Effect of Feedback on Creativity in Social Learning Contexts

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Abstract
Social learning enables learners to interact with one another, which is a critical way to foster creativity. Although online social networking technologies have been widely adopted, few empirical studies have been conducted to illustrate the effect of online social interactions on creativity in the context of learning. In this research-in-progress, we attempt to fill this gap by investigating how feedback from others in an online social learning context affects learners’ creativity. Different from previous studies on the direct effect of feedback on creative performance, we go a step further to explore the underlying mechanism in an online social learning context and propose that feedback sign affects creative performance through the learners’ perception of feedback accuracy and intrinsic motivation. Moreover, we examine the characteristics of feedback providers and recipients that influence learners’ mental reactions to feedback sign. Our study is based on the stimulus-organism-response model and the feedback process model. A lab experiment will be used based on an online social learning platform. Undergraduate students will be recruited as participants.

1. Introduction
Social learning is distinct from individual learning as it takes place in a social context [1]. Furthermore, social learning is a process in which people learn from each other through social interactions [2]. Learners change their understanding by interacting with others. In addition, social learning is fundamental in coping with complexity and uncertainty [3], which offers opportunities for discovery and creation. Fostering the learners’ creativity is an important goal of education. In business, the emphasis on creativity has also created a need for the cultivation of creativity in education [4]. Given that creativity often occurs as an outcome of social interactions, social participation in the social learning process is an essential part of creativity [5]. At present, online social networking sites have become widely popular. Incorporating online social networking into learning activities may therefore provide an opportunity for learners to develop social connections with their peers, through which they construct identities, share ideas, and receive feedback [6]. Therefore, we propose that online social learning is a good way to foster creativity by incorporating online social interactions into the learning process.

Most previous studies that empirically examined the influence of social relationships on creativity have been confined to an organizational context. The extant studies on how social networks affect creativity attach great importance to the role of the network structure [7, 8]. Network structure can influence the interaction, but it is the real online interactions and information exchanged between the nodes that directly affect creativity. At this point, little is known about the effect of feedback as a specific type of social interaction on creative performance in an online social learning context. Feedback refers to the information provided by other individuals regarding their perception of one’s performance [9]. As an indispensable part of learning, feedback helps learners recognize their strengths and weaknesses based on which they can improve their performance. In line with previous research, creative performance is defined as the generation of products and ideas that are both novel and appropriate [10]. Creative performance is the behavioral manifestation of creativity potential [11].

Thus far, the existing studies on the effect of feedback on creativity have yielded inconsistent findings. Both positive and negative effects of feedback on creativity have been observed [12, 13]. In
addition, researchers have identified the effects of positive and negative feedback on creativity. The sign of feedback (i.e., positive versus negative feedback) is considered as an important characteristic of feedback messages, and taking feedback sign into consideration can help generate a clear understanding of the feedback’s role in creativity development. However, little attention has been paid to specific problems raised by the difference between positive and negative feedback [14]. Furthermore, the discussion on which type of feedback is conducive to promote an individual’s creativity has yet to reach a consensus. Moreover, whether feedback sign itself has a direct effect on or interacts with other factors to affect creative performance has yet to be fully understood [15, 16].

In light of these contrasting findings, we go a step further to study the mechanism under which the feedback sign affects creative performance. Understanding the feedback mechanism in relation to creativity has significant implications. By shedding light on the mental states of learners after receiving feedback, the black box of feedback is uncovered. When studying the direct effects of feedback on creative performance, scholars did not take into account the people’s mental processes. The uncertainty involved in learning calls for feedback, and illustrating the route of feedback can help educators gain more control over the effectiveness of the feedback. Furthermore, knowing when and how feedback affects creative performance can help feedback providers take appropriate measures to influence the recipients’ mental states and performance. In effect, researchers who have explored the indicators of creative performance have proposed several mediating mental states such as mood and motivation [5, 17]. Nevertheless, the mental states in reaction to feedback have not been well established. The present study complements the existing literature by proposing that the feedback sign affects creative performance through the perception of feedback accuracy and intrinsic motivation. Although external factors have been found to affect creative performance through intrinsic motivation, empirical validation of the mediating role of intrinsic motivation is lacking [18, 19]. Many researchers have taken the mediating effect of intrinsic motivation on creative performance for granted without testing it empirically. Furthermore, the opinion that intrinsic motivation is a mediator remains a subject of debate. For example, in Shalley and Perry-Smith (2001)’s study, no significant effect was found for intrinsic motivation to mediate the relationship between evaluation and creativity [20]. One possible explanation for the weak mediating effect of intrinsic motivation is that external factors also affect creative performance through routes aside from intrinsic motivation.

The feedback process model maintains that feedback acceptance is a critical variable to determine whether feedback is beneficial or detrimental to performance [21]. Although the importance of feedback acceptance has been discussed, such is not well recognized in the existing literature on creativity. In previous research designs, researchers used surveys or experiments to test the direct relationship between feedback and creative performance. However, whether subjects actually consider the feedback as accurate and accept it remains unexplored. People have different attitudes toward positive and negative feedback, and understanding feedback acceptance may resolve the problem of inconsistent findings on the effects of feedback sign. Based on the feedback process model and other relevant studies, feedback acceptance mediates the relationship between feedback and performance outcome [21, 22]. Only when feedback is perceived as accurate and acceptable can it affect the recipients’ attitude and behaviors. Ilgen et al.’s model defines feedback acceptance as the accuracy of feedback according to one’s performance [21]. As such, feedback acceptance is conceptualized as the perception of feedback accuracy in our study. Therefore, aside from intrinsic motivation, perception of feedback accuracy can likewise be expected to be an important mediator between feedback sign and creative performance.

In addition to feedback sign, the characteristics of feedback recipients and the source of feedback can likewise affect learners’ mental reactions to feedback [21]. Creativity always occurs during goal-oriented processes, and goals are important triggers of efforts. Hence, the individual differences in goal orientation may account for their differences in creative performance. Personal learning orientation is an important individual factor in the learning process. Therefore, we investigate whether learning orientation affects individuals’ mental reactions to feedback in terms of perceived feedback accuracy and intrinsic motivation. Furthermore, the expertise of a feedback provider also plays an important role in affecting people’s reactions to particular feedback [23]. This factor is also considered in Hildebran et al.’s (2013) study, which examines the impact of community feedback on creative performance [13]. Therefore, we also assess the expertise of feedback providers as a factor that affects people’s mental reactions to feedback sign.

The present study will broaden our understanding of how interactions in a social learning context affect learners’ creative performance by addressing the following research questions: (1) how does feedback...
sign affect learners’ perception of feedback accuracy and their intrinsic motivation? (2) How do learning orientation and source expertise affect learners’ mental reactions to feedback sign? (3) How do the perception of feedback accuracy and intrinsic motivation relate to the creative performance of learners?

The following section presents the theoretical background and hypotheses development, followed by experiment design, conclusions, suggestions for future research, and expected contributions.

In Figure 1, we illustrate the research gaps we attempt to fill. In contrast to our study that integrates feedback sign, perception of feedback accuracy, and creative performance, most previous studies have examined these factors separately. Although some studies have examined the effect of feedback on creative performance, to the best of our knowledge, none have investigated all three aspects.

Figure 1: Research focus of current study

2. Theoretical development and research hypotheses

In this section, we trace the development of the research model by linking the feedback sign to creative performance. First, we elaborate the relationship between feedback and creativity. Then, we investigate how feedback sign influences intrinsic motivation and the perception of feedback accuracy. In line with these arguments, we examine the moderating effects of personal learning orientation and expertise of feedback providers. Finally, we validate the links between intrinsic motivation, perception of feedback accuracy, and creative performance.

2.1. Feedback and creativity

In examining the effect of feedback in various contexts, scholars have drawn multiple conclusions. A meta-analysis conducted by Kluger and DeNisi (1996) suggested that on average, feedback interventions can improve performance, but more than 30% of the interventions have detrimental effects on performance [12]. Hildebrand et al. (2013) reported that feedback from online communities would impair consumers’ creativity on self-designed products by emphasizing the variety of self-designed products [13]. However, creativity is commonly measured not only by uniqueness, but also by appropriateness [24]. The dimension of appropriateness was not taken into consideration in Hildebrand et al.’s research. Other researchers have expanded our understanding of feedback by investigating the role of feedback sign, which is an important attribute of feedback. For example, Van Dijk and Kluger posited that positive feedback is more beneficial than negative ones when performing a task that requires creativity and open mindedness [25, 26]. By contrast, Podsakoff and Farh’s study suggested that negative feedback has a more positive effect on subjects’ performance than positive feedback [27]. Zhou’s study revealed that the feedback sign interacts with other factors such as feedback style to affect people’s creativity [16]. We summarize these key studies and their findings in Table 1. In response to these mixed findings, we extend existing literature by exploring individuals’ mental states in reaction to feedback sign and empirically examining how the feedback sign influences creative performance through the perception of feedback accuracy and intrinsic motivation. The current study focuses on an idea generation task. In line with the creativity literature, creative performance in such task is emphasized as the generation of ideas that are both novel and useful [28].

Our study is based on social cognitive theory, which indicates that an individual’s behavior is influenced by his/her social network, as well as the individual’s cognition [29]. This theory integrates social and cognitive processes to understand motivation, emotions, and actions. As a typical social cognitive model, stimulus-organism-response model posits that after humans receive an external stimulus, they experience mental processing, then generate outcomes [30]. The illustration of this model in our research context is shown in Figure 2. It shows that an external stimulus works on people’s behavioral outcome through mental processing. Specifically, “stimulus” refers to the feedback provided by other learners. The “organism” corresponds with people’s mental states (e.g., perception of feedback accuracy, intrinsic motivation), whereas the response part can be explained as the people’s creative performance.
| Table 1: Prior findings about the impact of feedback on creative performance |
|-----------------------------|-----------------------|-----------------|------------------|
| **Paper**                  | **Context**           | **Method**      | **Conclusion**   |
| Zhou (1998); Journal of Applied Psychology [16]. | Organization | Lab experiment | Individuals who received positive feedback showed greater creativity as compared to those who received negative feedback. |
| Mattern et al., (2013); Journal of Advertising Education [15]. | Education | Online survey | The impact of positive or negative feedback on the subsequent creativity scores of the subjects is insignificant. Negative feedback may have a more positive effect on creativity performance than positive feedback. |
| Connolly et al., (1990); Management Science [32]. | Computer-mediated groups | Lab experiment | Groups receiving critical evaluation generated more diverse problem solutions compared with those who received supportive evaluation. The idea quality is not affected by the evaluative tone. Supportive groups are more satisfied than critical groups. |
| Van Dijk and Kluger (2011); Journal of Organizational Behavior [26]. | Organization | Experiment | When performing promotion tasks that require creativity, people were more motivated and performed better after receiving positive feedback than they did after receiving negative feedback. |
| Hildebrand et al., (2013); ISR [13]. | Online customer community | Field study, experiment | Receiving feedback from other community members on initial self-designs leads to less unique final self-designs. (That is, community feedback stifles consumer creativity.) |
| Kluger and DeNisi (1996); Psychological bulletin [12]. | Multiple contexts | Meta-analysis | Feedback improved performance on average, but over 30% of the feedback reduced the level of performance. |
| Van Dijk and Kluger (2004); Applied Psychology [25]. | Not specified | Experiment | Under promotion focus, positive feedback increases motivation more than negative feedback does. Under prevention focus, negative feedback increases motivation more than positive feedback does. |

Learning theories state that learning is a process during which a stimulus received from an external context exerts an impact on the learner’s mental processes and cognitions, and finally changes the learner’s final performance [31]. Similarly, mental states, the core of social cognitive theory, are important in one’s learning process. Therefore, considering the learning theories and stimulus-organism-response model, we argue that in an online social learning context aimed at producing creative outcomes, external stimuli has a significant role in influencing the learners’ creative performance.
through their mental processes. Therefore, instead of testing the direct relationship between feedback and creative performance as has been done in previous studies, the current study examines how people’s mental states mediate the relationship between feedback and creative performance. The research model we develop is depicted in Figure 3.

![Figure 3: Research model](image)

2.2. Feedback sign, perception of feedback accuracy, and intrinsic motivation

Consistent with previous studies, the feedback sign refers to positive or negative comparisons between one’s creative performance and the situational criteria [16]. In this regard, positive feedback indicates that one’s current creative performance is better than the criteria. Conversely, negative feedback indicates that one’s creative performance is below the standards. Previous studies have revealed that positive and negative feedback have different effects on creativity. A study on the field of psychology proposes that understanding the mechanism that underlies the assessment of favorable and unfavorable feedback can help explain individuals’ reactions and overall performance [33].

In addition, the perception of feedback accuracy has a significant role in understanding whether feedback is beneficial or detrimental to behavior and performance [21]. Therefore, examining the role of an individual’s perception of feedback accuracy contributes to our further understanding of this mechanism.

Feedback sign is the most important attribute that affects feedback acceptance [21]. Self-enhancement tendency suggests that learners prefer to showcase a self-image and reject the comments that will impair such image [22]. Such tendency is also true in a creative context, in which uncertainty and risk are involved. Positive feedback is considered to be more pleasant and may improve a recipient’s self-image, and is therefore perceived as more accurate. Conversely, learners often invoke a self-protective process when confronted with negative feedback. Such learners spend more time and effort on collecting information to defend the negative feedback than focusing their attention on the task itself. Often, these learners discount negative feedback, and are even reluctant to accept such feedback, to maintain their self-image. As a result, negative feedback is less preferred and is perceived to be less accurate than positive ones.

Further, feedback is critical in basic human motivational processes [27]. As derived from the cognitive evaluation theory, feedback sign affects people’s perceived competence [16]. When learners are presented with positive feedback, they identify themselves as having higher competence. Furthermore, experiencing feelings of competence is more likely to intrinsically motivate learners [34]. Cognitive evaluation theory [35] posits that self-determination is an important psychological antecedent of intrinsic motivation. Compared with learners who receive positive feedback, those who receive negative feedback will undergo a more critical assessment. The feeling of control brought by the critical assessment will impair the learners’ self-determination and intrinsic motivation. In addition, learners feel comfortable in communicating with others and trying new things in a supportive context [36]. Therefore, we propose that positive feedback exerts a positive impact on intrinsic motivation by enhancing perceived competence and fostering a comfortable atmosphere.

In addition, people’s immediate reactions to feedback are often affective-oriented [37]. For example, positive emotions that result from positive feedback imply that the current situation is safe and therefore, learners with positive emotions will become more capable of exploring new ideas and thoughts. If their novel ideas are recognized, learners become more interested in the task and become more engaged in the succeeding steps. Positive emotions are also believed to be linked with divergent thinking [18]. Divergent thinking is often considered as creative thinking, which relates to imagination, provocation, and unstructured syntheses [38]. As a result, learners who experience positive emotions are more likely to observe the associations between different stimuli and integrate various resources, and are more motivated to engage in creative activities. Meanwhile, negative feedback may be seen as a threat to people [37]. Instead of concentrating on dealing with the task, learners who receive negative feedback may pay more attention in handling their negative emotions. These negative emotions will divert the learners’ attention from the task to themselves, and therefore narrow the scope of perceptual attention to the task, which is detrimental.
to subsequent creative performance. Therefore, positive feedback is more acceptable and motivating compared with negative feedback.

H-1: Positive feedback is more positively related to the perception of feedback accuracy than negative feedback.

H-2: Positive feedback is more positively related to intrinsic motivation than negative feedback.

2.3. Moderating effects of provider expertise and learning orientation

In line with the existing research on feedback, we predict that the expertise of feedback providers will affect people’s mental reactions to the feedback sign. Previous studies have identified the expertise of feedback providers as a variable that affects feedback acceptance [21, 23]. In fact, providers with high level of expertise are considered as more credible and are associated with high-quality information. Feedback from a trustworthy source is considered as more accurate and more likely to be accepted than that from a less credible source. Recipients will attach more weight to feedback from providers with high expertise, and such feedback has a great effect on recipients’ mental reactions and behaviors [13].

H-3: The expertise of the feedback provider will moderate the relationship between feedback and perception of feedback accuracy. Perception of feedback accuracy will be higher when the expertise of the feedback provider is high compared with when the expertise is low.

H-4: The expertise of feedback provider will moderate the relationship between feedback and intrinsic motivation. Intrinsic motivation will be higher when the expertise of the feedback provider is high compared with when the expertise is low.

Creativity requires people to try new things, which involve considerable uncertainty and risk. Therefore, people are inevitably confronted with negative feedback during the creative process. Although we argue that positive feedback is more acceptable and intrinsically motivating, understanding the effect of negative feedback is equally important, considering that learners are often faced with unfavorable feedback during creative activities.

How people react to negative feedback depends on their interpretation of the feedback. Individuals often set their goals at the beginning of creative activities, and the feedback recipients’ goal orientations affect how they interpret and react to external stimuli. Learning has been argued to be necessary for creativity [39]. As such, in a social learning context, learning orientation is the goal attribute owned by learners in creative activities. The effects of learning orientation on people’s reactions to negative feedback has also been emphasized by Malley and Gregory (2011), who proposed that a learning goal is explicitly related to mastering new knowledge, improving competence, and resolving challenging tasks, and that framing a learning orientation is therefore an effective way to make negative feedback beneficial.

We will investigate how learning orientation affects the learners’ mental reactions to negative feedback in our research context. First, learners with a high learning orientation are interested in the learning process itself, and are thus focused on developing personal competence during learning activities [40]. Therefore, such learners may focus more on the task and allocate more resources to accomplish it. In addition, learners with high learning orientation may not be concerned about whether they are praised as a person, but only care about what they can learn from the feedback. These learners often seek challenges proactively, allowing them to have more opportunities to learn. Negative feedback may also be viewed as useful information to develop competence. When negative feedback is received, a learning orientation will reduce the accompanying pressure, and learners will regard the feedback as an opportunity to discover their deficiencies and make corresponding adjustments. Therefore, learners with high learning orientation are more intrinsically motivated and are more accepting of negative feedback.

Second, learning-oriented individuals are more inclined to regard intelligence as dynamic and changeable [41] than those who have low learning orientation. Therefore, these individuals are more adaptable to the external context and make corresponding changes easily. According to social learning theory, when people have an explicit learning orientation, realizing negative discrepancies between what they actually do and what they seek to achieve as a result of negative feedback will motivate them to exert more effort.

Third, individual learning orientation affects a person’s attributions to positive and negative feedback [40]. People with low learning orientation tend to attribute negative performance feedback to internal causes such as personal competence, which is difficult to change. By contrast, highly learning-oriented people are inclined to attribute failures to external factors such as insufficient effort or ineffective strategies. As a result, highly learning-oriented people are more accepting of
negative feedback than their low-learning-oriented counterparts in that they believe they can improve their performance by exerting more effort and improving the effectiveness of their strategies.

Fourth, when a learner has a high learning orientation, the negative emotions accompanied by negative feedback will be alleviated [37]. In addition to helping people handle negative emotions, a high learning orientation can also arouse their interests in the task. Interest is linked with the desire to explore unknown things and build new knowledge, and it also fosters learners’ openness and receptivity to feedback. Therefore, people with a high learning orientation are more likely to accept negative feedback and are more motivated to undertake creative tasks after receiving negative feedback.

**H-5: Learning orientation will moderate the relationship between negative feedback and the perception of feedback accuracy.** When faced with negative feedback, people with a high learning orientation will have a higher perception of feedback accuracy than those with a low learning orientation.

**H-6: Learning orientation will moderate the relationship between negative feedback and intrinsic motivation.** When faced with negative feedback, intrinsic motivation will be higher for people with a high learning orientation compared with those individuals with a low learning orientation.

2.4. Perception of feedback accuracy, intrinsic motivation, and creative performance

In line with the feedback process model, feedback message will affect perception of feedback accuracy, which in turn influences goal-setting behaviors [21]. We deduce that an individual’s perception of feedback accuracy will affect creativity, which is also a goal-setting activity. Evidence from previous studies show that creativity is lower when critical feedback is expected by individuals [18]. Therefore, when feedback is recognized and accepted, its negative effect on creativity will be alleviated. Likewise, feedback acceptance mediates the relationship between feedback and intrinsic motivation in the context of performance appraisal [42].

Regardless of whether the feedback is positive or negative, if it is perceived as accurate, people are inclined to change their attitude and behavior based on the feedback. Given that creativity is a social action, people need to communicate with others to revise and polish their ideas during the creative process [8]. Feedback therefore provides a means for people to reach and understand others’ opinions and suggestions, which helps cultivate intrinsic motivation and creative performance. Moreover, once people recognize the appraisal, they tend to agree with the description of their performance, and will become more aware of their own abilities and conditions. Rather than spend time and effort finding evidence to reject unfavorable feedback, people are more likely to focus their attention and invest more effort in the task itself, take multiple perspectives, and explore new alternatives.

**H-7: Perception of feedback accuracy is positively related to learners’ intrinsic motivation.**

**H-8: Perception of feedback accuracy is positively related to learners’ creative performance.**

Although previous studies have demonstrated that external contextual conditions affect creativity through their impact on intrinsic motivation [24], the direct relationship between intrinsic motivation and creativity has not been well tested and examined through empirical means [18]. An individual is intrinsically motivated when he is interested in and fascinated by the task itself, rather than merely pursuing the outcome of the task. Intrinsically motivated people are more engaged, and will therefore devote great effort to do the task, identify problems from multiple perspectives, find diverse information, and produce multiple solutions [19]. Intrinsic motivation is an indicator of whether an individual approaches the creative task. Curiosity, cognitive flexibility, persistence, and enjoyment accompanied by intrinsic motivation often contribute to creative performance. If an individual is not intrinsically motivated to do a task in a creative situation, he will pay little attention to it and put little effort to seek solutions; therefore, the outcome is less likely to be creative. In addition, creativity is a complex activity that involves cyclic stages. Engagement and interest in the creative process can help overcome challenges and complexities and ultimately lead to the achievement of creative performance.

**H-9: Intrinsic motivation is positively related to learners’ creative performance.**

3. Research method

3.1. Social learning networking technology

We plan to use an online social learning platform, named IdeaWorks to test the proposed hypotheses. IdeaWorks is designed to allow users to conveniently explore and extend their social networks for learning, efficiently manage their ideas, interest groups, projects, and events, facilitate group learning
efficiency, and support innovative thinking. The platform is particularly valuable for enabling efficient and effective student-to-student and student-to-advisor interactions across academic departments, colleges, and universities. IdeaWorks is an appropriate platform for validating the research model for the following reasons. First, the purpose of this platform is to encourage students to be creative, which conforms to the aim of the current study. Second, the platform emphasizes collaboration and interaction between people; hence, social factors are important in this context. Third, using our own social learning network platform to perform the experiment will allow us to manipulate the variables, namely, the feedback sign and feedback source.

However, the platform presents some constraints in its current stage. One such constraint is that IdeaWorks has not been widely used. Given that online social learning may benefit from a large population of users, we still have to improve and enhance our platform to attract more participants. Nevertheless, IdeaWorks has the necessary features of a social learning network, and its usefulness for social learning and innovative idea generation has already been tested by its designers. Therefore, IdeaWorks remains a good platform for our research.

### 3.2. Experiment design

The focus of this study is on individual creativity in a social learning context. We will use a lab experiment to test the research model. Undergraduate students will be recruited as subjects. The independent variables will be manipulated with a 2 (positive or negative feedback)*2 (expertise of feedback provider: high/low) treatment. A control group with no feedback will also be included. Subjects will be randomly assigned to each group. The subjects will be informed that their creative performance in the task will be assessed by fellow learners through a social learning platform. Subjects will also be informed that they are part of a social group of four participants, and that the other group members will give them feedback on their work. However, to control the feedback sign and exclude other intervening factors in a natural social interaction, each subject will be the only real person in their groups, and the feedback that subjects will “receive” from other members in the group will actually be generated by a computer. After finishing the task, the subjects will receive a message that will identify their performance as being either in the top 20% (positive feedback) and bottom 20% (negative feedback) among all the individuals who performed the task. Positive and negative feedback will be randomly assigned to participants within each treatment group without associating the assignment with their actual performance to avoid the potential influence of participants’ inherent abilities [16].

The expertise will be manipulated by varying the major, grade, and experience of the feedback provider. To test the fifth and sixth hypotheses, learning orientation will be controlled by stating the purpose of the task to the subjects and will be manipulated within groups that receive negative feedback. To minimize possible biases of intrinsic motivation and learning orientation, we will assign subjects to high/low learning orientation groups randomly. For groups with high learning orientation, gaining knowledge and skills is emphasized. Meanwhile, in groups with low learning orientation, no knowledge gaining is emphasized, and subjects are simply asked to complete the task as required.

The measurement of the subjects’ perception of feedback accuracy and intrinsic motivation will be adapted from prior studies. Creative performance will be assessed using the consensual technique developed by Amabile (1982). Three judges who are familiar with creativity studies will assess the extent to which the independently generated ideas are creative based on a scale widely used in creativity research. Prior studies have shown that gender [43] and age [44] may potentially affect creativity. Therefore, we will control participants’ gender and age in our experiment. The participants’ experience and prior knowledge in using social networks or social learning networks will also be controlled.

As with many other experiments, the behavior of subjects might be affected by the experimenter. In our plan, the same experimenter will run all experiment sessions; hence, the effects of experimenters will be controlled. Also, subjects are more motivated to provide the best solution for the problem in hand when they realize that they are being observed. To address this potential bias, we will only reward subjects for the presence and completion of the experiment, rather than for performance of the task. In addition, subjects will be settled before a computer and will be asked to perform the task and receive feedback through the social learning platform. No communication will be allowed and no extra time for other cognitive efforts will be provided.

### 3.3. Experiment procedure

Before the experiment, we plan to conduct a pilot study to verify whether the experimental manipulation and measurement of variables are appropriate. In the first step of the experiment, subjects will be informed of the purpose of this.
experiment and asked to sign a consent form. Subsequently, a warm-up session using our social learning network will be conducted to allow the participants to become accustomed to the context and the technology of social learning networking. The experimental task will then be distributed to the subjects and they will be required to generate creative solutions to problems faced by an e-commerce shop (e.g., “An e-commerce company is losing customers. What can the shopkeeper do to retain and attract new customers?”), which will last for 15 min. The participants will be told that creative solutions should be both novel and useful. Once they accomplish the task, subjects will be informed that other participants from their social groups in the social learning platform will give them feedback based on the ideas they have generated. After 5 min, the subjects will receive feedback and will be notified that they can revise or improve their ideas based on the feedback in the following 30 min. To ensure that all subjects engage in similar cognitive activities when waiting for feedback, subjects will be required to fill out a questionnaire that includes their demographic and background information. Such information can be used to investigate potential individual differences that may affect their overall creative performance, such as individual ability, age, gender, and education level. By the end of the experiment, subjects will be required to fill a post-experiment questionnaire to report their intrinsic motivation, their perceptions on feedback accuracy, and their feelings about the treatment of the experiment.

4. Conclusion

This research-in-progress aims to outline a research framework and develop a thorough understanding of the role of external stimuli such as feedback sign in creativity development in a social learning context. We attempt to uncover the mechanism underlying the relationship between feedback sign and creative performance. The mediating role of the perception of feedback accuracy and intrinsic motivation is emphasized and will be tested through a lab experiment. Therefore, in this research framework, we propose that feedback sign affects creative performance through the perception of feedback accuracy and intrinsic motivation. The characteristics of the feedback providers (e.g., expertise) and feedback recipients (e.g., learning orientation), which are important in the current research context, are also discussed. The effect of such characteristics toward learners’ mental reactions to feedback sign will also be examined. In the near future, we will collect data to test the proposed framework.

Our study has both theoretical and practical significance for creativity research. On the theoretical aspect, this study attempts to extend the stimuli-organism-response model and the feedback process model to the field of creativity. By illustrating the feedback mechanism, the effects of feedback in fostering creativity will be better understood and built. This study examines creativity in an online social learning context, which is an interesting context that has not been widely studied by creativity researchers. In addition, investigating personal factors of both feedback providers and feedback recipients can provide a more complete picture of the feedback mechanism, which will then lay the foundation for future studies on feedback and creativity.

Furthermore, the current study may have implications for supervisors or managers on how to provide feedback. In particular, the characteristics of feedback, feedback providers, and feedback recipients should be considered before feedback is provided. For example, when a supervisor provides feedback to students in an online learning context, they should be careful since different mental reactions to feedback may lead to distinct performance. Understanding the characteristics of the feedback, feedback providers, and feedback recipients can therefore help predict the mental states and behavioral outcome of students. Moreover, the findings will also be helpful for designers of specific social learning networks. Designers may need to design an incentive mechanism to encourage learners to reveal some personal information to enhance the effectiveness of online social interactions.

One possible limitation of the current study is that we focus on one aspect of feedback, namely, feedback sign. In future studies, other aspects of feedback, such as feedback depth and feedback frequency, should be taken into account. Although we consider the perception of feedback accuracy and intrinsic motivation as mediators, future studies can explore other mediators, such as creative process engagement. Although the research model will be tested in a social learning context, it also has implications for generic organizations. We can also conduct future studies to understand feedback routes in fostering creative performance in organizations.

5. Acknowledgement

The authors would like to thank the mini-track chair and the anonymous reviewers for their precious comments and suggestions for improving the quality
of this paper. This work was supported by National Natural Science Foundation of China (No. 71471157), and the fund supported by City University of Hong Kong, EDGE Office (No. 6980108).

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