Using and Perceiving Emoji in Design Peer Feedback

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Abstract: Emoji are often used to express emotions or visually enrich text communications, but little is known about the impact of emoji in peer feedback. We conducted a qualitative study on emoji's roles in peer feedback in a small group collaborative design activity; the activity was conducted entirely online as part of a distance education class. Using content analysis on the feedback peers provided, and thematic analysis on transcribed interviews, we analyzed how emoji are used and perceived in four types of design feedback. Our analysis suggests that emoji increase peers' awareness of affective status, and are also used to mark minor cognitive feedback with a more personal flavor as part of document-based conversations. We found that emoji help to establish a general informality for peer feedback activities. We discuss the implications for the design of collaborative learning software that supports richer peer feedback.

Introduction

As Värlander argues, "emotions should not be considered as hindering learning. Rather, it underlines the focal role of emotions in learning as being a natural part of it" (Värlander, 2008). Delivering and receiving feedback among peer learners is more than simply transferring information (Falchikov, 2013; Jacobs, 1974); each emotion-containing communication is influenced by students' emotions at the time of expression (Race, 1996). With the prevalence of emoji and their prospects of expressing emotions, this paper examines the use and perception of emoji in peer feedback.

The Role of Emoji in Peer Feedback Work

Emoji are a very popular manner of expressing emotions in real-time communication, and have also become increasingly prevalent in a range of social computing technologies (e.g. Twitter, Instagram, SNSs). In an educational context, Zhang et al. showed that students annotated discussion posts with emoji or tags to signal their confusions or curiosity; these signals directed instructors' attention to places where students needed help or further clarification (Zhang, Igo, Facciotti, & Karger, 2017). In this case, the use of emoji rather than text-based hashtags offered a relatively easy mechanism for conveying emotions. Such findings suggest that the use of emoji among students may allow for transparent emotional exchanges and further direct instructors' cognitive efforts. This motivated us to investigate the role of emoji in peer feedback within small groups in online classes as a way to facilitate social interaction among distance learners.

One recent work leveraged crowdsourcing intelligence to express emotions in feedback with pictures versus text (Robb, Padilla, Kalkreuter, & Chantler, 2015). The designers who created the work being critiqued felt that both text and emotional images were more "threatening" than an abstract image; they also reported that the abstract images were inspiring. Nonetheless, text-based feedback is more likely to be used for giving conventional critiques: In a follow up study that examined how crowd workers felt when giving feedback using abstract images, emotion images and text, Robb et al. revealed that the type of feedback preferred was correlated with users' cognitive styles, and that over half of the participants valued engagement over clarity (Robb, Padilla, Methven, Kalkreuter, & Chantler, 2017). Furthermore, some participants who provided feedback said that they would have liked to use emoji in addition to image-based emotion feedback. Although images have been found more expressive for emotions, some users find ambiguity to be a desirable advantage of giving emotion feedback because it is harder to put emotions in words than to use an image, and emoji are prone to ambiguity due to varying interpretations (Miller et al., 2016).

In addition to expressing emotions for the user, the use of ambiguous and playful expressions of emotions may invite and leave more space for communicative moves from the recipients, which could encourage more social interaction. In this regard, ambiguous and abstract indicators (e.g. emoji) seem consistent with Jakobson's model of communication (Jakobson, n.d.). In that model, the simple act of continuing a conversation is valuable. Indeed, emoji have been used to manage conversation (Pohl, Domin, & Rohs, 2017), and even have been perceived as a more efficient and playful way of expression than text.

As a complement to text-based comments, emoji may provide additional emotional and situational information to the recipients. For example, a study that examined senders' intentions in US-based messaging reported that emoji are used as a social tool to engage the recipients in a conversation, to convey intended meaning, and to solicit certain reaction from the recipients, even when the senders intended nothing specific in the emoji themselves (Cramer, de Juan, & Tetreault, 2016). More generally, in a quantitative study of Twitter data (Pohl et al., 2017), emoji have been used as message decoration, to replace words, and to enrich text messages with respect to tones or meaning, in addition to serving the function of emotional annotation.

Despite the fact that emoji have become prevalent as part of a growing and universal language in text-based communication, researchers have not yet understood the role of emoji in remote collaborative learning tasks. Emoji seems to be a promising but under explored option for engaging online learners in conversations with additional situational information. We are especially interested in its potential in expressing emotional information in online learning environments where students often feel isolated and yearn for social connections with others (Sun, Rosson, & Carroll, 2018). However, emoji are subject to misinterpretations according to individual differences and varied rendering mechanisms across devices (Miller et al., 2016). Although it is possible that reacting to others' learning artefacts may stem from different interpretation and lead to differing emotional states, our study focuses on the impact of such emotions in interactive moves and interpersonal relationships situated in social learning activities. We now turn to our study of emoji as a mechanism for adding emotional content to peer-based critiques as part of a collaborative learning activity.

Research Setting

Situated in collaborative design activities among group members of an online bachelor degree program, we designed an online feedback tool called Emoviz to probe how peer feedback with emoji-entries affects the social interactions and relationships among online students.

Selecting Appropriate Emoji for Emotion Feedback

Previous studies found that emoji can be perceived very differently within and across platforms, and thus lead to senders' and receivers' misunderstandings (Tigwell & Flatla, 2016). In addition, there are certain emoji with complex emotion interpretations that can cause high levels of sentiment misconstrual. There seems to be a tradeoff between communicative expressiveness and the consistency of emoji interpretation. To wit, the simpler an emoji is, the more uniform are people's interpretations (Miller et al., 2016). To make our studies more generalizable and comparable with existing studies, we adopted the Unicode standardized emoji, displaying them consistently as a Portable Network Graphics (png) file to minimize the cross-device differences.

We used existing emotion frameworks and emotion-related learning models (D'Mello, Lehman, Pekrun, & Graesser, 2014; Pekrun, Goetz, Titz, & Perry, 2002; Plutchik, 2003) to we select eleven emotions that are relevant to academic peer feedback and design activity. These emotions include *joy*, *surprise*, *praise*, *pride, love*, *anger*, *confusion*, *anxiety*, *disapproval* and *boredom*. Considering the functions of emoji in social media research, we further included *playfulness* to extend the corpora of emotions in a broader sense (Pohl et al., 2017). As Table 1 shows, we chose three emoji as representatives for each emotion and proceeded to investigate the effectiveness of each one with a survey distributed to crowdworkers.

Table 1: Selecting representative emoji for relevant emotions for feedback

joy	😃 😆 😆	n.s.	confusion	😕 🤨 ❓	*p < .001*
surprise	😮 😮	n.s.	anxiety	🙈 😰 🙍	n.s.
praise	👍 👏 🙏	*p < .001*	disapproval	🙅 👎 🚫	*p < .001*
pride	😎 💪 👏	n.s.	boredom	😞 😣 😴	*p < .001*
love	😍 ❤️ 😘	*p = .001*	playfulness	😂 😏 😜	*p < .001*
anger	😠 😡 😤	*p < .001*			

We obtained 72 responses from Amazon Turk where we asked MTurkers to rate "*To what extent do you agree that the following emoji represent <selected emotion>*," on a Likert scale from 0 (Strongly disagree) to 100 (Strongly agree), excluding three that failed the quality test questions (we inserted two questions with clear answers to select the qualified respondents for emoji interpretations for our survey). Our participants are

all Americans (n = 69, 36 females), aged between 19 to 65, at an average age of 35.48. A majority of them (88.4%) used emoji in their online communications at least sometimes. Based on the General Linear Model to compare repeated measures, we found significantly different emoji for all emotions except for *joy*, *surprise*, *pride*, *anxiety* at the significance level of .001 with a Greenhouse-Geisser correction (see Table 1, highest emoji for each emotion is underscored). Regardless of the significance, the underlined emoji in Table 1 indicates which emoji candidates of each group were rated highest in the triplet. After this process, we selected the highest-crowd-rated emoji to represent each emotion, except for the confusion emotion; in that case we chose the higher-rated emoji that was also graphically consistent with the other set (i.e., 😟 instead of ❓).

Emoviz: an Emoji-enabled Online Annotation Tool

Emoviz is the online feedback tool depicted in Figure 1, offering customized regions for comments in text and/or emoji. Users can drag a rectangle over anywhere in a PDF file to leave comments (see Figure 1); the emoji included in the software were carefully selected through the aforesaid crowdsourcing study. They are displayed against a light-yellow rectangular background; any emoji can be appended to the end of a text comment. We adapted Emoviz for within-group feedback activities: students can upload documents in PDF format, give and receive peer feedback directly on the document. In addition, when comments are generated in the PDF document, a notification is sent to the PDF owner every 24 hours so that the submitters are aware of the feedback made to their document.
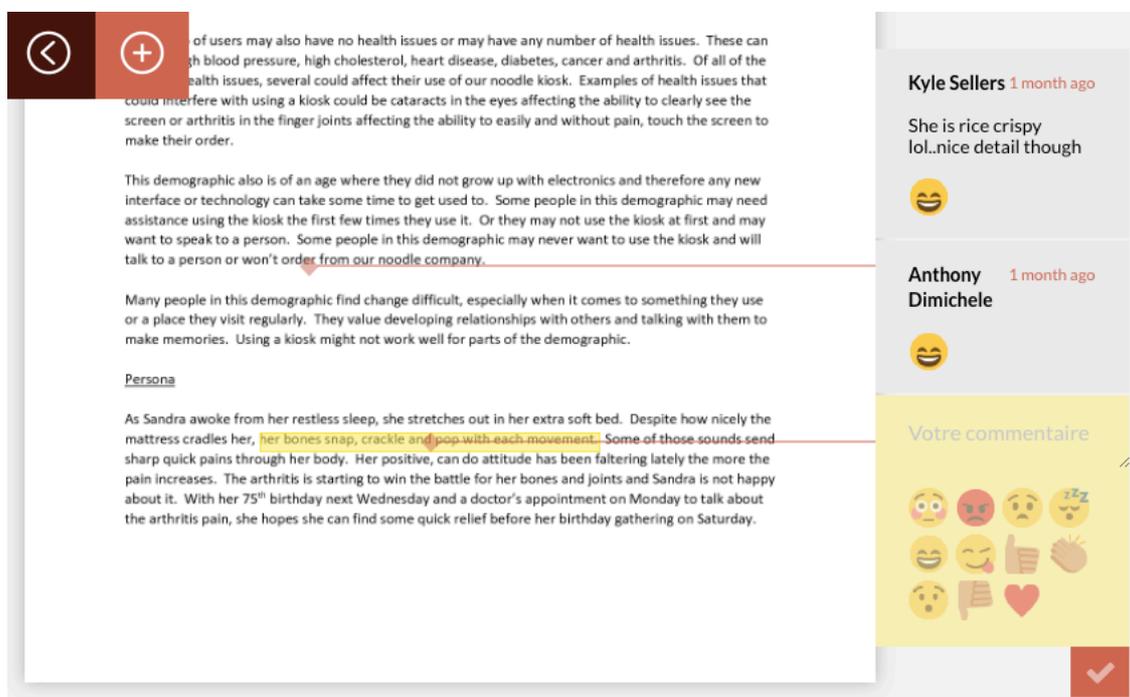

Figure 1. Emoviz User Interface for Giving and Receiving Feedback on PDF documents

Method

Procedure

Our study took place in an User-centered Design course offered by an online bachelor degree program of a Northeastern American university. Across the semester, the 50 students are tasked with a mix of individual assignments and group projects. In particular, our study built on two individual assignments that were embedded within a larger group project: one is the persona assignment, which is individual work but supposed to have other group members' feedback; another is the low fidelity prototype turned in PDF by individuals, aiming to yield a final prototype that the whole group agrees to proceed with (either building on top of one individual's submission or collaboratively generating a new prototype with all individuals' input). At the 8th week of the Fall 2017, we recruited students for the aforesaid two design activities via an opt-in invitation: all students of the

class were invited via Email link sent from Emoviz system, preceded by a call for participation sent by the course instructor on behalf of the research team and followed by a post-survey.

Data collection and analysis

Throughout this deployment of Emoviz, we collected both quantitative and qualitative data and analyzed the emoji use and feedback activities among our participants to triangulate our findings (see Table 2). As for the quantitative data, we collected survey responses after the first design activity with regards to their demographic information, group cohesiveness, frequency of using emoji and emotional awareness of other members in general. To measure group cohesiveness, we employed six items from a well-established scale (Podsakoff, Niehoff, MacKenzie, & Williams, 1993). Only 7 students out of the entire class filled in this survey, and group cohesiveness range from 5.29 to 6.29 on a 7-point Likert scale.

Table 2: Triangulated data for Emoviz use and feedback activity

Data source	#
Comment	51
Survey	7
Interview	6

To gather qualitative data, we recorded Emoviz use with respect to the uploaded design documents and comments left during the collaborative process. The first author applied open coding and axial coding to analyze the feedback content at the unit of a comment (n = 51) by first categorizing feedback content learners have left in the document, and then scrutinizing the emoji's role in different types of feedback. Specifically, we began with an existing feedback model that distinguish cognitive feedback (e.g. summarization, specificity of problems, explanations) and affective feedback (e.g. praise, mitigation) (Nelson & Schunn, 2009); in parallel we adopted elements of grounded theory to label feedback with emergent codes (Strauss & Corbin, 1998).

In addition to classifying feedback content and form, we interviewed six Emoviz users remotely over Google Hangout after the design activities had been completed. We chose to use Google Hangout because this particular real-time communication tool is quite familiar to online students (Sun & Rosson, 2017). The interviews lasted 53 minutes on average, and were transcribed by the first author. Using MAXQDA12 software, the first author generated initial codes and reviewed and iterated the codes on using thematic analysis (Braun & Clarke, 2006). In particular, we found these themes: general emotional connections felt in the remote group; task reflection; other tools they have used for group activities in the class; usability issues of Emoviz; barriers they faced in using emoji or expressing emotions with other peers; and the effect of using and interpreting emoji. For the purposes of this paper, we only present the codes from interview related to the use of emoji and the perceived functions of using emoji in peer feedback activities.

Participants

For our study, 13 students uploaded at least one design assignment for peer feedback activities from six groups in Emoviz. However, only 10 students representing three different groups received comments from other members, while the other three students' uploaded design work was unmarked. Among the participants, two were female, and half were Caucasian, followed by African American and Mixed Race. All but one student were working full-time while pursuing online degrees. Most students were in their fourth year of study (mean age = 33.14) and thus can be viewed as relatively experienced online learners.

Results

Among the 13 documents that received comments from peers, we found 51 comments from eight different learners; 22 of these contained a total of 30 emoji. Based on an existing cognitive and affective feedback model (Nelson & Schunn, 2009) and open-coding of feedback that was not covered by that model, we identified four types of feedback towards the design work or described scenarios in Emoviz (note that these are not mutually exclusive, see table 3): 1) cognitive feedback (e.g. specific suggestions); 2) affective feedback (i.e. positive or negative); 3) conversational feedback (e.g. raising attention, showing idiosyncrasy, and responses to others' comments); 4) comparative feedback based on feedback givers' self-reflections. Accordingly, by a close examination on each comment and the context in which the comment is made, we identified different roles emoji play in these different types of feedback situations. In the following sections, we use the notation that

combines the data collection name and the participant ID in the following sections. For example, IP28 refers to participant 28 in the interview data, whereas DP28 refers to the same person's data in the content analysis.

Table 3. 4 Types of feedback and the use of emoji

Type	Cognitive	Affective	Conversational	Comparative
# of comments	19	43	20	10
# of emoji	0	28	18	7
Examples	DP13: "You probably want "the" instead of "to" here"	P13: "Clean looking recap screen option! 👍" DP13: "Great size option! 😄❤️"	DP38: "She is rice crispy lol…nice detail though 😄" DP27: 😄	DP33: "Well written short story. So much more interesting than the bio I wrote :)"

Emoji Were Used Only with Non-Negative Feedback

Emoji were more pervasively used in the comments that expressed favorable review of design elements; in contrast criticisms or suggestions for improvement were shared as text only. More specifically, we observed that all the cognitive feedback (e.g. suggestions for improvement or critiques) was articulated in a text-only manner. However, participants wrote 28 positive comments to recognize, compliment or make jokes about others' work, and the remaining 23 comments were either neutral or negative, for example being used to ask for clarification, point out errors and to provide specific suggestions for improvement.

26 out of the 30 emoji and emoticons (e.g. :-) or :)), such as 👍, 😄, were used to praise or acknowledge others' good work, for example commenting on a clean layout or a specific design element. Although the numbers are too small to make a statistical comparison, there seemed to be a tendency to prefer emoji when commenting on graphical elements, such as persona photos or design sketches. For example, DP21 commented on a graphic photo at corresponds to DP28's persona description, "*What a serious looking man. Doesn't look like he's actually smiling* 😄😋👍 *,*" whereas DP28 responded with a 😄👍.

Only two comments leveraged emoji for negative emotions (i.e. 👎, which, instead of being a critique to the writing or design work, was a reaction to the story characters' unhealthy habits or behaviors. For example, DP40 commented "*Whoa!* 😮" in response to DP33's persona description "*Bob ordered nine cheese burger*". In general, 👍 were used most often (10 times), followed by 😄 (8 times), and 😋 (4 times); meanwhile, most of negative emoji were never used (e.g. 😡, 😴, 🙁).

Our follow-up interviews revealed that students chose not to use emoji in negative comments because the emoji available for negative emotion (e.g., 👎), were perceived as too aggressive for criticism that they wished to express in a mild way. For example, IP27, a stay-at-home Mom with 5 kids, would never use a sleepy face "*with people you don't truly know that well- you only know them through group experience.*" IP25, a senior male student, also felt it more appropriate to use positive emoji, thinking that "*the thumbs down could be a bit aggressive, especially if you are trying to approach from a 'yes, and' perspective and not the 'yes, but' one.*"

Indeed, honest expressions of critiques were also associated with perceived closeness among collaborators: IP38 suggested that he feels comfortable joking with familiar teammates, those who he regarded as "*friends*" even without emotional tones, such as "*lol,*" as opposed to "*when you are saying a statement you want to make sure the receivers understand you are not being serious what you are saying*". The unfamiliarity and lack of intimacy prevent students of a virtual group from giving negative comments more frankly.

Signaling Insignificant Cognitive Feedback with Emoji Markers

A closer scrutiny on the 22 comments that contain emoji revealed that, aside from the association between emoji and positivity, these comments were often informal, casual, and light-hearted – anything but serious call for attention. Examples include DP 38's comments on the described character, such as "*Ha! They are lazy* 😄", and DP13's reaction to the drawings of four types of bread in a User Interface sketch: "*Oprah 'I Love Bread' and so do I* 😄😋". Such comments seemed to contain a hint by the comment giver that a comment is meant to be expressing emotions at the moment (e.g. cheerful, surprised, etc.) IP33 appreciated the expressiveness of emoji, commenting "*without emoji it is just hard to convey what you are feeling about*

something - it is a very simple (way) of doing that." IP40 liked how emoji can articulate her real reaction in response to the described scenario at the moment: Looking at the document she commented on, she said, "*That emoji face I put there was exactly the big sad face I had after I read it (giggling). It is like a 'Wow'. You know a jaw drop reaction.*" She liked how the facial expressions of emoji in the feedback represented her real reaction.

IP34 further noted that emoji of different facial expressions enabled more nuanced expression and capture of feedback givers' emotional statuses: "*(if) you have somebody laugh with tears flowing from it- I tell you there is a person who is cracking up or the person is really amused compared with a mild amusement. Yeah, so emoji do make differences in those occasions.*" He further explained that the explicit emotional annotations with emoji denoted one's real social indication better than audio, "*if a person uses emoji, you precisely get that indication, but other than that, (like) audio chat without visuals, it is almost as limited as just text without any emoji.*" In this regard, emoji provide subtle social cues that enlighten the social interaction in an online environment where emotional statuses are hard to convey or perceive.

In addition to articulating the emotions right at the moment, emoji also helped to provoke an interesting conversation, by communicating an open posture of being engaged or sociable. For instance, 12 out of 20 conversational comments were decorated with emoji. IP34 attributed emoji to cues that remote collaborators "*can easily pick and follow,*" since use of emoji indicates "*when somebody is relaxed and engaged when we are having those conversation compared with someone (who) is not really engaged.*" Therefore, use of emoji gives students like IP34 a sense of "*if somebody is open to more communication.*" IP40 suggested that emotional elements evoked through humor also help online student get through course projects easier as they come and go from one course to another. For instance, after reading DP 27's description about an old grandma user "*her bones snap, crackle and pop with each movement*" (Figure 1), DP38 joked about how the character is extremely vulnerable, pointing out "*she is rice crispy lol...nice detail though*😄," and another team member DP13 responded to the joking comment with a 😄. DP38 explained in the follow-up interview that he liked to leave the impression of himself being humorous, and that emoji or its alternative, such as "*lol*", allowed him to express his personality more boldly. IP32 also found emoji help to create feelings of closeness to their peers who used them. As another example, DP31 joked about the looking of the persona picture along with the described scenario in text format when the persona was hesitating of quitting his job: "*Judging by the look of his picture, he plans to quit his job* 😜"

Whether emoji are used to express emotions or initiate an interesting conversation, comments that contain emoji should not be taken seriously (as opposed to how to improve the design work or to praise). Such non-serious signals are also perceived and accepted by feedback receivers - students interpreted the traditionally "*negative emoji*" in a positive way, appreciating the reaction from the readers. For example, IP33 regarded 👍, 👎 and 😮 altogether as positive feedback, articulating that he likes them. As he elaborated, "*it shows that she read it and she was not really disagreeing but empathizing with what I have written.*" In this way, emoji help to assure that designers' creative composition, such as illustrative depiction of a character or situation, in the design work has been understood in the intended way. IP27 also found it a relief to see others' funny comment on her carefully composed design persona, "*the fact they talked about how they enjoyed, the funny comments in return saying that they enjoyed it makes me think that 'okay, good'. It gave me a good feel as to whether or not what I was trying to say came across right, or what I said is alright to say.*" This use of emoji extended how people usually use emoji to complement a text and express their emotions (Zhou, Hentschel, & Kumar, 2017) with enriched semantics of feedback content.

Self-Reflection and Conversational Feedback

Surprisingly, we found a number of feedback comments that referred to a feedback-giver's own work or situation. For example, DP33 wrote "*Well written short story. So much more interesting than the bio I wrote :)*" in DP40's submission as a compliment while comparing it with his own submission. Description in a persona also sometimes evokes a sense of self-reflection, for example, DP27 felt a desirable state in reflection on her own tight schedule when reading DP13's work, commenting that "*Nice job! I kinda envy Noah's availability. :-)*" In another example, after reading the isolated living atmosphere of a grandma described in a scenario, DP38 expressed his empathy with the written character by DP27 in a sense of humor with "*Thanks for the guilt trip* 😳." It seems the reviewing experience is not only a critique session about a peer's work quality, but also sometimes a venue to share personal reflections with reference to personal work or experiences.

Meanwhile, we coded 20 comments as conversational feedback because of their dialogic nature, as if the feedback givers are talking with the feedback receivers in a social chit-chat: For instance, DP27 commented on the scenarios with an obvious conversational tone: "*This is so very true, I empathize with this user! For*

sure!". The emotional sentiments aroused by the design were depicted via emoji; Vice versa, as a feedback receiver, IP27 found comments with emoji more impressive and fun to be remembered. In particular, she took content related comment as indicators that her original meaning has been clarified enough to be understood by the reader to the effect that is intended by the designer.

Discussion

In contrast to previous studies that looked at emoji in message-based communication or social media (Miller et al., 2016; Zhou et al., 2017), our study is the first to examine the role of emoji in a group learning activity. Our study confirms the speculation from previous studies on emoji' advantage of representing ambiguous emotion feedback content (Robb et al., 2017). We describe how learners utilized the toning-up effects of emoji to signal non-verbal cues and personality, such as sense of humor and facial expressions. Embedding emoji as part of feedback options allows for more casual and in-situ marks of one's own emotion, and thus enhances perceived sociability in CSCL environments (Kreijns, Kirschner, Jochems, & van Buuren, 2007).

We also found that emoji served to initiate and manage conversation as part of a learning activity, as documented in social media contexts (Cramer et al., 2016). In this sense, emoji seemed also to carry over the norm of being socializing with other users as in social media platforms. Emoji in the peer feedback scenarios are used by feedback givers for initiating informal and light-weighted conversations. They are interpreted by feedback receivers as a social posture of the other interlocutor being friendly and responsive to their creativity and personality. In addition, we also observed the role of emoji to in eliciting empathized self-assessment and generating feedback based on social comparison with one's own design work. Therefore, our study points to the design opportunities of leveraging emoji to add more nuanced peer feedback content, such as depiction of in-situ emotional responses, and to elicit personal interaction among learners.

Further, we propose emoji can enrich the markers to specify the anchor points during the learning process beyond using emotional vs non-emotional markers (Lavoué, Molinari, Prié, & Khezami, 2015). With the lightened tones of emoji alongside the text comments, feedback givers can mark the "insignificance" of the feedback, enabling more nuanced layers of feedback types in addition to affective and cognitive feedback. In particular, feedback givers' use of emoji hints at the informal nature of the particular comment, and thus helps feedback receivers' distinguish casual content for entertainment, fun or other engaging gestures for social purpose from serious comments, which aligned with the conventional critique formats (Robb et al., 2015).

Limitation and Future Work

Although we have found evidence of using emoji to support peer feedback interaction, we admit the potential limitation introduced by our small sample size and the particular online class environment where group members are relatively cohesive. Although we do not have enough data to investigate this point, the use of emoji may also encourage more casual discussions which may hinder knowledge building dynamics. Besides, our interviews asked participants to recall their emoji use and response after finishing the peer feedback task, which may lead to memory lapse and inaccurate descriptions.

As discussed in the literature, the interpretation of emoji depends on platforms and situational factors. For the purpose of the study, we controlled the number and design of emoji to learning related emotions. Future research could expand to open-ended use of emoji and study their relationship to learners' perceived emotions. More quantitative research could also examine the association between emoji use and feedback perceptions.

Conclusion

Our study presents the first attempt of involving emoji in the context of design feedback activity, and also demonstrates ways of engaging distance students with emoji as feedback options in an asynchronous peer learning activity. Our findings revealed how emoji are associated with different types of feedback, and indicated the potential of emoji to transform a formal peer critique task into a more emotion-aware collaborative process. We also provide implications of utilizing informal language cues, such as emoji, in designing learning systems that consider and support socioemotional dimensions of online interaction.

Acknowledgement

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