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Assessing faculty perceptions of a pass/fail grading model in CS1.

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Assessing Faculty Perceptions of a Pass/Fail Grading Model in CS1

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***Abstract*—This Innovative Practice Full Paper outlines the findings of a survey conducted at the Robert Gordon University (Scotland, UK), focusing on feedback from faculty members and reflections subsequent to the introduction of a Pass/Fail grading system in the CS1 curriculum within the School of Computing, complementing previous work done focussing on the same implementation from the student perspective. This study aims to understand the impact of this grading model on teaching and assessment practices, student engagement, and motivation from the perspective of the module coordinators involved in the foundation year modules where this grading model was implemented. Analysis of the data indicates a generally positive reception of the Pass/Fail grading model among staff members. They reported streamlined marking processes and simplified grading grids as notable advantages. However, concerns were voiced regarding potential student demotivation and the ambiguity in determining the Pass/Fail threshold, which matched results from the student survey. Staff also encountered challenges in adapting assessment designs, particularly in shifting away from traditional grading paradigms. By shedding light on these observations, this paper contributes insights into the intricacies and consequences of integrating a Pass/Fail grading system into the early stages of an undergraduate computing curriculum. It not only underscores the need for careful consideration of pedagogical shifts but also provides valuable guidance for future implementation strategies.**

In summary, this research delves into the experiences and perspectives of staff members directly involved in implementing the Pass/Fail grading model. By addressing both the benefits and challenges encountered, it offers a comprehensive understanding of the implications of such a grading system within the context of undergraduate computing education. This, in turn, can inform decision-making processes and refine pedagogical approaches for enhanced faculty experience. Moving forward, exploring longitudinal effects of the Pass/Fail grading model on student retention rates could offer deeper insights into its efficacy in preparing students for future endeavors. Moreover, investigating potential variations in perceptions and outcomes across different academic settings and/or contexts could yield valuable comparative analyses.

***Index Terms*—assessment tools, grades, grading systems**

I. Introduction

This paper investigates reflections on the integration of a Pass/Fail marking scheme within the first-year computing (CS1) modules of a Scottish Higher Education institution. Motivated by the goal of alleviating stress and pressure on students entering higher education, this implementation aimed to provide a more supportive grading framework with a stronger focus on feedback and learning, rather than grade chasing. The study reports survey results from module coordinators responsible for transitioning their content from a traditional A-F letter-graded model to a Pass/Fail system, offering insights into various aspects of this pedagogical shift. The insights gleaned from the students have been published as a companion paper [1].

Some issues identified by the module coordinators about use of the Pass/Fail model in practice focus on student (de-)motivation, implying that the removal of letter grades may have an effect on the quality of submissions. Module Coordinators reported concerns that students might be artificially limiting themselves from excelling: "However, I do think it demotivates students from 'going the extra mile'", and indicated some difficulty in establishing the boundary between

what was considered a Pass, and what was considered a Fail ("It is however a challenge to design assessments that don't just default to a "pass" == "criteria for a D" under the A-F system"), with one member of staff indicating that it might be considered an unfair grading model: "Pass and fail is a harsh way to grade in my opinion as there is no borderline area.". Other responses follow this by suggesting that the binary nature might be too limiting, lacking in middle-ground in more formative cases ("[it] could have benefitted from a more nuanced distinction between students who passed well (with merit) compared to a satisfactory pass or a borderline fail"), leading to a lack of separation between those who perform exceptionally well, and those who scrape a passing grade. A further discussion of the challenges experienced with designing assessments and grading schemes will be further discussed later in this paper.

II. Background

The process of assessment is of central importance within any academic programme [2]–[4], serving to evaluate competence, identify gaps in learning and provide feedback for improvement [5], facilitate certification or accreditation of performance [6], as well as motivate and engage students in their learning tasks [7], [8]. In order to accomplish this, assessment tasks must satisfy some desirable criteria. They must be measurable, which means that we need some procedure to assign some kind of quantitative measure or statistic to the outcome of the assessment process.

This, in turn, means that any assessment task must be valid, i.e. it must measure the quality that the assessor intends, and it must be reliable, i.e. it must do so in a way that produces consistent outcomes under similar testing conditions. Validity and reliability are both essential to ensure that the assessment results are meaningful, and consequently useful, in the context in which the assessment is being carried out, but they are also necessary when providing performance indicators to stakeholders. While these technical requirements for accuracy and precision in the assessment process are necessary, they need to be supplemented by requirements for transparency and fairness. Transparency is required because students are more likely to be motivated when they understand what is expected of them and when they receive feedback on their progress [9]. Fairness [10] demands that assessment processes should not disadvantage individual students or groups of students because of characteristics which are not relevant to the outcomes being evaluated [11].

Assessment, therefore, is a multivalent, complex concept and these nuances are reflected in how it is operationalised within an academic programme, i.e. the grading process. Grading is usually defined in terms of the attribution of meaningful symbols related to student performance to individual pieces of work [12] to indicate levels of competence. The symbols are clearly meant to represent some summative measure of achievement in a student's course of study, but beyond that, they are important because of their close connection to wider aspects of the student experience [13]. They act as predictors for future educational performance, such as admission to, and success in, higher education [14]–[16]; as well as correlating with measures of educational disengagement [17]. Grading is therefore not synonymous with assessment, but a successful grading system should seek to further the aims and objectives of educational assessment.

A. Types of Grading

The ability to track levels of student performance at the end of a period of study is clearly an important aspect of assessment, but how this is done is controversial. The issues are broadly similar to those that arise in the general concept of assessment, namely the methodological basis of the process, the validity of the concept and the reliability of the process of assigning grades, as well as the affective impact on the learner experience.

With regard to methodological basis, grading is usually taken to be either norm-referenced or criterion-referenced [18]. Norm-referenced grading refers to assignment of a summary achievement statistic based on performance of the individual student relative to the population of those being assessed, whereas criterion-referenced grading evaluates performance against a set of pre-specified qualities or criteria, without reference to the achievement of others [19]. The requirement that assessment, especially at university level, should provide a basis for certification means that criterion-based grading is more common, as it is difficult, and in some cases, practically impossible, to gather appropriate data on a population, with respect to which normative grading could be performed. However, in the absence of sufficient clarity concerning the criteria themselves, criterion-based grading tends to devolve into normative grading of the specific assessment cohort, significantly limiting its effectiveness.

The issue of whether an assigning of grades really represents a summative measure of learning, i.e. the validity of the process, is also a matter of controversy. It is uncommon for modules or course units within a programme of study to have just one learning objective or outcome and so assessments rarely measure just one element of competence which can be represented in a single grade. There is a question, therefore, of how multiple learning objectives are combined within a single assessment, and how this aggregation is reflected in a single summary statistic. Poorly constructed assessments may include factors that do not indicate achievement in the domain they intend to measure, e.g., where the overall grade includes elements that either implicitly or explicitly consider surface-level features of an assignment such as formatting of text. Moreover, there is some evidence that affective factors such as the degree of effort, motivational elements, and other academic enablers play a part when assessors determine grades [12], [20].

Similarly, the consistency of the grade statistic and the way that it is assigned may be questioned. In order to be fair, grading should be internally consistent, i.e. grades assigned for similar pieces of work within the same assessment event should be similar [21], [22]. However, given that the results of

assessment also provide justification for certification, there is also an external consistency requirement which requires that, all things being equal, similar assessment responses should result in similar grades, regardless of where and when the assessment took place. We can therefore start to articulate some general operational characteristics of a grading scheme that should apply:

- A primary requirement is that it should allow for the evaluation of competence in whatever context the assessment takes place. Such an evaluation is necessary for certification purposes and also for the sensible return of feedback to learners.
- For validity purposes, the grading scheme must evaluate either a direct demonstration of competence or clearly defined and professionally agreed proxies for that competence.
- The range of the grades must allow suitable distinction to be made between various appropriate degrees of proficiency that are transparent and should neither be too limited nor excessive.
- Both the grades used and the assignment process used by teaching faculty should foster appropriate pedagogical goals, such as supporting assessment for learning, provision of useful feedback, etc.
- The reception of grades by students should encourage appropriate educational dispositions, such as encouraging good learning habits and providing motivation for continued engagement.
- Finally, the grading scheme should be fair and not disadvantage any individual or group based on factors that are not being assessed.

Numerical schemes provide one familiar model of a grading system. Percentages provides a simple scale to describe results (e.g. 0 to 100) and allow for the easy identification of a single cut-off point for success (e.g. 40%). The method of combining parts of an assessment reduces to simple arithmetical addition. A different model for grading would be the use of categorical grades, e.g. letter grades from A to F. While the process of assignment of categorical symbol grades can be qualitatively different from assigning numerical scores, in reality, the more symbols are used on a single achievement scale, the more the former resembles the latter, especially if there is some kind of mapping between the symbolic grade and some overall quantitative aggregate, such as a percentage range or a grade point score. While it is possible to retain some categorical character to the grade on, say, a six-point A to F scale, it is more difficult to do this as the number of categories grows.

One limiting case of a categorical grading scheme is a binary system with two categories, which we can denote *Pass* and *Fail*. A Pass/Fail system of grading is any scheme in which attempts to evaluate a piece of work and by assessing whether it satisfies minimal success criteria for a learning objective. In this paper, we focus on the use of such a system using so-called holistic assessment methods [23], [24]. The goal of this assessment process is to give an evaluation of work based on an academic judgement of its overall merit rather than a reductive aggregation of more atomic components of the learning objective. While there is nothing about these forms of holistic assessment which dictate the use of a binary marking scheme, sensible use of a non-trivial implementation of a Pass/Fail grading system does require an evaluation of work based on holistic principles. This does not mean that individual components of the assessment cannot be marked separately and then aggregated into a final summative grade but rather that any such aggregation process must consider the way that different elements combine into an integrated whole.

III. Method

A. Institutional Context

The Robert Gordon University is a higher education institution based in Scotland, UK. This study was carried out in the School of Computing, which offers a range of undergraduate programmes with Stage 1 entry (at the time of this study, these included *BSc (Hons) Computer Science*, *BSc (Hons) Computing and Creative Design* and *BSc (Hons) Cyber Security* and *MSci Computing Science*).

These undergraduate programmes share a common first year referred to as a "foundation year", where all students study the same set of core subjects, then select electives to complement their chosen course. Completion of the foundation year awards students with 120 SCQF credits, and allows them to progress to Stage 2, which is more tailored to their chosen course of study.

For the purpose of this paper, we use the term *module* to indicate a single subject (usually worth 15 SCQF credits) and *course* to indicate a full programme of study. The term *staff* refers to faculty members.

Recently, the design of Stage 1 was updated to incorporate a Pass/Fail assessment scale across all assessments and modules, thus promoting a greater focus on feedback rather than grades [1]. This was designed with the intention of allowing students more flexibility and creativity in how to complete their work beyond targeting minimum requirements, therefore better-preparing students for more granular grade distribution from Stage 2 onwards. Furthermore, the use of a Pass/Fail model, with its constrained and binary use of grading outcomes, allows for a greater focus on feedback. This approach helps to shift the focus away from a narrow focus on letter grades and towards a more comprehensive understanding of the student's strengths and weaknesses.

For each module of study, students would have been presented with coursework in week 1 of the semester, accompanied by a marking grid that adhered to a rigid template. This template provided guidance on the requirements for each assessment, as well as the guidance on what would constitute a Pass grade, and guidance on what would constitute a Fail grade.

At the Robert Gordon University, courses are overseen by Course Leaders, while individual modules are managed by Module Coordinators. Although the decision to adopt the Pass/Fail model was made at a higher strategic level for all

courses, the specifics of its integration into existing structures and assessments were left to the discretion of each Module Coordinator. This decentralised approach allows for flexibility and adaptation to each module's unique requirements and context, ensuring a more tailored implementation of the Pass/Fail model across the university's curriculum.

The purpose of this study is to understand the perception of this model following the completion of the first academic year within which this model was implemented. Evaluating the model from the perspective of the teaching faculty allows us to inform future pedagogy and refine how the model is implemented in future academic cycles.

B. Survey Design

A survey was created via Microsoft Forms by the researchers and validated by the School's Teaching Committee. It was validated by the School of Computing Ethics Committee and was distributed via e-mail to all Module Coordinators involved with foundation year modules during the 2022-23 academic session, with no remuneration for its completion. A total of 8 module coordinators completed the survey over a two-week period in September 2023, representing a completion rate of 100%. Module coordinators were asked to reflect upon their experience with the Pass/Fail marking system over the previous academic year (i.e. 2022-23).

A copy of the survey can be seen in Appendix A. First, Module Coordinators were asked questions on their teaching experience and to indicate broadly, how satisfied they were with the Pass/Fail marking system. They were also asked about their perception of student behaviour regarding their engagement and motivation when faced with this marking system, and about their perception of academic rigour when designing assessments under this binary grading model; this includes challenges, quality of feedback and time spent on feedback. Finally, module coordinators were asked to consider best practices for other institutions implementing such a system. Whilst the Microsoft Form required faculty members to log in for validation purposes, in order to preserve anonymity this information was not saved. Therefore, individual responses can not be attributed to individual faculty members.

C. Survey Analysis

Data was extracted from the survey responses using Inductive Content Analysis (ICA), a method for extracting and sorting the qualitative data that can be found in open and semi-categorised text. ICA calls for the investigator to take two passes at the content of a survey, questionnaire, or interview transcript [25]. The first pass is used to extract all of the ideas that have arisen. The second pass is to sort those ideas into meaningful categories. A third pass can be used to tally them, but it is important to remember that this is qualitative data and so cannot be used for calculating mean-based derivations, assumptions, or conclusions. Schamber [26] and Dervin [27], [28] show that ICA can be used with great success to capture the underlying intentions of participants as well as their innate cognitive behaviours.

Within the context of this study, the dataset was analysed in two stages. During the the first pass of the data, the answers to the 12 questions of the survey were sorted into issues put forward by the participants. The second pass clarified the key issues arising from the responses, thus forming the discussion points for this paper. During this pass, some issues were identified for future work.

IV. Results & Analysis

A. Demographics

Participants were asked to report their gender identity. Whilst the sample size is fairly small and will not be used to slice the data, we are including this data for descriptive purposes.

TABLE I
Self-Reported Gender Identity

Gender	Count
Male	5
Female	3
Non-Binary	0
Prefer Not To Respond	0

All participants were asked to report on their experience with teaching. The results of this question are in Table II, and show a good spread of experience across our sample size.

TABLE II
Teaching Experience

Teaching Experience	Count
0-5 years	3
5-10 years	2
10+ years	3

B. Satisfaction with the Pass/Fail Grading Model

Survey respondents were asked to report their satisfaction with their experience of grading on a Pass/Fail model during the 2022-23 academic session by means of a 5-point Likert scale, ranging from 1 (Very Dissatisfied) to 5 (Very Satisfied). All participants responded to this question, which is summarised in Table III.

The responses generally indicate positive perceptions of satisfaction among Module Coordinators, with several participants expressing similar sentiments. Participants were asked to elaborate on their score by means of an open-end text box. The data collected here can help provide context to the high variance observed in these satisfaction levels.

TABLE III
Distribution of Responses to Pass/Fail System Satisfaction Question

Satisfaction Level	n
Very Dissatisfied	0
Somewhat Dissatisfied	2
Neither Nor	0
Somewhat Satisfied	5
Very Satisfied	1

An analysis of the data indicates that Module Coordinators felt that this model streamlined their marking processes and led to simplified and more streamlined grading grids and processes (”Grading grids are simpler and easier to construct, defining exceptional and adequate performance indicators within Pass, and unsatisfactory indicators in Fail” // ”removed the burden of justifying a specific grade and allowed more focus on constructive feedback for students”). This led to a removal of superfluous data (”It works very well at removing extraneous detail from what is required of students - i.e., under an A-F system, an A and a D still get them to the same place, and at this early stage it’s not essential to see a trajectory towards a particular degree classification”), and put the emphasis on building foundational skills: (”[it] does an excellent job of focusing the student on what matters - namely, building a minimal foundational skill set. This is really useful for first year.”). For most, student performance was identified as having a positive impact on the Module Coordinators’ perception of the benefits of this grading model (”Only by measuring assessment will we be able to determine how many and how much of our students were able to understand our teaching methods and retain the module’s content. I’m pleased with how well each student did in this regard.” // ”[..] resulted in a reasonable number of module passes where utilised”).

C. Changes in Student Engagement/Motivation

Module Coordinators were given an open question to respond to the prompt: ”Have you observed any changes in student engagement or motivation with the Pass/Fail system?”. Despite it being a binary question, it evoked open responses from all by one participant (n=7).

Module Coordinators indicated that this model reduced perceived stress in the classroom: ”my students were noticeably less intimidated by assessment” // ”[it] relieves students of the pressure to outperform their classmates and enables them to take it easy and unwind while still receiving the knowledge they require to obtain employment in the future and develop”. Some respondents highlight an emerging trend caused by the move to Pass/Fail, where students feel that they do not need to push themselves to excel, without a perceived ’reward’ for doing so: ”There are also often less students who put in additional effort to assessments or labs beyond the minimum requirement”. The observation of reduced participation underscores a potential concern, and is echoed by other responses: ”less students tend to push themselves and just opt for baseline pass levels”. As one respondent pointed out, ”without additional motivation of high grades, the easier route of minimally fulfilling pass criteria will be tempting for more students”. This trend suggests the need for a closer examination of the broader implications of the Pass/Fail system on student motivation and academic engagement.

D. Challenges in Assessment Design

Module Coordinators were asked to submit a Yes/No response to the question: ”Have you encountered any challenges in designing fair assessments under this system?”. Responses were mixed, with 50% of participants responding ”Yes” (and were asked to elaborate further), and 50% responding ”No”. A number of themes emerge from this analysis, highlighting the unforeseen challenges encountered by Module Coordinators in the various aspects of assessment design using the Pass/Fail grading model:

- Mapping Assessment Requirements: Participants commented that it was challenging to translate an existing letter-graded assessment (using A-F) into a Pass/Fail assessment due to the challenge in ”identifying what the bare minimum is for a Pass, and designing a marking grid to clearly reflect this”. Whilst some Module Coordinators attempted to draw a line where anything above a D (in the old grading system) would now be a Pass, they found that ”[letter] grades don’t translate directly into Pass/Fail”.
- Balancing Multi-Stage Assessments: Some Module Coordinators experienced difficulty with combining grades for portfolio-based assessments, or assessments with multiple components: ”I have found that balancing modules with various parts can become challenging - having had students pass a module when providing minimal effort in one part and borderline in another.”
- Feeling Restricted by Binary Grading: Participants highlighted that the Pass/Fail model felt limiting during the grading process, especially if they had prior extensive experience of using letter grades: ”It’s difficult to get out of the A-F mindset when designing assessments. Since a D is a pass, it would follow that the criteria for a ”pass” should map to that for a D - but that doesn’t seem fair on students who are capable of demonstrating a higher standard.”
- Re-Evaluating Assessment Requirements: Respondents felt that they could not re-purpose existing material or previous assessments: ”As a result, I had to completely re-evaluate the concepts that I wanted students to learn and how they would be assessed. This involved quite drastic changes to the method of assessment”. This led to an overhaul of assessment strategies across the foundation year: ”The challenge here is in designing assessments that are inherently pass/fail - i.e., the requirements are such that it would be impossible (or at least very difficult) to map the assessment to an A-F scale.”

1) Time Spent on Feedback: Those who responded ”Yes” to the above question were asked *How has the time you spend on feedback change when using the Pass/Fail system?*. This was done through a 3-point Likert scale system ranging from ”I spend less time on feedback” to ”I spend more time on feedback”.

TABLE IV
DISTRIBUTION OF TIME SPENT ON FEEDBACK

Feedback Statement	n
I spend less time on feedback	2
I see no change in the time I take to give feedback	2
I spend more time on feedback	0

50% of respondents reported spending less time on feedback. This suggests a potential positive impact of the Pass/Fail system on the efficiency of the feedback process, thereby streamlining workload. It is also encouraging to see that none of the respondents reported an increase in the time spent on feedback. The response rate here is too low to make generalised statements based solely on this data. Further work in this area might consider looking not only at time spent on feedback, but also time spent on general module administration and preparation.

E. Quality of Feedback

Respondents were asked to comment on whether the way they provide feedback changed due to the implementation of the Pass/Fail marking system with the question *Has the Way you Provide Feedback Changed?*. 63% responded 'Yes' (and chose to elaborate further), and 37% responded 'No'. The data suggests a notable impact on the respondents' approach to providing feedback to students.

Participants in the study suggested an impact on time efficiency when grading using the Pass/Fail system compared to using letter grades. One participant noted that binary grading was less time-consuming: "Less time is spent justifying the grade, and more emphasis is given on constructive feedback". Other responses focussed on the ability to spend more time giving constructive feedback: "I am better able to provide feedback on specific technical competencies rather than aligning my feedback with subgrades". This shift in grading approach resulted in an increased emphasis on helping students understand the rationale behind the assigned grade. According to one participant, they "[expand] explanations a lot further so students understand why they fail or pass." Additionally, the provided feedback was described as being more fine-tuned, addressing strengths, weaknesses, and future points.

In contrast to the above, one participant suggested that as Pass/Fail was a new system, they needed to spend more time justifying themselves in the student feedback to help coach the students: "I have to expand my explanations a lot further so [students] understand why they fail, or why they pass".

F. Implementation Challenges

An open-text question asked participants *What challenges have you faced in your implementation of the Pass/Fail system in your module(s)?*. All participants responded to this question.

Two themes emerge from the analysis of these responses. The first is that of grading challenges: participants reported finding the boundary between Pass and Fail to be a challenging space to recognise in light of the various module structures, assessment designs and learning outcomes that were being assessed, especially when compared to a more structured A-F approach: "Finding the right measure for a fail or a pass" / "[the challenge was] moving out of the A-F mindset when designing assessments" / "there was little flexibility in recognising if students 'just met' or 'just missed' the minimum requirements for a passing grade". There was a perceived lack of flexibility in recognising variation in student performance, posing challenges in ensuring fairness and equity in grading: "Trying to ensure equity for students that passed with a 'good pass' [...] there felt to be less room for flexibility on grade achievement". The second theme that emerged was that of student engagement: Module Coordinators reported that students were focusing on completing only the required work to achieve the Pass grade, rather than pushing themselves to excel, as they might have with an A-F grading scheme: "[They opted] for the bare minimum rather than exceeding requirements".

G. Impressions of Student Experience

An open-text question asked participants: *What is your impression of student feedback with regards to the Pass/Fail system?*. All participants responded to this question.

An emerging theme was the importance of directed feedback. As Pass/Fail by design, does not allow students to immediately understand the measure of their success or failure, it falls down to the awarded feedback to be able to do so in a constructive and scaffolded manner: "The main disadvantage for students seems to be the notion of 'gauging skill level' - i.e. understanding their own proficiency at a certain subject. This is something that the granularity of grades provided at a glance. [..] Pass/Fail can achieve this, but it will require more integration with feedback". That said, respondents indicate that this might have an impact on the perceived time efficiency gains of such a system: "Providing nuanced feedback that indicates performance level to student requires as much, if not more, effort than assigning grades".

One of the participants raised a perceived danger: if a student provides very little in the amount of work, there is a limit to the amount of feedback that can be given, thereby potentially demotivating the student: "less work, less feedback = lack of motivation". The authors posit that this is not solely a Pass/Fail issue, but a larger issue around grading and the impact of that grading on students' motivation. A complementary study was carried out to examine the reaction to the implementation of the Pass/Fail marking system from the student perspective, and has been published separately [1].

H. Recommendations

An open-text question asked participants: "Based on your experiences, what recommendations or best practices would you suggest for other institutions considering a Pass/Fail system?". All participants responded to this question.

Two broad recommendations can be drawn from the responses. First, participants highlighted the importance of an overarching implementation plan when transitioning a system that works on alternative grading systems into one that is binary: "Implement the system from scratch, including designing brand new assessments that are inherently based on Pass/Fail, instead of simply updating the grading scheme for existing (multi-point) assessments". Any marking grids should not simply draw a line at the previously banded passing grade, but Module Coordinators need to carefully consider the

competencies required by students: "Provide more guidance on what the differentiating factors are for a Pass/Fail (is it just what was previously a D (a passing grade)" / "Marking criteria have to be detailed so students understand the reasons for the fail, or a pass".

The second recommendation emphasises the rising importance of implementing strategies to motivate students to push beyond the minimal effort required of a Pass: "I would like to see something that rewards students for extra effort". Whilst participants did not come to a natural conclusion on what this might look like, some suggested that the binary system was too rigid in its approach: "Having weights either side of Pass/Fail might improve motivation - a balance of removing the grade chase but also providing incentive. So Pass+, Borderline Fail (BF) etc." / "Include a "pass with distinction" qualifier to provide motivation for high-achieving students".

V. Conclusions & Future Work

This study explored the experiences of Module Coordinators within the School of Computing at the Robert Gordon University following the implementation of a Pass/Fail marking scheme across the existing first-year computing (CS1) modules. Motivated by the intention to alleviate stress on students entering higher education and foster a more supportive learning environment, the shift to a Pass/Fail grading model aimed to promote a more comprehensive understanding of feedback and learning in the formative stages of these students' higher education journeys.

The survey results, obtained from Module Coordinators responsible for transitioning their content to the new grading model, portrayed a generally positive reception. The findings indicate an overall positive perception of satisfaction, with an average satisfaction level of 3.8 out of 5. It should be noted that the Pass/Fail grading model demonstrated efficiency gains, as indicated by a reported reduction in the time spent on feedback which did not compromise the quality of feedback, with Module Coordinators emphasising a more focused and constructive approach.

Challenges encountered in the implementation of the Pass/Fail system revolved around defining the boundary between Pass and Fail, as well as concerns about student motivation, with Module Coordinators reporting that students were seen to be limiting effort to meet the minimum requirements of the assessment to achieve a Pass grade – the lack of a higher grade de-motivated extra work. The discussion suggests that careful consideration and guidance are essential in designing binary-graded assessments.

In summary, this study provides insights into the experiences of module coordinators on the implementation of a Pass/Fail grading model across the CS1 curriculum, offering a comprehensive understanding of its advantages and challenges. As educational institutions actively seek innovative grading approaches, these findings can be used as a stepping stone for informed decision-making and future improvements in pedagogic practice.

A. Limitations

Whilst the survey was completed by all module coordinators involved in study modules which were assessed using the (at the time) newly implemented Pass/Fail grading model, the small sample size of participants (n=8) may restrict the generalisability of findings to a broader context, or to other institutions. Additionally, the study focused exclusively on the perceptions of module coordinators which might introduce potential bias. A separate study examining the student perspective on the Pass/Fail grading model has been conducted, and these insights have been previously published [1].

B. Future Work

The Inductive Content Analysis method employed for the data analysis in this study features two passes through the data. On the second pass, some issues were identified for future work, which involves re-questioning in order to deepen understanding of the perspectives analysed in this study. This re-questioning stage would seek to gather more granular data for the faculty members' experience of prior teaching, to include experience with this particular course, with these particular students, and within this particular educational context. Qualitative data gathered here would give some additional context with which to analyse the rest of the responses gathered throughout the survey.

It is also imperative to recognise that these perceptions may evolve over time, and this study captured insights at a specific moment within the initial implementation of the Pass/Fail model in the curriculum. Future research with a larger and more diverse sample, incorporating multiple perspectives and conducted longitudinally, would provide a more comprehensive understanding of the long-term implications and effectiveness of the Pass/Fail grading model in undergraduate computing education.

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References

[1] M. Zarb, R. McDermott, K. Martin, T. Young, and J. McGowan, "Evaluating a pass/fail grading model in first year undergraduate computing," in *2023 IEEE Frontiers in Education Conference (FIE)*, pp. 1–9, 2023.

[2] J. Biggs, "Enhancing teaching through constructive alignment," *Higher education*, vol. 32, no. 3, pp. 347–364, 1996.

[3] L. Elton and B. Johnston, "Assessment in universities: A critical review of research," 2002.

[4] P. Broadfoot* and P. Black, "Redefining assessment? the first ten years of assessment in education," *Assessment in education: Principles, policy & practice*, vol. 11, no. 1, pp. 7–26, 2004.

[5] N. E. Winstone and D. Boud, "The need to disentangle assessment and feedback in higher education," *Studies in higher education*, vol. 47, no. 3, pp. 656–667, 2022.

[6] A. W. Astin *et al.*, *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education*. Rowman & Littlefield Publishers, 2012.

[7] T. T. York, C. Gibson, and S. Rankin, "Defining and measuring academic success.," *Practical Assessment, Research & Evaluation*, vol. 20, 2015.
[8] J. W. Michaels, "Classroom reward structures and academic performance," *Review of Educational Research*, vol. 47, no. 1, pp. 87–98, 1977.
[9] D. Boud, "Standards-based assessment for an era of increasing transparency," *Scaling up assessment for learning in higher education*, pp. 19–31, 2017.
[10] M. A. Flores, A. M. Veiga Simão, A. Barros, and D. Pereira, "Perceptions of effectiveness, fairness and feedback of assessment methods: a study in higher education," *Studies in Higher Education*, vol. 40, no. 9, pp. 1523–1534, 2015.
[11] J. Tai, R. Ajjawi, M. Bearman, D. Boud, P. Dawson, and T. Jorre de St Jorre, "Assessment for inclusion: rethinking contemporary strategies in assessment design," *Higher Education Research & Development*, vol. 42, no. 2, pp. 483–497, 2023.
[12] S. M. Brookhart, T. R. Guskey, A. J. Bowers, J. H. McMillan, J. K. Smith, L. F. Smith, M. T. Stevens, and M. E. Welsh, "A century of grading research: Meaning and value in the most common educational measure," *Review of educational research*, vol. 86, no. 4, pp. 803–848, 2016.
[13] E. Pattison, E. Grodsky, and C. Muller, "Is the sky falling? grade inflation and the signaling power of grades," *Educational Researcher*, vol. 42, no. 5, pp. 259–265, 2013.
[14] R. C. Atkinson and S. Geiser, "Reflections on a century of college admissions tests," *Educational Researcher*, vol. 38, no. 9, pp. 665–676, 2009.
[15] C. Thorsen and C. Cliffordson, "Teachers' grade assignment and the predictive validity of criterion-referenced grades," *Educational Research and Evaluation*, vol. 18, no. 2, pp. 153–172, 2012.
[16] R. Sawyer, "Beyond correlations: Usefulness of high school gpa and test scores in making college admissions decisions," *Applied measurement in education*, vol. 26, no. 2, pp. 89–112, 2013.
[17] K. De Castella, D. Byrne, and M. Covington, "Unmotivated or motivated to fail? a cross-cultural study of achievement motivation, fear of failure, and student disengagement.," *Journal of educational psychology*, vol. 105, no. 3, p. 861, 2013.
[18] R. Glaser, "Instructional technology and the measurement of learing outcomes: Some questions.," *American psychologist*, vol. 18, no. 8, p. 519, 1963.
[19] B. Lok, C. McNaught, and K. Young, "Criterion-referenced and norm-referenced assessments: compatibility and complementarity," *Assessment & Evaluation in Higher Education*, vol. 41, no. 3, pp. 450–465, 2016.
[20] P. J. Hay and D. Macdonald, "(mis) appropriations of criteria and standards-referenced assessment in a performance-based subject," *Assessment in Education: Principles, Policy & Practice*, vol. 15, no. 2, pp. 153–168, 2008.
[21] J. R. Echauz and G. J. Vachtsevanos, "Fuzzy grading system," *IEEE Transactions on Education*, vol. 38, no. 2, pp. 158–165, 1995.
[22] S. Wolming and C. Wikström, "The concept of validity in theory and practice," *Assessment in Education: Principles, Policy & Practice*, vol. 17, no. 2, pp. 117–132, 2010.
[23] D. R. Sadler, "Transforming holistic assessment and grading into a vehicle for complex learning," in *Assessment, learning and judgement in higher education*, pp. 1–19, Springer, 2008.
[24] R. S. Weiss, "Issues in holistic research," in *Institutions and the Person*, pp. 342–350, Routledge, 2017.
[25] H. Kyngäs, *Inductive Content Analysis*, pp. 13–21. Cham: Springer International Publishing, 2020.
[26] L. Schamber, "Time-line interviews and inductive content analysis: their effectiveness for exploring cognitive behaviors," *Journal of the American society for Information Science*, vol. 51, no. 8, pp. 734–744, 2000.
[27] B. Dervin *et al.*, "An overview of sense-making research: Concepts, methods, and results to date," 1983.
[28] B. Dervin, "From the mind's eye of the user: The sense-making qualitative-quantitative methodology," *Qualitative research in information management*, vol. 9, no. 1, pp. 61–84, 1992.

APPENDIX A: SURVEY

This appendix contains a text copy of the MS Forms survey distributed to participants.

1. How much teaching experience do you have?

- 0-5 years
- 5-10 years
- 10+ years

2. How satisfied are you with the Pass/Fail marking system?

- Very dissatisfied
- Somewhat dissatisfied
- Neither satisfied nor dissatisfied
- Somewhat satisfied
- Very satisfied

3. Can you elaborate on your answer above? *(free response item)*

4. Have you observed any changes in student engagement or motivation with the Pass/Fail system? *(free response item)*

5. Have you encountered any challenges in designing fair assessments under this system?

- Yes
- No

6. If your answer above was 'yes', can you expand? *(free response item)*

7. How has the time you spend on feedback change when using the Pass/Fail system?

- I spend less time on feedback
- I see no change in the time I take to give feedback
- I spend more time on feedback

8. Has the way you provide feedback changed due to the Pass/Fail marking system?

- Yes
- No

9. If your answer above was 'yes', can you expand? *(free response item)*

10. What challenges have you faced in your implementation of the Pass/Fail system in your module(s)? *(free response item)*

11. What is your impression of student feedback with regards to the Pass/Fail system? *(free response item)*

12. Based on your experiences, what recommendations or best practices would you suggest for other institutions considering a Pass/Fail marking system? *(free response item)*