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Improving Peer Feedback on Arguments

Mads Goddiksen

Department of Food and Resource Economics
University of Copenhagen

Introduction

Peer feedback can increase learning for both the person receiving feedback and, especially, the person providing (Nicol et al., 2013). Providing feedback on results of higher level cognition including evaluations and creative processes is what participants often find most challenging (UNSW, 2018). Clear and concrete guidelines should therefore be provided, if the peer feedback session is to be successful (Winstone and Carless, 2019, Ch 8).

Among the higher level cognition processes that are challenging to provide useful peer feedback on are evaluations of complex arguments and the creative construction of new arguments. The challenge is enhanced if the topic of the arguments or the practice of constructing and evaluating arguments itself is foreign to the participants. Despite the challenge, being able to construct and evaluate evidence-based arguments is one of the core skills of being an academic, and one that must be nurtured in university education.

The aim of this study was therefore to test an intervention – in the form of guidelines - designed to improve the learning outcome of peer feedback sessions where participants had to provide feedback on complex arguments.

Materials and methods

The intervention

The study took place over the course of four peer feedback sessions in two different iterations of the same course (described in Sec 2.2, 'Participants and course setting'). In the first two sessions, students were given a guideline with general advice on how to provide feedback on discussions and arguments. In the final two sessions, the general guidelines were supplemented with specific questions about the discussion they had read. All guidelines are presented in the Appendix.

The aim of the intervention was to get the person providing peer feedback to pay more attention to, and provide better feedback on, the arguments presented by their peer. Specifically, the aim was to aid the participants in providing feedback on the clarity and depth of the argumentation.

Following Toulmin's model of argumentation (Toulmin, 2003), a good argument is characterized by a clear conclusion supported by a general warrant and established particular facts. To increase the strength of the argument, the author may include a backing to support the warrant and counter potential rebuttals, e.g. by adding a modifier to the conclusion. Prior to the intervention, lack of clear conclusions was identified by the author as one common weakness in the argumentation by participants in the particular course, as well as lack of attention to potential rebuttals resulting in weaker arguments. The specific questions included in the revised guidelines therefore focused especially on these two areas.

The existing guidelines were supplemented with a number of specific questions to different parts of the assignments (see Appendix). For the discussion parts, which is where the author is expected to present his or her evaluation of existing arguments and construct their own, four specific questions were added to the existing guideline (see Appendix):

1. Summarise in your own words, the author's answer to [the specific discussion question].
2. Summarise in your own words, the author's argument for the answer to the question above.
3. Is the argument convincing?
4. It what ways could the argument be improved?

The first question aims to focus the participant's attention to the conclusion of the main argument, and the clarity with which this is presented. Similarly, the second question asks the participant to reconstruct the argument, potentially leading to the realization that this is difficult, either because (parts of) the argument is missing, or because it is unclear.

The two remaining questions focus on the constructive assessment of the arguments, encouraging the participant to propose objections and suggest improvements, thus addressing one of the common weaknesses identified prior to the intervention: Lack of attention to potential rebuttals.

Participants and course setting

The intervention took place in the 2021 iteration of a master course on risk assessment of chemicals (7,5 ECTS) at the University of Copenhagen (UCPH). The experiences from the 2020 iteration served as a reference for comparison. 26 students completed the 2021 version of the course, whereas 22 completed the 2020 version. With a few exceptions, all course participants were enrolled in the master program Environmental Science at UCPH. Around half of the participants had earned their BSc outside Denmark. Both iterations were conducted fully online, with lectures, theoretical exercises and peer feedback sessions taking place via Zoom.

Two written assignments:
During the course, participants hand in two mandatory individual assignments (3-4 pages). In both assignments, the participants discuss the decision regulate one or more chemicals in a specific way. As such, the core quality criteria for the assignments are very similar. In particular, both assignments require participants to analyse the regulation of a specific chemical, and

- *formulate a clear personal, but scientifically based, opinion about the regulation of said chemical, and*
- *argue for their opinion.*

Both assignments are handed in in two different versions. First, participants hand in a "beta-version". The instruction for this version is that it should be a complete and finished assignment, which will serve as the basis for the peer feedback session. After the peer feedback session, participants revise their assignments and hand in their final version for assessment. The

teacher (the author) also provides personal written feedback as well as general oral feedback on the final version of both assignments.

Peer feedback sessions:
Peer feedback has long been part of the course, in the form of in-class sessions (90 min), where students read and provide written and oral feedback on an assignment by a randomly selected classmate, and receive feedback from one classmate - usually the one they provide feedback. A guideline on how to provide feedback and what to focus on is provided before the class, and explained by the teacher before the session begins. The guidelines from the 2021 and 2020 versions of the course are shown in the Appendix.

Course evaluations show that the peer feedback sessions conducted prior to the intervention were rather well received. Most participants found the feedback they got at least somewhat helpful, and found that they learned something about their own assignment when providing peer feedback. Furthermore, the guidelines helped them understand what was expected of them, not only for the specific assignments, but also for the final exam. However, two problems were identified by the author:

1: Some participants felt that they gained very little from the sessions.

2: The quality of the discussion sections in the assignments was in many cases rather low.

Two causes for 1) were identified from the evaluations: first, some of these participants felt that their peer was unable to provide much useful feedback and, secondly, some did not perceive learning much from providing feedback.

Data

The data for the study consisted of:

- The assignments handed in the 2021 iteration of the course, both the beta and final versions (104 assignments in total).
- The written feedback provided by the teacher (the author) to the final versions of the assignments handed in the 2021.
- The teacher's summary of the feedback provided to the assignments in the 2020 iteration of the course.
- Qualitative and quantitative data from the oral and written course evaluations of the 2021 and 2020 iterations of the course.

A complete analysis of all 104 assignments was beyond the scope of this paper. Therefore, five participants were randomly drawn, and their assignments included in the analysis (10 assignments in total). No assignments from the 2020 iteration were included in the study, as they are no longer available to the author. However, the written feedback to all 52 final assignments submitted in the 2021 iteration of the course as well as the teacher's summary of the feedback provided to the assignments in 2020 were included in the study.

The data drawn from the evaluations were qualitative data from an oral evaluation conducted immediately after the first peer feedback session in 2021, supplemented with written comments from the general course evaluation, and answers to the standard evaluation question 2.6: "In my opinion, I have received relevant academic feedback on my oral and written work on the course".

Data analysis

A qualitative analysis of the argumentation in each of the ten included assignments broadly followed the Toulmin model of argumentation. After analysing each assignment individually, beta- and final versions were compared to identify potential improvements in the argumentation between the two versions. Finally, a comparison was made between the final versions of the first and second assignment of each student to assess progress across assignments.

The remaining data was included more or less in their raw form.

Results

Reception and perceived learning outcome

As shown in Fig 1, course participants were generally happy with the feedback they got on their oral and written work in the 2021 version the course - more so than in the 2020 version. In 2021, the average score for question 2.6 ("In my opinion, I have received relevant academic feedback on my oral and written work on the course") was 4,1, with 15 of 18 participants in the evaluation indicating that they agreed (N=8) or strongly agreed (N=6). One participant disagreed. In comparison, the average score in 2020 was 3.4 with only 8 of 18 participants in the evaluation indicating that they to

some extent agreed. No test for statistical significance of this comparison was performed.

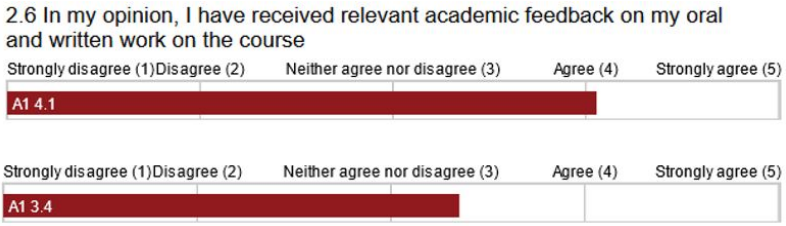

Figure 1: Participants' perception of the quality of the feedback received. Answers for 2021 are shown on top, the answers from 2020 are at the bottom.

In the oral evaluation following the first peer feedback session in 2021, the participants indicated that the allocated time was appropriate, and that reading an assignment by a peer had been interesting and beneficial for them. A majority indicated an intention to modify their own assignment based on thoughts they had had while providing feedback to their peer. In a more confidential discussion later, one student indicated that she had not gained much from the session. In her opinion, this was because her peer had not been able to provide any useful feedback, and because the quality of the peer's assignment had been so low that she had not gained anything from reading it. This indicates that although participants were generally satisfied with the feedback they got, the issue with some students feeling that they gained very little from the session identified in Sec. 2.2.2 ('Peer feedback sessions') had not been eliminated by the intervention.

In the qualitative part of the final course evaluation of the 2021 iteration, the peer feedback sessions were mentioned twice. One participant described them as "very useful" another wrote: "The 'peer review' feedback on assignments was really nice, as it gave us practice in reading and giving constructive feedback. " (Anonymous course participant, 2021).

The assignments

Progress from beta to final version:
Of the ten pairs of beta and final assignments included in the study, five showed improvement from beta to final version that could reasonably be at least partly associated with the peer feedback. Most commonly, the author had added additional facts or backing to the argument and improved the language to make the conclusions and arguments more clear. In two cases, an explicit consideration of a potential rebuttal had been added to the final version compared to the beta.

Of the remaining five pairs, two did not include a discussion section at all in the beta, whereas the final version did include a (very well argued) discussion. In two other cases, the beta and the final versions were nearly identical. In one of these cases, the author of the assignment made a comment upon submitting the final version, that she had only received positive feedback from her peer, and had therefore not changed much (although the teacher did find room for improvement). In the final case, the author drew more conclusions in the final version than in the beta, but the quality of the arguments did not improve.

Progress from first to second assignment:
The analysis of the assignments and written feedback showed that in both 2020 and 2021, the quality of the argumentation in the final versions of the second assignment was higher than in the final versions of the first assignment. Particularly, the clarity with which the participants presented their conclusions had improved, and fewer unjustified claims were made.

Progress 2020 to 2021:
Since the assignments from the 2020 iteration of the course were not available to this study, the progress in the quality of the argumentation from 2020 to 2021 had to be based the summary of the teacher feedback provided in 2020 to the assignments. This obviously introduces substantial uncertainty, and no meaningful conclusions could be drawn.

Discussion

The present study does not provide sufficient evidence to show that the intervention had an effect on the impact the peer feedback sessions had on the quality of the arguments in the participants' assignments. However, the

analysis did show that there was improvement in the argumentation from beta and final version in half of the assignment pairs included in the study.

Furthermore, the results presented above indicate that the intervention was successful in the sense that it contributed to improving the participants' experience in participating in the peer feedback session. Fewer students felt that they gained little or nothing from the sessions. However, there were still students who felt that they did not gain much from the peer feedback session, which was to be expected, as the perception of major differences in academic level in the peer feedback groups was previously identified a partial cause of this experience (Sec. 2.2.2, 'Peer feedback sessions'), and this was not addressed in the intervention. The intervention described in this study should therefore be combined with further interventions on e.g. the size or composition of the peer feedback groups.

Acknowledgements

The author wishes to thank Jan Sølberg, Anders Dahl and Morten Misfeldt for constructive discussions.

References

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A The feedback guidelines

Below are the guidelines used in the study.

2021 versions

Peer review of the first report

Here are some things to look for when giving feed back to your peer on the first report. I will be looking for similar things when assessing the final version. Remember that the point of peer feedback is to help your peer improve her or his report, and for you to have a constructive discussion that you can both benefit from. So be constructive, and hopefully your peer will be equally constructive when providing feedback to you.

Specific questions to consider are provided in the table below, but consider some general things first.

Overall
In the report, the author should demonstrate the following:

Knowledge

- of the Precautionary Principle (PP) and some challenges related to applying it
- of Neonicotinoids and Glyphosate and the controversies that surrounded their approval/ban in the EU

Skills

- In analysing relevant sources

Competences

- In discussing the use of the PP
- In constructing clear and concise arguments in writing

A report that ticks all of the above is a very good report.

Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all three sub-questions should be answered somewhere in the report.

Part 1
The answer to this question is a *description* (as opposed to an analysis or discussion). Descriptions should be *correct, relevant* and *concise*.

In this case, you are describing the Precautionary Principle (PP) and challenges related to applying it in an EU setting. This is a complex, difficult and very broad topic. Therefore, consider whether your peer provides *enough information* (i.e. all the information needed for the subsequent analysis and discussion) and whether this information is *correct*. There is also a real danger that your peer is providing *too much information*. In a short report like this (and in a scientific paper), this is a problem because your peer then has less space for the subsequent analysis and discussion.

In an exam situation, a good description is a good start. If the descriptive part fails, the whole assignment fails, but a good description does not on its own get you a good grade. At most, it gets you from 00 to 02

Part 2
The answer to this question is an *analysis*. In general, analyses should be *methodical*, *clear* and *true to the data/sources that it is based on*.

In this case, it will be important that the analysis is true to the sources is it based on – do you agree with the way your peer has read the main text? The analysis should also be connected to the description, and clearly presented and argued. It should be clear to you what the author believes the most important differences between the two cases are, and *why* the author thinks these are the most important. If it is not, help your peer by pointing out what you think is unclear and suggesting ways to clarify.

In an exam situation, a good analysis is key to getting a good grade. But a good description and analysis on their own do not get you a very good grade. At most, they get you from 02 to a high 7.

Part 3
The answer to this question is a *discussion*. In general, a discussion should have a *clear message* backed by a *strong argument*. This argument should to a very large extent be based on the foregoing analysis.

In this case, the author should discuss whether it was justified to use the PP to ban the neonicotinoids, but not glyphosate. This is a yes/no question, and the author's opinion should be clearly stated. More importantly, it should be *clearly argued*. It should be clear to you why the author believes what s/he does. If you do not agree, state your objections. Then the author can improve his or her argument by countering your objections. If you do agree, try to think of possible objections and discuss with you peer how you would counter them.

In an exam situation, a good discussion is key to getting a top grade. If combined with a good description and analysis, a good discussion is what gets you from a high 7 to 12.

Style and grammar
When providing feedback, focus mainly on the content. However, if there are obvious problems with language, grammar or punctuation, it would be kind of you to point it out. Also, consider whether the text is appropriately divided into sections.

References and sources
The report should have clear and consistent references as well as a reference list. If external sources have been used, these should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.

Specific questions to consider

	My feedback
Description	
Has the author presented all relevant information on the PP and the challenges related to applying it?	
Does the description contain information that is *unnecessary* for the analysis and discussion?	
Analysis	
Has the author, in your opinion, identified the most important differences between the two cases?	
Does the author explain *why* these differences are the most important differences?	
Is the explanation provided clear?	
Do you agree with the explanation?	
Discussion	
Summarise in your own words, the author's answer to whether it was justified to use the PP to ban the neonicotinoids, but not glyphosate.	
Summarise in your own words, the author's argument for the answer to the question above.	
Is the argument convincing?	
What parts of the argumentation would a person who disagree with the author's conclusion object to, and how?	
It what ways could the argument be improved?	
Spelling, grammar and references	

Peer review of the second report

Here are some things to look for when giving feed back to your peer on the first report. I will be looking for similar things when assessing the final version. Remember that the point of peer feedback is to help your peer improve her or his report, and for you to have a constructive discussion that you can both benefit from. So be constructive, and hopefully your peer will be equally constructive when providing feedback to you.

Specific questions to consider are provided in the table below, but consider some general things first.

Overall

In the report, the author should demonstrate the following:

Knowledge:

- Of relevant EU law

Skills:

- In identifying and analysing relevant sources

- In classifying chemicals according to their hazards to humans and the environment

Competences:

- In discussing data requirements for human health and environmental risk assessments of chemicals within various risk assessment frameworks
- In discussing potential solutions to emerging challenges for risk assessment and risk management.
- In constructing clear and concise arguments in writing

A report that ticks all of the above is a very good report.

Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all four sub-questions should be answered somewhere in the report.

Part 1
The answer to this question is a *description* (as opposed to an analysis or discussion). As always, descriptions should be *correct, relevant* and *concise*.

In this case, you are describing the selected chemical and its use (or some of its uses). For any chemical, there is a lot of information to present and many ways to present it. Therefore, consider whether your peer provides *enough information* (i.e. all the information needed for the subsequent analysis and discussion) and whether this information is *correct*. Sometimes, a picture says more than a thousand words, so also consider whether illustrations could help the presentation. There is also a real danger that your peer is providing *too much information*. In a short report like this (and in a scientific paper), this is a problem because you peer then has less space for the subsequent analysis and discussion.

When it comes to describing use, again consider whether the amount of information is appropriate, and if your peer has chosen to focus on only a part of the use, check whether this is clearly stated.

Part 2
The answer to this part is also a description, a description of the regulation covering the chemical under consideration. The above applies to this part as well.

In an exam situation, a good description is a good start. If the descriptive part fails, the whole assignment fails, but a good description does not on its own get you a good grade. At most it gets you from 00 to 02

Part 3
The answer to this question is an *analysis*. In general, analyses should be *methodical*, *clear* and *true to the data/sources that it is based on*.

In this case, the analysis consists of an analysis of why the regulation described part 2 is the way it is. It will be important that the analysis is true to the sources is it based on, that it is connected to the description in part 1, and that it is clearly presented and argued. In this case,

you might not know the sources that you peer is drawing on, but that makes you even more capable of providing feedback on clarity.

It should be clear to you:

- what the author considers the most important issues with the chemical,
- what your peer sees as the main reasons for why the regulation is the way it is.

If this is not clear, point out what you think is unclear and try to suggest ways to clarify.

In an exam situation, a good analysis is key to getting a good grade. But a good description and analysis on their own do not get you a very good grade. At most they get you from 02 to a high 7.

Part 4
The answer to this question is a *discussion*. In general, a discussion should have a *clear message* backed by a *strong argument*. This argument should to a very large extent be based on the foregoing analysis.

In this case, the author should discuss whether the current regulation on the selected chemical is appropriate. This is a yes/no question, and the author's opinion should be clearly stated. More importantly: it should be *clearly argued*. It should be clear to you why the author believes what s/he does. And if you do not agree, state you objections. Then the author can improve his or her argument by countering your objections.

In an exam situation, a good discussion is key to getting a top grade. If combined with a good description and analysis, a good discussion is what gets you from a high 7 to 12.

Style and grammar
When providing feedback, focus mainly on the content. However, if there are obvious problems with language, grammar or punctuation, it would be kind of you to point it out. Also, consider whether the text is appropriately divided into sections.

References and sources
The report should have clear and consistent references as well as a reference list. A tricky issue in this report could be citing legal texts, check whether it has been done appropriately.

Sources should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.

Specific questions to consider

	My feedback
Description	
Which chemical(s) is the assignment about?	
Which use(s) of the chemical(s) are considered?	

Has the author presented all relevant information on the chemical(s), use(s) and risk(s) related to?	
Has the author included all relevant information on the relevant regulation?	
Does the description contain information that is *unnecessary* for the analysis and discussion?	
Analysis	
Summarise in your own words, the author's answer to why the current regulation is the way it is?	
Is the explanation provided clear? If not, what could be improved?	
Is the explanation drawing on relevant and reliable sources?	
Do you find the explanation plausible?	
Discussion	
Summarise in your own words, the author's answer to whether existing regulation is appropriate.	
Summarise in your own words, the author's argument for the answer to the question above.	
Is the argument convincing?	
What parts of the argumentation would a person who disagree with the author's conclusion object to, and how?	
It what ways could the argument be improved?	
Language, spelling, grammar and references	

2020 Versions

Below are the guidelines 2020 sessions. The main difference is the absence of a detailed scheme with questions, particularly questions to the discussion sections.

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Skills

- In analysing relevant sources

Competences

- In discussing the use of the PP
- In constructing clear and concise arguments in writing

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Below are some suggestions on what to look for in the answer to the sub-questions. Note that the sub-questions need not be answered separately, but all three sub-questions should be answered somewhere in the report.

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The answer to this question is a *description* (as opposed to an analysis or discussion). Descriptions should be *correct, relevant* and *concise*.

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Part 2
The answer to this question is an *analysis*. In general, analyses should be *methodical*, *clear* and *true to the data/sources that it is based on*.

In this case, it will be important that the analysis is true to the sources is it based on – do you agree with the way you peer has read the main text? – that it is connected to the description, and that it is clearly presented and argued. It should be clear to you what the author believes the most important differences between the two cases are, and *why* the author thinks these are the most important. If it is not, help you peer by pointing out what you think is unclear and suggesting ways to clarify.

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In the report, the author should demonstrate the following:

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- Of relevant EU law

Skills

- In identifying and analysing relevant sources
- In classifying chemicals according to their hazards to humans and the environment

Competences

- In discussing data requirements for human health and environmental risk assessments of chemicals within various risk assessment frameworks
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- In constructing clear and concise arguments in writing

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When it comes to describing use, again consider whether the amount of information is appropriate, and if your peer has chosen to focus on only a part of the use, check whether this is clearly stated.

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The answer to this part is also a description, a description of the regulation covering the chemical under consideration. The above applies to this part as well.

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In this case, the analysis consists of an analysis of why the regulation described part 2 is the way it is. It will be important that the analysis is true to the sources is it based on, that it is connected to the description in part 1, and that it is clearly presented and argued. In this case, you might not know the sources that you peer is drawing on, but that makes you even more capable of providing feedback on clarity.

It should be clear to you what the author believes the most important issues with the chemical is. It should also be clear to you what your peer believes are the main reasons for why the regulation is the way it is. If this is not clear, help you peer by pointing out what you think is unclear and suggesting ways to clarify.

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Part 4

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References and sources

The report should have clear and consistent references as well as a reference list. A tricky issue in this report could be citing legal texts, check whether it has been done appropriately.

Sources should be of high quality, meaning that they should have gone through some degree of external quality control – the stricter the better. Peer reviewed research publications published in well-respected journals have been through the strictest control (editor + peer review). Newspaper articles have been through less strict control (editor only). Lecture slides have generally not been through any kind of external quality control and as such, they are not very reliable sources.