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Agency Development and Valuing Peer Perspectives: Lessons from an Intervention to Enhance STEM University Students' Feedback Literacy

ABSTRACT

In order for students to benefit from feedback, they must develop their feedback literacy. To investigate the extent to which informing students about feedback knowledge and scaffolding practice for making sense of feedback increases feedback literacy, we conducted a skills-based intervention study. The results showed that the intervention increased students' feedback knowledge, that is, their understanding about the purpose of feedback and the need to engage with it proactively. However, the intervention did not increase participants' feedback literacy to a statistically significant extent. This may be due to the centrality of learner agency in feedback literacy and lack of time for this complex construct to develop. Findings from post-intervention focus group interviews revealed variation in students' understanding and agency in relation to engaging with feedback and the importance of including various opportunities to develop agency as part of feedback literacy training, including through peer perspective sharing. Cultural influences on feedback processes appeared to be less significant than anticipated. Instead, individual differences, such as personal interpretations of feedback and associated emotional responses, were more likely to create barriers, and should therefore be considered when developing feedback literacy. This paper offers suggestions for implementing more effective feedback literacy development opportunities, including those that emphasise building on a foundation of feedback knowledge and the role of peers and peer feedback. We propose that future studies should develop an integrative approach to feedback literacy training that acknowledges the complexity and time demands of agency development.

KEYWORDS

feedback literacy, intervention, agency, feedback knowledge

INTRODUCTION

The most powerful influence on academic achievement is feedback (Hattie 2009). However, its influence depends greatly on students' knowledge of feedback, their ability to demonstrate proactive recipience of feedback (Winstone et al. 2017), and their skills in responding to feedback (Malecka, Boud, and Carless 2022). Studies have demonstrated that a lack of feedback knowledge and feedback literacy prevents students from effectively reflecting on feedback and using it to significantly influence their learning (Boud and Molloy 2013; Hui et al. 2023). To help our students maximise the impact of feedback on their learning, we investigated the extent to which a skills-based intervention increased

students' feedback knowledge and literacy. Focus group interviews held after the intervention explored barriers and facilitators to students' further development of feedback literacy.

Feedback knowledge and feedback literacy

A sound knowledge of feedback is a prerequisite for developing feedback literacy (Zhan 2022), and building feedback knowledge is part of the process of becoming feedback literate (Sutton 2012). When evaluating the impact of an intervention to improve students' engagement with feedback, we consider it is important to distinguish between feedback knowledge and feedback literacy, as we view them as different stages on a continuum towards productive engagement with feedback. Here, we distinguish feedback knowledge from Carless and Boud's (2018) view of feedback literacy in order to allow us to formulate and analyse an intervention study.

We define feedback knowledge as an acquired understanding of the purpose of feedback and the need to engage with it proactively. It includes students' awareness of the impact of feedback, different sources of feedback, and barriers within feedback processes. Students need to be cognisant of the value of various sources of feedback in order to be receptive and responsive to them. This includes obtaining feedback internally, for example, through self-reflection. Moreover, learners need to be aware of the barriers in feedback processes so that they are prepared to address them during feedback processes.

According to Winstone, Mathlin, and Nash (2019), four barriers can prevent students from engaging with feedback. These are awareness (i.e., not knowing the source and purpose of feedback), cognisance (i.e., not knowing the strategy to act on it), agency (i.e., not feeling empowered to act on feedback), and volition (i.e., not having the intention to invest effort in using it). Cultural differences in feedback processes are of great importance and are receiving increasing attention (Rossiter 2022; Rovagnati, Pitt, and Winstone 2022; Tian and Lowe 2013). As global population mobility has increased significantly, international students now account for 22% of the total student population in UK universities (data source: Higher Education Statistics Agency 2020/21). The ensuing linguistic barriers and cultural differences between domestic and international teachers and students have created challenges in terms of feedback practice for both students and teachers (Rossiter 2022; Tian and Lowe 2013). As a result, a nuanced awareness of linguistic and cultural literacy is an important aspect of feedback engagement in a multicultural learning environment (Rossiter and Bale 2023). As well as being a prerequisite, we suggest that developing feedback knowledge is easier than developing feedback literacy and may present a realistic first step.

Feedback literacy refers to "the understanding, capacities, and dispositions needed to make sense of information and use it to enhance work or learning strategies" (Carless and Boud 2018, 1315). It is a set of skills that help students gather feedback, analyse the feedback, and use it to improve their learning. Table 1 provides definitions and examples to illustrate the distinction between feedback knowledge and feedback literacy.

Carless and Boud (2018) proposed a four-feature framework to illustrate the factors involved in developing students' feedback literacy and university teachers' understanding of how to promote students' feedback literacy and uptake of feedback. These four features are: appreciating feedback processes, making judgements, managing affect, and taking action. Together they emphasise how students take an active role in continually developing their capabilities when reacting to feedback, making sound judgements about academic work, and managing affect, including the uncomfortable

Table 1. Definition and example of feedback knowledge and feedback literacy

	Definition	Example
Feedback knowledge	An acquired understanding about the purpose of feedback and the need to engage with it proactively. It includes students' awareness of the impact of feedback, different sources of feedback, and barriers within feedback processes.	I know of a range of sources from which to get feedback.
Feedback literacy	A set of skills that help students gather feedback, analyse the feedback, and use it to improve their learning.	I can interpret and act on feedback.

emotions provoked by feedback (Ippolito et al. 2020). The combination of the three interrelated features (i.e., appreciating feedback, making judgements, managing affect) maximises the potential for students to take action in response to feedback.

Role of agency

Along with the paradigm shift towards emphasising students' active engagement in feedback processes (Boud and Molloy 2013; Carless and Boud 2018) and away from stressing the transmission of feedback information (Hattie and Timperley 2007), student agency is now recognised as crucial (Carless and Boud 2018; Nieminen et al. 2022). Human agency refers to an individual's belief that their actions can bring about change and that they can contribute to the course of events (Bandura 2006). In the context of feedback in higher education, the concept of agency refers to "students' active role in the process of seeking, receiving, generating, and acting upon feedback information" (Nieminen et al. 2022, 95). Winstone, Mathlin, and Nash (2019) refer to agency as proactive recipience and highlight the way that the characteristics of the receiver and sender, as well as features of the message and context, influence this.

This dominant paradigm is closely tied to social constructivism, which also focuses on the active role of individuals in the co-construction of knowledge and skills through dialogue and sense-making and the interdependence of social and individual processes (Carless and Boud 2018; Palincsar 1998). From this perspective, students need to be aware of the necessity to move beyond a passive receiver role in order to take on a more empowered role in feedback processes.

Feedback literacy interventions

Given the crucial role of feedback, researchers have been working for decades on interventions that enhance the use of feedback and, more recently, to develop feedback literacy. A review by Winstone et al. (2017), which focused on feedback intervention studies published between 1985–2014 that aimed to enhance the use of feedback, found that these interventions fell into four categories. Interventions aimed to better equip students to use feedback by providing them with opportunities to take the perspective of feedback providers fell into the first category. Second, interventions aimed to help students track their learning progress and use of feedback. Third, structured sessions or workshops aimed to advise students on how to respond to feedback, or to help students by showing examples of previous cohorts' assignments in order to demonstrate how to better approach assignments. Fourth, interventions aimed at changing the way feedback is presented by feedback providers. As these interventions often focus on one aspect of the feedback process, their effectiveness in improving students' feedback literacy, which is a whole set of skills, is limited. Winstone et al. (2017) concluded that to maximise benefits, students should be offered holistic, rather than piecemeal, interventions that target multiple barriers and skills simultaneously.

Building on this foundation, Winstone, Mathlin, and Nash (2019) developed an engagement with feedback toolkit to support the development of students' feedback literacy, which includes a feedback glossary, guide, workshop, and portfolio. Reflecting on their intervention, Winstone, Mathlin, and Nash (2019) recommended that a skills-based intervention focused on tackling barriers to performing these core behaviours has good potential for impact. Their viewpoint is in line with Yan and Carless (2022) who suggest that genuine feedback literacy involves core behavioural elements, namely the skills to seek, generate, process, and respond to feedback. As a result, we sought to implement and evaluate a skills-based intervention to support students in developing the core behaviours of feedback literacy.

Current study

This study centres on the design, delivery, and evaluation of our skills-based intervention. As gaining feedback knowledge is a prerequisite to becoming feedback literate, we first provided an interactive training session focused on knowledge building. We then provided a skill-building, scaffolded practice session in order to help learners develop skills to act on feedback. Scaffolded practise with peer support, which mainly involves discussion, is an effective way to develop skills (Yuriev et al. 2017). By practising responding to feedback and discussing this with peers, students can learn how to decode the language used in feedback, explore strategies to act on it, and empower themselves to implement feedback (Nieminen et al. 2022). From a social constructivism perspective, these dialogues and sense-making, and the interdependence of social and individual processes stimulate students' active role in the co-construction of knowledge and skills (Carless and Boud 2018; Palincsar 1998). This scaffolded practice may also help students to identify practical problems in the feedback process and, by discussing them, receive immediate support from their peers.

We aimed to investigate whether informing students about feedback-related knowledge and facilitating scaffolded discussion and practice on feedback can increase students' feedback knowledge and literacy. To this end, we compared the effects of an intervention condition in which some participants attended the intervention programme while others attended a control condition. We hypothesised that: "Feedback knowledge would significantly increase for participants in the intervention group, compared to the control group" (Hypothesis one); and "Feedback literacy would significantly increase for participants in the intervention group, compared to the control group" (Hypothesis two). We also conducted focus group interviews to gain a deeper insight into the barriers and facilitators within feedback literacy development processes.

METHOD

Participants

To secure a medium effect size ($\eta^2 = .25$) for a difference in feedback knowledge and feedback literacy between pretest and post-test in two groups, 46 participants are required in order to achieve a power of .90 based on power analysis using G*Power 3.1.9.6 (Faul et al. 2009). We invited first-year students from a STEM (i.e., science, technology, engineering, mathematics) focused international research-intensive university in the UK to join this study. 52 students (M age = 18.51 years, SD = .80, 72% woman) signed up, and we randomly assigned them to an intervention group or a control group. We compensated participants' time and effort with a £20 gift voucher. After the intervention, we invited all participants to take part in focus group interviews, and 10 volunteered. This resulted in two focus group interviews with five participants in each. We compensated each participant in the focus group with an additional £10 gift voucher. Participation was voluntary, and we obtained informed consent from all participants prior to the intervention and focus group interview.

Intervention design

The intervention consisted of two sessions lasting one hour each (see Appendix 1 for an overview of the intended learning outcomes and related activities in each session). In session one, the knowledge-building phase, we provided training to help participants build their knowledge about feedback. This consisted of instruction and discussion of the purpose of feedback, barriers to using feedback, sources of feedback, and finally, a presentation of the four-feature feedback literacy framework. After a one-week interval that allowed participants to reflect and absorb knowledge, participants undertook session two, the skill-building phase. Here, participants considered, with the support of their peers and facilitators (i.e., Kate Ippolito and Luotong Hui), five short extracts of feedback collected from relevant coursework. Within small groups of three to four peers, participants discussed their thoughts about the purpose of each piece, how they felt about it, and what actions they would take. The facilitators moderated discussion and reflection among participants, rather than tell them what was right or wrong. By discussing, sharing, and concluding in what way they would respond to each feedback extract, we expected that participants would develop the skills to act on feedback. We anticipated that the knowledge built up in session one and the skills to act on feedback developed in session two would facilitate the development of feedback literacy.

Measures

We measured feedback knowledge and feedback literacy before and after the intervention as dependent variables.

Feedback knowledge

We asked participants to elaborate on their knowledge of feedback in the pretest and post-test, which used an open-ended question approach. Studies by Boud and Molloy (2013) and Winstone, Mathlin, and Nash (2019) inspired the development of these questions. We included a total of four questions (e.g., Where and from whom do you think you can get feedback? Please list as many sources of feedback as possible. See Appendix 2 for all four questions and coding schema). All co-authors and participants in the pilot study reviewed the questions for readability. The responses were coded from 0 to 5 (0 = completely lacking in feedback knowledge; 5 = high level of feedback knowledge) based on the training materials students received. Luotong Hui initially coded all responses, and Magda Charalambous coded 20% of the responses (interrater reliability = .93). Luotong Hui and Magda Charalambous discussed any disagreements and reached consensus. To prevent any potential bias in interpretation, we omitted whether data was from students in the intervention group or control group during the coding of open-ended responses.

Feedback literacy

We used the feedback literacy questionnaire developed by Zhan (2021) was used in the pretest (Cronbach's $\alpha = .89$) and post-test (Cronbach's $\alpha = .98$) to measure feedback literacy (e.g., I am always ready to take the comments that directly point out my mistakes). Participants indicated to what extent they agreed with the included statements on a 6-point rating scale (1 = strongly disagree; 6 = strongly agree).

Barriers and facilitators during feedback processes

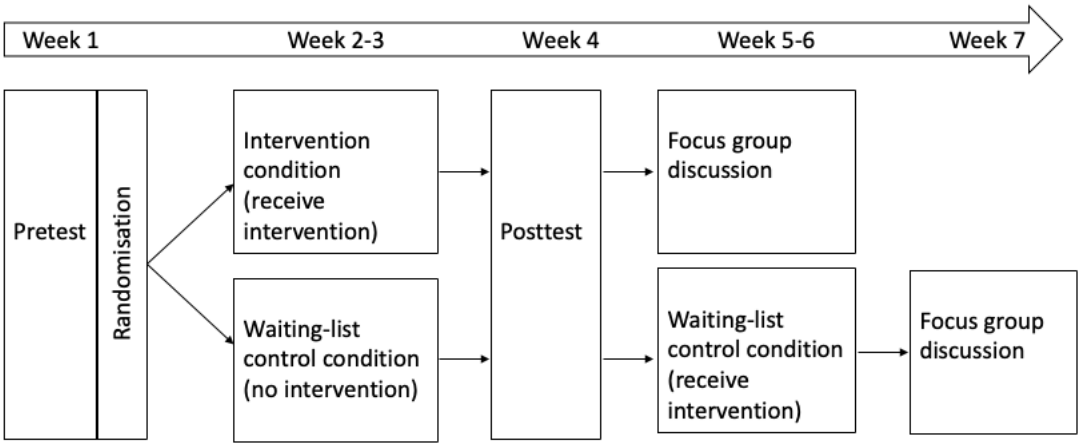
After the intervention, the focus groups discussed barriers and facilitators to students' engagement with feedback. These discussions enabled us to gain insight into the development

process of feedback literacy (e.g., what was the value of the training, whether students had put new understanding into practice, and what challenges they perceived in doing so). In addition, the focus groups discussed the knowledge and skills that participants gained from the training, and suggestions for improvements to feedback literacy training in order to further evaluate and enhance our intervention in the future.

Procedure

The procedure and timeline of this study is illustrated in Figure 1. During the pretest phase in week one, all participants completed the feedback knowledge questionnaire and the feedback literacy questionnaire on the Qualtrics online survey platform. We then randomly allocated them into one of the two conditions. From week two to week three, participants in the intervention condition received the intervention in-person in a lecture hall. Participants in the control condition did not receive the intervention at this time. During the post-test phase in week four, all participants answered the feedback knowledge and feedback literacy questionnaires again on Qualtrics. Focus group interviews with participants in the intervention condition took place after. In the meantime, participants in the control condition received the intervention (referred to henceforth as the "waiting-list control condition"), followed by the focus group interview the next week.

Figure 1. Study procedure with indicative timeline



Data analysis

We analysed the quantitative data using R version 4.1.2. To test whether participants' knowledge of feedback and feedback literacy differed significantly between the two groups at the pretest and the post-test, we performed a robust Analysis of Variance (ANOVA) using the WRS2 package (Mair and Wilcox 2019), as the data did not meet the assumption check for ANOVA (e.g., normal distribution). We also audio recorded the focus group interviews, transcribed verbatim, and analysed using Braun and Clarke's reflexive thematic analysis approach (Clarke and Braun 2021). Luotong Hui , Kate Ippolito, and Magda Charalambous read the transcripts thoroughly. Luotong Hui used NVivo 12 for initial coding. Luotong Hui, Kate Ippolito, and Magda Charalambous discussed and iteratively refined the codes to capture units of meaning in relation to participants' experiences of feedback. Luotong Hui then applied the modified codes to the entire dataset. All authors discussed the initial and refined codes until we reached final interpretations.

RESULTS

Nine participants dropped out after the pretest, and 43 participants completed the whole training and both the pretest and post-test questionnaires. We first present the quantitative results for each hypothesis, followed by the qualitative results from the focus group interviews to provide a deeper interpretation of the numerical trends observed. See Table 2 for a summary of the variables from hypotheses one and two. We then present further thematic analysis findings gained from the focus group interviews, providing additional layers of understanding.

Table 2. Means (standard deviations) of feedback knowledge and feedback literacy at the pretest and post-test in the two groups

		Intervention group n = 23	**Control group n = 20**
Feedback knowledge	Pretest	1.79 (1.09)	1.76 (1.10)
	Post-test	2.95 (1.30)	1.59 (1.01)
Feedback literacy	Pretest	4.62 (0.49)	4.76 (0.47)
	Post-test	4.60 (1.07)	4.46 (1.15)

Feedback knowledge responses were coded on a scale of 0 to 5, aligned with the training materials, while feedback literacy was measured on a 6-point rating scale.

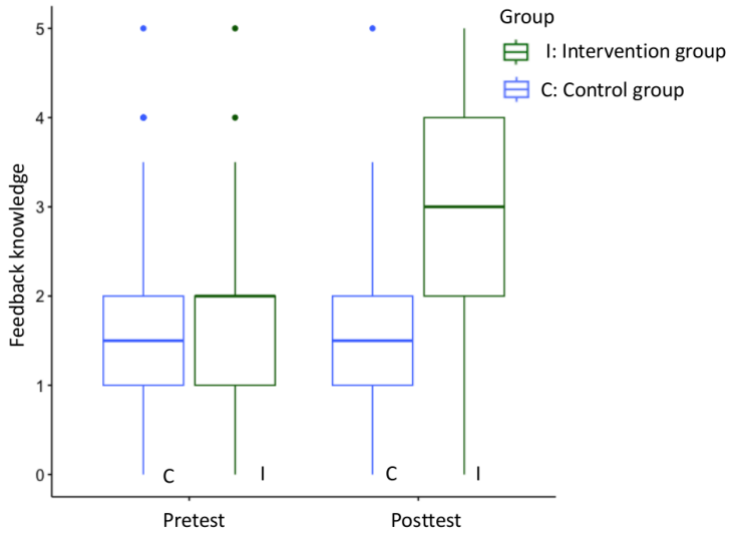
Feedback knowledge

To test hypothesis one, we conducted a 2 (group: intervention group vs. control group) × 2 (time: pretest vs. post-test) between-subjects repeated-measures, robust ANOVA to measure whether feedback knowledge significantly increased for participants in the intervention group compared to the control group. The main effect of the group was significant ($p < .001$), indicating that feedback knowledge was higher for the intervention group. The main effect of time was also significant ($p < .001$), indicating that feedback knowledge was higher at the post-test. There was a significant interaction effect between group and time ($p < .001$). Figure 2 depicts the mean feedback knowledge of the intervention and control group at the pretest and post-test, illustrating that the intervention group participants had significantly more knowledge than control group participants ($p < .001$) after the intervention. This supported hypothesis one.

In-depth qualitative data from our post-intervention focus group interviews corroborated that the students had good knowledge about feedback. However, knowledge levels varied between students, especially regarding feedback's various purposes and sources, as well as insight into how to overcome barriers by using feedback.

Regarding the purpose of feedback, some participants indicated knowledge gain in terms of realising how different providers of feedback may have different intentions for their feedback: "I quite dislike unspecific feedback, but it could also be a way that the mentor or whoever is telling you is trying to encourage you to research it yourself or to go and find your own solutions to problems" (Focus group 2, Matt).

Figure 2. Feedback knowledge of the intervention and control groups during the pretest and post-test



Cultural and linguistic differences can be a barrier to knowing the purpose of specific feedback. However, in contrast to previous studies (Rossiter 2022; Rovagnati, Pitt, and Winstone 2022), our participants indicated that they did not perceive such cultural barriers. Rather, participants in both focus groups agreed that ambiguity in feedback was due to individual differences, rather than cultural ones:

> Even native speakers will also have trouble in really knowing. I feel like unless you know the person giving you feedback, the ambiguity will always exist regardless of culture. Things like "might" or "you might want to" . . . is just ambiguous regardless of where you're from. (Focus group 1, Leila)

> Personally, I feel that the cultural differences are not that big a problem because I feel that most of us at least, at this age, have a similar culture. Somehow, in my own experience, I feel like it's mainly personality that has to do with it. (Focus group 2, Shana)

Despite becoming more knowledgeable about the potential sources of feedback, some students' responses indicate that lack of volition and agency could form persistent barriers: "I would like to ask the professor for more clarification or give it to my peers to read it or self-reflect, but that would take a lot of time" (Focus group 1, Ruby). These ideas will be considered more fully in the thematic data analysis of focus group findings in the subsequent section.

Feedback literacy

A 2 (group: intervention group vs. control group) × 2 (time: pretest vs. post-test) robust ANOVA was conducted to test hypothesis two, that is whether the feedback literacy of participants in the intervention group increased significantly after the intervention compared to those in the control group. The result demonstrates that there was no significant interaction effect between group and time for participants' feedback literacy rating ($p = .06$). The descriptive results in Table 2 suggest that this p-value is not related to the intervention effect, rather it is caused by the changes at pretest and

post-test from the control group. The main effects of group ($p = .77$) and time ($p = .38$) were also not significant. These results indicate that there was no difference between the two groups in feedback literacy rating at pretest and post-test. This result did not support hypothesis two. Despite a lack of statistical significance regarding the impact of our intervention in feedback literacy at cohort level, the focus group interviews revealed valuable insights into individual participants' development of feedback literacy that can inform future design.

Table 3. Quotes from the focus group interviews mapped to the four features of Carless and Boud (2018) feedback literacy framework.

Features	Quotes
Appreciating feedback	Before when I received feedback, I would look at the mark first. If the mark for me was good enough, I wouldn't bother to improve anymore. But now I think every feedback we receive is very valuable and we should act on it. (Focus group 1, Ezikiel)
Making judgement	When I received the feedback, it was useful, but there were no specific ways to improve, e.g., the graphic title thing, I think at least for them [teaching staff], you have to depend more on self-reflection than any guidance. (Focus group 1, Alice) After receiving feedback, we need to digest it, not just follow it. We need to consider which do we need to take into consideration and which we just . . . That's great. We could receive but we don't need to necessarily take on actions. (Focus group 2, Oliver)
Managing affect	Just reminding yourself that even the lecturers once were in your position and they needed feedback to get to where they are today. So, just putting it into perspective so that you don't get too hung over about getting negative feedback because everyone needs it to grow. (Focus group 2, Zack)
Taking action	You look through your previous feedback, it gives you a broad checklist to look through when you're self-reflecting on each feedback you received and if you've actually managed to apply it in your next piece of work. (Focus group 1, Alice)

The shaded row indicates where students had mixed levels of skills.

Qualitative data revealed an increased appreciation of feedback for continual improvement and growth beyond the assessment it related to (see Table 3, quote linked to "appreciating feedback"). Others demonstrated multi-step approaches to taking action on the feedback they received (see Table 3, quote linked to "taking action"). Some participants were rather good at managing affect and coping with the emotional labour experienced during the feedback processes (see Table 3, quote linked to "managing affect"). For instance, they regulated their emotions by focusing on the specific action they would take in order to use the feedback to improve their learning: "Usually, it's not that bad. I just deal with it by converting it into an action statement. 'What can I do from here onwards?' So, it should be fine" (Focus group 2, Shana).

When prompted to reflect, others discussed positive elements, including supportive teacher intentions in feedback that might initially provoke a negative emotion:

> I'm not that negatively emotional a person. So, if you give me some kind of negative feedback, I know you care about my essay or the work that I have done. So, I will correct them instead of just sinking into a bad emotion. (Focus group 2, Ya)

This illustrates an emotion regulation strategy known as cognitive change (Gross and Thompson 2007). As Ya recognises, our intervention may have given them a more agentic perspective, from which

to see the relational value, rather than the outward threat of feedback and how to use it to effect change and behaviour that protects against "sinking into" an unhelpful emotional reaction. However, students in the study seemed to lack the necessary skills to make useful judgements about how to act with agency on feedback, as will be discussed in the following paragraphs.

Differential development of agency

The detailed discussion of feedback exemplars in session two enabled students to recognise that the same feedback can provoke different responses in different people. This provided a more nuanced view of the challenges teaching staff face in anticipating the impact their feedback may have on a learner. Furthermore, participants' reflection on their role and responsibility in giving feedback to their peers reinforced this insight:

> Because everyone is different and no matter how perfectly you phrase your feedback some people are going to be upset. Some people will still not know what you are trying to say. So, I think it's just about learning how to interpret that, whatever sort of feedback it might be. (Focus group 2, Shana)

Shifting between seeing themselves as recipients and givers of feedback seemed to help students develop their sense of agency in both roles:

> I reconsidered more my tone when I give feedback and how to balance being positive but also not sounding too demanding or harsh. But also, not being too doubtful about your own feedback. You don't want to use too many "you could," "you might." Give some clear things. (Focus group 2, Zack)

The use of modal verbs such as "could" and "might" has been criticised for creating ambiguity, particularly for students from different cultural backgrounds (Rossiter 2022). However, some students recognised that it is often intended by teaching staff to encourage agency in students, a sense that they are choosing whether or not to act on the feedback, as noted by this participant below:

> When it comes to ambiguity, you've actually got a point, that if the professors think you might want to add this to your essay, then I think a bit of self-reflection, whatever it is, the self-awareness, becomes it's important, because you need to decide now what to do. If it's more important, you will do it, and if it's not, then you can work out any alternatives. (Focus group 1, Ruby)

In this way, some students demonstrated a high level of agency, the ability to reflect on one's own and others' thoughts and actions is the most distinctly human core characteristic of agency (Bandura 2006; Code 2020).

Need to scaffold ongoing agency development

However, our data also suggested that the development of feedback literacy is a long-term, ongoing process that is arguably never complete, as the demands of feedback contexts are constantly changing. Students' comments on how they coped with perceived ambiguity and unspecific feedback suggest their levels of agency varied. For example, when asked what kind of feedback is useful, some students indicated that specific (i.e., corrective) feedback is preferable, as it clearly tells them what is

right or wrong and how to act on it: “I just like specific feedback [that tells me what to do], so I don’t really mind positive or negative” (Focus group 2, Matt).

Lack of agency prevented students from making useful judgements about feedback, and lack of volition reduced their intention to invest effort in acting on feedback. Some students did not agree with their teachers that students should self-reflect on feedback and work out how to make progress, but rather expected clarification and specific guidance from instructors. This attitude not only demonstrates a lack of agency, but also places students and teachers in an adversarial, rather than collaborative, relationship, which can damage their relationship and therefore the effectiveness of feedback: “When I received the feedback, it was useful, but there were no specific ways to improve, for example, the graphic title thing, I think at least for them [teaching staff], you have to depend more on self-reflection than any guidance” (Focus group 1, Alice).

Students’ limitations in making their own judgements and reliance on the judgements of those giving feedback could be perceived as matter of honesty or lack thereof:

> I like people be honest to me about something that haven’t done well . . . after that, I know this part, I lack the knowledge, so I have to improve that and I can take some actions specific to that. (Focus group 2, Ya)

However, as Ya indicates, some assessor judgement provides useful scaffolding to support agentic action taking.

In the same way that some students expected to be told what to do, they might expect feedback responses to take into account the different ways and degrees to which they developed agency. Furthermore, students demonstrate a desire for opportunities to act more agentically by engaging in conversations with feedback providers. This suggests the need for students to develop their agency collectively with feedback providers, indicating a need for interventions that specifically address these perspectives. However, assessment feedback is often given anonymously to students, which means that students do not have opportunities to act agentically by engaging in conversations with feedback providers, as they do not know who to talk to: “It would be quite unsatisfactory to receive such unspecific feedback. If I knew who was giving the feedback, I might speak to them and ask for clarification” (Focus group 1, Helen).

Peer influence on agency

Interestingly, regarding session two discussions about feedback with peers, focus group participants indicated that they were surprised to learn that everyone had different feelings, judgements, and reactions to the same piece of feedback. This process opened their minds to the possibility that feedback could be interpreted in several ways and encouraged them to reflect on feedback and rethink their approach to feedback:

> The second session gives a sense of how we look at different opinions from our peers. Everyone has different feelings about the same comment we have. Someone may think this is really nice and very good, but someone may think that the comment is very mean. I think it’s really interesting to see different opinions on it. (Focus group 1, Ezikiel)

> I agree with Ezikiel, and I would say that it's useful for us to hear how people respond differently, because it reminds us not to take things too personally, just because we might interpret certain feedback as being especially critical. (Focus group 1, Helen)

As the quotes above illustrate, group discussion with peers is an important process in which peers share and contribute to each other's feedback literacy, including emotional responses and awareness of different perspectives. Participants indicated that the interactive skill-building session (session two) was very helpful, as they were able to apply and practice the abstract knowledge they had learned in the first session in discussion with each other. More importantly, the discussion in session two allowed an active and social learning process that helped participants to learn from peers and to reflect on their own responses to feedback in the light of other's responses.

The discussion processes with peers also helped them to develop agency, as they learned how to provide feedback that does not intentionally upset others. Participants demonstrated that they would use their empathy to give feedback that was intended to empower and develop agency in the recipient:

> If you're giving steps to go with the criticism, then I think it's a lot more intentional and genuine. And as if you care about the person that you're giving feedback to, rather than just trying to put them down or criticise them all the time. I think, also, just picking up on small details that are good that they've done. Because it generally feels nice when someone notices small detail on your work that most people wouldn't notice and they give you praise for it. (Focus group 2, Zack)

As well as learning how to respond to feedback, they also learned how to give feedback collaboratively, deepening their understanding of the process. Peer support also increased agency in responding to feedback, for example, by actively seeking alternative interpretations when judging feedback: "I think it's because it was more active. So, we got to practice and we saw real-life examples and after discussing with people, we also learned new ways and different ways of interpreting the feedback" (Focus group 2, Shana).

DISCUSSION

We conducted a skills-based intervention study to investigate to what extent informing students about feedback knowledge and scaffolded practice of feedback actions increases feedback knowledge and literacy. We found that after the intervention, feedback knowledge increased significantly for participants in the intervention group compared to the waiting-list control group, supporting hypothesis one. Our intervention helped students in developing their feedback knowledge. However, although feedback knowledge increased significantly after the intervention, the mean for the intervention group at post-test was only 2.95 out of 5, which is still low. This echoes the findings from the focus group interviews that some barriers, such as some students' lack of agency, may be present, as evidenced by the differential development of students' agency. As gaining knowledge and diminishing barriers of feedback processes is a slow and complex process, future studies should continue to work towards increasing students' feedback knowledge.

The relatively low knowledge of feedback may be one of the reasons why hypothesis two—that feedback literacy would increase significantly after the intervention for participants in the intervention group—was not supported. Insufficient knowledge of feedback may prevent the development of feedback literacy, as evidenced by the lack of skills when making judgements. More

specifically, some students indicated that they liked specific feedback, which shows their preference for being told what to do, rather than for self-reflection and self-regulation. Their preference implies that they have not developed a sufficient level of agency when dealing with feedback. Conversely, other focus group participants reflected that, as a result of the intervention, they now prefer more generalised feedback because they realised that this creates opportunity to work out how to do it themselves, suggesting that students may be aware of the importance of gaining agency. However, it still takes time for students to develop agency, even though they are aware that they need to have it. Students may be in a state of conscious incompetence, which means they are aware of the key aspects and requirements of gaining feedback literacy, but they have not yet gained these skills, as this takes time, which may also explain why hypothesis two was not supported. Developing feedback literacy is a complex process that involves students gradually adjusting their beliefs about the purpose, origin, use of feedback, and their role in the process, as well as reinforcing their behaviour and skills (Winstone and Carless 2019). In line with the work of Little et al. (2024), we also suggest that future intervention research could collect longitudinal data to measure feedback literacy, for example, six months after the intervention, which may allow sufficient time to develop agency and build necessary feedback literacy skills.

Although our training addressed the role of agency in feedback processes, the results indicated that not everyone gained the awareness or skills required to become agentic. The lack of agency may be related to a lack of volition, as it hinders students from investing effort in responding to feedback. Despite recent recognition of the important role of agency, there is still a lack of robust theoretical research on agency in the area of feedback literacy (Chong 2021; Nieminen et al. 2022). As Boud and Molloy (2013) point out,

> Unless students see themselves as agents of their own change, and develop an identity as a productive learner who can drive their own learning, they may neither be receptive to useful information about their work, nor be able to use it. (705)

As a result, lack of agency may not be simply a barrier to the development of feedback literacy (Nieminen et al. 2022). Rather, the development of agency should be a foundation for the development of feedback literacy, and feedback literacy training should include opportunities to actively and consciously develop agency, rather than treating it as just one of many barriers. Indeed, Malecka, Boud, and Carless (2022) stated "given that feedback literacy requires an active student role, there needs to be multiple occasions of practice" (912). Future studies should focus more on enhancing students' agency by helping them to develop feedback literacy over time. Training should offer students multiple opportunities and sufficient time to practice, enabling them to gradually develop agency and feedback literacy. Ideally, this should be integrated into the curriculum, allowing students to track their reflections and feedback usage through an e-portfolio. This approach would help students build both agency and feedback literacy over time (Hui et al. 2023). At a theoretical level, researchers in the field of feedback literacy should ensure that interventions gather data that contributes to how this construct functions. At an institutional level, educators who provide feedback should create opportunities for students to act agentically. Given the complexity of developing feedback literacy, it is essential that researchers, educators, and students work together to address this issue from different perspectives.

Students highly appreciated the second session, where they discussed feedback behaviours with peers and indicated that peer support is an effective, enjoyable way to develop their skills. The role of peers in developing feedback literacy is broadly consistent with social constructivism learning

theories (Price, Handley, and Millar 2011). Through group discussion with peers, students become aware that all feedback can be useful and that different people have different ways of interpreting feedback. Conversely, this also made them aware that they do not have to respond to all feedback, but should consider which feedback to convert into action. From a social-relational perspective, discussing feedback with peers can reduce the power differentials and negative emotional reactions that can arise from teacher feedback (Yang and Carless 2013). This can serve to normalise and neutralise uncomfortable emotion in learning. It taps into students' undervalued capacity for showing context relevant empathy (Ippolito and Kingsbury 2024), which comes from their mutual and developing understanding of the complex environments in which interactions take place (Szanto and Krueger 2019), including giving, receiving, and using feedback on assessed work. This was most evident when students considered their role as feedback givers, over which they took great care.

We found that cultural influences may not be as strong as we expected. Rather, individual and personality differences were more likely to cause ambiguity and personal interpretations in feedback processes. As students indicated, getting to know the teacher might help students to reduce ambiguity and interpret their feedback more accurately. Future research could investigate how and to what extent individual and personality differences influence the perceived ambiguity of feedback.

The study has some limitations. Firstly, due to the timeframe of the project, we only measured the short-term effect of the intervention, which was one week after the intervention. However, we recognise that the development of feedback literacy is an ongoing process, and future studies should measure the longer-term effect of such interventions. Secondly, in order to control for extraneous variables such as maturity, we specifically invited first-year students who had just started university to participate in this study. Future studies could explore whether there is a difference in feedback literacy between years of study, which may have implications for the type of feedback they would find most effective.

CONCLUSION

The aim of this study was to develop a feedback literacy intervention programme to improve feedback knowledge and feedback literacy. Our findings suggest that providing students with feedback knowledge and scaffolded practice increased students' knowledge, but did not significantly improve their feedback literacy. Data from focus group interviews suggested that the limited impact on feedback literacy may be due to differential development of students' agency. In addition, our findings highlight the importance of peer influence, an often overlooked but crucial component in cultivating students' feedback literacy. Consequently, we recommend that future feedback literacy interventions should be structured in a way that provides students with the opportunity to share their multiple perspectives on the same piece of feedback. This peer-led, collaborative approach can harness the differential development of students' agency. Furthermore, an intervention should enable students to take on the role of feedback giver, as well as feedback receiver. In addition, it is imperative to raise awareness among feedback providers of the importance of supporting student agency in the wider context of assessment and feedback design, thereby extending the potential for students to become feedback literate beyond a targeted intervention. This research sheds light on the intricacies of fostering student feedback literacy and emphasises the essential role of agency and peer influence.

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ETHICS

This study was approved by the ethical review board of the university.

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APPENDIX 1

The intervention details

Session 1: Timing	Session 1: Intended Learning Outcomes	Session 1: Activities
00:00	- Introduction and goals	- Introduction of the session
00:05	- Understand the definition of feedback - Recognise the purpose and the power of feedback	- A trainer presents the definition, purpose, and the power of feedback - Ask participants to pair share their prior knowledge about feedback
00:10	- Recognise the definition of feedback literacy - Understand the core behavioural elements of feedback literacy – seeking, generating, processing, and acting on feedback - Identify the barriers to developing feedback literacy - Stress the cultural barrier - Reflect on these barriers in participants' own feedback practice	- A trainer presents the definition of feedback literacy, barriers to developing feedback literacy - Small group discussions (5 mins) about the barriers and share with the whole workshop on Padlet
00:20	- Recognise the sources of feedback - Distinguish the internal and external feedback - Recognise the importance of internal feedback	- Students speak aloud about the sources and share with the whole workshop - A trainer presents sources of feedback and explains the external and internal feedback
00:25	- Recognise the own flaws while acting on feedback - Recognise the importance of appreciating feedback - Recognise how to make judgements and how to improve judgement accuracy - Recognise how to manage affect and take action	- Students reflect on previous behaviour on feedback actions by sharing with their group (5 mins) - A trainer presents the four-feature feedback literacy framework
00:40	- Retrieve the information to increase long-term memory regarding the knowledge presented in this session	- Students are asked four open questions related to feedback knowledge and are asked to write down the answers without help (10 mins)
00:50	- Homework and close session	- Students are given 5 pieces of feedback collected based on real examples from previous coursework and are asked to read them after the training and think about how they would like to act on these feedbacks

Session 2: Timing	**Session 2: Intended Learning Outcomes**	**Session 2: Activities**
00:00	- Introduction and goals	- Introduction of the session
00:05	- Gain skills in acting on different types of feedback	- In small groups, students discuss 5 pieces of feedback one by one, including the value of those feedback exemplars, their judgement, their affective response, and how they would act on it. Each group posts a summary of their response of Padlet and contributed to a whole group discussion. Each piece of feedback is given 8 minutes (6 minutes discussion and inputting results, 2 minutes support from two facilitators who have educational psychologist backgrounds) Note. Facilitators mainly choose interesting posts from students on Padlet and encourage students to have in-depth discussions, rather than instructing students.
00:55	- Close session	

APPENDIX 2

Feedback knowledge questionnaire and coding schema

Questions	Coding schema
Q1. Where and from whom do you think you can get feedback? Please list as many sources of feedback as possible.	C1: Internal feedback (2.5 point) C2: External feedback (2.5 in total, 0.5 point for each category): C2_1: Teachers/tutors/professors C2_2: Peers/classmates/seniors students C2_3: Online resources C2_4: Parents/family C2_5: Books
Q2. What are the barriers for students to act on feedback information?	1 point for each category C1: Cognisance (i.e., not knowing the strategy to act on feedback) C2: Awareness (i.e., not knowing where to get feedback and purpose of feedback) C3: Agency (i.e., not feeling empowered to act on feedback) C4: Volition (i.e., not having the intention to invest effort in acting on the feedback) C5: Culture (i.e., language, the tone of feedback, modal expressions within feedback)
Q3. How do you manage your emotions when receiving negative feedback?	1 point for each category C1: Accept the fact that effective feedback should include constructive criticism, or accept negative emotion C2: Avoid defensiveness and be aware that you are here to make progress C3: Be proactive in seeking suggestion even though critical feedback is provided, as feedback judge your work not you C4: Aware of tone/culture aspect of feedback C5: Put away feedback and come back later
Q4. What are the difficulties of giving and receiving feedback in a multicultural learning environment? And how can they be overcome?	C1: Language (1.5 point) C2: Tone (too direct/too indirect) (1.5 point) C3: focus on how to use this piece of feedback to improve your learning, instead of the negative emotion evoked by "the tone of feedback" (e.g. asking for clarification, self-reflection, ask peers) (2 point)

APPENDIX 3

Five pieces of feedback used in the intervention

1. You could also improve introduction by providing a paragraph at the end highlighting what is the key knowledge gap from the literature you have reviewed, what aspect of this literature gap you plan to tackle, and how. You might want to consider these feedback comments when writing your next lab report. (from Rossiter (2022))

2. Take out unnecessary references; change the layout so that it is easier to know in which order to read the text boxes.

3. I don't penalise "poor" data, but your UV data are a bit far from what I'd expect to see. Are you sure you blanked the spec before taking the measurements? Alternative issues might be bubbles in cuvettes, etc.

4. I can see you tried really hard to include relevant materials and you have attempted to choose relevant methods. I commend you for choosing the right computational procedures – that was the important and difficult part of the task and you did a good job here but I'm a bit disappointed with your description of your procedures which slightly lacked some important level of detail. You provided a drawing of the apparatus but it wasn't as clear as it could have been. Overall, it was a good attempt and you have good foundations here, you just need to fine tune the detail. Well done for completing this part. (from Rossiter (2022))

5. Very nice a good attempt and you have good foundations here, you just need to fine tune the detail. Well done for completing this part. opening statement, I quite like how it explains the process to non-scientists. You might want to think about adding a critical review of the publications. i.e. "Benouis et al. and their study". This and other sentences like this in the section could benefit from actually representing their findings and how is it relevant to what you are trying to do.