



# An Exploratory Study into Graduate Students' Attitudes Towards Peer Assessment

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**Abstract.** In recent decades, many researchers have been working on the effectiveness of peer assessment in higher education. Being a useful teaching tool, peer assessment enables students to actively participate in learning and create a student-centered learning environment. Many studies focused on the influence of peer assessment on student learning, however, few studies have explored indicators that teachers can use to identify potential problems regarding students' attitudes towards students' feedback and peer review process. Thus, this is an exploratory study, trying to understand indicators for success and problems regarding students' peer feedback process. We had 93 international students performing three peer-feedback assignments (each assignment of around 2000 words and each review of at least 250 words) on the topics of digital transformation, design thinking, and leadership in an Innovation and Entrepreneurship Basic course. For each of the tasks, students completed questionnaires about their attitudes towards peer assessment in general, providing peer assessment and the usefulness of the received peer assessment. We investigate the correlation between students' performance, students' assignment lengths, and students' reviews lengths and attitude questionnaire items and we present the correlations we observed. These correlations can serve as first indicators to teachers to detect potential problems with peer assessment and get insights into student's perceptions of the peer assessment process.

**Keywords:** Peer assessment · Learning attitude · Essay length · Review length · Higher education

## 1 Introduction

Peer assessment is the process in which students grade products that have been produced by their peers [6], students consider, value and provide comments on

products that were created by students that have a comparable level of knowledge, skill, and expertise [31]. In general, two main goals of assessment procedures can be identified: assessment for accreditation and assessment in the context of learning. In the later peer assessment and peer feedback are considered instructional strategies that have the potential to support students' domain-specific knowledge and reasoning skills [10]. Peer assessment may take on different forms. For example, by mainly focusing on the assessment in terms of grading or marking and facilitating this process through the use of rating scales and checklists. In addition to grades, peer assessment might also include written comments or feedback in which a more rich and detailed evaluation of the quality of the product and suggestions for improvement are communicated. Since the formulation of these comments invites students to engage critical reflection on the work or performance in relation to criteria this often also provides more opportunities for learning. Previous study compared three different forms of peer assessment, scoring without commenting, feedback in the form of comments, and integrated scoring and feedback [2]. Their results show that students benefited most from the assessment procedure that included integrated scores and feedback. This is partly explained by the behaviors this type of assessment induces in the learner. Students that are invited to not only grade the work of their peers have to formulate feedback that is useful for the receiver and therefore is more likely to be engaged in cognitive as well as social problem-solving processes. Research identifies potential benefits for the students providing peer assessment and feedback that are related to the behaviors the reviewing student as well as the receiving students engaging in. Reviewing students in integrated peer assessment procedures are checking the rubric to grade the work they have to assess but also compare their own work with the work of the peer they are assessing, this might also stimulate the reviewers to critically reflect on their own work [23]. Moreover, in the process of assessing and providing comments reviewers apply their domain-related knowledge and reasoning skills when they provide feedback on a product created by a peer. Reviewers also practice their communication skills in the process formulating the feedback suggestions [18]. The created feedback allows the receiving student to explore the perspective of another student.

Despite the potential benefits research findings are still inconclusive. The results of a review study show only a little evidence for learning through peer assessment in higher education, and research into students' attitudes towards peer reviewing and feedback shows mixed results [8]. Although in general students seem to appreciate peer assessment procedures, students might be hesitant to rate their fellow students [28] or provide comments because they feel that they do not have the expertise to evaluate the work or feel uncomfortable rating their fellow students [29]. Moreover, the receiving students might question the validity of the assessment [4] or usefulness of the grade and accompanying comments. This last work shows that even if checks of the peer assessment and feedback provided indicate high levels of reliability and validity from the perspective of the instructors, students still provide low estimates of the reliability and validity [4]. These issues also touch on the perceived usefulness of peer feedback in general. In

their classical work on peer feedback, Ilgen et al. [12] explain that peer feedback needs to be received by the peer, accepted as accurate, perceived as useful, and should result in changes or learning. For the perception of the assessment and feedback as useful, it is important that the students have sufficient confidence in their own assessment and feedback skills and the skills of their fellow students [26]. Next to the level of confidence in the knowledge and skills, experiences with the assessor might also shape students' attitudes towards the educational benefits of the peer assessment procedure. From the content, and specificity of the comments provided the receiving student might infer the expertise level of the reviewer [5], in case of a positive impression of the level of expertise, the feedback that is provided is often considered more useful [27]. Therefore, students' attitudes towards the benefits of peer assessment might change after they have received the assessment and feedback provided by their peers.

The content of the information that students provide and receive through peer assessment might vary due to variation in the elaborateness and specificity of the comments students receive, feedback containing more clues seems to be related to higher learning outcomes [17] and is perceived as more useful by the receiving student and therefore contributes to a more positive attitude to peer assessment in general. The elaborateness and specificity of the provided feedback seem to be related to the level of expertise. Students with higher levels of expertise in the domain and good communicative skills often provide more critical and elaborate comments. Students with lower levels of expertise often refrain from detailed feedback and provide more general praise. Taking these findings into account we investigate the relationship between attitudes and perceptions related to peer feedback and assessment and students' task performance. More specifically we will explore the relationship between students' task performance, their attitude towards providing assessment and feedback, and the characteristics of the feedback they provide. As well as how the perception of the usefulness of peer assessment and feedback is influenced by general characteristics of the received assessment and feedback.

Furthermore, many previous studies have proven that the essay length can reflect on the essay's quality [13, 15, 30]. Therefore, in this study, we discuss the relevant factors that affect students' attitudes towards peer assessment, including assignment lengths, feedback lengths, and students' performance. These correlations can serve as first indicators to teachers to detect potential problems with peer assessment and get insights into student's perceptions of the peer assessment process.

Resulting in the following research questions. 1) What are the general attitudes of graduate students towards peer assessment? 2) What is the correlation between students' learning performance and their attitudes towards peer assessment? 3) What is the correlation between students' word counts of the assignments and their attitudes towards peer assessment? 4) What is the correlation between students' word counts of the reviews they provided, they received, and their attitudes towards peer assessment?

## 2 Methods

### 2.1 Course Structure and Assignments

The aim of the Innovation and Entrepreneurship Basics course is to enable students to:

- Get an in-depth understanding of the general process of developing an idea and starting up a new technology-based company,
- The ability to systematically explore customers and markets.
- Understand alternative technological solutions already or nearly in the market and to identify the potential value technology in the value chain of existing companies,

For its implementation the course relies on blended learning and the students are asked before the class to watch videos and like this come in class prepared [9, 20]. The blending approach usually employed for this course is described in detail in [19]. Three of the sessions are fully online and are accompanied with a peer assignment, for them the students need to successfully deliver the assignments and peer reviews for the following three sessions:

**Introduction to Digital Transformation** students need to analyze the newspaper industry, what challenges did the newspapers industry face and how were challengers handled, which were the main technologies that enabled the digital transformation of the newspaper industry, which industry will be the next one to be digitally transformed similarly like the newspaper industry and why.

**Leadership** the students need to imagine that they are the project leader in a company that has at availability distributed team members in London, Mexico, and works with freelancers from Singapore, with specific profiles described in the assignment. They need to come up with a plan on how to give their client the integrated and successful solution s/he requested and to make sure all parts will seamlessly work together. One of the limitations is that instead of working on the project for 6 weeks (as would be the realistic deadline to deliver the project), the company has only 4 weeks to deliver the projects and the students need to come up with a 4-week plan for the project, define a weekly communication and exchange schedule, a team-work protocol on how and when to share information and work in progress, define feedback loops with all people involved, and identify tools to use for coordination of the personnel

**Design Thinking** students need to analyze the water shortage issue, an introductory text that contains relevant observations was given as a starting point and then the students needed to analyze the given points, form two insights and learn from them, and use the “How might we... question” to solve the problem.

As part of the peer-review process, besides providing feedback on how to improve the assignment (based on specifically designed rubrics for each of the three assignments), students also provided marks to their peers on a scale from

0 to 100 to each other. In this paper we analyze and we investigate correlations between, the mark provided, the lengths of assignment and length of assessments, with the student's responses of the scales on attitudes (see details in subsection Measurement).

## 2.2 Participants

All the participants are 1st year Master's degree students in computer science coming from different Computer science specializations. The students were assigned randomly and were asked to review. The total number of students was 93 with 67 males and 26 female students. All the participants were inquired for consent before filling out the surveys.

## 2.3 Measurement

An assessment suite consisting of three questionnaires that assess attitude: 1) right after submitting the assignment, i.e. before providing peer assessment on general attitude towards peer review 2) after providing feedback on an assignment of a peer, a questionnaire on attitude towards providing peer review 3) after receiving feedback, a questionnaire on the perception of the received feedback. All three scales of the questionnaire are based on existing questionnaires and include items that focus on peer assessment as well as the accompanying feedback, to match the set-up of students' peer assessment experience that included not only grading but also required to provide feedback. According to Cronbach's alpha test, the reliability of the survey is 0.93. The items of all three scales can be found in Table 1.

*General Attitude Questionnaire.* This questionnaire was designed to measure the attitude to peer reviewing and assessment with respect to a specific task. The questionnaire consisted of 12 items that were based on the work of Huisman [11] and Roskams [25].

*Attitude Towards Providing Feedback.* After reading the assignment and providing feedback students were asked to complete a scale consisting of 4 statements that should be rated on a 5 point scale ranging from 1 (completely not applicable to me) to 5 (completely applicable to me). Three statements referred to their perceived ability to provide fair and useful assessment to their peers (e.g. I could make a fair assessment of my peer).

*Perception of the Received Assessment.* After receiving the grades and feedback the receiving student completed a short questionnaire, consisting of 4 statements that focused that addressed the perceived fairness, usefulness and, quality of the received comments.

## 2.4 Procedure

All the assignments had the same deadline, December 1st, 2019. After the students finished the delivery of the assignment, the first survey was delivered aimed

**Table 1.** Students' scores in the attitude scales

Item	Statement	M (SD)
1	I understand the content of this course	4.16 (0.89)
2	I have enough content related knowledge to provide meaningful peer feedback	3.83 (0.97)
3	I have the skills needed to provide meaningful peer feedback	3.87 (0.90)
4	I understand the feedback criteria provided to me by the teacher	3.76 (1.15)
5	I think peer assessment is a fair method to assess students' performance	3.28 (1.24)
6	I believe that it is very important for me to learn how to participate in peer assessment	3.95 (1.07)
7	Involving students in feedback through the use of peer-feedback is meaningful	3.75 (1.08)
8	Peer-feedback within the course is useful	3.64 (1.12))
9	Feedback should only be provided by the teaching staff	3.03 (1.32)
10	Being capable of giving constructive peer-feedback is an important skill	4.46 (0.74)
11	Being capable of dealing with critical peer-feedback is an important skill	4.56 (0.72)
12	Being capable of improving one's work based on received peer-feedback is an important skill	4.54 (0.62))
13	I could make a fair assessment of my peer	4.19 (0.90)
14	I learned useful skills by assessing other students and giving comments	3.85 (1.10)
15	In general, I am confident that the peer-feedback I provide to other students is of good quality	4.07 (0.86)
16	In general, I am confident that the peer-feedback I provide to other students helps them to improve their work	3.98 (0.89)
17	Peer assessment was fair to me	3.98 (1.03)
18	The comments made by the peer assessor made sense and potentially could improve my work	3.85 (1.06)
19	In general, I am confident that the peer-feedback I receive from other students is of good quality	3.82 (1.10)
20	In general, I am confident that the peer-feedback I receive from other students helps me to improve my work	3.75 (1.14)

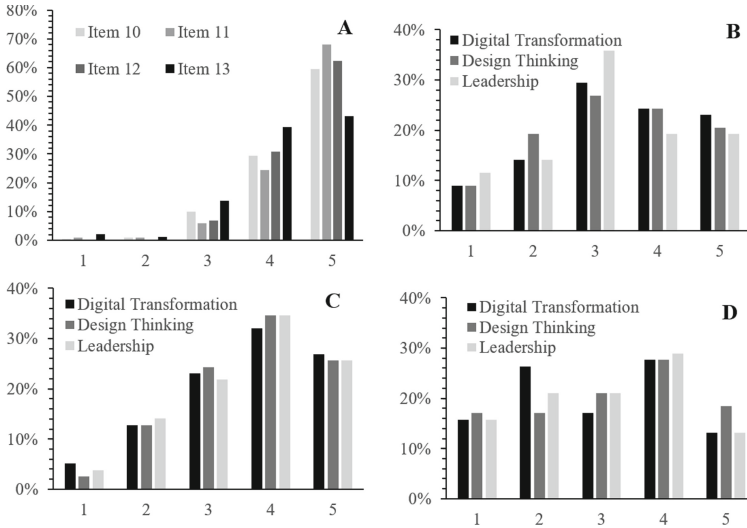
to measure the attitudes towards peer review for the given task. The deadline for providing peer review for the three assignments was December 15th, 2019 after which immediately the second questionnaire was delivered aimed at understanding attitudes of the students towards providing feedback. The reviews were opened to the students and they could start consulting them on December 27th, 2019, and students needed to fill in the last questionnaire at the latest by January 15th, 2020. All the surveys were collected via SurveyHere ([www.surveyhero.com](http://www.surveyhero.com)) platform.

### 3 Results

#### 3.1 Students' Responses in the Attitude Scales

The purpose of this study is to explore the graduate students' attitudes towards peer assessment. According to the results in Table 1, the average of all items is 3.92, which indicates that students generally have a positive attitude towards peer assessment. Although the students' attitudes towards peer assessment varied in different assignments, on average, items 10, 11, 12, 13 valued the most while 5, 8, 9 valued the least by them in the attitude scales.

We further observed items with higher average scores. The results in Fig. 1A reveal that students mostly valued peer-feedback skills, including providing constructive suggestions, handling critical reviews, and improving their work based on the reviews they received. Moreover, students commonly believed that they can provide fair peer assessment. In the above items, only less than 5% of the students expressed disagreement or inapplicability. Furthermore, about a quarter of the students didn't believe the fairness of peer assessment (Fig. 1B), and 15–18% of the students have denied the usefulness of applying peer assessment in the classroom (Fig. 1C). Besides, 37%–42% of the students considered that feedback for their assignments can only be provided by the teaching staff instead of peers, as shown in Fig. 1D.



**Fig. 1.** 1A: the percentage of students' numbers of each score in items with higher average scores. 1B, 1C, 1D represent items 5, 8, 9 respectively. Item 9 is a reversed item that score 5 indicates completely disagree with the content of this item

### 3.2 The Correlation Between Assignment Grades and Scale Scores

In order to explore the correlation between students' performance and their attitudes towards peer assessment, we used Pearson's chi-squared test to examine the relation of assignment grades and the scores in the attitude scales. The results of the study showed that students' grades for each assignment and the average scores in the entire scales were not significantly related (data not shown). However, we found that there was a positive correlation between certain items in the attitude scales and assignment grades. From the statistical results in Table 2, we can see that the average grades for all assignments are positively correlated with items 9, 10, and 11 in the attitude scales. The result reveals that the lower the students' average grades were, the more likely the students thought that the comments can only be given by the teaching staff. Moreover, students with higher grades tend to value the skills of giving constructive comments and dealing with critical ones. Similar results can also be observed in the assignment of digital transformation. As for the assignment of design thinking, the better grades the students got, the more likely they perceived the meaningfulness of peer assessment (see item 7). However, there is no significant correlation between the assignment grades of leadership and their scores of each item in the attitude scales.

**Table 2.** Pearson correlation between students' grades and scale scores.

	Item 7		Item 9		Item 10		Item 11	
	r	p	r	p	r	p	r	p
Digital Transformation	.139	.217	.195	.088	.264*	.018	.279*	.012
Design Thinking	.231*	.042	.125	.277	.047	.680	.052	.648
Leadership	.037	.741	.140	.211	.164	.146	.144	.202
The average of three assignments	.073	.524	.248*	.028	.250*	.027	.224*	.049

\*Correlation is significant at the .05 level (two-tailed). Note: r: the value of Pearson' r, p: 2-tailed significance value. Items without significant correlation are not shown in this table.

### 3.3 The Correlation Between the Word Counts of Assignments and Scale Scores

We further explored the correlation between the word counts of students' assignments and their scale scores. As shown in Table 3, the average scores of all items in the three scales are positively correlated to the word counts of the assignments of design thinking and leadership. However, as for the assignment of digital transformation, no significant correlation was found. We then examined the relationship between word counts and the scores of the attitude scales submitted at different time phases (before providing feedback, after providing feedback, and after receiving feedback). In the first-time phase, students who wrote more words in the assignment of design thinking and leadership tend to score higher in the



attitude scales. The first scale is mainly designed to evaluate the importance of peer assessment to students. From these two assignments, it can be seen that the students with more written words in these assignments valued the importance of peer assessment more. Then, the second scale only shows a significant correlation between students' word counts of the assignment of leadership and their scale scores. The items in the second-time phase were mainly designed to ask students whether they could provide high-quality feedback. From our analysis, it seems that the more words students wrote in the assignment of leadership, the more likely they believed they could provide high-quality feedback as well. In terms of the result of the third scale, it seems that the more words students wrote in the assignment of design thinking, the higher scores they got. The items in the third scale are mainly related to students' perception about the quality of the feedback receiving from peers. Thus, we can know that the more words students wrote in the assignment of design thinking, the more likely students appreciated the quality of the comments given by peers. It is worthy to note that the word counts of each assignment were significantly related to the assignment grades and the word counts of feedback given to peers.

### 3.4 The Correlation Between the Word Counts of Peer Assessment and Scale Scores

We also explored the correlation between students' word counts of peer assessment and their scale scores by dividing the data into two parts. The first part was to examine the relation between students' word counts of reviews they gave and

**Table 3.** Pearson correlation between word counts, grades, and scale scores.

	Grades	Giving Review	All	Scale I	Scale II	Scale III
Digital Transformation						
Pearson Correlation	.296**	.290**	.117	.156	.116	-.030
Significance (two-tailed)	.008	.010	.306	.169	.309	-.790
n	79	79	79	79	79	79
Design Thinking						
Pearson Correlation	.364**	.349**	.253*	.232*	.125	.243*
Significance (two-tailed)	.001	.002	.025	.041	.277	.032
n	78	77	78	78	78	78
Leadership						
Pearson Correlation	.303**	.389**	.260*	.270*	.263*	.243*
Significance (two-tailed)	.007	.000	.020	.016	.019	.373
n	79	79	79	79	79	79

\*Correlation is significant at the .05 level (two-tailed). \*\*Correlation is significant at the .01 level (two-tailed) Note: 'All', 'Scale I', 'Scale II', 'Scale III' shown in the table respectively represent the average scores of all items, the items before providing peer assessment, after providing peer assessment, and after receiving peer assessment from peers in the scales.

their second scale scores. The second part mainly focused on the relation between students' word counts of the reviews they received and their third scale scores. The results in Table 4 indicate that only the leadership assignment shows a significant correlation between the word counts of the peer assessment and scores in items 16, 18, and 20 of the scales. In this assignment, the more the review words students gave, the more likely they are confident to provide high-quality reviews. Similarly, the more review words they received, the more possible they trusted the quality of the reviews. It seems that students determined the quality of the given leadership reviews based on the number of words. However, no significant correlation was found in the other two assignments.

## 4 Discussion

The aim of this study was to perform an exploratory investigation of factors that influence attitudes towards peer review assessment in graduate students. We employed correlations to explore discover patterns of dependencies between the different factors we took into account, the aim of future work is to use regression analysis to check the relationship between performance and attitudes.

### 4.1 Students' Attitudes Towards Peer Assessment

According to the results of the students' responses in the scales, the vast majority of the students regarded peer assessment as an important skill. On the other hand, although most students had positive attitudes towards cultivating peer assessment skills, some still disagreed with the usefulness of applying peer assessment in the context of this master course. Interestingly, some students were doubtful about the fairness of peer assessment even though most students perceived that they can provide fair feedback, which is consistent with the result of previous research [25]. This might be because these students were first-year

**Table 4.** Pearson correlation between word counts of peer assessment and scale scores

	Giving Review		Receiving Review			
	Item 16		Item 18		Item 20	
	r	p	r	p	r	p
Digital Transformation	.189	.095	.039	.735	.037	.749
Design Thinking	-.054	.638	.017	.883	.095	.408
Leadership	.222*	.049	.234*	.038	.248	.029
The average of three assignments	.125	.274	.142	.214	.161	.160

\*Correlation is significant at the .05 level (two-tailed). Note: Giving Review: the word counts of peer assessment given to peers. Receiving Review: the word counts of feedback received from peers. r: the value of Pearson' r. p: 2-tailed significance value. Items without significant correlation are not shown in this table.

graduate students who lacked the experience of face-to-face cooperation, they did not establish trust in their relationship. Thus, they considered that only the teaching staff is qualified to provide feedback to students.

#### **4.2 The Correlation Between Students' Performance and Attitudes Towards Peer Assessment**

According to Pearson Correlation analysis, the correlation between students' performance and their attitudes towards peer assessment would vary depending on the topic of the assignment. Overall, students who performed better tend to support that feedback can also be given by people other than the teaching staff. Moreover, students with better performance pay more attention to the cultivation of peer-feedback skills, especially for the digital transformation assignment. It is worth mentioning that in the design thinking assignment, the better the students performed in the assignment, the more likely they perceived the meaningfulness of peer assessment.

#### **4.3 The Correlation Between Students' Assignment Lengths and Attitudes Towards Peer Assessment**

The results suggest that in addition to students' performance, their assignment lengths also are positively correlated to their attitudes towards peer assessment. Surprisingly, as for the assignments of design thinking and leadership, the correlation between assignment lengths and students' attitudes towards peer assessment is much greater than their performance and peer-feedback attitudes. However, there is no significant correlation shown in the assignment of digital transformation. It may be because the design thinking and leadership assignments were designed to cultivate students' entrepreneurship which requires them to work in groups. However, as for digital transformation assignments, students can accomplish their assignments by figuring out the theories and models themselves without having group discussions. Nevertheless, the results indicate a difference between the assignments of design thinking and leadership. In the assignment of leadership, students with longer assignment lengths tend to be confident in providing higher-quality peer feedback. Considering that students' assignment lengths were significantly correlated to their grades, students with longer assignment lengths might indeed have the potential ability to provide constructive and valuable advice to help peers improve their work. On the other hand, as for the assignments of design thinking, students writing more to express their thoughts were more likely to believe that peer-reviewed opinions can assist them to improve their work. Besides, we noticed that students' assignment lengths reflected on their performance. It is probably because the more detailed the students elaborated on their work, the more likely they can express their ideas clearly and thoroughly, which leads to higher-quality essays. However, it still needs further analysis to validate whether a longer essay or feedback can demonstrate a better-quality argument. Also, the students with longer assignments generally offer longer feedback to peers as well.

#### 4.4 The Correlation Between Students' Feedback Lengths and Attitudes Towards Peer Assessment

The content of the assignment of leadership is mainly to discuss how if the student is a leader, he will lead the team forward with time constraints. The result indicates that students considered that the longer the comments were, the better the arguments were for issues related to teamwork. However, the relationship between students' feedback lengths and their attitudes towards peer assessment is not shown in the assignments of digital transformation and design thinking.

#### 4.5 General Impressions and Learnings from the Course

In general, we observed that the students scored high on the assignments. In our view what contributed to this was that the rubrics of the assignment were quite clear in this respect and for instance if the assignment is asking the students to give two examples of something, the rubrics asked the reviewer 'did the peer provide 2 examples?' This might have resulted in students giving points for finishing the job without taking the quality of the work into account. Most students received high points for the assignments. Looking into the log files, we found out that mainly students that wrote the assignment last minute received lower points or no points at all. This might be due to the fact that these students did not take the time or have the time to check the requirements. Based on these findings and observations, we conclude that in a MOOC like learning environment, that was alike in our study, the design of the instruction and the rubric should inspire in-depth elaboration and not mainly serve as an easy checklist. Participants in our study were not informed about the potential benefits of the peer assessment procedure and did not receive instructions on peer assessment and providing feedback. Results of a recent meta-analysis [14] into the effects of peer assessment reveals that training in peer assessment is often associated with higher learning effects. In future editions of the course, this will be implemented and effects will be evaluated.

We also believe that from this work and this data set that we have created for this study, we can draw interesting conclusions for the development of entrepreneurship skills and competencies and how much actually peer-review assignments online can help (or not) the development of them. Other works have looked in this direction too, that is if peer review can be used to determine development of soft skills [21]. We observed that the students felt freer to give feedback and usually wrote more in the Design Thinking and Leadership assignments, while usually their feedback was more contained in the Introduction to digital transformation session. We believe that this was due to the different nature of the assignments, and while the Introduction to the digital transformation required the reviewer to comment on an assignment submitted by the peer on key technologies that enabled the digital transformation for the newspaper industry or what were the challenges the industry faced (based on their knowledge gained), the other two asked the students to provide critique or review of a

potential solution the peers needed to come up on their own, and we believe that both in these respect, the assignments and the peer reviews highly depended on the entrepreneurship skills and competencies developed by the students. It would be a further experiment to design with standardized questionnaires to use for this that will help us measure if this was the case or not.

## 5 Conclusions

With this study, we explore indicators that teachers can use to identify potential problems regarding students' attitudes towards students' feedback and peer review and indicators for success and problems regarding students' peer feedback process. These indicators can be used to detect potential problems with peer feedback and get insights into student's perceptions of the peer feedback process.

### 5.1 Conclusions

This study aims to explore students' attitudes towards peer assessment, as well as the relationship between their performance, their assignment lengths, their feedback length, and their attitudes towards peer assessment. The results indicate that students generally have positive attitudes towards peer assessment, which is consistent with previous research [1, 3, 16, 22, 25]. Moreover, even though most students emphasize the importance of developing peer-feedback skills, some students still denied the usefulness of peer assessment. It might be because students do not have enough confidence in their peers' feedback skills as well as the level of expertise [26, 27]. The situation that the students do not have sufficient confidence in their peers also reflects on their perceived fairness of peer assessment. Cheng and Warren [3] also mentioned that students doubt their objectivity while assessing their peers, since they are more likely to mark higher scores to peers who treat them friendly. Furthermore, students are used to being graded by teachers, so they tend to trust the reliability of teachers' ratings more than the peers' [16, 25]. Similar results can also be seen in our study, in which many students considered that only teachers are qualified to give feedback to them. The same study [3] pointed out that students thought the ratio of teachers' ratings to students' ratings should be 3:1, and our results confirm this statement. This approach can help students gradually change from teacher-centered to student-centered learning. Teachers can also provide rubrics as grading criteria for students to follow.

This study indicates that students' performance will reflect on their attitudes towards peer assessment, especially for the peer-feedback skills. The length of the assignment was also highly correlated to the student's performance and his attitude towards peer assessment. Many previous studies have proven that the essay length is positively correlated with the student's performance [13, 15, 30], which implies that essay length can indeed reflect on the essay's quality. Also, it is worth to mention that as for the leadership assignment, longer feedback

tends to be more likely considered as high-quality feedback. It might be because students with longer comments were more likely to accurately clarify their views. Other works also stated that students benefited from the peers' perspectives in the feedback [18], and our study confirms that as well.

## 5.2 Future Directions

This study used an innovation and entrepreneurship course in computer science curriculum as a case to explore students' attitudes towards peer assessment and the correlation with performance. The research results indicated that students had different attitudes towards peer assessment in the different topics of assignments. Obviously, students' attitudes towards peer assessment would be affected by the topic of the assignment. Thus, we suggest extending the research of peer feedback and assessment to other scientific subjects in the future to observe whether the phenomena will be similar or different.

The researchers used Pearson's correlation to initially analyze the collected data in this exploratory study for graduate students' attitudes towards peer assessment. In the future, regression analysis will be used to further explore the interplay of the students' performance and their attitudes toward peer assessment. Moreover, in our current study, students' assignments were graded by their peers based on the rubrics given by the teacher. There is a potential for the teaching staff to reformulate the rubrics based on the learning objective of each topic and re-grade the students' assignments, so that we can compare these two ways of performance assessment.

Furthermore, the relevance of feedback length to feedback quality is worthwhile to do further research as well. According to previous studies, the review quality can be examined from three aspects: 1) giving comments according to the rubrics given by the teacher. 2) evaluating peers' work (criticism or praise) with specific examples. 3) providing constructive suggestions to help peers improve their work [7,24].

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