Measure What You Value: Developing Detailed Assessment Criteria for Engineering Capstone Projects

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Abstract

An important area of development in the UK and other systems of higher education over the last decade has been the widespread use of specific statements describing the intended learning outcomes students achieve, in contrast to using syllabus content to define courses and programs. In measuring how well students have satisfied an intended learning outcome one approach is to use developed assessment criteria that specify qualitatively, by level of achievement, student performance. Writing developed assessment criteria requires faculty to make explicit complex areas of professional practice; but on the other hand, the process produces a number of important educational benefits one of which is assessment transparency. Additionally, if the developed assessment criteria are communicated to students before submission of work, students are able to engage with low stakes assessment tasks, and to use the feedback generated to improve performance via effective peer and self-assessment prior to formal assessment. In this paper, the development of learning outcomes and developed assessment criteria currently used by 65 members of teaching staff, to assess 300 undergraduate students in the five elements of assessment of final year capstone projects are reported. The approach used in the development of the scheme, and a comparison with its predecessor are described and benefits for students, staff and the institution are considered.

Introduction

This paper describes the development of effective marking, grading and feedback approaches relating to the learning outcomes achieved by students undertaking individual technical projects in the final year of undergraduate study (referred to here simply as projects). In the UK, the term assessment is used to characterize all of the processes relating to the grading, marking and evaluation of students’ learning activities and is used in that context in this paper. The development took place in an engineering school with approximately 1200 undergraduate and 300 postgraduate students, in a UK university where projects are supervised on a one-to-one basis.

Projects feature in many engineering programmes and, in departments with traditional curricula and pedagogic orientations, are one of the most highly valued experiences a student undertakes prior to graduation. In departments with progressive pedagogic policies, the project’s role is even more significant as an element of problem based learning approaches in engineering (see for example, Problem Based Learning in Engineering1). In UK undergraduate engineering degrees the project typically represents between 25% and 33% of the academic credit of the final year and represents a significant use of departmental resources. Within recent quality assurance
frameworks there is evidence that projects are viewed as more important than their associated academic credit would warrant, by the interest shown by professional and statutory bodies during accreditation of courses and by the focus of external examiners (a peer oversight approach used in the UK), on project quality. For potential employers, projects offer independent evidence of graduating students utilizing higher order learning such as analysis, synthesis and evaluation in problem solving settings and tangible evidence of a student’s ability to engage with an engineering problem.

From a teaching viewpoint the supervision of individual projects represents a rare and valuable opportunity to engage with students on an open, one-to-one basis and for staff to share in the social construction of learning. And, despite the ever present pressure to provide further efficiency gains in teaching, one-to-one supervisory arrangements (sometimes termed tutoring) are highly effective at improving achievement as Bloom observes.

'Most striking were the differences in final achievement... it was typically found that the average student under tutoring was about 2 standard deviations (sigma) above the average of the control [conventional] class (the average tutored student was above 98% of the students in the control class).'

Learning and development is also strongly supported by one-to-one supervision as it requires students to talk about their current understanding, with the result as described by Di Bello and Orlich, that,

‘... the very act of speaking about one’s current understanding makes one’s understanding implicit. Often an individual may have a sketchy or partial understanding of aspects of formal theory but be unaware of exactly what is understood or not understood.’

On the other hand one-to-one supervision is very expensive, and as staff student ratios have changed from about 1:8 in 1990 to approximately 1:25 in 2005 and financial transparency has increased, the relative cost of supervising projects in this way has also increased.

Learning outcomes

The 1990s represented a decade of continuous and substantial change in higher education. In the UK the call for public accountability developed by successive governments resulted in significant change. As part of the change, students were empowered as consumers of higher education and universities have made strenuous effort to make sure these new customers are well informed. Normally in the UK this is done by publishing statements that specify the intended learning outcomes (ILOs) students should be able to achieve, if they are properly admitted and apply due diligence to their studies. ILOs are meant to be easily understood by a lay audience and should be written in a format which is directly accessible by intending students and others who may be interested.

From the university’s viewpoint ILOs, specify the essential learning that a student must acquire for successful completion of a program of study. ILOs are developed for complete study programs, for years of study and for smaller structural elements, termed variously as
courses/modules/units in different contexts. Current thinking on the development of intended learning outcomes suggests that they should normally involve a combination of the following.

- Knowledge and understanding
- Intellectual abilities
- Practical, subject-specific skills
- Generic or transferable skills

It is customary to consider all ILOs to be of equal value and successful completion should imply that students have at least achieved some threshold level in each of the ILOs. Clearly, this has had implications for traditional assessment approaches.

Of the four elements mentioned above, ILOs relating to generic or transferable skills (sometimes termed process skills) are as important as the other more subject-based factors. Decomposing process skills into recognizable activities in the project would include ILOs relating to organization and time management, working and negotiating with others, information skills, and both informal and formal communications skills (report writing, summaries, presentations etc.). Putting aside the difficulties involved in assessing whether an individual has really achieved a threshold pass in all of the ILOs - it is clear that without at least a threshold pass in ILOs relating to communication skills other subject based ILOs cannot be readily assessed within normal higher education assessment frameworks.

Biggs\textsuperscript{6,7} tells us that one effective approach to developing learning environments is to begin by asking the question: \textit{what do we want students to be able to do as a result of learning?} The answer to this question informs both the ILOs and is the basis for developing the assessment process and criteria that are used to confirm an individual’s achievement. Overall, this approach specifies that the design of an educational experience builds linkages (or alignment) between the content, the learning process and the assessment of learning - to the ILOs. This process, called constructive alignment, requires that the ILOs inform:

- The way the curriculum is designed
- The learning methods employed
- The teaching approaches used
- The types of assessment utilized

The relationship between these four items should be clear, authentic, and as free as possible of what Snyder\textsuperscript{8} termed the \textit{hidden curriculum}. Indeed one of the key aims in development of the assessment scheme described in this paper was to make available to both staff and students the previously hidden elements of assessment decision making utilized when grading student project work.

Assessment context and theoretical background

Historically the purposes of assessment were relatively straightforward but with the search for greater efficiencies and accountability in higher education, the roles and purposes of the
assessment process are now extensive. In 1992 the UK Engineering Professors’ Conference\(^9\) considered that there were three main aims of assessment:

- to ensure that students’ learning matches the goals for the course…students are ‘strategic learners’ and so concentrate on the kind of learning that will give them high marks. ‘Assessment tends to draw learning through a course’;
- to ensure that students have achieved specified levels of knowledge and measurable skills;
- to grade students’ abilities or potential capabilities in understanding and complex skills, as stated in the course aims.

A decade later by 2002 the purposes of assessment had become significantly extended\(^10\) to address the following objectives:

- pass or fail a student;
- grade or rank a student;
- allow progress to further study;
- assure suitability for work;
- predict success in future study and work;
- signal employability and selection for employment;
- provide feedback to students;
- motivate students;
- diagnose students’ strengths and weaknesses;
- help students to develop self-awareness;
- provide feedback to lecturers on student learning;
- evaluate a module’s strengths and weaknesses;
- improve teaching;
- ensure the module is creditworthy;
- monitor standards over time.

Given this range of purposes it is clear that assessment is a potent force in shaping what tutors focus upon in teaching and what students concentrate on in the learning process. It informs what, how and why students learn.

One basic choice in the design of assessment schemes is whether failure in assessment will have important and costly consequences. Assessment of this type is termed high stakes, and is often end point. Historically, the English model of degree assessment, in which degree classification and accreditation (acceptance of the degree award by the relevant professional body) are essentially determined by the result of final exams, is a typical high stakes assessment scheme. As observed by Oppenheim, Jahoda and James\(^11\) a number of hidden assumptions (subsequently termed the Oppenheim assumptions), supported this normative process of university examinations in the UK in the 1960s. One of these assumptions (no. 12) is that ‘forced regurgitation of knowledge under stress is predictive of future performance’. Whilst the efficacy of this statement when applied to closed systems (e.g. armed service training) may be arguable, in a university system with wide participation of students from a large range of financial and
social backgrounds it is more problematic. As university fees in England (as distinct from Scotland, Wales and Northern Ireland) are set to significantly increase towards £3000 per annum in 2006 Oppenheim assumption no. 12 cannot be supported as an approach to differentiate between students’ performance. While high stakes assessment places stress on the student it also places stress on the tutors as noted by Roos who suggests that the use of high stakes assessment ‘tends to inflate students’ measured achievement –because teachers play the high stakes game and teach to the test’ and thereby potentially distorting standards.

Alternatively, low stakes (often continuous) assessment provides continuing feedback on performance at each assessment step, and thus allows students to adjust their learning to meet the desired threshold level and to learn more about the assessment process itself.

These two types of assessment are sometimes conflated with Scriven’s notion of formative and summative assessment. Assessment is termed formative if it is designed to help students to do better next time and does not contribute to final grades; it is the limiting case of low stakes assessment- i.e. no stakes. Whereas summative assessment directly contributes to the final grading of the student and may, or may not, provide useful feedback to improve performance and in the limiting case is the high stakes assessment described earlier. Pragmatically it is difficult to engage engineering students with no stakes assessment unless the link through to summative assessment is made explicit.

A further area of assessment dimensionality is divergent versus convergent assessment. In engineering, assessment is often used to explore whether students can obtain the same right answer as their teacher and others. This type of assessment, termed convergent assessment, allows students to show that they possess a specific subset of predetermined knowledge, understanding and skills. While conversely, divergent assessment is designed to allow students to demonstrate individuality and diversity. Clearly both these ideas have a place in engineering education but it is suggested that in projects the divergent approach should dominate.

Assessment framework

Applying these ideas to the assessment of projects within a school running some 300 projects a year (¼ of the student population) requires careful implementation, not least because marking and grading of students’ work is such a central role for individual academic staff members as teachers. A poorly determined assessment scheme can potentially produce disengagement with the process by staff, and it is critical for success that this does not take place. On the other hand new faculty need guidelines and induction into project assessment and a clear assessment framework helps to assure equity in assessment.

Within the context of this paper implementation is made more complex because the school in which the work was undertaken presents three types of undergraduate engineering degrees, differentiated by professional body accreditation. All three types of degree programmes are different, in that they have closely related yet distinct ILOs to represent the aims of the individual programmes. The projects elements of the three types of degree award are also very similar but with important distinguishing features, however for simplicity only the assessment framework for the BEng awards with Incorporated Engineer accreditation (BEng, IEng
Students undertaking BEng (IEng) awards who successfully complete the final year project are required to demonstrate the ability to:

- Undertake a risk assessment of a project.
- Undertake a search of information/literature related to a specified topic.
- Appraise relevant practical techniques to be used to obtain specified data in order to achieve set objectives.
- Formulate a project specification including a work plan to achieve desired project objectives.
- Efficiently and effectively communicate information orally and in the form of technical reports.
- Show initiative and independence in conducting an investigation of an engineering problem under the guidance of a supervisor.
- Apply selected modern technology and research techniques with proficiency.
- Analyse results/data obtained using qualitative and/or quantitative methods.
- Discuss critically the results of his/her work and their accuracy within the context of the current understanding of the relevant technology.
- Communicate the findings of an engineering investigation in a structured and coherent fashion in accordance with the specified guidelines.

These are the ILOs for the project, and to demonstrate the achievement of these ILOs students undertake the following set of low stakes assessment tasks (along with their phasing during the UK academic year):

- Submission of a Risk Assessment and Project Specification (November).
- Maintenance of a laboratory/project log book (weekly review)
- An interim Oral Presentation (early January)
- Submission of an interim report (half way through the project timescale at the end of January)
- Demonstration (May)
- Final Oral Presentation and Q&A session (May)
- Final Written Report (end of April)

Custom and practice within the school has been for the final oral presentation to be extended to take in the demonstration and review of the log book. The interim oral presentation and the interim report are assessed by one (different) member of staff, the final oral presentation is independently assessed by three members of staff and all the other elements are independently assessed by two members of staff.

Developing the marking and grading assessment criteria

One way of undertaking change within educational development settings is to use external (to the department/school/institution) consultants to act as change agents. However change driven from within the department/school is potentially more powerful as it has the advantage of being seen
as relevant, authentic and sensitive to the subject. On the other hand, it has the disadvantage that it can be seen as managerial rather than developmental. To address this negative feature the grading scheme presented in this paper was piloted during academic year 2003-04.

The prototype assessment sheets were produced by a working group of three staff from three different areas of engineering, but with a common interest in the educational improvement of projects. The approach used involved revisiting the learning outcomes for the project and to ask why we were using the assessment methods currently in place. One positive outcome from this process was the realization that much of the assessment methodology that had been used for project marking was supported by educational theory. However the existing scheme lacked the transparency required and threshold statements were proposed to anchor the scheme. The threshold assessment criteria are at the 40% (or C grade) and represent the minimum passing level the school accepts.

Within the existing UK way of differentiating degree performance at the undergraduate level marks above 70% represent what is termed first class performance and consistent performance at this level means a student may be awarded a degree with first class honours. Approximately 5% of students perform at the first class honours level and the working group had the task of defining first class performance within the context of the project. Once the threshold and first class performance levels were agreed the working group filled in the gaps by qualitatively deciding how student performance at other levels could be represented. The outcome of this process was piloted in parallel with the traditional assessment scheme but for the duration of the pilot scheme staff had the choice to use either the old system or the new system as long as students were informed. The format used for publication of the new scheme was that of assessment grids (sometimes referred to as rubrics). In the assessment grid the major contributions of each assessment task are codified and descriptors are given for all levels of achievement of the whole range of grades. These descriptors or assessment criteria are an intersubjectively agreed portrayal of performance. All descriptors above the pass level are written in a positive way.

During the pilot scheme no member of staff decided to use the conventional approach and the complete take up by staff of new scheme generated significant feedback for improvement. One area which produced useful discussion was in the production of the project risk assessment. If the view is taken that a project risk assessment is engineering specific then assessment becomes a binary decision. In other words have all the potential risks been identified and assessed and have sufficient controls been put in place to reduce the residual risk to an acceptably low level - or not? On the other hand the process of undertaking written and formalized risk assessments is becoming so common in the UK that undertaking a risk assessment should now be seen as a common or transferable skill rather than engineering specific. If the production of a risk assessment is a common skill then risk assessments may be graded. The latter view was used to develop the assessment criteria for risk assessments used in the scheme.

During 2005 the scheme was incorporated as school procedure and four elements of the grading scheme used during 2004-05 are presented in the appendix to this paper. These represent the assessment criteria and feedback sheets for the project specification and risk assessment, the interim oral presentation, the interim report and the final report.
Operationally as students submit work for assessment and grading they also submit a copy of the assessment criteria and feedback sheet. On the submitted assessment criteria and feedback sheets students mark, or rather assess their own work by ringing the descriptions they believe best describe the work they have submitted. Students are also encouraged to obtain a peer assessment from a respected student colleague before submission. However for academic credit only the mark awarded by the member of staff is counted but problems in the students’ perception of the assessment process can be diagnosed by the self and peer assessment task.

Discussion

Although improving project assessment was the major aim of this work another concern the school has relates to the difficulty in providing rapid, effective and useful feedback to students on submitted work. The school has a self imposed deadline of returning marked work within two weeks of submission, this is often difficult to achieve and was also a problem with the previous version of the project assessment scheme. In laboratory settings staff give rapid feedback to students on their performance very close in time to the event. Commonly staff work with students whilst those students are in Vygotsky’s zone of proximal development where they understand how to do some learning task but require the support of a mentor for success and to take the next step in learning. This feature is also one of the reasons why effective laboratory sessions are highly valued as opportunities for students to make rapid progress in their learning. Unsurprisingly this means that the technical elements of individual student’s projects are effectively supported with a good standard of feedback and supervision in lab sessions and design meetings and therefore the new scheme focused on other areas of feedback to students.

Educationally, the nearer in time feedback is to the learning it relates to, the better and allowing *apriori* access to developed assessment criteria helps to foster a reflective approach amongst students, as previously described. For staff, the use of assessment grids as feedback sheets is efficient and effective in supporting the specific requirement for the timely return of marked work and the rapid provision of feedback.

From an ontological viewpoint, publication of assessment criteria prior to assessment places particular demands on the assessment criteria themselves. Although as mentioned earlier the ILOs from a programme of study are aimed at a lay audience this does not necessarily mean that the assessment criteria are also written in this way. If this is not understood then assessment criteria may be produced which are insufficiently refined and become simply a check list*. The approach used in the development of the assessment criteria presented in this paper is that students are emergent professionals and their prior educational experience and in some cases significant life and work place experience should be reflected by producing assessment criteria which are open to critical review by the students themselves.

As is often the case evaluation of the success of this type of intervention is difficult to quantify, however the following qualitative observations can be made. Before the implementation of the present scheme there were continuing low level complaints about projects from students to the school management. Although these were often grumbles rather then about specific factors it is

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* For example a simple check list assessment criterion for a literature review might include statements such as *…utilises information from four refereed journal papers published since 2002.*

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likely that the inflexibility and excessive uncertainty of the previous assessment scheme contributed to this behavior. The scheme described in this paper gives students’ more confidence that their work is sound and the low level grumbles have stopped. Indeed the new scheme seems to be liked by students a factor which is evidenced by the feedback to staff at formal staff/student committee meetings.

A further benefit is that the new scheme supports the divergent assessment of projects. The formal controlling documentation allows for a wide range of types of projects to be undertaken but these can appear educationally risky to both students and staff. Consequently the range of types of project taken by students has been narrower than that envisaged at the time the program documentation was written. The new scheme tries to supports a wider range of project types by encouraging dialogue between students and staff on assessment. Staff can have confidence that they can effectively assess non-traditional/unconventional projects and students can see how this type of project can gain academic credit. The working group hopes that a wider range of project types will be undertaken as the new assessment scheme matures.

Prior to the introduction of the new assessment scheme problems had arisen for staff from both the excessive variability of achievement by students in projects and for the school resulting from the variability in marking consistency. Both these sources of variability meant that before confirmation of results additional written commentary was being produced by staff on a fairly regular basis, to further justify why students were being graded at a particular level. These further important commentaries were not shared with students and therefore did not contribute appropriate feedback but were produced to make explicit the marking decisions the individual staff member had taken. Clearly staff effort in producing the additional internal marking reports are an important element in providing quality control but were not being used to support learning. Under the system described in this paper a high degree of assessment transparency is achieved within the university’s engineering academic community and with external examiners. External examiners and colleagues can see how and on what basis assessment decisions have been made and the need for further justificatory report writing is removed. Project assessment is therefore more efficient and the effort that is employed by staff on assessment is more effectively directed at improving student learning.

In deciding upon the threshold level statements significant discussion occurred in the working group, in for example the requirement for students to demonstrate a relatively higher degree of competence in engagement with the literature than in elements of project planning (say). A further area of consideration was in how to grade a student who had demonstrated some elements of the assessment described by D grades. All engineers within the school that the author has spoken to about this factor visually integrate the grade to give an average, whereas colleagues from sociology appear more likely to lock the overall mark to the lowest grade achieved. This may be to do with the way argumentation is developed in each field however for the purpose of this scheme the decision about how the grade was finally decided upon was left to individual assessors.

Deciding what constitutes excellent or first class performance is a very important judgment since it must be remembered that at the same time as undertaking their project students are also engaged with a significant burden of other academic study (between 66% and 75% of study
time). Because of this important factor excellent or first class performance in the project looks like highly competent performance when taken out of context and would be inappropriate if applied to the dissertation phase of a masters degree for instance.

Looking back over the development process a number of generic process steps have been taken and together with observations these are summarized in the following list. For the approach to be used in a different school or with different number of students the list serves as a suggested checklist for implementation:

1. The learning students are expected to achieve in engaging with the project was written as a set of learning outcome statements.
2. Constructive alignment was used to vary the assessment tasks from the old scheme where necessary.
3. Each assessment task was associated with a number of learning outcomes that are explicitly stated.
4. Many of the assessment tasks significantly develop key/transferable skills.
5. An open, frank and wide discussion was undertaken by staff to produce a threshold (minimum passing) description for each learning outcome in each assessment task.
6. These threshold statements were written in a positive and encouraging way.
7. Further wide discussion was used to identify statements of excellence in each of the learning outcomes in each of the assessment tasks.
8. The excellent/first class statements were agreed and stated in a positive and encouraging way.
9. Statements for other levels of performance, in each learning outcome, for each assessment task, were written, again in a positive way.
10. Performance in assessment tasks which does not meet the threshold standard also has descriptors but as this type of performance is often deficient rather than simply wrong these descriptors focus on deficiencies in the work. It is difficult and possibly counterproductive to write the assessment criteria for grades below the threshold passing mark in a positive way.
11. A virtual learning environment was used as an effective way to manage implementation and to phase information release so as not to overload students and staff.
12. Copies of the completed assessment sheets were collected immediately after each completed assessment task was marked as primary evidence of implementation.
13. Staff were reminded regularly that the descriptors are, and will remain, tentative to encourage as much criticism as possible of the assessment criteria themselves to drive forward improvement.

The project assessment scheme described in this paper is effective and efficient and based on current progressive educational theory. It provides a low stakes / formative assessment load with the degree of summative assessment tuned to provide encouragement to the strategic approaches to learning of the modern engineering student. The use of assessment sheets provides rapid feedback for learning and transparency. The scheme emphasizes the importance the school places on the development of transferable skills and subject based knowledge and skills and acknowledges the stated demands of UK employers of graduate engineers [17].
References

1. Problem Based Learning in Engineering http://www.pble.ac.uk/


Appendix: Assessment and feedback sheets

BEng (Eng) Assessment Criteria and Feedback Sheet

IMPORTANT NOTE TO STUDENTS: YOU MUST ACHIEVE AT LEAST A “C” IN THE GENERAL AND RISK ASSESSMENT COLUMNS TO PASS THIS ASSESSMENT TASK

<table>
<thead>
<tr>
<th>MARK</th>
<th>General</th>
<th>Background</th>
<th>Aims and Objectives</th>
<th>Work Programme, Deliverables and Benefits</th>
<th>Work Plan</th>
<th>Risk Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;70</td>
<td>A</td>
<td>Work submitted by the given deadline. Excellent written work, presentation and style. Work carried out independently, without supervision and the minimum of advice.</td>
<td>Literature used is up to date and relevant. Clear identification of context. Background reflects the perception that the professional incorporation of engineering will use existing technology to solve new problems. Aims and objectives are well identified, clear, valid and achievable. Aims have high technical merit at the professional incorporation engineering level demonstrating deep understanding. Practical, clear and overall link to objectives. Clear evidence of completeness. Link to social, ethical and commercial context justified. Project programme is valid and achievable. Full analysis of cost and resource implications.</td>
<td>Gantt chart is complete using appropriate tools. Achievable and robust plan. Clear interpretation of key issues raised at the proposal stage. Work programme is valid and achievable. Full assessment of the cost of work units and/or deliverables.</td>
<td>Gantt chart is complete using appropriate tools. Achievable and robust plan. Clear interpretation of key issues raised at the proposal stage. Work programme is valid and achievable. Full assessment of the cost of work units and/or deliverables.</td>
<td>Risk assessment fully completed to a high technical standard and fully justified. Issues are clearly identified. Language of written communication is confident, informed and aimed at the correct audience.</td>
</tr>
<tr>
<td>55-69</td>
<td>B</td>
<td>Work submitted by the given deadline. Excellent written work, presentation and style. Tasks carried out with a below average level of supervision and advice.</td>
<td>Literature used is mainly up to date and relevant. The project is linked to practice. Description is technically informative at the professional incorporation engineering level. Aims and objectives are identified which are clear, valid and achievable. Aims have good technical merit. Demonstrating practical understanding of the engineering process. Practical, clear and overall link to objectives. Some evidence of completeness. Some links to social, ethical and commercial context justified. Work programme is valid and achievable. Full analysis of cost and resource implications.</td>
<td>Gantt chart is complete using appropriate tools. Achievable plan. Complete interpretation of key issues raised at the proposal stage with only minor oversights. Clear assessment of the cost of work units and/or deliverables.</td>
<td>Gantt chart is complete using appropriate tools. Achievable plan. Complete interpretation of key issues raised at the proposal stage with only minor oversights. Clear assessment of the cost of work units and/or deliverables.</td>
<td>Risk assessment fully completed to a high technical standard. Issues are clearly identified. Language of written communication is well informed and aimed at the correct audience.</td>
</tr>
<tr>
<td>40-54</td>
<td>C</td>
<td>Work submitted by the given deadline. Task requiring significant level of supervision and advice. Written language is clear with only minor typographical, grammatical and spelling mistakes.</td>
<td>The background of the project is described. Some evidence of the link to practice. A serious search for information has been attempted. Description has technical merit. Aims and objectives are identified. Aims have technical merit. Significant links to objectives. Work programme is complete with only minor omissions. Programme has links to objectives. Some analysis of cost and resource implications.</td>
<td>Gantt chart is complete using appropriate tools. Achievable plan. Some interpretation of key issues raised at the proposal stage. An assessment of the cost of work units and/or deliverables is demonstrated.</td>
<td>Gantt chart is complete using appropriate tools. Achievable plan. Some interpretation of key issues raised at the proposal stage. An assessment of the cost of work units and/or deliverables is demonstrated.</td>
<td>Risk assessment completed to an appropriate technical standard. Issues are identified. Language of written communication is aimed at the correct audience.</td>
</tr>
<tr>
<td>30-39</td>
<td>D</td>
<td>Work possibly not submitted by the given deadline. Task requiring a high level of supervision. Written language has significant errors which hinder the meaning of the work.</td>
<td>The background of the project is only partially described using out of date or irrelevant information. Little evidence of link to practice. Little evidence of a serious search for information. Description is at the craft/technician level. Objectives are poorly identified. Aims become partially relevant. Aims have minor technical merit. Objectives are poorly identified. Aims partly relevant. Aims have minor technical merit. Objectives are poorly identified. Aims have minor technical merit. None or only minor links to objectives. Work programme is incomplete. Program does not link to objectives. Little analysis of cost or resource implications.</td>
<td>Gantt chart incomplete or missing. Planning overoptimistic and not evidence based. Partial assessment of cost and resource issues.</td>
<td>Gantt chart incomplete or missing. Planning overoptimistic and not evidence based. Partial assessment of cost and resource issues.</td>
<td>Risk assessment is incomplete. Some issues are identified. Language of written communication hinder the meaning of the work.</td>
</tr>
<tr>
<td>&lt;30</td>
<td>E</td>
<td>Work possibly not submitted by the given deadline. Student unresponsive to supervision and direct advice. Written work very difficult to comprehend with serious grammatical and spelling errors.</td>
<td>Little relevant background to the project is described. No apparent link to practice. Information gathering is superficial. Description is of little technical value. Objectives are not stated or very poorly identified. Aims are irrelevant or not linked to the project. No link to objectives. No work programme. Program does not link to objectives. No analysis of cost or resource implications.</td>
<td>Gantt chart incomplete or missing. Planning overoptimistic and not evidence based. No assessment of cost and resource issues.</td>
<td>Gantt chart incomplete or missing. Planning overoptimistic and not evidence based. No assessment of cost and resource issues.</td>
<td>Risk assessment is missing or only partially completed. Language of written communication seriously hinder the meaning of the work.</td>
</tr>
</tbody>
</table>

GRADE: PROJECT SPECIFICATION

STAFF NAME:

GRADE: RISK ASSESSMENT

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# BEng (IEng) Assessment Criteria and Feedback Sheet

**IMPORTANT NOTE TO STUDENTS: YOU MUST ACHIEVE AT LEAST A “C” IN THE GENERAL COLUMN TO PASS THIS ASSESSMENT TASK**

<table>
<thead>
<tr>
<th>MARK</th>
<th>General</th>
<th>Background and Aims</th>
<th>Presentation Style</th>
<th>Visual Aids</th>
<th>Ability to generate audience interest</th>
<th>Ability to answer questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;70</td>
<td>A</td>
<td>Work submitted by the given deadline</td>
<td>Project background and aims fully explained and justified. Relevance argued and explained.</td>
<td>Excellent and lucid presentation style, appropriate use of language.</td>
<td>Excellent, effective and appropriate use of available visual aids.</td>
<td>Audience enthralled</td>
</tr>
<tr>
<td>55-69</td>
<td>B</td>
<td>Work submitted by the given deadline</td>
<td>Project background and aims fully explained and partially justified. Relevance identified and explained.</td>
<td>Good and lucid presentation style, appropriate use of language.</td>
<td>Good and effective use of available visual aids.</td>
<td>Audience interested</td>
</tr>
<tr>
<td>40-54</td>
<td>C</td>
<td>Work submitted by the given deadline.</td>
<td>Project background and aims explained. Relevance identified and explained.</td>
<td>Good and clear presentation style, appropriate use of language.</td>
<td>Appropriate visual aids used.</td>
<td>Audience remain attentive</td>
</tr>
<tr>
<td>30-39</td>
<td>D</td>
<td>Work possibly not submitted by the given deadline.</td>
<td>Presentation unrelated to Project background and aims. Relevance not identified or unexplained.</td>
<td>Indistinct presentation style, inappropriate use of language.</td>
<td>Inappropriate use of visual aids</td>
<td>Audience inattentive</td>
</tr>
<tr>
<td>&lt;30</td>
<td>E</td>
<td>Work possibly not submitted by the given deadline.</td>
<td>Project background and aims not addressed. Relevance not identified or unexplained.</td>
<td>Inappropriate presentation style, inappropriate use of language.</td>
<td>No use of appropriate visual aids</td>
<td>Audience disinterested</td>
</tr>
</tbody>
</table>

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**GRADE: ORAL PRESENTATION**

**STAFF NAME:**
### B.Eng (I.Eng) Assessment Criteria and Feedback Sheet

**IMPORTANT NOTE TO STUDENTS:** YOU MUST ACHIEVE AT LEAST A “C” IN THE GENERAL COLUMN TO PASS THIS ASSESSMENT TASK

<table>
<thead>
<tr>
<th>ASSESSMENT TASK: INTERIM REPORT</th>
<th>NAME:</th>
<th>COURSE:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>MARK</th>
<th>General</th>
<th>Literature Survey</th>
<th>Aims and Objectives</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;70</td>
<td>A</td>
<td>Effective and appropriate survey beyond material taught on the course including reviewed, justified and evaluated material from a variety of sources. Material is critically considered to derive support for project development. Major theoretical knowledge and practice located and identified.</td>
<td>Clearly defined key aims and objectives that are practicable and reasonable within the project remit. Objectives contribute to subject knowledge basis or practice.</td>
<td>Demonstration of an effective, efficient and practicable work plan. Demonstration of skill and critical understanding of the design and development process.</td>
</tr>
<tr>
<td>55-69</td>
<td>B</td>
<td>Effective and appropriate survey beyond material taught on the course including reviewed, justified and evaluated material from a variety of sources. Major theoretical knowledge and practice located and identified.</td>
<td>Clearly defined key achievable aims and objectives. Objectives contribute significantly to the individual’s learning.</td>
<td>Demonstration of an effective and practicable work plan. Knowledge and practical understanding of the design and development process.</td>
</tr>
<tr>
<td>40-54</td>
<td>C</td>
<td>Survey directly reflects issues relevant to the project taken from a variety of sources and clearly reviewed. Major theoretical knowledge and practice located and identified.</td>
<td>Aims and objectives are identified and outlined with only minor omissions. Objectives represent a qualitative improvement in the individual’s learning.</td>
<td>Demonstration of a practicable plan and knowledge of issues relating to the design and development process.</td>
</tr>
<tr>
<td>30-39</td>
<td>D</td>
<td>Material used is only partly relevant to the project with little or no review. Not all major theoretical knowledge and practice is located and identified.</td>
<td>Aims and objectives demonstrably incomplete or not specified. Objectives are demonstrably unachievable within budget and time scale. Objectives do not represent a learning opportunity.</td>
<td>Work plan is only partly related to the project and is demonstrably flawed or impractical. Little or no knowledge of the design and development process.</td>
</tr>
<tr>
<td>&lt;30</td>
<td>E</td>
<td>Little or no relevant literature is utilised. Not all major theoretical knowledge and practice is located and identified.</td>
<td>Little or no exposition of aims and objectives. Objectives are demonstrably unachievable within budget and time scale. Objectives do not represent a learning opportunity.</td>
<td>Work plan is unrelated to the project with only minor knowledge of the design and development process.</td>
</tr>
</tbody>
</table>

**GRADE: INTERIM REPORT**

**STAFF NAME:**
B.Eng (I.Eng) Assessment Guidance and Feedback Sheet

IMPORTANT NOTE: YOU MUST ACHIEVE AT LEAST A “C” IN BOTH THE GENERAL AND DISCUSSION AND EVALUATION COLUMN TO PASS THIS ASSESSMENT TASK

<table>
<thead>
<tr>
<th>MARK</th>
<th>General</th>
<th>Discussion and evaluation</th>
<th>Literature Survey</th>
<th>Aims and Objectives</th>
<th>Methodology</th>
<th>Engineering Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>A</td>
<td>Work submitted by the given deadline</td>
<td>Excellent written work, presentation and style. Work carried out independently. Report guidelines followed. Evidence of effective use of IT and information retrieval systems.</td>
<td>Results are fully and effectively discussed and evaluated in the context of existing understanding. Evaluation addresses a limited range of interest foci. Results are fully presented.</td>
<td>Effective and appropriate survey beyond material taught on the course including reviewed, justified and evaluated material from a variety of sources. Material is critically considered to derive support for project development.</td>
<td>Demonstration of an effective, efficient and practical approach to problem solving. Demonstration of appropriate skill and critical understanding applied to the design and development process.</td>
</tr>
<tr>
<td>80</td>
<td>B</td>
<td>Work submitted by the given deadline</td>
<td>Good written work, presentation and style. Tasks carried out with a below average level of supervision and advice. Report guidelines followed. Evidence of effective use of IT and information retrieval systems.</td>
<td>Results are discussed and evaluated in the context of existing understanding. Evaluation addresses a limited range of interest foci. Results are presented.</td>
<td>Effective and fitting survey beyond material taught on the course including reviewed, justified and evaluated material from a variety of appropriate sources.</td>
<td>Demonstration of an effective and practical approach to problem solving. Demonstration of knowledge and practical understanding of the design and development process.</td>
</tr>
<tr>
<td>60</td>
<td>C</td>
<td>Work submitted by the given deadline</td>
<td>Task required an average level of supervision and advice. Written language is clear with only minor typographical, grammatical and spelling mistakes. Report guidelines followed. Evidence of the ability to use appropriate IT and information retrieval systems.</td>
<td>Results are discussed and evaluated in the context of existing understanding. Evaluation addresses a limited range of interest foci. Results are presented.</td>
<td>Survey directly reflects issues relevant to the project taken from a variety of sources and clearly reviewed. Some evaluation of the referenced material.</td>
<td>Demonstration of an effective approach to problem solving. Evidence of some knowledge and understanding of the issues relating to the design and development process.</td>
</tr>
<tr>
<td>40</td>
<td>D</td>
<td>Work possibly not submitted by the given deadline.</td>
<td>Task required a very high level of supervision. Written language has significant errors which hinder the meaning of the work. Report guidelines not followed.</td>
<td>The discussion or results is seriously limited. Evaluation is seriously limited.</td>
<td>Material used is only partly relevant to the project with little or no review.</td>
<td>Inappropriate approach to problem solving which is only partly related to the project and is demonstrably flawed or impractical. Little or no knowledge of the design and development process.</td>
</tr>
<tr>
<td>20</td>
<td>E</td>
<td>Work possibly not submitted by the given deadline.</td>
<td>Student unresponsive to supervision and direct advice. Written work very difficult or impossible to comprehend with serious grammatical and spelling errors. Report guidelines not followed.</td>
<td>Results are not presented to an adequate level to allow evaluation to be effective or are not presented. Evaluation is very limited in scope or non-existent.</td>
<td>Little, irrelevant or no literature is utilised.</td>
<td>Undefined or non-existent aims. Few or none of the objectives achieved. Implicit objectives irrelevant or inconsequential.</td>
</tr>
</tbody>
</table>

GRADE: REPORT

STAFF NAME:

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