	University	**Glasgow**
	Department	**Computing Science**
	Module	**CS1P**
	Overview	The traditional level 1 Computing Science course accommodating 157 students consisted of two lectures per week, one two hour labs and a one hour tutorial every fortnight (one in each week). Labs and tutorials were divided into groups of around 10-15.
	Drivers for change	Learning to programme depends upon a series of sequential steps, which if missed out at any stage can lead to students becoming stuck and de-motivated. In past years, lecturers have often delivered significant amounts of material before the students have worked with any of it. Because of the stepwise *and* experiential nature of programming learning, students are unlikely to be able to engage with or understand new material when they haven't had a chance to practically work with, and embed understanding of, the material of the last lecture.
	Intervention	The current intervention was designed to offer students increased and more frequent formative feedback opportunities in order to facilitate the click-into-place factor to facilitate forward progress. It was hoped that this would increase student engagement and in turn enhance performance and progression rates. The traditional bi-weekly lectures and rotating fortnightly tutorials and labs were replaced with one weekly lecture and one large group tutorial (LGT) with a two hr lab in between, every week. Feedback from tutors was used to shape the LGT session. A tick system was introduced for completion of weekly exercises amounting to a total of three ticks per week. These could be completed/awarded at any time during semester in which they're given but two-thirds was required to be completed in each semester. A free programming project (FPP) was introduced for each semester in order to give the students additional ownership. Students were actively encouraged to help each other more after the mid semester 1 test to enhance exposure to assessment format.
PROCESS		
EMPOWERMENT		
NICOL'S 7 PRINCIPLES OF GOOD ASSESSMENT DESIGN		
	Principle 1 (clarify criteria)	(1) Students gained a clear idea of criteria and expected standards through undertaking regular exercises out of class (2) Practice tests enabled students provided further clarification of the learning goals and performance standards expected of students for the final exam.
	Principle 2 (self-assess, reflect)	(1) Students were provided with increased opportunities for reflection through discussion at large group tutorials (2) Students gained increased opportunities to reflect and self assess their learning in the course of enhanced opportunities to work on creating their own programmes.
	Principle 3 (tutor feedback)	1) Early feedback was available from handset questions in both the lecture and the LGT. 2) Students had increased opportunities for immediate individual face-to-face tutor feedback during lab sessions as they were actually working on problems. 3) Generic feedback was provided after the first class test with regard to students comparative performance in relation to the class average.
	Principle 4 (peer feedback)	1) Peer discussion was enhanced by the use of EVS during large group tutorials 2) Students had increased opportunities to work together in the lab programming than in pervious course iterations
	Principle 5 (motivation)	1) Self-regulation was promoted through tutors being more interactive with students than in their traditional role of semi-lecturers. This empowered students to become more autonomous in their approach to learning. 2) Free Programming Projects were designed to enhance ownership and engagement as students had m ore control over their deadlines and tasks.

ENGAGEMENT	GIBBS & SIMPSON'S 4 CONDITIONS OF TIME & EFFORT ON TASK	**Principle 6** (close feedback loop)	1) A sequence of learning activities was provided 2) The students had preparation work to do for the lab session to encourage them to attempt to solve problems and write programs *away* from a machine. 3) Combined tutorial/lab sessions provided students with an opportunity to discuss conceptual underpinnings before doing practical exercises and ending the session with further discussion relating the two activities. 4) A scaffolded approach to learning was provided with 3 practical exercises/activities/tasks per week, clumped in fortnightly sections, with typically the first week's exercises being more preparatory/easy in nature, and the second week's exercises building towards a larger programming problem to be solved. 5) Students had an opportunity to complete all of the learning activities associated with one cycle before going on to the next cycle.
		Principle 7 (shape teaching)	1) Teaching staff receive increased feedback from students from the use of EVS handsets in large group tutorials 2) Individual and generic EVS data was passed to tutors to shape tutorials 3) Tutors monitored student performance and problems during labs to report to lecturers to shape lectures
		Condition 1 (in and out of class)	1) Paper and pencil exercises provided students with the opportunity work anywhere and in their own time, thereby offering them increased flexibility and helping them to distribute their study effort evenly across the duration of the course and engage with engage with the concepts of the lecture.
		Condition 2 (spread evenly)	1) More opportunities were made available to students to work regularly on problems and therefore to spread their efforts out more evenly across the year than had existed in previous years.
		Condition 3 (deep not surface)	1) The large group tutorials covered material from current and previous weeks with peer discussion via EVS handsets, with which answers were recorded. The expectation was that the students would have engaged with the material covered, through the pencil and paper exercises and through previous weeks' lab exercises. The questions were therefore designed to work with the students' deeper understanding of the concepts.
		Condition 4 (high expectations	1) The opportunities for practice assessments conveyed the appropriate standard of performance that would be required for the students.

OUTCOME	**Efficiencies**	1) Staff marking time has been reduced and redistributed to increased contact time between staff and students.
	Informal Learning Gains	Student discussion session responses indicated that 1) Having the opportunity for practice exams with the class tests had increased learning 2) EVS use had increased students engagement during lectures The class post semester 1 questionnaire revealed that 3) Generic feedback through EVS on the class test and discussion of the issues had increased learning for the majority of students more than the traditional written feedback and that the comments and explanations had been more useful Quantitative data from Assessment and Feedback Experience Questionnaires revealed that 4) Students had benefited from progressively clearer criteria through the repeated cycle of exercises and feedback and through being provided with the opportunity to complete two class tests 5) Reflection on learning was enhanced through increased opportunities to work on practical problem solving exercises with immediate feedback on hand from tutors in labs and from being able to compare performance with peers during EVS exercises/tests. 6) Timeliness of feedback was improved through immediacy of feedback on EVS in lectures and through interaction with tutors while doing exercises in labs rather than being delayed in the former paper and pencil exercises. 7) Increased understanding through being given opportunities to work through problems and learn from their mistakes 8) Increased engagement during lectures through the use of EVS 9) Increased opportunities to close the gap between current and desired performance through the frequent opportunities to practice between labs and in the class tests as well as through the repeated learning cycle between lectures and lab exercises 10) More even spread of study time over the year Staff interviews revealed 11) Increased diagnostic powers through EVS responses and regular feedback between lecturers and tutors from the observations in the lab sessions. 12) Redistributed staff time on task involving reduced marking time and increased student contact time.
	Formal Learning Gains	