# Formative Assessment Structures in First and Second Year Architectural Technology to Enhance Student Learning

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## Abstract

The multiplicity of learning and teaching theories and strategies that a teacher can use to assist the process of developing greater student learning and engagement is very broad and it can be overwhelming determining what best suits a teacher's particular environment or the type of learning required to be undertaken by the learners. However some in particular stand out from an Architectural Technology perspective that we believe will benefit many other taught project based Engineering and Built Environment courses.

While the subject 'Architectural Technology' is often very closely associated and allied with Architecture, it is in fact quite different. The emphasis is on the construction technologies rather than a design concept. Architectural Technologists also have very strong links with the other built environment professionals that form part of the methodology or process that 'gets buildings built'.

In the world outside academia, graduates of the many different professions and disciplines that form the project teams that work alongside each other – collaborating and contributing their various skills that all amalgamate to complete construction projects of many different sizes and varying complexity. This great collaboration unfortunately does not generally take place between the various Built Environment courses delivered, yet we probably all teach, and the students learn, in a similar experiential manner.

In this paper, we will outline and demonstrate how a technique called 'Crit-marking' can be used in a rigorous, technical and legislative discipline that will not only improve the quality of feedback to the learners, but will be faster and more timely. Promoting greater student engagement as well as nurturing deeper learning, this productive learning activity will help develop and enhance students employability skills along with an improved confidence, all moving towards enhanced personal and professional development.

This particular formative feedback process and method of assessment can be adapted for wider use to suit many different course types as well as become a far more creative and rewarding process for staff and students alike.

**Keywords**: experiential learning, formative assessment, formative feedback, productive learning activity

## Outline of Fellowship Project

### Introduction

The successful outcome of this small action research study, whereby the measurement of the effectiveness of formative assessment strategies through qualitative surveys (conducted with the students' consent) which formed the research undertaken for the Teaching Fellowship, has expanded the implementation of Formative Assessment as a teaching and learning methodology in the Department of Architectural Technology. (The data collected and disseminated through this project is available in another paper.)

Upon completion of our current research, information extracted from the strategic student and staff surveys has already helped support our earlier instinct that this strategy 'works', by demonstrating its observed effectiveness. We believe that the particular method we use (called 'crit-marking') which has been adapted from the 'crit' process applied in architecture and other design courses, could now be tailored to benefit other taught, project based Built Environment courses.

In looking at a method upon which to base our research, we initially established that the Gibbs and Simpson model '*11 conditions under which assessment supports learning*' (2004) was the most appropriate framework for this particular study as there appeared to be a scarcity of information about formative assessment in higher education. The Gibbs and Simpson model was extremely useful and helped us to structure our research.

*Context*

The current Ordinary Degree, (changing to a Level 8, Honours Degree in September 2010) Bachelor of Science in Architectural Technology, is a constructively aligned syllabus, with explicit assessment criteria undertaken in a continual assessment method in a studio environment. The studio environment mimics an Architectural Office in the 'real world' in the manner in which realistic projects are set and in how the students are expected to engage.

> **Student intake – Average class size 55**
>
> - Points 425 (2007), 380 (2008) to 370 (2009)*
>   Demand generally exceeds place numbers
> - 1st Round CAO
> - Mature – circa 10%
> - Round '0'– circa 10%

*Reduction in points reflects impact of global recession particularly in the construction industry

**Table 3.1 Class size and demonstration of diversity of student (learners) type on B.Sc. programme**

Architectural Technology requires that the solutions to technical assembly problems of a building are the requirements that must *work*, for example, to keep water out, or not. The students have a choice of 'answers' they can produce, but they need to be sure that their solution is appropriately applied, meeting rigorous legislative and regulatory requirements also. The students are given a 'problem' and required to solve it by producing work in studio. They will discuss the project with their peers, studio staff or in a group or workshop style session. Using their relevant subject lecture notes or *webcourses* resource to research, work out one way, revise and re-work, all to arrive eventually at their proposed solution.

'The "crit" is the review of the learning-by-doing process' (Flynn, 2005: 11, 16), a formative feedback method usually used to critique or review *original* individual designs. We have adapted this method to assess work that must meet compulsory regulatory and legislative criteria. We also apply the 'crit' as a technical review process during projects as well as at the end of a project, post assessment. The 'realistic' workload immediately places the student in a productive learning activity which directly generates intrinsic motivation because of its perceived relevance. The Architectural Technology students are expected to complete project work, written assessments and undertake research outside their busy 36 hour contact week.

> **Studio project work (15 ECTS) per semester**
>
> - continually assessed over 2 semesters
> - 6 supporting subjects (5 ECTS each) – summative assessment
> - Practical *'learning by doing'* principle – course core ethos
>   60 ECTS Total

**Table 3.2: Subject ECTS on B.Sc. programme per academic year**

While most students successfully achieve the learning outcomes, we feel that this intensity in the past has led to a surface-learning syndrome among them. As on many courses, many students 'write' or 'learn' only to pass on information or declare the level of their learned knowledge as required but not to any great depth. (Despite this, it is a peculiar fact that Architectural Technology students have generally graduated in the past with an exceptional ability to 'think on their feet'. They have demonstrated an excellent work ethic and make reasonably good critical judgements when required – all of which has greatly enhanced their employability potential.) The very practical 'learning by doing' principle, rather than merely accepting 'received', handed down wisdom, like many other courses, is also very much a core ethos of Architectural Technology which must be protected and augmented.

While there is a carefully planned sequence of tasks and projects to help pace the students' learning and time management, the projects which are constructively aligned are also structured to provide sufficient formative tasks. However, we realised that if there is a delay in receiving feedback on a task, as has happened in the past, the student can be uncomfortable or uncertain about what the desired outcome required on any subsequent task should be. Thus, the successful completion of each 'task' must clearly enable the learner to address each new task with recently learned incremental knowledge, skills, confidence and development. Any hold-up to this learning process in the past was a problem.

*Tutors Workload*
Any delay in providing feedback caused a knock-on effect, inducing stress among the students or learners. Tutors were aware of this anxiety while assessing work and attempting to meet required learning outcomes, and as a consequence the workload for tutors also had become quite onerous. As projects became progressively more complex, so too did the time required for assessment. Attempting to notate every piece of every student's work thoroughly enough to ensure that the feedback would be of good quality and was returned rapidly, created further pressure. Then to discover that despite the written or annotated comments on each student's work, its return invariably triggered further verbal explanations being required by a number of students. This subsequently doubled up on the 'feedback' process as well as consumed time allocated to the next project. Additionally, some of those students who appeared to accept the 'written' feedback comments as given did not necessarily understand the full extent or depth of the tutor's comments which became evident in subsequent project work. This was frustrating and as tutors we frequently wondered about the effectiveness of what we were undertaking. This prompted a thorough re-evaluation of the whole project assessment process.

*Time for Change*
By examining the situation it became clear that the 'crit' process we already used in a general way could be adapted for use to create a new assessment process that could provide quality formative feedback to each student individually. By arranging and timetabling all staff engaged in teaching in the studio environment to be available together on an agreed day or days to undertake the formative assessment was one of the keys to the success of the whole enterprise. This also reflected how feedback on projects at critical stages in an architectural office would also be undertaken, thus provided the students with an element of 'experiential' learning.

*New Feedback Structure*
We came to realise that a series of carefully planned tasks and projects which would help pace the students' learning and their time management were required
- to avoid any delay in delivering or receiving feedback

- that each tasks' successful completion should clearly enable the learner to address each new task with
  - incremental recently learned knowledge,
  - confidence, skills,
  - competence and development.

We also recognised the need to be very clear in stating the aims and learning outcomes of each project and task in order to
- improve the quality and speed with which formative feedback is given
- help enhance the depth and level of learning
- provide reflective time

By the staff 'year team' agreeing on these objectives and 'front loading' the detail and very thorough preparation of the brief, the usually burdensome and often very time consuming task of assessment has been transformed. This is achieved by a clear and rigorous marking or grading process conducted during the 'crit-marking' process, which matches the carefully planned project brief. Students and teachers are all very clear about what is required along with what elements carry what assessment weighting within a project or task from the outset.

*Crit Marking – How it Works*
The marking 'crit', commencing by having *every* student's work displayed on the walls of the studio, immediately allows each student to see how their work looks alongside that of their peers and as they become more familiar with the process they can see where they are positioned within the class group, subconsciously developing 'self' and 'peer' learning.

Following a gallery style walk-about by all, some general observations made by the staff about the project are then delivered to the class group covering the following common points:
  (a)  Outlining and reminding the students of the learning outcomes that were expected to have been achieved, based on the brief issued at the beginning of the project.
  (b)  Reminding the student group how the project work done is to be assessed.
  (c)  How any work may be revised – if required.

Following several questions and answers and some general discussion with the class group, the studio tutors then break off into pairs initially to examine each student's work. Each staff member has a copy of the original brief issued to the students along with a separate Marking Sheet which identifies the Project, lists each student's name, and allocates an individual percentage under each of the following examples of headings:
- Demonstration of Technical Knowledge,
- Layout and Presentation (both visual and verbal, each marked separately) and
- Competence Demonstrated.

The students are then encouraged to talk about their project as the staff 'meets' each student, while standing beside their work. Students or their colleagues record any feedback comments of significance by the teaching team at this point. Research material can also be included, usually in a booklet form and displayed on an adjacent table to support the student's work. Other students awaiting their turn are encouraged to listen, observe or take part in the discussion. Tutors may indicate during the course of the discussion that something may be 'wrong' yet will talk through with the student how it can be 'fixed'. Frequently a technical issue or misunderstanding which may be common to several projects may require an informal workshop to take place on the spot which

includes and informs the whole class group.

Often in the course of the discussion with the student a tutor can glean whether the student understood what they were doing, or not. As CAD forms such a large portion of the course, and students can easily 'send' each other information electronically, the 'crit' process helps eliminate the complexities of any copied or downloaded work.

As staff then progress to the next student's presentation, they individually award marks for the work just viewed onto the structured 'Marking sheet'. These marks are then collated jointly by the staff *after* the session with the class group outside studio time, where they are then discussed and refined by the teaching team, prior to posting the grades awarded. The grades awarded are provisional, giving each student an indication of how they are doing. As the syllabus is taught in a continuously assessed framework, each student knows that they can revise their work towards their final grade at the end of the academic year.

This whole process of assessment generally can be done in one full day. With more complex projects, however, it could run over two days. While it is tiring for teachers, it is also very rewarding. One can perceive immediately improved incremental interaction, a significant improvement in the students' verbal skills, and tutors get to know their students better.

*Student and Staff Feedback*
The student feedback has been that they are very pleased to get their results so quickly, and can work to improve their grades immediately on subsequent projects. We have also observed an improved effort in taking notes and writing down any feedback during the individual 'crit' on the students' part. Almost as important, tutors have discovered that this method of 'formative feedback' assessment is a really far more pleasant, interactive task than the customary summative assessment undertaken over weeks previously. All staff recognise that the project brief preparation and pre-'crit' and post-'crit' meetings and discussions are extremely important, stating the required learning outcomes clearly and the method of assessment of each part.

Because of the perceived informality and collaborative quality of the feedback, even the most inhibited student has no difficulty with this method of assessment if it is handled sympathetically.

## Project Summary of Findings

The introduction of formative feedback and formative assessment through the improved studio 'crit' process has helped enormously towards the rapid improvement in quality of much of the student project-based work, which was evidenced at the end of year exhibition and commented on by the external examiners. The pass rate between projects had improved as even weaker student's grasped concepts and understood their purpose. (By the end of the students' first week in college it was discernible that the atmosphere within the class group was more open and friendly than in previous years at this stage of the 'settling in process' for first-years.) The qualitative survey conducted as part of this study, observes that 89% of first year students and 100% of the second year students surveyed confirmed preference for the 'marking crit' as a form of assessment, which has underpinned our initial anecdotal observations.

Improving the quality and speed with which formative feedback is given to the students *immediately* after the completion of each task or project has helped enhance the depth and level of learning as well as alleviate any anxiety that may have arisen, which was common when there was unavoidable delay. Student retention also seems to have improved, but this is from observation only and will

require further research to be undertaken to support this particular aspect.
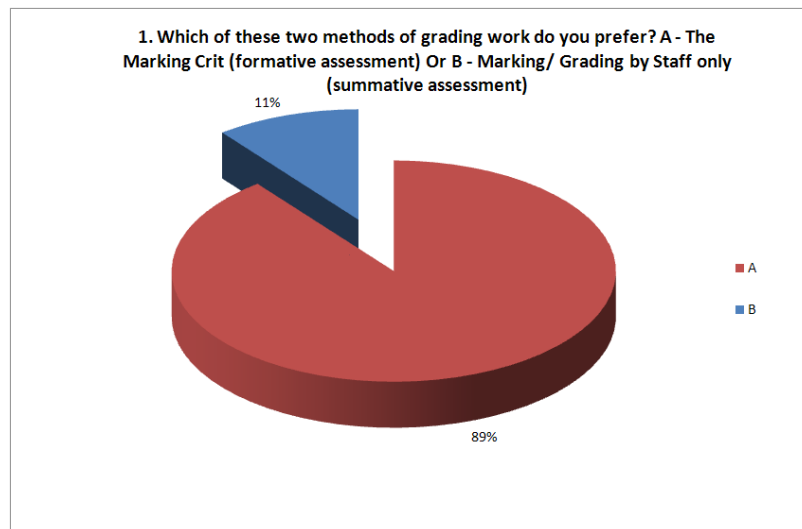


**Figure 3.1: First Year DT105-1 Online Survey – Assessment Preferences:
Mid Semester 2 Academic Year 2009–2010**

The improvement in the level of self assessment or reflection on learning, along with work done as individuals and in groups has developed improved peer and teacher dialogue *around* learning. An improved culture of motivational philosophy and self-respect has also emerged. In conclusion, this study has helped the students to define their own understanding of learning as well as to enhance their learning experiences.

This responsibility the students have taken towards their own learning will also remain with them for the rest of their lives. Through employing improved teaching methods (and enhancing those existing methods that work) for the wide diversity of first year student 'types' and in light of external economic factors reducing numbers of teaching staff, all whilst delivering a good first year experience is an ambition that we may yet realise, despite resource constraints.

**Conclusion**

The positive feedback and observations made by both students and staff has encouraged us to bring this method of feedback and assessment forward into the new Honours Degree programme commencing in September 2010, refining it further as we, as teachers, also learn more through the process. Regardless of developments in e-learning or computer technology, as we are still dealing with human beings, this form of formative assessment and feedback will benefit other project based curricula, or disciplines. Posters, displaying a synopsis of students work, along with a dialogue *around* learning deliver immediate and effective verbal feedback, whether peer or teacher based.

The argument has been made that by implementing the Gibbs and Simpson framework '*11 conditions under which assessment supports learning*' (2004) as a 'check list' to support our method which has enhanced all students' learning and development, all within existing resource limits in Architectural Technology.

> Using two-stage assignments with feedback on the first stage, intended to enable the student to improve the quality of work for a second stage submission, which is only graded,

Cooper (2000) has reported how such a system can improve almost all students' performance, particularly the performance of some of the weaker students.

(Gibbs & Simpson, 2004: 24)

The rate with which educators research and share new methods to enhance teaching and learning, despite economic constraints and external criticisms, is to be applauded. However, course managers must not view any changes in emphasis of teaching that enhances learning, such as this method of formative assessment and formative feedback, as being a 'solution' to reducing teacher numbers. The argument is made that by nurturing deeper learning through improved reflection on 'knowledge' learned, and by promoting greater student engagement, students as individuals and in groups will develop skills to improve their potential employability and confidence, while moving towards greater personal and professional growth.

## Future Work and Recommendations

The long term strategic aims of our research are:

- to improve the approach to assessment practices, in particular formative, in undergraduate Architectural Technology programmes in the Dublin School of Architecture

- to strengthen the link between teaching and research in the discipline of Architectural Technology and other Engineering and Built Environment education disciplines

- to foster excellence in undergraduate learning and teaching in both Architectural Technology education and Engineering and Built Environment education.

## Acknowledgements

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