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Assessing students' peer feedback literacy in writing: scale development and validation

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ABSTRACT

Peer feedback activities are characterized by peers performing both roles of feedback provider and receiver, and peers are found to benefit from both roles. However, in current feedback literacy studies, the emphasis has been overwhelmingly given to students' understandings, capacities and dispositions in receiving feedback, and existing student feedback literacy scales measure only the receiving side of feedback literacy. Students learn from providing and what they provide fundamentally shapes what others receive. This study conceptualizes peer feedback literacy as students' capacities and attitudes in providing and receiving peer feedback, and developed and validated a peer feedback literacy scale on the basis of responses from 474 Chinese university students. Exploratory and confirmatory factor analyses were conducted, and four factors emerged: feedback-related knowledge and abilities, cooperative learning ability, appreciation of peer feedback, and willingness to participate. The resulting scale showed good psychometric properties and revealed some surprising associations with student major, year and amount of prior experience.

KEYWORDS


Peer feedback literacy; writing; scale development; Chinese university students

Introduction

Feedback has long been considered central to improving students' learning (Hattie and Timperley 2007), but its impact requires that the learner 'understands the feedback and is willing and able to act on it' (Price *et al.* 2010, 279). Some students persistently fail to engage with feedback due to various internal factors such as their lack of understanding of its value or willingness to respond (Hill and West 2020). The construct 'feedback literacy' was coined to capture a range of internal factors driving students' productive use of feedback (Han and Xu 2021). Some prior work has focused on student feedback literacy in the general academic context (Zhan 2022a). Other scholars have argued that feedback literacy is a discipline-specific concept (Winstone, Balloo, and Carless 2022) and examined it in specific contexts such as feedback on academic writing (Yu and Liu 2021; Li and Han 2022).

Students receive much of their feedback from instructors, and their response to instructor feedback has generally been the focus of feedback literacy studies. However, peers can also be a source of feedback that has importantly different learning affordances. On the one hand, peer feedback can have many benefits, such as being more timely than instructor feedback (Wu *et al.*

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2022) or producing learning benefits from providing feedback (Lundstrom and Baker 2009). On the other hand, it can offer more challenges because it is dependent upon peers being willing to provide feedback (Zhan 2021). Peer feedback has been recommended as a method for improving students' general feedback literacy (Carless and Boud 2018).

We argue that peer feedback is itself a particular feedback activity which is heavily influenced by feedback literacy: it can influence both what is produced and how it is received. It is possible that peer feedback literacy is conceptually separable from general feedback literacy. Building upon some early qualitative investigations of peer feedback literacy (Han and Xu 2020), the present study seeks to specify the notion of peer feedback literacy, and then develop and validate a peer feedback literacy scale in the context of English as a Foreign Language (EFL) writing.

Literature review

Conceptualizing peer feedback literacy

With the spread of new literacy studies, 'literacy' has transitioned from a general ability to read and write to a capacity needed in a particular field (Roberts 1995). Informed by these studies, Sutton (2012) proposed the concept of feedback literacy as 'the ability to read, interpret and use written feedback' (p. 31). Though not explicitly stated, this definition framed students as recipients of feedback. Carless and Boud (2018) elaborated Sutton's concept by defining feedback literacy as 'the understandings, capacities and dispositions needed to make sense of information and use it to enhance work or learning strategies' (p. 1316). This definition has been widely accepted in studies like Han and Xu (2020) and Yu and Liu (2021). Although disposition was added to Sutton's (2012) original construct, it again framed students as receivers of feedback.

An often-cited definition of peer feedback is 'the use of learners as sources of information and interactants for each other in such a way that learners assume roles and responsibilities normally taken on by a formally trained teacher, tutor, or editor in commenting on and critiquing each other's drafts in both written and oral formats in the process of writing' (Liu and Hansen 2002: 1). In other words, peer feedback inherently involves students in providing feedback. Peer feedback has been recognized as a means of developing students' feedback literacy (Carless and Boud 2018).

Other researchers have drawn attention to students needing feedback literacy to participate meaningfully in peer feedback activities; for this reason, instructors typically provide some training (e.g. Min 2005; Gao, Schunn, and Yu 2019). In peer feedback activities, students both receive and provide peer feedback. Providing feedback requires a feedback literacy that is different from that of receiving feedback. Thus, the original student feedback literacy concept, which only emphasizes the student's receiving feedback, is not compatible with peer feedback activities.

We propose the concept of peer feedback literacy as learners' capacities and attitudes needed for productive engagement with the many activities related to peer feedback. There are two critical dimensions to peer feedback literacy: (1) it involves both capacities and attitudes; (2) the capacities/attitudes must cover providing and receiving peer feedback. The rationale for this proposed definition is as follows. First, since feedback literacy is thought to be context-specific, addressing feedback from peers is likely a substantially different context from the context of instructor feedback (e.g. different timing, formality and obligations to act). Second, students often have different attitudes towards peer versus instructor feedback (Huisman *et al.* 2020). Though students generally perceive peer feedback activities as useful and valuable (Ghahari and Sedaghat 2018), they still worry that peer feedback is too simple and lacks sufficiently detailed comments (Lee and Evans 2019).

Third, simply from the receiving side, there are differences in feedback content. The feedback students receive from their peers can be systematically different in accuracy (Allen and Katayama

2016), complexity of issues addressed (Gao, Schunn, and Yu 2019) and overall amount (Patchan, Charney, and Schunn 2009), which can influence what is required for students' positive engagement. Fourth, there can be more agency and additional skills required in obtaining peer feedback (i.e. students can recruit additional feedback from their peers). Fifth, the act of providing feedback to peers likely requires some additional skills and attitudes relative to simply acting upon received peer feedback. For example, students should learn how to cooperate with their peers since they have more opportunities to communicate with them.

Studies on the dimensions of student feedback literacy

Since Sutton's (2012) pioneering work, the literature has gradually expanded upon the dimensions of student feedback literacy, sometimes from a theoretical analysis, sometimes from qualitative coding of student interviews and revision behaviors, and sometimes using quantitative analyses of student surveys. Table 1 summarizes this literature, although it should be noted that scholars have often used different terms in labeling the components (e.g. Sutton's use of epistemological, ontological, and practical) or combined aspects into a larger dimension (e.g. Han and Xu's cognitive dimension).

At its core, most scholars agree that feedback literacy involves two elements: appreciating feedback (recognition of feedback's value) and taking action (e.g. responding to the feedback by revising). The former can be seen as a motivator of the latter, but there are additional skills involved in taking action as well. A number of scholars have also added two additional components: making judgments (capacities in judging the qualities of their own work and the received feedback) and managing affect (capacities in appropriately dealing with their feelings, attitudes and emotions related to processing feedback).

More recently, several researchers have worked to further expand Carless and Boud (2018) framework. Using student interview data, Molloy, Boud, and Henderson (2020) drew attention to the activity of eliciting more information during processing of feedback, which was reinforced by Joughin *et al.* (2021) theoretical argument that students should actively seek feedback, and Zhan (2022a) included this aspect in her feedback literacy scale. These studies showed the communicative and cooperative aspect in feedback processes. The peer feedback activity, in

Table 1. Different dimensions of feedback literacy and peer feedback literacy as theorized (T), qualitatively coded (Q), and measured via survey (S).

	Appreciating feedback	Making judgments	Managing affect	Taking action	Eliciting feedback	Communicative skills
<i>Student Feedback Literacy</i>						
Sutton (2012)	T	–	–	T	–	–
Carless and Boud (2018)	T	T	T	T	–	–
Joughin <i>et al.</i> (2021)	–	–	–	–	T	–
Ketonen, Nieminen, and Häikiöniemi (2020)	Q	Q	–	Q	–	–
Han and Xu (2021)	Q	Q	Q	Q	–	–
Molloy, Boud, and Henderson (2020)	Q	Q	Q	Q	Q	–
Song (2022)	S	S	–	–	–	–
Yu, Zhang, and Liu (2022)	S	S	S	S	–	–
Zhan (2022a)	S	S	S	S	S	–
Zhan (2022b)	Q	Q	–	Q	Q	–
<i>Peer Feedback Literacy</i>						
Liang (2019)	S	S	S	–	–	S
Han and Xu (2020)	Q	Q	Q	–	–	–
Man, Kong, and Chau (2022)	T	–	T	T	–	–

Boxes indicated combined dimensions.

nature, is cooperation among students. Thus, cooperative learning ability is vitally needed. The abovementioned factors involve two types - capacities and attitudes - which are also corroborated by the students' own understanding of feedback literacy (Zhan 2022b).

Recently three validated feedback literacy scales have been developed to measure learners' general feedback literacy from different perspectives. Song (2022) focused on the attitudes of feedback literacy which included three factors: feedback conception, feedback trust and self-efficacy. Yu, Zhang, and Liu (2022) measured students' feedback literacy in writing, using Carless and Boud (2018) four features as factor names and adding a fifth (acknowledging different feedback sources). Zhan's (2022a) scale included six factors, with three on capacities and three on attitudes.

Studies on peer feedback literacy and its measurement

Currently, studies on peer feedback literacy are still scant. Liang (2019) was perhaps the first scholar to propose this term. Her framework of peer feedback literacy contained three dimensions: affect, knowledge and communicative skills. However, the questionnaire used to measure peer feedback literacy was not validated.

Han and Xu (2020) investigated the effects of teacher feedback on peer feedback in Chinese master students' EFL academic writing. Based on the literature and qualitative data from three participants, they proposed two dimensions of peer feedback literacy: cognitive readiness, which can be aligned with making judgments and taking action; and social-affective readiness, which can be aligned with appreciating feedback and managing affect.

As part of developing peer feedback training, Man, Kong, and Chau (2022) proposed a new conceptualization of aspects of peer feedback literacy in providing peer feedback. It covered three of the core aspects of feedback literacy: appreciating peer feedback, managing affect and taking action. However, formal measures of each of the components were not provided and no direct attention was given to the skills or attitudes required in providing productive peer feedback.

To our best knowledge, no scale has been developed to measure peer feedback literacy. The factors covered in the existing literature on student feedback literacy suggest that such a scale would involve skills and attitudes involved in taking action as well as skills and attitudes for eliciting feedback. It should add skills related to providing feedback. The current study seeks to develop and validate a peer feedback literacy scale that specifically includes these aspects but allows for the possibility that they may not be empirically separable dimensions.

Students' prior experience with feedback can influence their feedback literacy. In a study using narrative inquiry, international postgraduates' feedback literacy was found to be relatively low because their prior feedback experiences did not match the educational practice of the host country (Rovagnati, Pitt, and Winstone 2022). In the peer feedback domain, there is little prior research on peer feedback literacy and experience. However, one study found that feedback willingness was lower among students who only experienced peer feedback once, relative to both those students who had no prior experience and those who had more experience (Kasch *et al.* 2021). Since early experiences may include poor peer feedback practices (Zong, Schunn, and Wang 2022), the initial decline with experience may not be surprising. Additional research is required to examine factors predicting peer feedback literacy levels, including amount of prior experience and student maturity levels.

Methodology

Research questions

This study aims at developing and validating a peer feedback literacy scale (PFLS) in English writing and exploring the current situation of students' peer feedback literacy using the scale. It addresses the following three research questions:

RQ 1: What are the separate factors within peer feedback literacy?

RQ 2: Is the resulting PFLS psychometrically reliable and valid?

RQ 3: Does the PFLS survey reveal patterns in which university students are likely to have low PFL?

Participants

The research participants were 474 university students recruited by convenience sampling. The authors contacted colleagues who were university English teachers and had used peer feedback writing activities previously in their instruction. The universities included one national top university, six provincial top universities and one common university, representing the major three types of universities in China. However, the exact number of participants from each university is unknown as students answered the questionnaire anonymously.

The researchers shared the questionnaire link through WeChat (a widely used Chinese social media platform) with the university's EFL teachers. All the teachers had the experience of conducting peer feedback activities. The teachers were asked to explain to their students the research purpose and confidentiality commitment based upon a written script provided by the researchers.

Participants were between 17 and 35 years old ($M=19.7$, $SD=2.2$), 46% male and 89% undergraduates. 116 students (25%) majored in English (including linguistics, literature and translation); 127 students (27%) majored in various other arts and 231 majored in science (49%).

Prior experience with peer feedback was used as a screening criterion for participation. In terms of number of prior peer feedback activities, 2 was the median and there was a wide range across participants ($SD=32.1$), even within participants at a given year/level, consistent with peer feedback still being a sporadically-used pedagogical technique.

Measures

The survey items were all written in Chinese, the participants' native language.

Demographics

Students were given five background questions that asked them to report their gender, age, grade, major and the number of times they had previously participated in peer feedback activities. The grade options were freshman, sophomore, junior, senior and postgraduate. To report majors, students choose from three provided choices: arts, science and English.

Peer feedback literacy scale

The items in the PFLS were generated by drawing upon three resources: adapted and translated items from general feedback literacy scales, prior research on peer feedback, and interviews with seven writing teachers and five university students. The teacher interviews were conducted with teachers who had some experience with implementing peer feedback and asked their ideas on what abilities students need in peer feedback activities. The student interviewees were with those who had previously undertaken peer feedback activities, who were asked to recall what they and their classmates did in peer feedback and what features they believed were necessary. The interviews were carried out in their first language, Mandarin Chinese, and were recorded with the interviewees' consent.

Different sources played different roles in item generation: interviews and the literature review suggested possible items; experts suggested technical refinements; and students suggested

minor linguistic refinements. Revisions were done sequentially to produce the first version of the PFLS, which consisted of 30 items, spanning five intended factors: appreciation of peer feedback, knowledge of peer feedback, abilities in providing and making use of peer comments, cooperative learning ability, and willingness to participate. These dimensions ended up going beyond the core dimensions identified in Table 1 due to the various ways in which peer feedback is different from instructor feedback. The factors covered both cognitive readiness (knowledge and abilities) and affective readiness (feedback appreciation and willingness). As a survey measure, we note that the factors involve perceived abilities; such perceptions are usually correlated with actual abilities and also influence actions (Bandura 2006). Each item involved a 6-point Likert scale, ranging from 1 (totally not true of me) to 6 (totally true of me).

We then consulted six experts to determine if the instrument was appropriate to the disciplinary context in which the instrument was intended to be used (i.e. English as a Foreign Language Instruction), and to anticipate possible wording issues which would likely influence psychometric properties. The experts were professors/instructors specializing in either foreign language teaching or psychometric measures. They recommended a small number of wording revisions, such as adding 'I think' for the items involving the appreciation of peer feedback factor. The revised questionnaire was then shared with five students who were highly proficient in English writing (and thus likely to have good PFL) to check whether the items were unambiguous. Finally, the 30-item PFLS was obtained (see Appendix for an English translation of the version given to participants) with an initial goal of having five factors with six items each.

Data collection

Participants completed the questionnaires anonymously via *Wenjuanxing*, an online survey tool. The survey included three parts: introduction (purpose of the survey and confidential commitment), demographic information and the PFLS Likert items. Data from 474 students (76%) was retained based upon students correctly responding to two check items in the survey.

Data analysis

The data were randomly separated into two datasets: dataset 1 ($N=238$) was used for a series of exploratory factor analyses (EFA) in SPSS 26 to obtain the factorial structure of peer feedback literacy, and dataset 2 ($N=236$) was used for confirmatory factor analyses (CFA) in AMOS 24 to examine the goodness-of-fit of the factorial structure. Item characteristics, internal consistency and discriminant validity were examined using dataset 2. These analyses resulted in a 20-item PFLS. We examined the descriptive statistics of students' current level of peer feedback literacy with prior experience, year/level and major using the full dataset.

Results

RQ 1: determining separable factors within peer feedback literacy

Before conducting the EFA analyses, we examined the skewness and kurtosis of each item. All items were within ± 2 (see [supplementary material A](#)), which was acceptability close to normal distribution to support EFA analyses (Bryman and Cramer 2001). The item-total correlations for all items were above the recommended benchmark ($r > .40$, $p < .01$; Wu 2010) (see [supplementary material B](#)). Finally, the Kaiser–Meyer–Olkin measure of sampling adequacy was 0.938 ($\chi^2 = 11358.68$, $df=2,278$, $p = .000$), which demonstrated that the data was suitable for factor analysis.

The EFAs were conducted using principal component analysis as the extraction method, promax with Kaiser normalization as the rotation method (i.e. assuming correlated factors), and

using eigenvalues > 1 to determine the number of factors. We iteratively re-ran the EFA after stepwise deleting the items which (1) had loadings of greater than $|0.4|$ on more than one factor; and/or (2) had no factor loading greater than $|0.4|$ (Cohen, Manion, and Morrison 2011).

A four-factor solution based upon 26 items (Table 2), accounting for 62% of total variance, was obtained. Examining the items within each factor, factors were named: feedback-related knowledge and abilities (FKA), willingness to participate (WP), cooperative learning ability (CLA), and appreciation of peer feedback (APF). The factors FKA and CLA were the capacities needed in peer feedback activities, and the factors WP and APF were the attitudes towards the peer feedback activities. All factors had items involving both providing and receiving peer feedback.

The scree plot also supported using four factors. Forcing three factors led to the combining of APF and WP items into one factor, which theoretically mixes cause and consequence. Forcing five factors resulted in one factor that had only two items and was also highly correlated with other factors.

To confirm the factorial structure produced by the EFAs, a set of CFAs was conducted using dataset 2. Multiple rounds of CFAs were conducted in order to obtain a model that produced acceptable model fit indices (Hu and Bentler 1999; Wu 2010). Model 1 involved all items from

Table 2. EFA factor loadings for each item (values below .3 are hidden).

Item	FKA	WP	CLA	APF
Q15 I have the knowledge of judging the quality of peer feedback.	0.91			
Q17 I have the knowledge of how to provide valuable comments.	0.83			
Q30 I have the knowledge of different genres (e.g. exposition, argumentation, narration).	0.80			
Q14 I am able to judge whether the peer comments are reasonable.	0.80			
Q8 I know the features of an excellent composition.	0.79			
Q13 I have enough linguistic knowledge to participate in peer feedback activities.	0.79			
Q26 I am able to offer specific revision solutions to peers' writing.	0.60			
Q27 I am able to offer reasons when providing suggestions to peers.	0.57			
Q20 I am willing to be responsible for the feedback that I provided to peers.		0.82		
Q31 I think that I am responsible for thinking about peer feedback I received.		0.79		
Q11 I think that I should be meticulous when providing feedback to peers.		0.74		
Q22 I will be meticulous in dealing with the feedback that I have received.		0.67		
Q28 I am willing to explain my feedback comments to peers.		0.58		
Q16 I am willing to accept peer feedback although it may be very harsh.		0.55		
Q3 After class, I am able to communicate with classmates on how to accept peer comments.			0.82	
Q25 After class, I am able to communicate with classmates on personal opinions of providing peer feedback.			0.81	
Q1 I am able to turn to other classmates for help when I encounter difficulties in commenting on peers' writing.			0.73	
Q29 I am able to take the initiative in inviting peers to comment on my writing.			0.73	
Q5 I am able to actively turn to peers for help when receiving the feedback that I cannot understand.			0.71	
Q21 I can actively offer help to peers if they do not know or are not certain in how to provide comments.			0.52	
Q4 I think that multiple peer feedback (i.e. more than 2 peers offering feedback to one composition) is more effective than single teacher feedback.				0.89
Q12 I think that participating in peer feedback activities can enhance my English proficiency.				0.72
Q2 I think that providing peer feedback can make me learn from peers' writing, thus improve my English proficiency.				0.66
Q6 I think that peer comments can make me reflect on my own writing.				0.59
Q18 I think that participating in peer feedback activities can enhance my interest in learning English.				0.58
Q9 I think that peer comments can make me learn from others' thinking patterns.				0.55
Cumulative % of variance explained	40.2	50.3	57.7	61.9

Items in italics are those removed in the final CFA model.

the EFA, but it was not an acceptable model. After eliminating 6 items either because of low factor loadings (lower than 0.6) or high modification indices (higher than 5 and causing decrease of goodness-of-fit indices), the final model (Model 2) consisted of 20 items (see Figure 1) and had acceptable fits statistics (see Table 3).

Given the high correlations between factors, we also ran a second-order CFA (Bollen 1989), which has been also previously done in studies of feedback literacy (Yu, Zhang, and Liu 2022), and found that this model (see supplementary material C) also had acceptable goodness-of-fit indices (Table 3). Since the second-order model was more complex and its fit indices were slightly worse than those of Model 2, we selected Model 2 as the final model.

RQ2: reliability and validity of the PFLS

The reliability of the factors from the final model was examined in terms of internal consistency (see Table 4). The reliabilities of the four factors were found to vary between .80 and .89, which are all considered good and well beyond the minimal benchmark value for acceptable reliability of .70 (Hair et al. 2010), suggesting that each factor had enough remaining items.

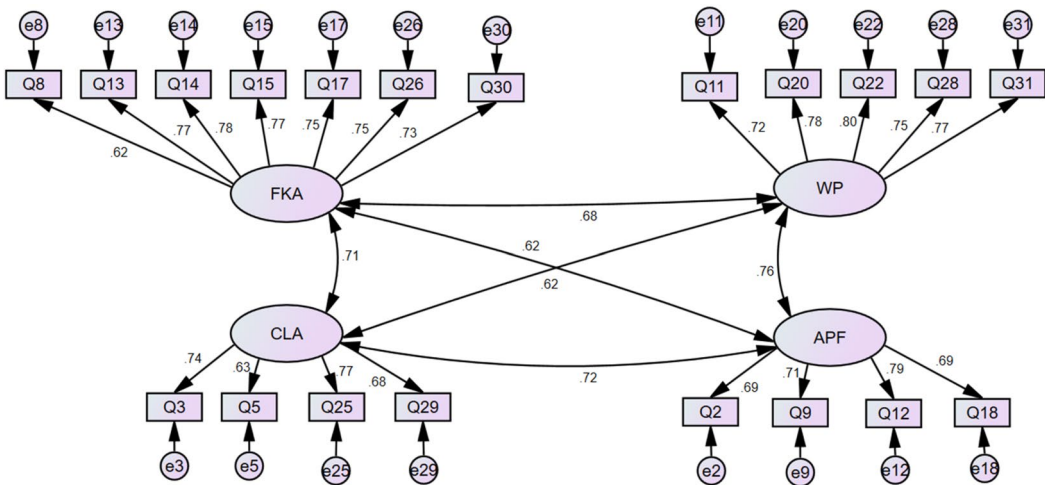


Figure 1. Confirmatory factor analysis item loadings and factor correlations from the final model (Model 2).

Table 3. Goodness-of-fit indices for each of the CFA models (acceptable values in bold).

Model	χ^2	df	χ^2/df	RMSEA	SRMR	CFI	TLI
Benchmark	—	—	<3	< .08	< .08	> .90	> .90
Model 1	647.8	293	2.21	.072	.065	.891	.879
Model 2	302.1	164	1.84	.060	.053	.943	.934
Second-order model	316.8	166	1.91	.062	.056	.938	.929

Table 4. Internal consistency reliability (Cronbach α) of each PFLS factor.

Factor	Internal consistency
Feedback-related knowledge and abilities	.89
Willingness to participate	.88
Appreciation of peer feedback	.81
Cooperative learning ability	.80

Table 5. HTMT ratio of correlation values among the four Peer Feedback Literacy factors.

Subscale	FKA	WP	APF	CLA
Feedback-related knowledge and abilities (FKA)	–			
Willingness to participate (WP)	0.68	–		
Appreciation of peer feedback (APF)	0.63	0.76	–	
Cooperative learning ability (CLA)	0.70	0.64	0.74	–

Table 6. The minimum, maximum, mean and standard deviation of the students' scores in PFLS.

Factor	<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>
Globe scale	2.5	6.0	4.6	0.6
Feedback-related knowledge and abilities (FKA)	2.0	6.0	4.4	0.7
Willingness to participate (WP)	2.4	6.0	5.0	0.6
Appreciation of peer feedback (APF)	1.3	6.0	4.8	0.7
Cooperative learning ability (CLA)	1.0	6.0	4.3	0.9

Convergent validity and discriminant validity were also examined. The CFA factor loadings of all the items ranged from .62 to .81, suggesting strong convergent validity at the item level. To examine discriminant validity of the items, we conducted a heterotrait-monotrait ratio of correlations (HTMT) analysis, which examines the ratio of the inter-item correlations between constructs to the inter-item correlations within a construct. Values below 0.85 are considered acceptable (Henseler, Ringle, and Sarstedt 2015). All four factors showed adequate discriminant validity according to this analysis. In other words, the factors were meaningfully different and the strong correlations among the factors were not caused by items that measured multiple factors (Table 5).

RQ3: varying levels of university students' peer feedback literacy

For each participant, scores were calculated on each of the four factors and overall PFL using the 20-item final version of the instrument (see Table 6 for descriptive statistics). Figure 2 presents boxplots; the box shows the interquartile range with a median line; the bars show the full range minus outliers, and the circles and asterisks show statistical outliers and extreme outliers (the numbers are the case IDs for each outlier). We chose boxplots rather than bar graphs because some of the scales had skewed distributions and showed interesting patterns within parts of the distributions when examined by experience and major subgroups. Willingness to participate had the highest values, with students' WP scores tending to fall between 4.5 and 5.6, whereas the other scales had positive but more moderate values between 3.8 and 5.2. Overall, students were higher on willingness and attitudes towards peer feedback and lower on knowledge and abilities related to peer feedback.

To address RQ3, we examined variation on the scales by various student characteristics. We began by conducting a series of one-way ANOVAs (analyses of variance) to examine whether students of different majors (the independent categorical variable) significantly differed in peer feedback literacy and its four factors (the dependent variables). Only the APF scores were significantly different by major ($F(2, 471) = 5.65, p < .01$). LSD (least significant difference) post-hoc tests examining which specific means were significantly different from one another indicated that English majors were significantly lower in their APF scores than arts students ($p < .05$) and science students ($p < .01$). Figure 3 shows that the main difference was that fewer English majors had high APF scores; the median values were the same across groups as were the lower interquartile values.

We also examined whether peer feedback literacy varied by amount of prior peer feedback experience. Given the highly skewed distribution in amount of prior experience, three categories were created (excluding the 14 students who did not respond to this item): one ($n=37$), two

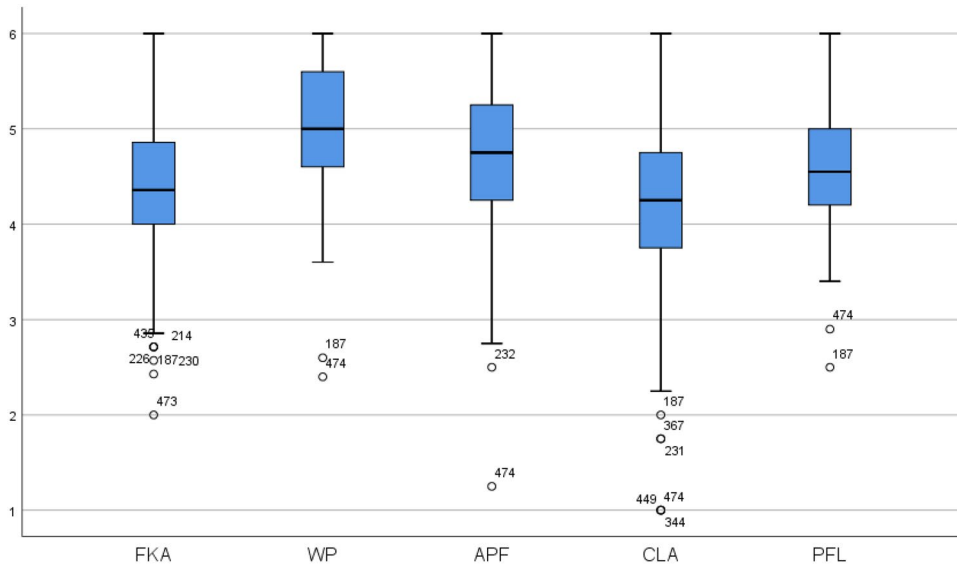


Figure 2. The boxplot of overall peer feedback literacy and its four factors.

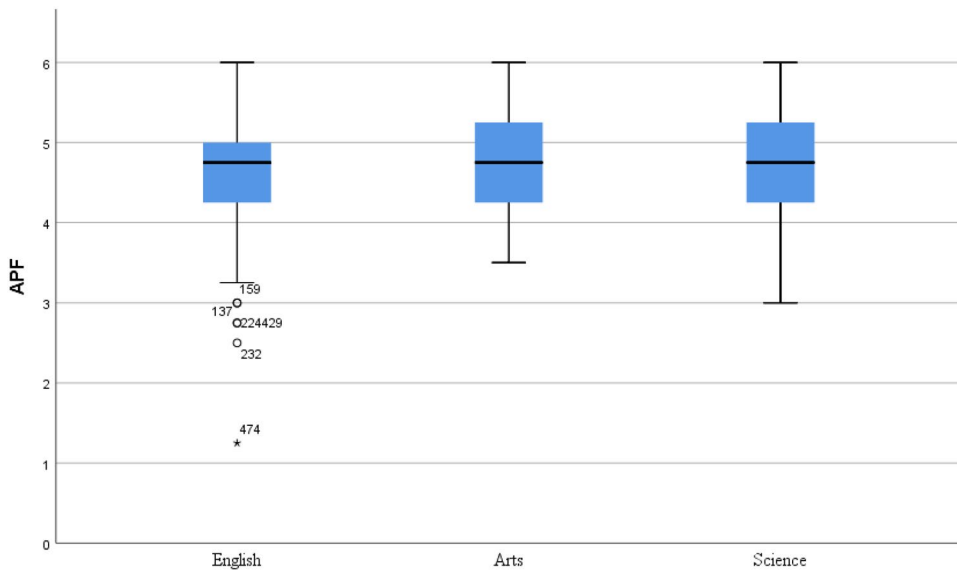


Figure 3. The boxplot of APF scores (appreciation of peer feedback) by major.

($n=205$) and three or more ($n=218$). ANOVAs using these experience categories applied to each factor found statistically significant overall differences on all four factors: FKA $F(2, 457) = 3.04$, $p < .05$; APF $F(2, 457) = 3.18$, $p < .05$; CLA $F(2, 457) = 3.58$, $p < .05$; WP $F(2, 457) = 3.93$, $p < .05$. LSD follow-up contrasts revealed that for two factors, students with peer feedback experience with two prior papers had significantly higher scores than did students with experience of only one prior paper: greater willingness to participate ($p < .05$), and greater cooperative learning ability ($p < .05$). For feedback knowledge and abilities, only those students with peer feedback experience with three or more prior papers had significantly higher means than the other groups. For appreciation of peer feedback, students with peer feedback experience with two prior papers had the highest scores.

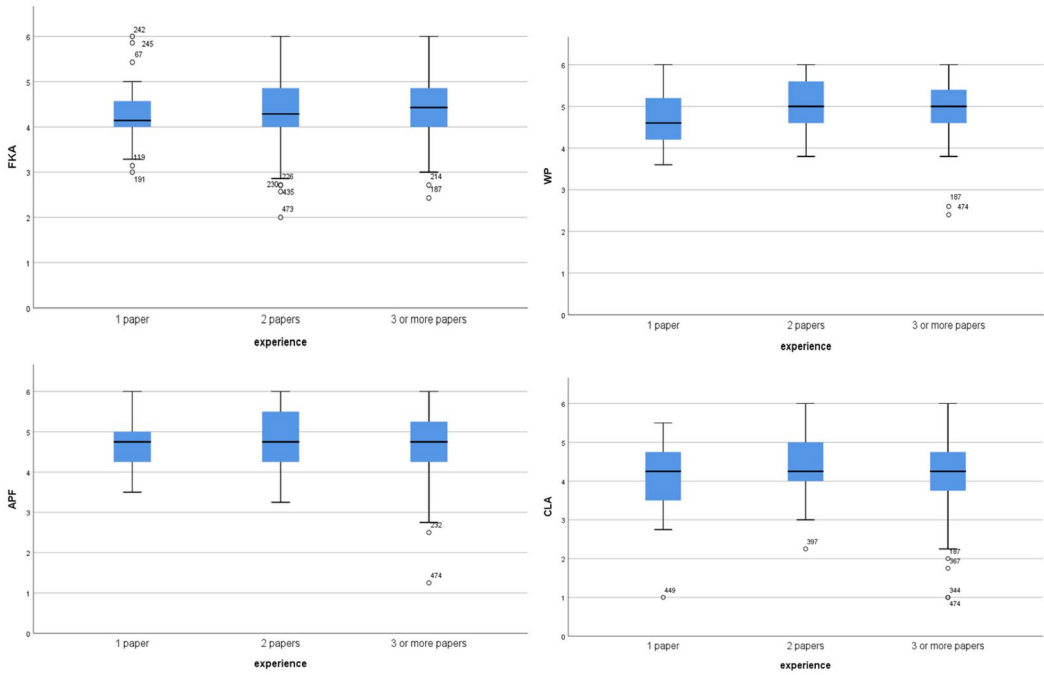


Figure 4. Boxplots of factor scores by amount of prior experience with peer feedback.

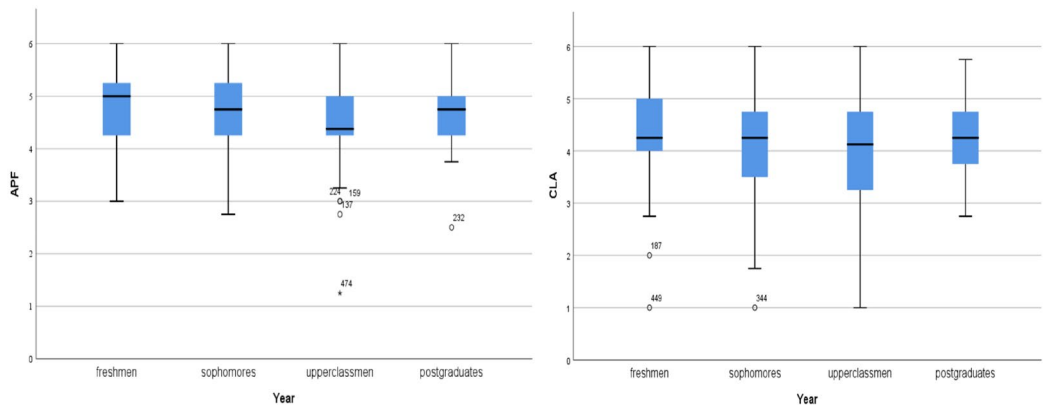


Figure 5. Boxplots of Appreciation of Peer Feedback (left) and Cooperative Learning Ability (right) scores by Year.

Figure 4 presents the boxplots for each of the factors by amount of experience. It is interesting that often the differences by groups influence the distribution of levels more than the median values: having more than one experience sometimes addresses the lowest level responses. Willingness to participate stands apart in that both the lower end of the distribution and the median values are higher with more experience.

Looking at developmental patterns by student year, there were statistically significant differences by year for appreciation of peer feedback $F(3,470)=5.97, p < .01$, and for cooperative learning ability $F(3,470)=5.09, p < .01$. There was a significant association of year with amount of experience based upon the three experience categories, $\chi^2(6)=185.6, p < .001$. However, it was really only the freshmen who had less experience than the other three year groupings: 22% of freshmen had 3 or more prior experiences, whereas between 83% and 92% of the

other students had 3 or more prior experiences. As shown in [Figure 5](#), freshmen are actually the most appreciative of peer feedback and have the greatest (perceived) cooperative learning ability, which perhaps relates to the extent to which they collaborate or the relatively simpler tasks they would need to share with peers.

Discussion

This study extends prior research by developing and validating a peer feedback literacy scale that included a broader range of factors proposed in the literature, critically examining how providing and receiving aspects should be treated. The EFA revealed (and the CFA confirmed) four separable PFL factors: feedback-related knowledge and abilities, willingness to participate, cooperative learning ability and appreciation of peer feedback, all of which cover both items about *providing* and *receiving* feedback. The factor analyses supported combining knowledge and abilities as well as providing and receiving, which echoed Han and Xu (2021). Generally, the four factors are in line with previous qualitative studies, such as Han and Xu (2020) which proposed cognitive readiness and social-affective readiness of student feedback literacy in peer feedback activities. Li and Han (2022) also supported these two dimensions in exploring feedback literacy in L2 disciplinary writing.

In the factors of the present scale, FKA and CLA are two specific types of cognitive readiness, and WP and APF can be considered as two types of social-affective readiness. This factorial structure echoes Carless and Boud (2018), except that we integrated the emotion aspect in the items of our scale instead of keeping it as an independent factor, because students can complete the peer feedback task led by their motivation and 'set their own emotions aside' (Li and Reynolds 2021, 24).

The four factors of the PFLS also shared some similarities with existing scales of general feedback literacy. For example, the *feedback-related knowledge and abilities* factor echoed Yu, Zhang, and Liu (2022) 'making judgments' factor and Zhan's (2022a) 'processing' factor. The *appreciation of peer feedback* factor aligns with Zhan's (2022a) 'appreciation of feedback' and Song's (2022) 'perceived usefulness of feedback'. The factor *willingness to participate* is close to Zhan's (2022a) 'readiness to engage' factor and Song's (2022) 'understanding of responsibility' factor.

By contrast, the *cooperative learning ability* factor is the most novel contribution to the measurement of feedback literacy. Peer feedback activity emphasizes cooperation between peers and cooperative learning theory has been one of the guiding theories (Yu and Lee 2016). Cooperation among peers can be realized in two ways with peer feedback. First, in peer feedback activities, a student can receive feedback from more than one peer, providing more learning opportunities. Second, students can cooperate outside peer feedback activities, which was emphasized in this factor. It can include help-seeking abilities, which was one kind of cognitive ability identified more recently (Han and Xu 2020; Molloy, Boud, and Henderson 2020). In Zhan's (2022a) feedback literacy scale, the factor 'capacities in eliciting feedback' was similar to this *cooperative learning ability* factor in the PFLS, though her factor was more general and ours was specific in peer feedback. Besides seeking feedback from peers, sharing personal opinions on how to provide and deal with peer feedback was also covered in this factor. In peer feedback activities, communication with peers can be conducive for students to overcome difficulties (Zhan 2021). It can also enhance knowledge construction through social interaction with peers (Chen and Gao 2022), which can seldom be achieved from receiving instructor feedback.

Reliability and validity tests (internal consistency, convergent validity, discriminant validity) further proved the sound psychometric indices of the PFLS. The final version of the PFLS only includes 20 items, making it convenient for both research and applications. Future studies should examine the validity and reliability of the scales in other contexts, such as countries with less respect for teachers or greater use of student-centered instruction.

Participants were found to have relatively high peer feedback literacy and high variability in peer feedback literacy within every major, year and prior experience level. Our sample involved students whose teachers chose to participate in the study, all implementing peer feedback in their courses in a context where there recently has been considerable research and practice, and these instructors had provided some training to students. A large sample targeting a broader cross section of instructional contexts will likely find a less positive account of peer feedback literacy. It is an open question for future research to uncover what exactly underlies the variation across students in peer feedback literacy. Possible explanations might include especially positive or negative prior experiences with received or provided peer feedback, overall self-efficacy in writing, or broader support for peer/collaborative learning.

The substantial number of students with only moderate peer feedback literacy likely has implications for levels of engagement. Recent studies have found that students have relatively positive affective engagement but relatively low cognitive and behavioral engagement, especially in dealing with content-focused peer feedback (Yu *et al.* 2019; Fan and Xu 2020). The lack of engagement may in turn hinder the development of peer feedback literacy, potentially explaining why there was not a strong association between amount of experience and peer feedback literacy. In order to produce a stronger learning cycle, it is likely necessary for students to have more detailed and prolonged peer feedback training (Man, Kong, and Chau 2022). That English majors had the lowest appreciation of peer feedback suggested that future research should unpack potential causes of this difference in attitudes, such as a greater emphasis on teacher feedback or a tendency to experience less useful forms of peer feedback (e.g. non-anonymous feedback or only single peer feedback).

Conclusion and implications

Against the backdrop of little prior work on measuring peer feedback literacy, the theoretical value of this study lies in that it is first to propose a peer feedback literacy model derived using quantitative data. The proposed model helps researchers and teachers better understand peer feedback literacy and offers insights to the design of training. The scale can be a convenient instrument for researchers and teachers to measure their students' peer feedback literacy. It can be used for diagnostic purposes before peer feedback activities are conducted.

This study implies that teachers should be aware that students' peer feedback literacy is a multi-factor construct, which involves both cognitive and social-affective readiness. Teachers may need to enhance students' social-affective factors as well as improve their cognitive and collaborative abilities in peer feedback training. That students' levels on the cognitive factors fall behind their social-affective factors reveals that mastering knowledge and skills is a long process. Thus, in order to enhance students' abilities, teachers could conduct teaching interventions. Feed-forward meetings (Hill and West 2020) and teacher feedback on peer feedback (Han and Xu 2020) are two possible methods deserving attention.

The study has limitations. First, participants were mostly from top universities in China. To reveal a more general picture of university students' peer feedback literacy, future studies can recruit a larger sample size of participants from all levels of universities. Second, as a self-report measure, the ability dimensions actually measured the self-efficacy of students' perceived abilities. Future studies should explore behavioral measures to examine the empirical relationships of self-perceptions with a wide range of peer feedback behaviors.

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Appendix: English translation of the items of the PFLS

1. I am able to turn to other classmates for help when I encounter difficulties in commenting on peers' writing.
2. **I think that providing peer feedback can make me learn from peers' writing, thus improve my English proficiency.**
3. **After class, I am able to communicate with classmates on how to accept peer comments.**
4. I think that multiple peer feedback (i.e. more than 2 peers offering feedback to one composition) is more effective than single teacher feedback.
5. **I am able to actively turn to peers for help when receiving the feedback that I cannot understand.**
6. I think that peer comments can make me reflect on my own writing.
7. I am able to write peer comments based on the evaluation criteria designed by the teacher.
8. **I know the features of an excellent composition.**
9. **I think that peer comments can make me learn from others' thinking patterns.**
10. Please choose '2 not true of me very much' for this item.
11. **I think that I should be meticulous when providing feedback to peers.**
12. **I think that participating in peer feedback activities can enhance my English proficiency.**
13. **I have enough linguistic knowledge to participate in peer feedback activities.**
14. **I am able to judge whether the peer comments are reasonable.**
15. **I have the knowledge of judging the quality of peer feedback.**
16. I am willing to accept peer feedback although it may be very harsh.
17. **I have the knowledge of how to provide valuable comments.**
18. **I think that participating in peer feedback activities can enhance my interest in learning English.**
19. I am able to extract the actionable information which facilitates composition revision from the peer comments I received.
20. **I am willing to be responsible for the feedback that I provided to peers.**
21. I can actively offer help to peers if they do not know or are not certain in how to provide comments.
22. **I will be meticulous in dealing with the feedback that I have received.**
23. Please choose '4 relatively true of me' for this item.
24. I know the task requirements for peer feedback activities.
25. **After class, I am able to communicate with classmates on personal opinions of providing peer feedback.**
26. **I am able to offer specific revision solutions to peers' writing.**
27. I am able to offer reasons when providing suggestions to peers.
28. **I am willing to explain my feedback comments to peers.**
29. **I am able to take the initiative in inviting peers to comment on my writing.**
30. **I have the knowledge of different writing genres (e.g. exposition, argumentation, narration).**
31. **I think that I am responsible for thinking about peer feedback I received.** After receiving feedback, I can revise my writing according to the reasonable elements of the comments.
32. Notes: 1. The bold items were the retained 20 items in the final version of the PFLS.
33. 2. Items 10 and 23 are check items.