly de-motivated. So while this formula appears to work well for some students, a different tract may have to be employed for others. However many of the students appeared to be more motivated this year than last. This was evidenced by their willingness to attend labs at 9am even when they are not coming to the sessions. Motivation was also maintained for longer this year and this has had a direct effect on increasing attendance. This may be due in part to the fact that the facilitators told them from the introductory sessions that the course would run for 12 weeks, in contrast to the previous years initial suggestion that it would run for 6 weeks, with the other 6 weeks being tagged on at the end.

Student Perspective

Responses from the student focus group suggested that confidence was increased. Accelerator students felt good about their ability since they observed their peers struggling with things that they by then understood, and they realised that most students struggle with aspects of the 2nd year course at some stage.

Principle 6: Provides opportunities to close the gap between current and desired performance

Students undertook three class tests in weeks 3, 6 and 9, which indirectly supported the six level 2 assessed exercises by giving students the opportunity to practice their conceptual understanding and directly supported the end of term exam preparation by consolidating knowledge and enhancing exam technique.

Principle 7: Provides information that can be used to help and shape the teaching

Feedback is received by the tutors from the students generally through class discussions and exam grades. The learning logs also provided some feedback on the areas that students found difficult or easy but they ideally require to be monitored by facilitators more than they have been to date. As a result of the feedback received, facilitators were able to focus on particular types of problems during sessions.

Feedback between facilitators and the lecturer in weekly meetings. Some of the facilitators have also had an opportunity to discuss issues face-to-face during lab sessions. Although it was initially hoped that facilitators would compile weekly session reports, time constraints prohibited this from being carried through. Sessions were periodically summarized by evaluators, but the opportunities to monitor individual student progress could have been enhanced through regular facilitator report writing. It would perhaps be worth looking at future options regarding monitoring and reporting the outcomes of sessions and compiling student records.

Condition 1: Sufficient assessed tasks are provided for students to capture sufficient study time

The accelerator course appeared to alter student time on task outside of the sessions firstly in respect of encouraging student to pursue peer feedback. Students were more likely to attend a lab in a group even when facilitators were not present than they would have previously. Students were particularly likely to work together on difficult concepts or programming exercises.

Condition 2: These tasks are engaged with by students orienting them to allocate appropriate amounts of time and effort to the most important aspects of the course

The course provided a structured opportunity for regular increased time on task outside of contact time, compare to the traditional course. In order to keep up with the general learning schedule, students were advised to study for 2 hours outside of the session and this was reportedly adhered to fairly well, meaning that study effort was distributed evenly over the course. However, facilitators also noted that the study location could significantly affect the quality of study. Other factors such as part-time employment and social commitments also significantly impacted on student time on task outside of sessions as well as on session attendance. The structure of the accelerator class tests enabled the students to allocate study time and build from one assessment to another by supporting the level 2 assessed exercises.

Student Perspective

Responses from the student focus group suggested that students would spend 1 ½ - 2 hours generally, but quite frequently may work up to 4 hours per day. The five o'clock session forced them to be at university, so between lectures and the 5 o'clock session they often ended up spending the spare time working in the lab.

Condition 3: Tackling the assessed task engages students in productive learning activity of an appropriate kind

Study patterns appeared to vary among students with some trying to learn the lecture content simply in order to pass while others seemed to be trying to achieve a deeper understanding of the material. For some students being able to have regular practice, discussion and expert support (scaffolding) has enabled them to increase both understanding and implementation of programming. It appears that as long as they commit themselves to the course, and attend it regularly enough, they do stand to gain benefits in these areas.

Student Perspective

Responses from the student focus group suggested that they found this study technique very useful as it helped them to improve their exam taking technique

Condition 4: Assessment communicates clear and high expectations

Students were able to gain a knowledge and understanding of clear and high expectations through the class tests and feedback with the subsequent opportunities to use this feedback to improve their learning standards before the next assessment.

Formal evaluation outcomes

Staff time on task

There were no staff time reductions achieved by the introduction of this course since this was never the objective of the re-engineering. Increases included 40 hours of lecturer time comprised of weekly facilitator feedback meetings, weekly follow-up phone calls, and occasional one to one student meetings. Student facilitators each recorded around 70 hours including weekly facilitator feedback meetings, weekly photocopying and daily sessions.

Accelerator 2 Student perspective of learning benefits

Qualitative data from the students focus group suggested that the most beneficial aspects of the accelerator course included, having the opportunity to work together with other students, which encouraged them to increase their work efforts. Students appreciated the fact that since they often had different problems, they could share information, acting as dual learner/teachers. They also felt that the intervention had increased their time on task. In addition, they perceived lecturers to be much more approachable than they did in first year, suggesting that the accelerator course appears to have broken down perceived communication barriers. However students were unhappy with some aspects of the log book. While the idea of weekly planning was popular, if tasks took longer than planned, students were de-motivated and low in confidence since they felt that they had failed to achieve their goals. This appeared to be a problem of students underestimating time on task. They require more help in learning how to unpack the tasks. For this reason the Accelerator 1 logbooks were substantially simplified.

Limitations

There was a problem with an early drop in attendance. This may have been due to a lack of communication, poor planning or a lack of insight into the value of the course. However, it is important to bear in mind that some of these students may have simply lacked the motivation to maintain attendance, so it cannot be concluded that the format of the course is at fault. Nevertheless, there were some identifiable problems such as the middle sections of the log books, which seemed to confuse and annoy students. There was also reportedly a progressively lax approach to timekeeping of both facilitators and students.

Accelerator 2 Student perspective of learning benefits

Sustainability

The redesign is entirely sustainable as long as facilitators are willing to give up their time for it. In terms of financial viability, the benefit outweighs the cost if even one student is retained and progresses to level 3.

Future progress and strategic development

Dissemination

Conclusion

APPENDIX (i): Sample page from Accelerator 2 Learning Log

Daily Programming Log								
Day								
Date								
LAST SESSION'S GOALS		Complete	Time On task	Easy	Moderately Difficult	Difficult	Notes:	
1.								
2.								
3.								
4.								
PROGRESS		Breakthrough		Good progress	Moderate progress	Little progress	Expand:	
Understanding concepts								
Understanding language								
Problem solving								
STUDY TECHNIQUES in order of usefulness with 1 – most useful and 6- least useful	Tutor discussion	Group peer discussion		Paired peer discussion	Paired Practice	Solo practice	Visual aides	Reason:
Amt of time spent in sessions using these techniques								
No. of hours spent outside sessions using these techniques								Other study plans:
NEXT SESSION'S GOALS				Expectations of challenge				
				Easy	Moderately difficult	Difficult	Notes:	
1.								
2.								
3.								
4.								

APPENDIX (ii) Sample page from Accelerator 1 Learning Log

Daily Programming Log **Week: 1**
Day: Monday
Date:

Goals	Time estimation	Notes/Comments

What were my achievements?

Goals completed	Time taken	Notes/Comments

What was easy, challenging or helpful in today's session?