

The Role of Student Conceptions of Feedback and Marker Comments on Student Performance

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ABSTRACT

Exploring the efficacy of feedback is a constant challenge for practitioners, who frequently observe that students do not use feedback. Early areas of feedback research focussed on feedback information and contexts, while more recent theory places a strong emphasis on what students bring to the interaction. How students conceive of the purpose and sources of feedback moderates how they interpret and use feedback. Student conceptions of feedback seem to impact achievement, but mechanisms are not well understood. This study investigated student conceptions of feedback in parallel with specific feedback and assessment events to determine if different conceptions are linked to different academic outcomes. Using self-reported survey responses within an introductory science course, student conceptions of feedback (SCoF) were mapped to observed uses of feedback, and subsequent performance, constrained by marker comments and prior academic performance. Within a well-fitting structural equation model, the conception Feedback tells me if I am meeting expectations loaded on improved performance ($\beta = .21$) but did not relate to self-reported use of feedback, which was somewhat explained by the conception I enjoy getting feedback ($\beta = .17$). Greater academic performance prior to the course reduced enjoyment of feedback ($\beta = -.14$) and created fewer marker comments on work ($\beta = -.49$). Overall course performance was weakly explained by three conceptions of feedback (i.e., Feedback tells me if I am meeting expectations, $\beta = .15$; Feedback is tutor comments, $\beta = .11$; Peer feedback helps, $\beta = -.13$) and strongly by prior educational performance ($\beta = .29$). These results show that conceptions of feedback weakly contribute to feedback usage and better performance, but clearly show the challenge of providing usable feedback to academically able students. This study provides insights into previously undocumented interactions between moderators of feedback processes.

Keywords: feedback; conceptions (SCoF)

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INTRODUCTION

Feedback is how students gain information as to how their work or understanding measures up against required standards and potentially how to meet those standards. However, the availability of feedback does not automatically translate into learning progression (Hattie & Timperley, 2007; Kluger & Di Nisi, 1996). Not only do students need the right information at the right time, but they also need to have appropriate dispositions and approaches to feedback (Carless & Boud, 2018; Panadero & Lipnevich, 2022). Student conceptions of feedback (Brown et al., 2016) have been shown to meaningfully relate to academic self-efficacy, self-regulation of learning, and academic performance. However, it is unclear how specific feedback conceptions mediate the learner's approach to using feedback, or what the consequent impact of those behaviours is on academic performance. This study contributes to the field by examining how student conceptions of feedback influence their use of the feedback they received within a first-year university science course.

Feedback Context and Content

Feedback must help a student recognise gaps in their knowledge, areas to improve, and how to proceed if it is to contribute to learning. Importantly, upon receipt of feedback, there must be an opportunity to act on it and show evidence of its impact; this means feedback has to come before a final, summative evaluation. Feedback (e.g., grade, marks, or comments) typically comes after an external evaluation by a third party (e.g., the teacher or peer) (Hattie & Timperley, 2007). For novice students, the expert perspective of the teacher is integral to developing competence in a domain. In an ideal world, each student would have access to regular individual dialogue with teachers while working on a learning task so that they can adjust and improve prior to the final summative evaluation. However, in many higher education contexts, most feedback arrives too late, leaving no chance for students to make improvements (Jessop & Tomas, 2017; Lipnevich et al., 2020). Since providing evaluative comments on student work is both restricted in frequency and is labour-intensive for teachers, it is essential that feedback is designed in such a way as to optimise the likelihood of it being acted on. Designing courses that make explicit the feed-forward function of teacher evaluation of summative student work can enable students' transfer and application of the feedback given. However, there is still variability in the efficacy of marker feedback even when the aforementioned conditions are met.

Student Conceptions of Feedback

The learner's approach to the feedback process shapes how they go about using feedback to progress their learning. Student conceptions of feedback seem to have an impact on their achievement (Brown, 2011; Brown et al., 2016; Gao & Brown, 2023). Consistent with the idea that beliefs and attitudes predict intentions and behaviours (Ajzen, 2005), this implies that student engagement with and use of feedback are influenced by their conceptions of its purpose and their attitudes toward it. Therefore, a better understanding of the adaptive and maladaptive responses and attitudes of students towards external feedback has the potential to enhance feedback practices. Moreover, knowledge of the conceptions held by a particular cohort of students can inform responsive teaching decisions relating to feedback.

To explore student conceptions of feedback as a self-regulatory mechanism, Irving & Peterson (2007) developed a student self-report survey (i.e., student conceptions of feedback; SCoF). This inventory has been used successfully across a range of contexts to identify adaptive and

maladaptive conceptions of feedback (Brown et al., 2016; Brown & Zhao, 2023; Gao & Brown, 2023; Harris et al., 2014). Among first-year university students, the belief that “*I actively use feedback*” positively predicted self-regulated learning, academic self-efficacy, and academic achievement (Brown et al., 2016). In general, when feedback was used and students perceived feedback as useful, feedback contributed to better achievement and performance (Brown & Zhao, 2023). However, the same study reported that relying on peers or teachers/tutors for feedback correlated with worse performance. A systematic review found that when students perceived feedback as useful, feedback contributed to better achievement and performance (Brown & Zhao, 2023). Thus, it is plausible that student conceptions of feedback, particularly those about its purpose and utility, map to student behaviour and actions in response to feedback. We therefore hypothesise that a student’s individual conceptions influence their feedback use, which may result in improved performance in subsequent tasks. To date, student’s use of specific feedback information has not been investigated alongside student conceptions of feedback.

Research Aims

This study uses data from a first-year and first-semester biological science course designed to make explicit to students the feed-forward function of teacher comments on graded work. The aim is to investigate the influence of student conceptions of feedback on their use of the marker’s feedback. The questions addressed in this study are:

- a) What conceptions of feedback were held by first-year Biological Science students?
- b) How did those conceptions relate to student self-reported uses of feedback and academic performance?

METHODS

Context

This study took place in a first-year core course focussed on ecology and evolution for the Biological Science major at the university (90 out of 478 students gave permission for data use). Written communication and critical thinking skills were explicitly taught in this course, and transition into university was supported by activities that assisted students to become self-regulated learners who could actively engage with feedback. For most students, this is one of their first courses of study at university.

The course was designed to include multiple feedback opportunities and to facilitate students’ interaction with, and use of, feedback to enhance the quality of their work or learning strategies. The curriculum was designed to emphasise coherence and continuation of skill development from one assessment to the next, using the feedback strategies discussed in the literature review. Assessments had both a formative and summative function, as skills and concepts from earlier graded assessments were revisited and extended in later assessments. In each summative submission, the markers provided individualised feed-back and feed-forward comments that would be relevant to the subsequent assessment. Some rubric criteria used for evaluating assignment 1 were used again for assignment 2, and students were required to apply what was suggested in the feedback to a different context. Assignment 1 was a 500-word synopsis, whereas assignment 2 was a 1500-word scientific report. The assessment areas covered in both rubrics for assignment 1 and assignment 2 included

scientific academic writing style, critical thinking, use of scholarly sources, citations, and referencing. Markers were trained to provide future-focussed comments that suggest ways to improve against these criteria.

Study Design

This was a non-experimental observational study based on natural outcomes generated by the teaching process. The study focussed on a single feedback cycle between assignment 1 and assignment 2. Multiple data sources were used to triangulate how student conceptions were related to their behaviours and outcomes. The four data sources for each participant were:

- a) A baseline survey capturing beliefs and attitudes toward feedback (SCoF).
- b) The markers' feedback given at the end of assignment 1.
- c) Individual written reflections about how they used feedback for assignment 2.
- d) Performance on the assignments and on the overall course.

Collecting matched data over time allowed structural modelling by regressing the SCoF data onto the self-reported feedback uses and evaluation, and onto marker comments and performance in course assessments and overall grade.

Participants

Ninety students in total participated in the study. Most participants were female (72.2%), with a mean age of 20 ($SD = 2.82$). Sixty per cent of all participants were Pakeha/European, a quarter Asian (27.8%), six were Māori (6.7%), three (3.3%) Pasifika, and two (2.2%) another ethnic minority. All participants were in their first semester of their first year of study. These students had achieved well in their secondary schooling, with a mean incoming grade point equivalent (GPE) of 5.2/9.0 ($SD = 2.0$), with nearly three-quarters of participants (73.3%) having achieved a B grade equivalent or higher. All but one student was enrolled in a Bachelor of Science degree. The course in which the current study was conducted was compulsory for students majoring in Biological Sciences and an elective otherwise.

Instruments

Student Conceptions of Feedback Student perceptions of feedback were captured using the SCoF inventory (Irving & Peterson, 2007). The instrument captures five latent factors: 1. I actively use feedback with a subfactor, I enjoy feedback; 2. Peer feedback helps; 3. I ignore feedback; 4. Feedback tells me if I am meeting or exceeding expectations; and 5. Tutor/marker comments are helpful and clear. Theoretically, four of these factors are adaptive, while "I ignore feedback" is maladaptive. Once a well-fitting model was established, factor scores were calculated for each student using the average of raw responses for each factor to represent each student's position on the factor. This produced scores that follow the same scale as the response scale. These factor scores were used in subsequent structural equation modelling.

Marker Feedback

Categorical content analysis (Smith, 2000) was used to identify the nature of the markers' feedback. A simple three-point ordinal scale was used to classify feedback. Identification of a fault was considered the simplest feedback, whereas description of how to correct a fault was given a higher standing. Finally, feedback that directed students' attention to addressing the

issue in the future was given the highest weight. The scale and the descriptor are summarised as follows:

- a) Evaluative: identification of errors with no suggestions for improvement.
- b) Corrective: commentary on issues or corrections with a recommended path for improvement.
- c) Facilitative: specific feedforward comments or reflective questions oriented to development and creating awareness for application in future contexts.

Each comment was assigned a score, and the weighted sum of all scores generated a quality score for each instance of the markers' comments. These comment scores were then used in a structural equation model.

Students' Use of Feedback

Students' use of feedback was evaluated through their reflections using categorical content analysis (Smith, 2000). A simple four-point ordinal scale of feedback use was created, in which greater weight was given to uses that involved deeper processing of the feedback. The weightings were as follows:

- a) No reference to the feedback was mentioned.
- b) Error Fixing: the student reported correcting surface feature errors (e.g., formatting, punctuation).
- c) Corrections: the student mentioned the application of corrective feedback comments from assignment 1.
- d) Facilitative: the student reported using the feedback to seek new information, knowledge, or alternative feedback to improve their work.

Each reflection element was assigned a score, and the weighted sum of all scores generated a quality score for each instance of student reflections. These comment scores were then used in a structural equation model.

Academic Performance

Three measures of academic performance were captured. These were the incoming grade point equivalent (GPE), the overall final grade in the course, and the score difference between assignment 1 and assignment 2. Since the two assignments were scored using the same rubric, the score difference was adjusted to account for the amount of possible increase (i.e., the difference between assignment 1 and 2 divided by the possible gain from assignment 1 to the maximum score). This prevented a penalty against students who had performed very well initially since their score change was evaluated against the possible gain to reach the ceiling score (Hovland et al., 1955).

Modelling Relationships Between Variables

The SCoF responses were analysed using confirmatory factor analysis, while the relations among constructs were evaluated with structural equation modelling (SEM). Both procedures were carried out using AMOS (Arbuckle, 2021). The fit of models to the data was determined by examining multiple fit indices. A well-fitting model would have a normed chi-square ratio <3.00, Comparative Fit Index (CFI) and gamma hat values >.95, and root mean square error of approximation (RMSEA) and standardised root mean squared residual (SRMR) values

<.05. Acceptable fit is attributed if the normed chi-square ratio is not statistically significant, the CFI and gamma hat values >.90, and root mean square error of approximation (RMSEA) and standardised root mean squared residual (SRMR) values <.08.

The hypothesised SEM model specified that student conceptions of feedback and markers' comments would both influence how students used feedback. Student use of feedback was assumed to mediate the influence of conceptions and markers' comments on the improved marks in the subsequent assessments. Other paths between variables were also explored based on MI and theoretical underpinnings. This included investigating whether incoming GPE could be a determinant of behaviours and performance.

Given the obtained sample of $n = 90$, paths would have to be $\beta > .20$ to be statistically significant. However, because the sample size was small, an exploratory approach was deployed, and the retained paths $\beta > .10$ were reported even though they were not statistically significant. It is acknowledged that, by adopting a lower β threshold, we are exercising some flexibility with conventional standards and could be accused of p -hacking (Kahan, Forbes, & Cro, 2020). Nonetheless, these paths may generate important insights that warrant testing in a larger study.

RESULTS

SCoF Measurement Model

A good-fitting model was achieved for Student Conceptions of Feedback. After removing one item for >10% missing data, confirmatory factor analysis indicated the model reported by Brown et al. (2016) had poor fit ($\chi^2 = 624.383$, $df = 288$; $\chi^2/df = 2.168$, $p = .14$; CFI = 0.624, gamma hat = 0.385; RMSEA = 0.110; SRMR = 0.268). The five-factor model was improved by removing items that had weak loadings (<.30; cofq4) or strong cross-loading to other items or factors (cofq5, cofq7). The entire factor *I ignore feedback* (i.e., cofq2, cofq6, cofq19, cofq25, and cofq31) was deleted because the loadings were not statistically significant. Deletion of this factor seems intuitive given the course emphasis on using and understanding feedback. The resulting trimmed model contained 18 items explained by four factors with good fit ($\chi^2 = 148.92$, $df = 128$, $p = .10$; $\chi^2/df = 1.16$, $p = .28$; CFI = 0.953, gamma hat = 0.976; RMSEA = 0.042; SRMR = 0.074).

Table 1 shows the five factors, their items, factor loadings, factor means, and factor robustness statistics. While the model had an excellent fit, only two factors had a coefficient H above 0.8, suggesting that these factors may not be replicable. It is likely that the small sample size has contributed to this relatively weak robustness.

All the retained factors were positively endorsed with scores above "moderately agree". The students agreed most with *I actively use feedback*, giving it a score of "mostly agree". The weakest score was seen for the *Peers help* factor. All factor intercorrelations were between weak and moderate, ranging from $r = .24$ -.61.

Table 1. SCoF Factor Information and Items.

Code	SCoF factor and item	Factor loading
	Active use of feedback ($M = 5.04$, $SD = 0.62$; coefficient $H = 0.71$)	
cofq32	I actively use feedback to help me improve	.52
cofq13	I make active use of feedback from my tutors and/or markers	.58
cofq9	I use feedback to set goals/targets for the next assessment	.55
cofq18	Feedback makes me try harder	.61
cofq23	Feedback changes the way I learn and study	.60
	Enjoyment subfactor ($M = 4.83$, $SD = 1.02$; coefficient $H = .92$)	
cofq11	I look forward to feedback from the markers	.96
cofq3	I enjoy getting feedback	.56
	Peers help ($M = 4.28$, $SD = 0.73$; coefficient $H = 0.87$)	
cofq20	Feedback from my classmates helps my learning	.68
cofq30	Feedback from my classmates really helps me	.90
cofq17	I make active use of the feedback I get from classmates	.40
cofq12	I can trust feedback from my peers	.68
cofq22	I learn better when my friends comment on my works	.47
	Meet expectations ($M = 4.68$, $SD = 0.84$; coefficient $H = 0.55$)	
cofq27	I know I have done well if the result is better than last time	.84
cofq26	Doing better than my parents expect is doing well	.30
cofq16	Doing better than the expected or required standard is a good result	.65
	Tutor/marker comments ($M = 4.90$, $SD = 0.68$; coefficient $H = 0.70$)	
cofq21	Feedback from my markers makes it clear how to improve	.70
cofq29	Tutors and/or markers give me trustworthy and honest feedback	.66
cofq8	Markers of my work give me clear feedback	.61

Markers' Comments

All students received a grade and personalised annotations on their assessment submissions, with an additional general statement providing an overall evaluation of the work and some encouraging words. The mean number of total comments that each student received from their marker was 11.3 ($SD = 5.4$). Among these comments, evaluative feedback was given the most frequently ($M = 8.5$ comments per student, $SD = 4.8$). This was given roughly four times more than corrective feedback ($M = 2.367$, $SD = 2.611$). Facilitative feedback was given infrequently ($M = 0.433$, $SD = 0.654$). Sixty-four participants (71%) received only feedback highlighting surface errors or corrections. Seven participants (7.8%) were given some feed-forward advice on how to resolve issues beyond surface aspects of their writing. The mean feedback comment score was 1.3 ($SD = 0.3$).

Most markers avoided editing student work; instead, they explained rules or processes for students to follow to remedy identified weaknesses in the submitted writing. When feed-forward comments were provided, they primarily directed students to the sources of information or suggested strategies that would help the student to build evaluative judgement.

Reported Use of Feedback

One third of the participants ($n = 31$) did not report using marker feedback to improve their second assignment. Eight students (9%) used feedback to fix evaluative features in their writing. Nearly a third of the participants ($n = 27$) made corrective efforts to improve their

writing, while approximately one quarter of them ($n = 24$) reported seeking feedback from sources to assist with their improvement. The mean feedback use was 1.1 ($SD = 0.9$).

Performance Improvement

The mean score of assignment 1 was 78% ($SD = 14.2\%$), and that of assignment 2 was 80% ($SD = 13.9\%$). The mean absolute improvement across these criteria was 22% ($SD = 14.2\%$). About half of the students (51%) improved from assignment 1 to assignment 2, and 16% demonstrated no change in performance, while a third (33%) performed worse. As a result, the mean improvement as a proportion of the potential gain was negative 9% ($SD = 113\%$).

Incoming and Final Course Grades

These students had achieved well in their prior schooling and continued to perform well during the study. The mean incoming grade point equivalent (GPE) was 5.2 ($SD = 2.0$), while the mean for the final course grade was 6.7 ($SD = 1.7$).

Structural Model

A well-fitting structural equation model indicates multiple potential causal pathways from SCoF to students' use of feedback and their achievement. To address the small sample size, factor or variable scores were used, giving a total of 10 variables. The structural model positioned entry GPE as a predictor of all SCoF factors, markers' comments, feedback use, improvement score, and final course grade. Following the chronological flow of data collection, the SCoF factors were regressed onto feedback use, improvement score, and final course grade. Markers' comments regressed onto feedback use, improvement, and final course grade. Feedback use regressed onto improvement and course grade. Degree of improvement regressed onto final course grade. All statistically non-significant paths were removed, resulting in a model (Figure 1) with an excellent fit ($\chi^2 = 12.346$, $df = 27$, $p = .99$; CFI = 1.00, gamma hat = 1.00; RMSEA = 0.000; SRMR = 0.0449). All path values $> .20$ were statistically significant. The amount of variance explained in these relations is shown as the squared multiple correlation or R^2 value beside each construct. The amounts explained are small ($.06 < R^2 < .37$; Cohen, 2013).

Although the sample size impacted the statistical significance of the observed path values, their direction and relationships have generated interesting insights. Two SCoF factors loaded onto enjoyment of feedback (i.e., *I Use Feedback* and *Tutor Comments are helpful and clear*). *Meet Expectations* loaded onto the amount of improvement students exhibited. The *I enjoy feedback* factor was a weak predictor of reported feedback use. The final course grade had positive loadings from *Tutor/marker comments are helpful and clear* and *Feedback tells me if I am meeting, or exceeding expectations*, while *Peer feedback helps* reduced course grade. Unsurprisingly, students' entry GPE strongly reduced the quality of markers' comments, suggesting that the markers had less to say about the writing of academically better students. The initial GPE had a strong prediction on the final course grade. Similarly, initial GPE loaded somewhat on the degree of improvement in assignment 2, again suggesting that more able students made more progress despite receiving less sophisticated markers' comments. GPE had an inverse path to the *I enjoy feedback* factor, indicating that more proficient students did not enjoy getting feedback, probably because these students did not receive high-quality feedback, nor did they enjoy having their faults pointed out.

In terms of feedback practices, the quality of markers' comments supported greater or deeper use of feedback, especially among students who were less able academically. Naturally, the level of reflective use depends on the level of comments, such that a student who got only Level 1 feedback could not logically claim to use Level 2 or 3 responses. Hence, corrective and facilitative feedback is likely to help academically weaker students who enjoy receiving tutor comments and who intend to use feedback for improvement.

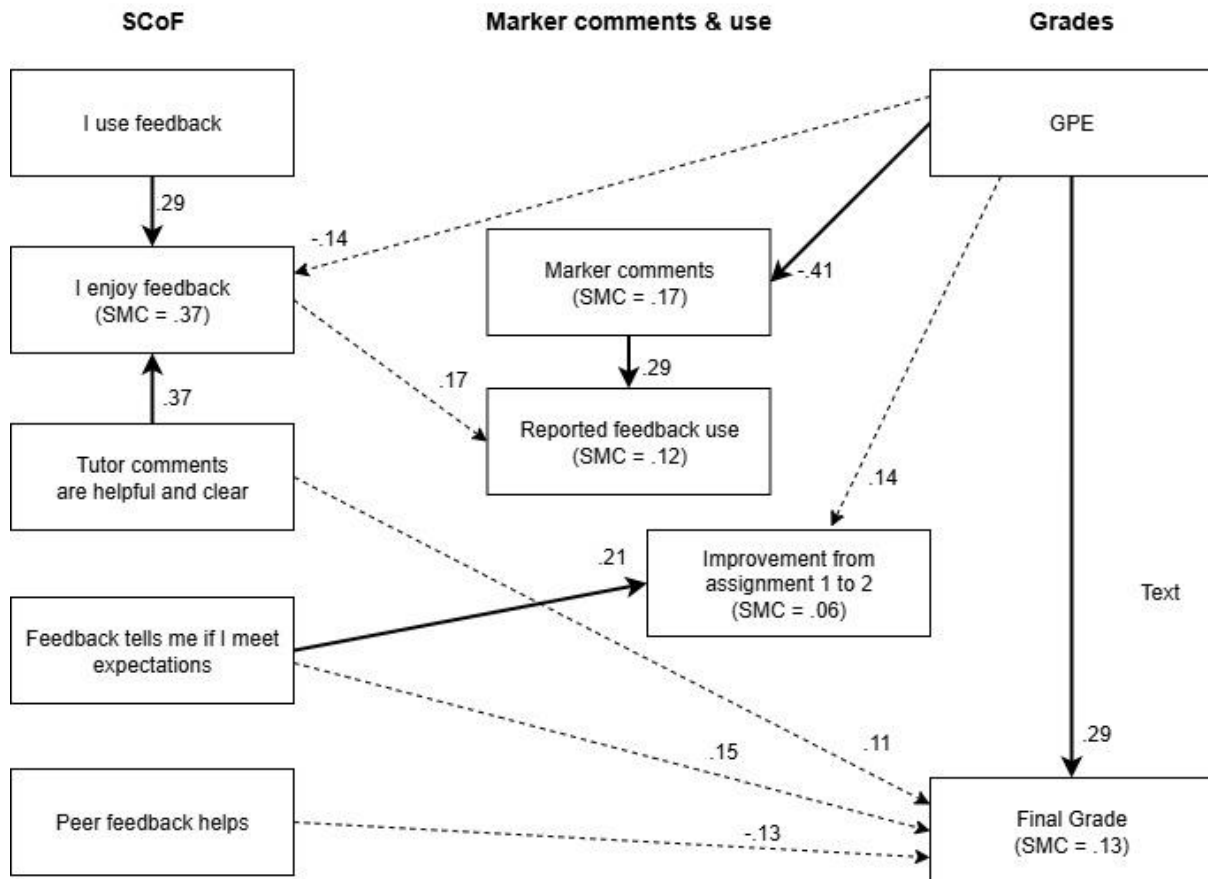


Figure 1. Structural equation model of relations among SCof, Feedback use, Improvement, GPE, score, and Marker Comments.

Note. All values are standardised weights; statistically significant paths are represented as solid lines; residuals removed for simplicity.

DISCUSSION

Influence of SCof on Student Performance and Behaviour

This study has extended our understanding of how student conceptions of feedback influence student learning by showing its relationships, not just with academic performance, but also with student feedback use. In contrast to a previous study in the same institution (Brown et al., 2016), this study discovered a number of differences in how SCof factors influenced academic performance. Unlike the results yielded in the mentioned study, the conception that tutor comments are helpful had a positive effect on performance and on student enjoyment of feedback. On one level, it is intuitive that students value and use tutor comments. Students in previous studies thought their tutors knew what quality looks like in the current context, and

since tutors would be grading submitted work, they were in the best position to provide reliable feedback (Brown et al., 2016; Harris & Brown, 2013). Enjoyment of feedback also depended on endorsing the idea that students would use feedback to improve their learning. While the path value was not statistically significant, the path from enjoyment to reported feedback use supports a supposition that it is enjoyment, or at least positive emotions towards feedback, that drives feedback use rather than simply recognising the benefits of feedback.

Furthermore, conceiving of feedback as a matter of meeting expectations supported both writing and course grades to improve. This adds to the already compelling evidence from meta-analyses that knowledge of results answers the question “how am I going?” and enhances understanding of criteria and goals (Hattie & Timperley, 2007). Knowing how current performance measures up is necessary for self-monitoring and leads to improvements in performance by assisting learners in refining their understanding of the goals. Students who use feedback to work out if they are meeting expectations tend to improve more than those who do not. This construct has obvious connections with self-regulated learning.

It seems, in the context of the explicit teaching about feedback and the academic weight placed on responding to feedback, students understood the importance of meeting expectations and the role that markers’ comments had towards helping them achieve those expectations. This suggests that explicit instructions on the purposes and nature of feedback, as implemented in this course, might translate markers’ comments into appropriate behavioural responses.

The negative effect of peer feedback on overall course grade replicates Brown et al. (2016). Learning activities and assessment structures in this course were designed around embedded formative feedback opportunities. These included peer-dialogue centred on exemplars and rubrics, peer-review of draft work, and written reflection focussed on the use of feedback alongside in-person dialogue while working on assessment. Students did these things irrespective of whether such behaviours fit with their incoming conceptions. However, students were asked to respond to markers’ comments, not those of their peers. This small negative path to overall course grade could be interpreted as an inappropriate emphasis on depending on tutors rather than engaging with peers, as has been argued elsewhere (Cho & MacArthur, 2010; Nicol, Thomson & Breslin, 2013; Panadero & Lipnevich, 2022). On the other hand, students may be justified in thinking that their peers, as fellow novices, are not reliable informants for improved performance (Peterson & Irving, 2008). The negative path to achievement may imply that students who only use peer feedback achieve lower grades.

Most importantly, unlike many other studies (Brown & Zhao, 2023), explicit endorsement of using feedback to improve learning did not load onto any of the feedback behaviours. Instead, that factor influenced student behaviour through enjoying getting feedback. Notably, that conception diminished for students with greater academic proficiency. This creates an interesting conundrum: how to make feedback enjoyable even though it might be critical or insufficiently sophisticated. In this context, it seems clear that not having a positive emotional reaction to getting feedback leads to less effort to implement it.

Markers’ Comments

As predicted, how students reported using feedback aligned with the feedback level in the markers’ comments, which indicates that students had read and used their feedback.

However, the lack of a path between comments and improvement indicates that markers' comments do not necessarily create greater improvement even when students report having made use of the feedback. Thus, we return to the classic instructor problem: I have given them feedback, but they do not use it. The lack of impact of feedback on observable outcomes shows how difficult it is to give the feedback that will actually help students improve (Hattie & Timperley, 2007; Nicol & Macfarlane-Dick, 2006). While markers were encouraged to avoid overly academic terminology, there was no guarantee that students understood those comments. It has been argued that students with a low level of feedback literacy fail to learn from feedback (Carless & Boud, 2018; Winstone et al, 2017); yet the SCoF factor scores did not suggest that these students lacked understanding or appreciation of what feedback was and what it was for. Just as likely, the time between getting feedback and producing the second assignment might simply have been too short to allow students to internalise and learn how to write better. Additionally, the difference between the two assignment tasks might have prevented the feedback on the first assignment from supporting an improved performance on the second assignment. In other words, the feedback might not have been relevant for the subsequent assignment (Winstone et al, 2017). This would be the case if students were not able to transfer and apply the feedback to the new context. Transfer of learning is dependent on how similar two contexts are (Thorndike & Woodworth, 1901). Transfer is easier when the source and target are closely related. In this study, some rubric criteria are closely related across assignments (for example, referencing), while others require more abstraction (for example, critical thinking). Therefore, students might not recognise the relevance of feedback to the second assignment. A further potential explanation lies in the awarding of a summative grade for assignment 1. Other studies have observed that feedback comments can be undermined when given with grades and scores (Lipnevich & Smith, 2009). Grades do not work well for formative purposes (Black & William, 1998; Schute, 2007; Lipnevich & Smith, 2008). This surfaces two conundrums: Firstly, individual teacher feedback is only provided on graded assessments due to limited resourcing; and secondly, how to assign ungraded tasks that students do not strategically choose to avoid (Harris et al., 2018) is still a major challenge in higher education.

Prior Achievement

Somewhat counterintuitively, students with a high GPE experienced less enjoyment from feedback than weaker students. This was not a significant path, but it is a plausible one given the significant negative causal path from GPE to the level of marker comments. More importantly, the sophistication of markers' comments greatly reduced as student GPE increased. We have to conclude that the initial work of more able students had fewer features that needed correcting. Thus, the markers would make more comments about surface features, which are likely to be the last few aspects of an assignment to which a student gives attention. It is conceivable that such feedback on minor details does not result in an enjoyable learning experience, particularly for proficient students (Kluger & DeNisi, 1996).

The relationship between GPE and final grade was positive. This is an obvious and understandable autoregressive path in which prior performance predicts later performance (Biesanz, 2012). Those who start better tend to end better. Those students also improved more, even though they received less sophisticated feedback. Knowing learning strategies that consistently work and lead to progress is what sets competent students apart from others (Hartwig & Dunlosky, 2012). Thus, when work is of a high quality, markers have to work much harder to provide feedback that actually helps those students improve even further.

Alternatively, it may be better for instructors to not comment on the surface and trivial features of a well-constructed work and instead generally point out the need for attention to those features without colouring the page with “red ink”.

Conversely, the performance of weaker students may stem from a less refined understanding of the goals and assessment criteria, weaker adherence to robust task processes, and weaker domain competence. Therefore, markers have much more leeway in terms of giving substantive comments that speak to the process and self-regulation, and possibly even giving content knowledge, rather than just identifying errors. Given that more sophisticated feedback was prioritised, it seems likely that less competent students would perceive that feedback as useful and enjoyable.

Limitations

A considerable limitation of this study is that it was underpowered. Therefore, generalising from these findings is not possible. Nevertheless, weak loadings on paths from conception factors to performance measures indicate that conceptions may play a role in how students use feedback. This warrants further investigation. Future studies with a larger sample size may reveal other statistically significant paths. It should also be noted that the sample population was relatively homogenous in terms of age, stage, gender, degree (Science), entrance qual, and to some extent ethnicity (60% Pākehā). This creates a bounded setting ideal for capturing shared understanding of experiences within a specific context, but it precludes generalising from the findings. It is possible that students from different demographics would experience the same situation differently.

Another limitation arises from the artefacts used as datapoints. All data points were generated as part of the usual learning experience, which contributes to the validity of the findings. However, feedback use was inferred from self-reported student reflections and may not have captured the full range of ways that a student thought or felt about the markers' feedback. Just because a third of participants did not report using feedback does not necessarily mean they did not think about or engage with it. Reflection captures what the student thought about or remembered at the time of writing, but not necessarily everything they did. Learner diaries could be an alternative that captures feedback use during the writing process and offers additional potential gains in terms of student metacognition, although at the expense of greater student workload. Focus groups could elucidate more details about feedback use, but they would be peripheral to the model because outputs are collective rather than individual.

Scoring of markers' comments has limitations because only the feedback level is considered. Relational variables such as tone, personalisation, encouragement, or praise have not been quantified here, nor has the volume of comments or whether the comments are past or future-focused. Quantifying markers' comments on a more nuanced scale, or alternatively on multiple scales, may reveal different causal paths.

Lastly, the study involved students' responses to feedback within a two-week window of time. Markers' comments were returned from assignment 1 two weeks prior to the submission of assignment 2. Apart from the overall course grade (which encompassed more content and skills than the assignments used in this study), students' performance in later similar tasks was not evaluated. Therefore, this study does not lend itself to inferences about long-term

effects of markers' comments on students' writing, nor does it provide information about changes in conceptions over time.

Research Implications

The study determined that student conceptions of feedback account for some of the variation in the effectiveness of situated feedback practices, but to a lesser degree than the content of markers' comments or prior achievement level. The level of information in markers' comments aligned with how students used feedback, but neither the markers' comments nor student-reported feedback use predicted improvement in the subsequent assignment or the final course grade. Future studies investigating the lack of improvement could centre on student comprehension of comments and consider ways to untangle feedback messages from grades. A follow-up questionnaire was intended as part of this study to evaluate temporal changes in conceptions and elicit feedback from students about the utility of the marker's comments and their affective responses to them, as well as information about other sources of feedback they used. It was unfortunate that the limited number of respondents invalidated the incorporation of this data into the model. This could have answered some of the questions raised in the discussion. Revisiting the study with future cohorts with a view to incorporating this information into the model could elucidate whether students' comprehension of and confidence in the feedback, or affective dimensions (related to academic emotions, motivations, and goals), play a role in feedback use and performance improvement. Nevertheless, structural equation modelling was useful in illuminating some aspects of feedback practices in the course that warrant further attention. Competent students received lower-level feedback and fewer comments than weaker students, which highlights a gap in the training of markers and future training should therefore include content such as how to give feedback to demonstrably capable students to extend their learning.

Conclusions

The findings from this initial attempt to unpack the role of student conceptions of feedback on learning improvement provide potentially important insights despite being based on a relatively small sample. This study provides empirical data that reinforces the notion that it is having productive conceptions of feedback that lead to greater use of feedback, greater improvement, and greater overall course performance. The study provides insights related to how instructors can support deeper and more effective conceptions of feedback, leading to more productive responses. Students who start university with the expectation that they will use feedback to determine the quality of their work improve more than those who do not hold this conception. Ensuring that feedback supports a positive affective response towards using feedback is likely to lead to learning gains. This raises questions about how to assist students in developing this awareness and acting on it. Importantly, this study points to the diversity of student responses to feedback based on their prior academic performance.

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