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Analysis of the Development
of a Marking Approach
for the Assessment of
Architectural Drawings

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Analysis of the Development of a Marking Approach for the Assessment of Architectural Drawings

Malachy McGarrigle

Abstract

Achieving consistent marking of architectural drawings between different tutors can present challenges, including reliable benchmarking of acceptable standards to ensure valid, trusted and justifiable final grades. The purpose of this project is to develop and analyse a marking approach using different tutors to assess architectural drawings, seeking to mitigate personal subjectivity and realise more reliable, convergent assessment decisions. The study explores the development of a structured approach to drawing assessment between tutors to reduce inconsistent marking and achieve more aligned results across different cohorts within Unitec's New Zealand Diploma in Architectural Technology. A clear, structured method is envisaged, whereby tutors evaluate content and draughtsmanship on individual drawings to produce more consistent assessment decisions across cohorts taught by different staff. The methodology included document analysis of early assessment material on the relevant papers and previous course iterations. Project findings will benefit tutors across construction drawing papers, helping them generate clear, reliable and consistent assessment decisions both individually and collectively. The approach can be utilised to assess drawings at various construction stages, and demonstrates clearly to tutors and students what is being assessed and, importantly, how it is being assessed.

KEYWORDS

Architectural drawings, assessment, reliable marking, Aotearoa New Zealand, rubric, tertiary education

Introduction

This project arose from observations of various methods used to assess architectural drawings at Unitec across Level 5 and 6 courses on the New Zealand Diploma in Architectural Technology qualification (NZDAT). When large teaching teams were employed, the impact of marking diversity influenced by tutors' personal opinions was noted. This project investigated the development of a marking approach for architectural drawings to help tutors generate reliable and consistent results while mitigating the impact of subjective opinions. Another important aim was to generate an efficient process that yields trusted results while avoiding making onerous time demands of assessors. Level 5 drawings typically assessed are the Major Project house presentation drawings produced in the Level 5 Scoping and Preliminary Design paper and production drawings in the Level 5 Documentation paper.

The drawings included in the marking set for this project were from a Level 5 NZDAT Documentation for Small Buildings paper. The present CONS5708 Documentation 1 paper of the active NZDAT is the follow-on from the previous CIBC5045 Documentation for Small Buildings paper. Both are Level 5 and there are no real changes other than the paper titles, codes and the rolling of the four earlier learning outcomes into one. In CIBC5045 the four individual learning outcomes required the production of location, assembly, component and schedule drawings, and in CONS5708 there is now just one overarching learning outcome, which asks for the same four drawing/document types.

The major assessment on this paper is the production of a set of typical drawings suitable for the construction of a medium-sized Aotearoa New Zealand dwelling. The nature and requirements of the assessment have not changed since the researcher began teaching at Unitec in 2011. The Documentation paper basically requires a set of construction drawing plans, and architectural BIM (building information modelling) software has been used to produce these outputs since before 2011. Physical hard-copy prints are now less used on many papers, as the work can be assessed digitally in PDF form, and this reflects electronic submission processes used within industry today.

With the advent of AI in recent years, Unitec tutors have discussed possible methods of automating marking, but to date there are no obvious ways to incorporate automation into the drawings assessment that the author is aware of. Comprehensive checklists are provided to the students for each individual drawing output. It should be noted also that providing drawing content from the checklists is only one element of the assessment, as this information must be checked to see if individual drawing content is relevant, appropriate and correct. An interim evaluation session is built into the delivery of the Documentation paper, involving various feedback methods, including peer review to engage learners better and to highlight the standard of drawing submissions expected and required.

The drawing checklists provided to students are updated to reflect major changes in standards or Auckland Council and Building Code requirements. An external architect assessor attends the interim evaluation sessions and advises on current standards and requirements – for example, the planning rules and

controls updated in recent years to comply with the changes introduced as part of the Auckland Unitary Plan.

In 2011 Level 5 studio papers such as the above used competency-based assessment with overall grades of Competent or Not Yet Competent. High-quality work could, however, be awarded a Merit grade. As shown in Figure 1, the rubric only lists the drawings required in the set and an assessor mark on a 1–5 scale based on their review of the submitted work.

ELEMENT 1: Prepare location drawings

Performance Criteria	Comments	C	NYC
Drawings to council consent level, in sequence as required for construction, use appropriate symbols and scale			
Cover sheet			
Town planing and site plan			
Site and drainage plan			
Lower level floor plan			
Upper level floor plan			
Elevations (four required)			
Foundation and subfloor framing plan			
Mid level floor framing plan			
Roof framing plan			
Roof plan			
Cross sections (two required)			
Long section			

Figure 1. 2013 Documentation drawings marksheet.

Drawing checklists were available, but no definitive guidance was given to tutors on an assessment approach. Final grades relied mainly on the professional judgements of the individual assessors. This can vary significantly, especially with new staff entering academia from industry, whose initial expectations of student work standards can be unrealistic. In addition, the process was almost binary, with no scope for middle ground on final grades. Unitec subsequently adopted an 11-point grading system ranging from grade E to grade A+. This substantial change prompted the design of a marking system to help any grades across this range to be awarded with more justification and confidence.

A rubric, shown in Figure 2, was subsequently developed for Documentation 1 drawing sets, listing all the required drawings in a top section and marked against scales that varied based on perceived drawing complexity. Assessors referred to individual drawing checklists when assessing drawing content. Some drawings were given higher weightings due to their importance relative to others. For example, floor plans, construction sections and assembly got more marks than a cover page or finishes schedules. The bottom half of the rubric set out what were considered elements of good draughtsmanship, e.g., line weights, use of hatches, sheet layouts and minimal drawing clashes.

	Fail	Ok	Excellent	Possible 83					
Drawings have relevant and complete content such as structure, construction systems and main checklist items.	0	1	2	3	4	83			
- Cover page - 2 - Ground Floor plan -8 4 elevations 4 - Component drawing and Schedules. 4 - Site Town planning 4 - Timber Sub Floor 8 - Concrete Slab 8 - Roof framing plan 8 - Roof Cladding plan 4 - Construction section 8	0	1	2	3	4	2			
	0	1	3	4	5	6	7	8	8
	0	1	2	3	4				4
	0	1	2	3	4				4
	0	1	3	4	5	6	7	8	8
	0	1	3	4	5	6	7	8	8
	0	1	3	4	5	6	7	8	8
	0	1	2	3					3
	0	1	3	4	5	6	7	8	8
Assembly details 18	0	3	6	9	12	15	18		18
Ext finishes schedule 4	0	1	2	3	4				4
Internal finishes schedule 4	0	1	2	3	4				4
	Fail	Ok	Excellent	Possible 30					
Good Draughtmanship eg:-	0	1	2	3	30				
- Lineweights and Styles - Sheet Layouts - Set out of Notes and Legends, - Scales, - valid Cross Reference Markers - minimal drawing Clashes - consistent Font Sizes and Styles - Controlled Leader lines. - Appropriate use of Hatches and Tones - Printed output clear and legible.	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	0	1	2	3	3				
	1	1	2	3	3				

Figure 2. 2017 Documentation drawings marksheet.

The rubric in use turned out to be very onerous and time consuming, requiring lengthy checking of discrete items for individual drawings. Despite its limitations, however, it led to the crucial decision to base any future drawing-assessment approach on two main elements, namely Drawing Content and Drafting Skills. A spreadsheet was developed that identified individual drawings required in the assignment drawing set, with columns provided where assessors input their marks for Drawing Content and Drafting Skills. These were then aggregated to calculate a total mark for each drawing (Figure 3).

Cover sheet	Layout design	Total	Site and Town Planning	DS	Total	Concrete Slab plan	DS	Total	Timber sub floor framing	DS	Total	Floor plan	DS	Total	Mid floor framing	DS	Total	Lower Roof framing plan	DS	Total
5	5	5	5	5	10	5	5	10	5	5	15	5	5	15	5	5	10	5	5	10
5	4	4.4	4	4	8	3	4	7	4	4	12	4	3	11	3	3	6	3	3	6
2	3	2.6	5	5	10	4	5	9	4	5	13	5	3	13	4	4	8	4	4	8
5	2	3.2	4	4	8	4	4	8	4.5	4	13	4.5	4	13	5	4.5	9.5	5	4.5	9.5
5	3	3.8	4	4	8	4	3	7	4	3	11	4	2	10	3	3	6	3	3	6
		0			0			0			0			0			0			0
		0			0			0			0			0			0			0
Cover sheet	Layout design	Total	Site and Town Planning	Drafting skill	Total	Concrete Slab plan	DS	Total	Timber sub floor framing	DS	Total	Floor plans	DS	Total	Mid floor framing	DS	Total	Lower Roof framing plan	DS	Total
CONTENT			Assessing how complete the drawing is in terms of content in relation to checklists provided to students																	
DRAFTING			Assessing whilst considering item such as those listed below :																	
			1.lineweights and types						2.Drawing layouts						3.Clashes extent of and control					

Figure 3. Partial view of current Documentation spreadsheet. Blue = Content, orange = Drafting.

Some drawings, such as floorplans, subfloor plans and sections were given higher weightings, due to their complexity and larger content. Checklists for drawings were provided for reference and verification of content requirements. Guidance notes relating to aspects of drafting skills, such as fonts, line types, clashes, etc., were also highlighted on the spreadsheet for easy reference.

The other major feature of the current spreadsheet is a column for the assessor's gut feeling or professional judgement mark. This is a mark based on an overarching impression by the tutor of the quality of the drawing set, which was then factored into calculating the student's overall mark and grade. This mark, awarded out of 5, is shown in a column to the right in Figure 4.

Mid floor framing			Lower Roof framing plan			Upper roof framing plan			Roof cladding plan			Elevations			Cons sections			Details prepared located, referenced			Total			Gut feeling																																														
DS	Total		DS	Total		DS	Total		DS	Total		DS	Total		DS	Total		DS	Total		Total	Total	%	Gut feeling	Gut %																																													
5	5	5	10	5	5	10	5	5	10	5	5	10	5	5	10	5	5	15	5	5	15	135	100	5	100																																													
1	3	3	6	3	3	6	2	3	5	3	3	6	3	3	6	4	4	12	3	3	9	92.4	68.44	3	60																																													
3	4	4	8	4	4	8	4	4	8	5	5	10	5	5	10	5	4	14	2	3	7	112.6	83.41	3.5	70																																													
3	5	4.5	9.5	5	4.5	9.5	4.5	4.5	9	4	4.5	8.5	5	5	10	5	3.5	13.5	3.5	3	10	115.2	85.33	4	80																																													
0	3	3	6	3	3	6	3	3	6	4	4	8	4	4	8	3	3	9	3	4	10	92.8	68.74	3	60																																													
0			0			0			0			0			0			0			0	0	0		0																																													
0			0			0			0			0			0			0			0	0	0		0																																													
Mid floor framing		Lower Roof framing plan		Upper roof framing		Roof cladding plan		Elevations		Constructi on sections		Details located, referenced												Gut feeling																																														
led to students																							Is the content relevant to the drawing or superfluous? Is it correct?																																															
3.Clashes extent of and control																							4.Font sizes, choice and consistency																							5.Hatch/ fill types appropriate,																								

Figure 4. Partial view of current Documentation 1 spreadsheet, showing 'gut feeling' column.

The main reason for this addition to the process is based on previous assessment experience. The author, when teaching on the United Kingdom's Higher National Diploma (HND), invited local architects to attend student critique sessions of drawings prepared for the Project module in the Business and Technology Education Council / Edexcel Level 6 award. Guests were not given any detailed marking material, as the intention was for them to focus on questions and comments regarding the student submissions. However, they frequently jotted down their own criteria and marked accordingly. At critique conclusion it was interesting to compare their grades and opinions with the marks applied using the formal rubric, as there was often very little difference.

This experience led to exploration of the academic merit of applying an assessment professional judgement as a form of mark modifier. The proposed marking process discussed here includes a professional judgement gauging the benefits of using both numbers and professional experience, a kind of 'head and heart' approach, so to speak, availing both quantitative and qualitative information.

The marking approach focusing on drawing content and drafting skills has been employed at Unitec by two tutors since 2018 and found to be easy to use, efficient and much less onerous than earlier iterations. Initial application of this marking approach was in the residential Documentation 1 paper, followed by assessment of presentation drawings in the residential Scoping and Preliminary Design paper with another tutor adapting it for use in a Drawing 1 paper.

Methodology

The methodology in this project includes a literature review and experiential knowledge acquired over 30 years of teaching and assessing architectural drawing papers in the United Kingdom and Aotearoa. Empirical data extends to colleague discussions both within Unitec's National Diploma courses since 2011 and externally at academic fora such as national moderation events.

Non-random purposive sampling involved participants populating the marking spreadsheet and collection by the researcher of marks data and comments. For the sampling, a sanitised set of Level 5 documentation drawings was prepared comprising the majority of the drawings required for the Documentation 1 course of Unitec's Architectural Technology diploma. The source material was a medium-standard student set submitted in a previous iteration of the course with all student identification removed. A medium B-grade set was chosen as it was considered more likely to generate marking variation and findings for discussion.

The 16 participants approached were from Unitec and other Aotearoa polytechnics, and one local architect, and 14 responded. Groups were created categorising participants based on their perceived proximity to Unitec, the Documentation 1 course, and existing familiarity with the marking approach. Those who had taught on the course in previous years or acted as a moderator were grouped together, and other groups were formed based on whether they had experience of using the method of marking under study. This was done to identify whether an assessor's familiarity with the process, course or any previous discussions led to any noticeable trend or pattern in the marks awarded.

Participants returned the spreadsheets with marks awarded to each drawing for content and drafting skills, generating individual drawing aggregates. Professional judgement (gut feeling) marks out of five were awarded then aggregated with individual drawing totals to generate a final grade for the overall drawing set.

The author re-marked the selected drawings in the sanitised set, and this new data set was compared to the marks for the relevant drawings originally awarded to the student submission. The original marks awarded to the student form part of the overall data analysis and discussion in the Findings section of this research. The re-marking was sufficiently removed timewise from the original assessment that the research author did not remember the original student involved or marks allocated.

Literature review

It was difficult to find literature discussing the same specific aspects investigated in this project, namely the assessment of architectural drawings both for presentation and documentation. This was especially true with recent literature, and most architectural drawing analysis was found in books as opposed to conference or journal papers. Another issue was that the most

relevant discussion was often found in publications more than ten years old. However, the points made in older literature were still considered relevant today, despite the many developments in architectural drawings over the years, such as computer-aided design (CAD) and BIM. Literature consulted included publications discussing the requirements of architectural drawings, and papers on the design of assessment rubrics and scoring systems.

A Unitec School of the Built Environment paper from 2008 has similar aims and objectives to this study, although not in relation to drawings, instead analysing the development of a rubric to assess student reports produced for the Bachelor of Construction degree Industry Project research paper.

Albeit in an older study, Davies and Birchmore (2008, p. 34) identify aims such as “achieving and maintaining consistency in the marking process” and reducing marks variation between assessors, objectives shared with this project. A difference between the studies is that this research is reviewing an approach using a marks spreadsheet and checklists, whereas that paper investigated the development of a rubric using assessment criteria and levels of performance.

Shared intentions, however, include items such as reducing assessor divergence, clarifying marking expectations and highlighting where areas of discrepancy are typically found to occur. In this study, that involves identifying specific drawings where marks vary significantly.

Davies and Birchmore (2008), quoting Pathirage et al. (2007), note that “The likelihood of inconsistency in assessment increases as more supervisors become involved in the course.” This situation has arisen in past documentation papers at Unitec, where different tutors assessed drawings across several cohorts and discrepancies were identified at moderation discussions.

Davies and Birchmore’s (2008) paper discusses marking by supervisors who may not always be subject-matter experts, differing from Documentation 1 papers in this study, where typically all assessors have relevant qualifications and industry experience. A similarity was also noted with their observation relating to possible tutor bias, where they highlighted discrepancies in their research between the student supervisor’s marks and those given by the external examiner. These mirrored similar situations observed on Unitec Documentation 1 papers, where a tutor’s marks sometimes differed from the initial opinion expressed by the course moderator.

HOW SHOULD THE RUBRIC OR SCORING SYSTEM BE DESIGNED?

Dawson (2015) discusses the definition of what an assessment rubric actually is, highlighting how the term ‘rubric’ has proliferated in educational literature since the late 1990s. He states that a rubric is a tool to support assessors in making summative judgements, while Reid and Cooney (2008, p. 893) define it as “a scaled set of criteria that defines a range of what acceptable performance looks like.” Burton (2006, p. 73) and other authors concur that a rubric measures student performance against pre-set criteria while also helping to “describe, clarify and communicate requirements.” Burton (2006), quoting Scarino (2005), also describes characteristics such as contextualising and focusing on expectations and requirements, facilitating judgements,

avoiding bias and subjectivity to achieve fairness, and defence of final assessment decisions.

Reid and Cooney (2008) discuss the advantages of designing an efficient and less time-consuming assessment process, stating that the more expedient the process, the more likely it is to be adopted for long-term use. Their paper also advises seeking a balance between ease of use and the precision of the data.

Burton (2006, p. 77) describes a scenario in which the wording of an assessment required that 60% of items such as footnotes conformed with a particular style; to mark according to the rubric, this would entail the tedious and time-consuming task of actually counting footnotes. Burton suggests that phrases such as “footnotes predominantly conform to the style guide” could be used, rather than requiring an exact percentage to be determined. An overly precise approach in defining marking criteria appears to be a response to some earlier researchers, for example Popham (1997, cited in Dawson, 2015), who questioned whether early rubrics were designed to be deliberately opaque and lacking in clarity.

Literature highlighted the need for reliable, valid rubrics and scoring systems, but Humphry and Heldsinger (2014) questioned whether enough study, research and testing had been done to verify whether typical rubric structures produced trusted results. Various rubric forms were discussed, all aiming to achieve a marking system with scoring guidelines enabling fair and sound judgements using precisely defined criteria. Rubric samples included those where quality levels or definitions were expressed through proficiency statements such as ‘good’, ‘very good’, etc., or in grade levels set out as numbers, or in line with a college grading system such as A, B, C, etc. Perlman (2003) recommends that scales of more than six or seven levels be avoided to reduce divergence in marking. She also stresses the practice of providing examples to students, ideally at different levels of achievement, mapping these to a range of scale points that adequately address performance from poor to excellent.

No paper on rubric design focused on architectural drawings and, although one showed a rubric for assessment of a design project, the criteria listed did not cover presentation media such as drawings or digital models. A study from Poland, by Gawlak et al. (2021), did relate to drawing-skills assessment of prospective architecture degree candidates, but, as their evaluation was carried out before any actual architectural drawing teaching, the criteria reviewed were not as specific as those required in the Unitec papers. The Polish study sought six qualities from their candidates’ drawings, and of these, the two most appropriate to Unitec requirements would be composition and proportion.

The assessments graded using our marking system for Drawing Content and Drafting Skills were all focused on the production and presentation of architectural drawings. These covered the drawings necessary at developed design and documentation stages, where the former are media prepared for design review by a client and the latter are drawings enabling the builder to price and construct the project. Our exercises would fall under Perlman’s definition of ‘performance assessment’, which she defines as essentially consisting of two parts, a task and a set of scoring criteria or a scoring rubric

(Perlman, 2003). We have sought in our assessment approach benefits listed by Perlman, specifically that a good set of scoring guidelines enables fair and sound judgements by clearly defining criteria and parameters for reviewing student work. As our tasks relate to assessing drawing sets typical of those within industry, we have also sought to align with Perlman's aspiration that good performance tasks are worthwhile, interesting and relate to instructional outcomes, in our case the learning outcomes for the drawing papers (Perlman, 2003).

The scoring system devised seeks similar aims to those discussed in the literature. The rubric design attempts to provide a comprehensive, clear assessment tool enabling efficient assessment of student work and devised in line with Simkins' (1989) objective of highlighting work elements regarded as especially important.

The scoring spreadsheet focus of this research project refers assessors to extensive drawing checklists provided to students. This is necessary because the graphic outputs in the Documentation 1 paper relate to quite sophisticated construction drawings. Perlman (2003, p. 5) discusses "dimensions on which performance is rated." The Unitec checklist allows assessment of our 'rubric dimensions', namely the individual drawings. The proposed marking system's checklist defines what is required of the dimensions/drawings, enabling detailed cross-checking of the Content assessment element. Assessors record presence or absence of key content by both checklist reference and their own professional experience. Flexibility in use of the scoring system allows scaling of assessment dimensions by number, grade or statement, and tutors have used a variety of methods to date at Unitec when using the Content and Drafting approach.

What is the purpose or intent of the drawings?

Several important points emerged from the literature that help define the properties of specific architectural drawings to students, and reinforce the proposed assessment approach to tutors. The importance of emphasising the intended purpose of the drawings, awareness of who would view the drawings, and viewer's ability to understand them came through in a number of texts. What are the drawings supposed to do? Why do they even exist? Leibing (2009) and Wakita (1999) highlight that builders are not concerned with the means of drawing generation, as long as the information contained is accurate and communicated clearly.

What qualities are required of the drawings?

Ching (2015) states that architectural drawings should be meaningful and comprehensible, with no unintended distractions that affect their being clearly understood. Leibing (2009) defines keywords beginning with the letter C to help draftspeople produce quality outputs. Remembering the words 'clear', 'concise', 'complete' and 'care' should help students incorporate the properties expected of good architectural drawings.

What content should the drawings contain?

The importance of drawing content in provision of comprehensive and correct information is highlighted in the literature. Also emphasised is the need

to control content level to avoid obscuring a drawing's intended purpose, thereby compromising communication of essential information. Leibing (2009) supports the view that checklists are an effective way to manage drawing content, particularly when regional requirements may have to be addressed. No paper reviewed explicitly discussed how architectural drawing assessment could be carried out, whereas an aim of this study is to evaluate an approach that has been used successfully in various forms over numerous recent years at Unitec. Our research focuses on analysis of construction drawing assessment, but the marking approach has also been used to assess presentation drawings.

How should drawings be organised?

BRANZ (2018) states that the critical requirements of drawings include being legible, neat, unambiguous and arranged in a logical sequence.

The learning outcomes of Unitec's Level 5 Documentation 1 paper specifically reference location, assembly, component and schedule drawings. The LACS system (named with the first letter of each of the four drawing types) has been adopted for drawing organisation in this paper. Clarke (2016) and Wakita (1999) emphasise the need for good drawing organisation that provides easy interrelationship of drawings to others within the set. It is also stressed that uniformity of drawing organisation is crucial, including the importance of adequately recording, dating and referencing versions where revisions have been made (New Zealand Government, 2022).

Drawing techniques and draughtsmanship

Drawing techniques vary widely within both industry and academia, but drawings used in architecture and engineering need to be comprehensive, correct and accurate, and provide the required information. Leibing (2009) states, however, that architect's drawings are more likely than those of engineers to employ variation of line weight to communicate and clarify exact requirements. Poor draughtsmanship, such as clashes where lines or symbols overlap on top of each other, possibly obscuring another drawing element, are to be avoided at all costs. Leibing (2009) highlights an example where clashes led to the misinterpretation of vital information, because a dimension line obscured a number specifying the structurally crucial size of a reinforcing bar. Wakita (1999) states that errors can be mitigated by good drafting practice, such as avoiding clashes, e.g., not interrupting or crossing dimension lines, or running leader lines across details.

How should drawings be assessed and what criteria may be of value?

Students generally want to know what is being assessed and how the work is being assessed. Words identified from literature, such as 'knowledge' and 'checklists' equate to the 'what' or Content element of Unitec's marking system, enabling comprehensive reviews to take place. For the 'how' aspect, words and terms such as 'graphical depiction', 'legible', 'logical sequence', 'comprehensible', etc. map neatly onto the focus on drafting skills in the Drafting element.

Findings and discussion

A total of 14 result sets were used in this project (Table 1). This includes the mark set for the student's originally submitted work as well as the author's revisited marking data for the sanitised drawing set.

TABLE 1. PARTICIPANT GROUP NUMBERS AND PROFILES.

Group	Number of samples	Group profile
All	14	All participants, including original mark set and author's revisited marking data.
A	4	Present and recent Unitec tutors who have worked on the Documentation 1 course recently or are currently involved. Includes the author and course moderator.
B	6	Unitec tutors who have worked on the Documentation 1 course previously, but have not been involved recently.
C	4	Participants external to Unitec who are not familiar with the Content-Drafting spreadsheet approach.

ORIGINAL VS REVISITED MARKS

As previously described, the author was the marker for the original student work that has been used to create the sanitised document set for this project. The author also marked the sanitised drawing set along with the other research participants, with enough time elapsing since the original marking event that there was no recollection of the student or marks. Both the original grade and that generated when the author remarked the drawings are included in the data sets for groups 'All' and 'A' in the table above.

The revisited marks differed slightly across many of the drawings; however, the 'gut reaction' mark did not change, and the final aggregated percentage mark for the author's remarking was only 1.35% different from the original. The author's remarked final grade of B- was the same as the original grade awarded, when marks were applied as per Unitec's 11- point scale, shown in Table 2.

TABLE 2. UNITEC'S 11-POINT GRADE SCALE.

Course Grade Boundaries										
0 – 39.5	40 – 49.5	50 – 54.5	55 – 59.5	60 – 64.5	65 – 69.5	70 – 74.5	75 – 79.5	80 – 84.5	85 – 89.5	90 – 100
0	39.5	49.5	54.5	59.5	64.5	69.5	74.5	79.5	84.5	89.5
E	D	C-	C	C+	B-	B	B+	A-	A	A+

On reflection, immediately after reassessment of the work, the author felt that his new marking may have been coloured by his knowledge of some of the marks received from other participants for the drawing set. This was perhaps the result of some subliminal pressure not to mark too easily or harshly when compared to others. Davies and Birchmore (2008) also note that

some assessors may feel pressure to conform to opinions expressed by more experienced colleagues.

OVERALL RESULTS

The combined results received from all participants are shown in Table 3. The overall marks are the final marks from participants after their 'gut reaction' has been averaged with their mark totals for the drawing set. The variance between groups for the highest overall mark was 20 marks, which illustrates a considerable difference between groups. The highest marks were seen in Group B, which consisted of Unitec colleagues who have been part of the course in the past but have had no recent involvement.

TABLE 3. RESULTS FROM PARTICIPANT CATEGORY GROUPS.

Group	Average drawing set mark	Average drawing content mark	Average drafting skills mark	Average gut reaction mark	Average modified mark	Highest overall mark	Lowest overall mark
All	77.6	79.3	75.5	71.7	74.7	95.1	64.2
A	72.9	75.7	69.3	68.5	70.7	75.1	66.6
B	81.4	82.2	80	76.6	79.0	95.1	68.4
C	76.5	78.4	73.9	67.5	71.9	82.7	64.2
Mark spread	8.5	6.5	10.7	9.1	8.3	20	4.2

The reasons for the large variance in marks cannot be verified in this research, but may be influenced by two participants wanting to support their colleague's project, despite being 'time poor.' Busy ongoing workloads possibly meant that they were unable to devote as much time to the marking exercise as it warranted. Both participants concerned responded very quickly with data after they received the research material, so the exercise may have been rushed.

The variance between lowest overall marks in each group is significantly smaller, at 4.2. No obvious reason for this emerges from the research. Based on experience, however, this could be due to tutors attempting to be positive in their grading unless work is of a very low standard or does not constitute a meaningful attempt.

Over the whole sample, the difference in marks between the final highest figure of 95.1 and lowest of 64.2 is greater than 30 marks, which is unacceptable. This situation, if arising in a test marking between members of a teaching team, would require a discussion to inform better future practice when separate tutor cohort groups have drawings assessed.

The least divergence in results was found within Group A, whose members were "Present and recent Unitec tutors who have worked on the Documentation 1 course recently or are currently involved. Includes the author and course moderator." The difference in marks between this group's average drawing set figure and the average 'gut reaction' is 4.4, and the difference

between their highest and lowest overall marks is 2.2. The members of this group have the most experience with using the assessment approach and discussing marks at end-of-study internal moderation, so the level of similarity is expected.

Similar analysis for other groups did not yield any definitive pattern or reasons for results. The greatest difference between average drawing set mark and 'gut reaction' was 9, observed in Group C. These participants external to Unitec did not use the 'gut reaction' mark moderator in their assessment processes, so this result could have been down to unfamiliarity with the approach in this project. The figure of 9 is not excessive, but again suggests that some pre-marking discussions would be of value. With hindsight, it would have been useful to ask participants when they recorded their 'gut reactions' – whether this was done before or after they marked the individual drawings.

GRADE ANALYSIS

The information from participants was converted into grades as per the Unitec scale, with results shown in Table 4. The prevalent grades for each column have been shaded. The spread of grades for the single drawing set in this exercise ranges from A+ to C+, which is clearly an unsatisfactory outcome.

TABLE 4. RESULTS AS GRADES FROM INDIVIDUAL AND ALL PARTICIPANT CATEGORY GROUPS.

Group	Average drawing set grade	Average drawing content grade	Average drafting skills grade	Average gut reaction grade	Average modified grade	Highest grade	Lowest grade
All	B+	B+	B+	B	B+	A+	C+
A	B	B+	B-	B-	B	B+	B-
B	A-	A-	A-	B+	B+	A+	B-
C	B+	B+	B	B-	B	A-	C+

The prevalent grade was a B+, with ten occurrences, and the least occurring were grades C+ and A+ (Table 5). It was also decided to quantify the grades shown in rows A to C and compare these with the grades obtained for the overall group. The most prevalent grade in Tables 4 and 5 is B+, with the A+ and C+ grades awarded least frequently.

TABLE 5. NUMBER OF OCCURRENCES ACROSS GRADE RANGE.

Grade	C+	B-	B	B+	A-	A+
Occurrences overall	2	5	5	10	4	2
Occurrences A, B and C only	1	5	4	6	4	1

REMOVING OUTLIERS

As results data was received by the author, it was possible to observe and compare the marks awarded by individual participants. Data received from two participants seemed unusually high in relation to the drawing set quality. These participants were members of Group B. One of these assessors gave a 'gut reaction' score of 5 out of 5, which would normally represent an exceptional drawing set.

Experience with these colleagues in the past had not indicated such generosity in allocating marks. This created some concern, as the marks seemed to be such outliers and could skew the overall results.

To investigate this further, the two perceived outliers were removed from the results (Table 6). This was done to see if the outliers' data had a significant impact on the figures and grades, and to attempt to verify whether their participation did have a significant effect on the overall figures or not.

TABLE 6. RESULTS WITH PERCEIVED OUTLIERS' DATA REMOVED.

	Average drawing set mark	Average drawing content mark	Average drafting skills mark	Average gut-reaction mark	Average modified mark	Highest overall mark	Lowest overall mark
All 14 samples	77.6	79.27	75.5	71.7	74.7	95.2	64.2
With outliers removed	75.2	77.1	72.9	68.7	71.9	82.7	64.2
Marks span	2.4	2.17	2.6	3	2.8	12.5	0
Spread with outliers included	8.5	6.5	10.7	9.1	8.3	20	4.2

With the two extreme marking sets removed, the difference between average marks changes only slightly, but the difference between highest overall mark across the groups reduces from 20 to 12.5. Across the whole sample, the difference is reduced from a range of 30 marks previously, to 20 marks with the two outliers removed. This gap between the new highest total of 82.7 and lowest total of 64.2 is still a concern, and would again require teaching team discussions on acceptable standards and use of the marking spreadsheet. Much of this divergence may be put down to insufficient guidance being provided to participants and also some assessor inexperience with using the proposed Content–Drafting spreadsheet method.

Table 7 shows the grade distribution with the outliers removed. The highest and lowest grades are A- and B respectively. This still represents a 10-mark spread, however, and would again require negotiation between assessors to come to a grade upon which all concur.

TABLE 7. GRADES FROM OVERALL GROUP WITH PERCEIVED OUTLIERS REMOVED.

Group	Average drawing set grade	Average drawing content grade	Average drafting skills grade	Average gut reaction grade	Average modified grade	Highest grade	Lowest grade
Modified	B+	B+	B+	B	B	A-	B

INDIVIDUAL DRAWINGS

Three individual drawings showed the greatest marks divergence across all group participants: Construction Section, Timber Sub Floor and Assembly Detail. Construction Section and Timber Sub Floor drawings both require a lot of content and subsequent drafting to produce good final compositions. Assembly Detail also requires a lot of information and content, including specific notes and items required for compliance, such as flashing dimensions. Details are also often cross-referenced to sections and plans, requiring the student to demonstrate good organisational and drafting skills such as cross- and back-referencing. To ensure more consistent marking, such drawings may benefit from special attention during any pre-marking briefing.

The cover sheet showed the least divergence. This sheet's composition involves a degree of subjectivity and requires less content relative to other drawings. The Concrete Slab drawing marks also indicated low divergence, again possibly because that drawing is not as content heavy as some others in the set.

PARTICIPANT FEEDBACK

Feedback received from participants was varied in its relevance, and there was some misunderstanding of what was sought. The intended comments were meant to focus on how easy the spreadsheet was to use, and while many did provide remarks on this, others did not. Some feedback instead focused on the way those individual tutors assessed the student's work. This reflected a practice noted in many New Zealand National Moderation events, where tutors frequently fall back on the relative comfort and safety of describing their own approaches rather than undertaking the more challenging task of providing a fair review of the work being moderated.

Other comments referred to judgement statements and how the marks may relate to these. A colleague at Unitec has adapted the Drawing Content–Drafting Skill approach, mapping judgement statements from 'Very Poor' to 'Excellent' using a 6-point scale, as in Figure 5. The marking approach discussed in this research therefore does permit variation in terms of the number and type of scales used to award credit under the two main headings of Drawing Content and Drafting Skills.

This rubric was developed by a colleague for his drawing paper and is shown only to demonstrate how the Drawing Content–Drafting Skills assessment approach can be, and has been, adopted by others. This rubric does provide detailed descriptions of performance required for drawings.

Marking Rubric (how marks are awarded)						
Drawing Content						
0	1	2	3	4	5	6
NO CONTENT All checklist content is omitted on the drawing	VERY POOR Most checklist content is missing on drawing	POOR Significant checklist content is missing on the drawing	SATISFACTORY Adequate/more than half the checklist content is present on the drawing	GOOD Significant checklist content is present on the drawing	VERY GOOD Most of the checklist content is present on the drawing	EXCELLENT All of the checklist content is present on the drawing
Drawing Skill						
0	1	2	3	4	5	6
NO CONTENT All content omitted	VERY POOR *Many drawing clashes *Many drawing errors *All drawings have incorrect line weight variation *Most/all handwriting is not legible *Most/All drawing elements are poorly laid out on the sheet *Mostly/all messy/untidy drawing style	POOR *Regular drawing clashes *Regular drawing errors *Most drawings have incorrect line weight variation *Significant hand writing is not legible * Many drawing elements are poorly laid out on the sheet *Mostly messy/untidy drawing style	SATISFACTORY *Minor drawing clashes *Minor drawing errors *Many drawings have correct line weight variation *Most hand writing is legible *Many elements visually balanced on the sheet *Relatively tidy drawing style	GOOD *Minimal dwg clashes *Minimal drawing errors *Most drawings have correct line weight variation *All hand writing is legible with some considered variation *Most elements are visually balanced on the sheet *Mostly tidy drawing style	VERY GOOD *No dwg clashes *No drawing errors *All drawings have correct line weight variation *All hand writing is legible and attractive with considered variation *All elements are visually balanced on the sheet *Very tidy drawing style	EXCELLENT *No dwg clashes *No drawing errors *All drawings have correct and attractive line weight variation *All handwriting is legible, stylistic and attractive with considered variation *All elements are visually balanced with attractive layout on sheet *Consistently tidy and attractive drawing style

Figure 5. Rubric mapping judgement statements and marks.

However, the use of headings such as ‘Good’, ‘Very Good’, ‘Poor’, etc. are seen by recent literature as vague labels that imply a standard, and it is emphasised that rubrics must include descriptions of what differing performance levels look like (Brookhart, 2018). Terms that do not communicate expectations adequately, risking reduced consistency across assessor teams, should be avoided (Dublin City University, 2023).

In terms of the comments that were received regarding use of the marking spreadsheet and approach, the overwhelming response was very favourable. One participant described it as “very user friendly, especially for someone who hasn’t marked one of these in a while.”

One Unitec respondent described the spreadsheet as so easy to use that they intended to adopt the approach on their own studio papers. This aligned with other observations that described the marksheet as user friendly and easy to use. One external participant described the approach as rigorous yet enjoyable to use. A comment was received stating that the approach was user friendly because it was not over complicated and avoided marking being “a long and painful process.”

No detailed comments or queries were received by participants on the consequences of missing content. The experience of the Unitec tutors using the Content–Drafting approach to date, however, indicates that this is very important and should form part of the pre-marking briefing to assessors.

Limitations and improvements

On reflection, it would have been useful to ask participants to give an indication of how much time they spent on the marking. One participant noted that it took them an hour to mark, but stated that they were a slow marker. Other participants provided no indication of time spent.

It would also have been helpful to advise participants that the research project was focused on marking only, and they were not required to provide feedback. It is recognised, however, that it can be difficult for some tutors to isolate marking aspects during assessment. Many tutors find they need to generate feedback as they mark, and such provision can be time consuming. The time element, therefore, should have been made more explicit in the participant project information.

Detailed instructions should also have been provided to assessors regarding the use of half marks. The participant instructions did not give any direction on this, but it may have improved consistency if it had been stated explicitly. Figures in the spreadsheets submitted indicate that some assessors did make use of intermediate marks on the 0–5 scale provided to them. This effectively extends the marking scale to 11 points, whereas Perlman (2003) suggests that scales of more than 6 or 7 levels should be avoided to reduce divergence.

Conclusion

An important aim of the development of this marking method was to produce a process that provided trusted, reliable results efficiently, while avoiding a system that made onerous time demands on assessors. A typical drawing set in a Level 5 Documentation paper at Unitec consists of around 12 drawings and includes upper- and lower-level roof framing plans and foundation plans, schedules, details, etc. This amounts to a total checklist count across all drawings of some 170 discrete items. Some repeated items, such as project name and title block on a master layout sheet, could be discounted, but this still gives a reduced total of around 138 items. Finding a way to cover this range of criteria while avoiding excessive time demands on tutors is a challenge that this project sought to address.

The marking approach explored resulted in considerable divergence in marks allocated, but was still considered valuable and easy to use by many assessors. This finding reinforces the need for pre-assessment discussions regarding expectations, standards and time allocation for the grading process, possibly then reducing the need for extensive post-marking deliberations. The research has identified factors that require greater attention in such discussions, such as provision of feedback, use of half marks, and the identification of drawing types that require more careful scrutiny. Paying particular attention to these areas is likely to improve the outcomes and consistency, as well as assessor workload.

The scoring system designed to mark and record achievement using

the main headings of Drawing Content and Drafting Skills is an efficient way of assessing student architectural drawings, but the reliability of the results will depend significantly on system familiarity and pre-marking briefing discussions. This is shown both by this research and by the fact that the system has been used across several courses at Unitec for grading drawings to date, both presentation and documentation, with good results. The course co-ordinators of three courses at Unitec use this scoring method with some slight variation, but have found the approach produces valid and reliable results, provided suitable preparation and guidance has been given to assessors.

The system is not onerous or time consuming, and achieves the intention of providing a user-friendly and efficient approach, albeit depending on assessor guidance and experience.

Recommendations

The marking spreadsheet should form part of an overall assessment strategy and approach that includes detailed pre-marking guidance briefings and post-marking moderation discussions.

Prior to individual grading, all assessors should meet to mark some work together and agree on standards. This process will help to benchmark the various performance levels for all assessors involved in the process.

Provide good clear guidance as to how to use the spreadsheet and checklists, especially around defining what is CONTENT and what is DRAFTING.

Review more technically complex drawings in detail to ensure that assessors are confident and consistent in their marking of these items. Those identified in the research include the Construction Section, Timber Sub Floor and Assembly Detail. Such drawings should be given particular attention in discussions before marking begins, to clarify acceptable standards.

Guidance should clearly address how to assess drawings lacking content and implications for the Drafting mark. Unitec tutors presently utilising the marking system feel that students should be penalised on the Drafting component if the content is incomplete. It was proposed that in such cases the mark should not exceed the Content mark, or perhaps be capped at half a mark above.

Make sure adequate time is allowed for the assessment exercise and discuss the time factor in pre-marking briefings, including the amount of feedback to be provided and in what form, e.g., marked-up drawings or audio recordings.

Discuss and agree within the assessment team whether half marks will be employed, and if not, whether marks should be rounded up or down.

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