Original article

A peer review card exchange game

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Abstract
Introduction: Peer review aims to ensure the quality of research and help journal editors in the publication process. COST action PEERE, which explores peer review, including its efficiency, transparency and accountability, organised a peer review school endorsed by EASE. We developed a card exchange game based on responsibility and integrity in peer review for a hands-on training session.

Methods: We used the approach for the development of training materials about responsible research and innovation developed by the HEIRRI project, and the principles of the card game for the popularisation of the philosophy of science.

Results: We created 32 card statements about peer review, distributed across 6 domains: Responsiveness, Competence, Impartiality, Confidentiality, Constructive criticism and Responsibility to science. We adapted the instructions for the game and tested the game during the peer review school at the University of Split School of Medicine, Croatia, May 2018. The feedback by the participants was very positive.

Conclusions: The Peer Review Card Exchange Game could be used as an introductory activity for teaching integrity and ethics in peer review training.

Keywords: peer review, card game, research integrity, training

Introduction

Peer review is external review by experts that helps improve the quality of articles in scientific journals.[1] It should identify both the quality and the flaws of the presented research, and should help journal editors decide what to publish.[2] Expectations from peer review include checking for methodological rigour, monitoring the quality of reporting, and critical assessment of the conclusions, thereby preventing the publication of poorly designed or executed research.[3] Peer review is not flawless, and its efficacy in assuring quality is not clear-cut,[4] but, as Winston Churchill said about democracy in politics, it is considered the best system we have come up with so far for evaluating research.[1]

The process of peer review as it occurs today, prepublication and as a guidance to the editors, began in the 18th century.[5,6] Since then, it has developed substantially[7], but there is little evidence regarding best practice or how to improve the peer review system.[8] Recent innovations include more open and democratic peer review, separated from journals,[9] pre-print servers, non-selective reviews that address only the methodology not the novelty or importance, open peer review associated with journals, which makes names of authors and reviewers available and pushes for publishing of review reports, and interactive peer review.[10,11]

One initiative that explores new frontiers of peer review, including its efficiency, transparency and accountability, is COST Action PEERE: New Frontiers of Peer Review. PEERE has representatives from 31 countries and aims to analyse peer review in different fields, evaluate different models and involve a variety of stakeholders in defining an agenda for reform in peer-led review.[12, 13]

Among its activities, PEERE organised a peer review school in collaboration with EASE at the University of Split School of Medicine, Croatia, May 2018.[14] The aim of the school was to present best available peer review practices, offer new perspectives, and discuss responsibility, support systems and the future of reviews. A part of it comprised hands-on training on responsibility and integrity in peer review, led by AM.

We wanted this training to be an interactive and inclusive introduction to the integrity and ethics of peer review so we developed a card game on peer review based on our experience with pilot training programmes in the H2020 HEIRRI project.[15]

Card exchange is a learning game developed by Bergquist and Phillips in 1975,[16] and subsequently popularised by Cobern in the philosophy of science.[17] The game is based on a conversation about the contents of the cards. Participants have to define what they consider acceptable and explain why, and they have to achieve a compromise with fellow participants while working as a group. The model was used to develop a card game on responsible research and integrity (RRI) in RRI training programmes developed by the HEIRRI project.[18]

In this report, we describe the development of the statements, based on issues in peer review, and adaptation of the game to a workshop setting. Our aim was to develop a set of statements that express certain viewpoints on the processes in peer review, that are easily understood and relevant to contemporary issues. We also wanted to include the statements that were simple and general and at the same time ambiguous enough to leave room for critical assessment and questioning by the participants.

Methods

Card statements
We looked for general guidelines for peer review, as well as training and introductory materials from the Office for Research Integrity Peer Review Resources at Yale University, USA,[19] Peer Review Quick Guide from the University of Northern Illinois, USA,[20] Responsible Conduct of Research Courses from Columbia University, USA,[21] The Society for Neuroscience, USA[22] and Resources for Research Ethics Education on peer review, University of California San Diego, USA.[23]

Using information from those sources, we selected six domains that would be addressed by the statements:

1. Responsiveness – the time needed for a review
2. Competence – the required skills and proficiency for a review
3. Impartiality – objectivity, biases and conflicts of interest
4. Confidentiality – privacy and trust in sharing materials
5. Constructive criticism – the scope of reviewers' work
6. Responsibility to science – the value and role of peer review in science and progress.

One of the authors (RT) drafted 30 statements that were then discussed with the other author (AM), which resulted in the removal of two statements from Responsibility to science domain. Four new statements were added after discussion, two to the Confidentiality domain and two to the Constructive criticism domain.

Card game instructions
For instructions, we relied on the philosophy of science card game by Cobern,[17] and on the modifications made for HEIRRI training materials.[18] In the philosophy of science card game,[17] each participant is given 6 to 8 cards at the beginning. They have 10 to 15 minutes to evaluate them and exchange with other participants. In the second phase of the game, participants pair up and repeat the process. In the third phase, pairs of participants combine to form groups of four. Participants have to choose three cards they all agree with and write a short paragraph on the nature of science. They discuss what they wrote with the instructor, and then look for elements of the statements on the cards in two case studies. While this is a detailed and thorough way of playing the card exchange, its disadvantage is the time it requires. To fit the game into the peer review schools' scheduled practical, we had to speed up the process. Regarding the content, we eliminated writing a short report and searching for statement elements in case studies. We added that, among the cards they were given (6–8 cards per group), the participants had to find one statement with which they all disagreed and two with which they all agreed. For these activities, around 30 minutes is advised.

After that, the main discussion is held. A speaker for each group should present the cards the group or pair agreed on and justify the statement. The same should be done for the card they disagreed on. The instructor's role is to guide the discussion, allow others to bring in their points of view and, ultimately, ensure the group comes to some sort of conclusion.

Regarding the format, we formulated our instructions for groups of participants (four to six participants in each group), but also offered instructions for starting the game as individuals. If participants were given cards individually, each participant gets 6 to 8 cards they can assess and exchange with others. The card game instructions are available in **Supplement 2**.

Implementation and evaluation
The card exchange game was piloted during the hands-on training called "Responsible peer review – how to avoid mistakes", as a part of the PEERE peer review school, which had 27 participants. The card exchange game was not evaluated specifically. Participants submitted final surveys on their experience in the peer review school. The surveys included nine questions regarding knowledge and skills gained and their anticipated use in the future, most and least valuable aspects of the school, opportunities for informal discussion, suggestions for improvements, willingness to recommend the school to others and miscellaneous; and three multiple choice questions on balance of time given to lectures and discussions, quality of discussions, and overall evaluation of the school. We analysed the survey answers for the comments on the card game, to assess the participants' opinions about and experience with the card game. We searched the text of participants' answers for keywords related to our training (card, exchange, integrity, responsible, ethics, Marušić – the teacher who led the card game). We screened answers that contained at least one of those keywords to confirm that they referred to our training specifically.

Results

The Peer Review Card Game had 32 final statements (Table 1). A print version of the cards is available as **Supplement 1**.

Card game instructions
The instructor allocates participants to groups of four to six people, depending on the overall number of the participants. We arranged the groups to be composed of participants from different fields of research, experience and level of expertise so that different experiences and professional standards could be exchanged during the discussion about card choices. Each group received a pack of six cards. Card packs for different groups had different cards, with some overlap.

The participants evaluated their cards, and decided whether or not they agreed or disagreed with the statements on the cards.

Piloting
Twenty seven participants were involved in the peer review edition of the card exchange game. They were from various fields of research (business, technology, maritime sciences, biomedicine, library and information sciences, social sciences and humanities), and had different levels of experience (PhD students, research assistants, associate professors, senior lecturers, editors). Participants were divided into five groups overall, three groups of five and two groups of six. The groups were formed to include representatives

from different communities. They were given six cards per group, along with the instructions. When they had all read the statements, exchanged the cards and reached consensus, which took around 30 minutes, the final discussion was held, which lasted for an hour. The statements were scrutinised and refined by all participants, starting with group 1, who presented their agreements first.

Evaluation

All 27 participants completed the surveys. In 93 open ended comments that they wrote in the survey, 17 statements related to the card game. Most card game mentions (n=15) were in answers to questions on knowledge and skills gained throughout the school (n=7) and the most valuable aspects of the School (n=8). All of the participants' comments were positive. The participants enjoyed the interactivity and discussion raised by the game, and mentioned there should be more such activities in training about peer review.

Discussion

This case study describes the development and successful implementation of a card game about peer review as a way to stimulate discussion and learning. The Peer Review Card Game sparked interest and engagement, and generated constructive discussion among different stakeholders in research, from early stage researchers to senior academics and journal editors.

Educational card games have been shown to be effective in improving students' understanding and knowledge, while being motivating and more desirable than traditional lectures.[24, 25] Card games have been developed for materials that have a more defined body of knowledge than does ethics, such as biology,[24] immunology,[25] and several games for chemistry.[26-28]

The Peer Review Card Exchange Game addresses ethics and integrity in the peer review system, which does not have definitions students should learn.[29,30] We believe this is a strength, because through the design of the game, participants are encouraged to define their views, verbalise them, compare them with those of other participants, refine and justify them to their peers.

This type of approach is supported by evidence from other research and integrity issues, which shows that decisions in this field are very often based not on previously described objective policies, but on moral principles. For example, studies on authorship credit showed that students who have no prior theoretical instructions intuitively come to similar conclusions as those who receive formal instruction on the International Committee of Medical Journal Editors' authorship criteria.[31] If the results of indirect approaches to teaching ethical criteria are similar to established, then introducing topics such as ethics in peer review in a form of a card exchange game could be more effective than only using the theoretical approach only, especially when factoring in participant engagement and satisfaction.[25]

We hope that the academic and editing community will use the card game (available in the **Supplements** to this article) in training activities and test, improve and adapt the game to different settings and peer review and research ethics topics.

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Authorship contribution: Both authors contributed equally to the research and writing of the manuscript.

Conflict of interest declaration: AM declares the involvement in the management structure of the COST Action PEERE.

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Table 1. Statements for the Peer Review Card Game

Domain	Statement
RESPONSIVENESS	A review should be done within designated time, otherwise authors could be hurt professionally.
	If a reviewer is too busy and knows that he or she will not manage to review within a designated time, they should decline to be a reviewer.
	Time needed for a careful and thorough review should be decided on by the reviewer, and not the editor or authors.
	It is more important that an appropriate reviewer assesses the research than to review the manuscript on time.
	If a reviewer is too busy and knows he or she will not manage to review in designated time, it is acceptable to ask help from a collaborator.
COMPETENCE	Reviewer should clearly declare his or her scientific competence to journal editor or a funding body before the review process.
	If a reviewer is unfamiliar with some methods or statistical analysis in a manuscript, he or she should ask a colleague or a statistician for help. It is not necessary to report this to the editor.
	If a reviewer is unfamiliar with some methods or statistical analysis in a manuscript, he or she should refrain from commenting on it and focus on areas of own competence. This should be reported to the editor.
	Peer reviewers should be only researchers from the same research field of the submitted manuscript.
	Research results should be assessed by experts from different fields, to make the assessment more valid.
IMPARTIALITY	One should not review papers from authors with whom they have previous research collaboration.
	Reviews should be double blinded, to avoid as many biases as possible.
	Reviews should be completely transparent, with reviewers' and authors' identities visible, and available online after editorial decision on publication.
	Apparent conflicts of interest do not have to be reported, as long as the review is performed ethically and responsibly.
	Not all conflicts of interest should prevent a reviewer from assessing a paper.
	A reviewer should never suggest citing his or her own work.
CONFIDENTIALITY	Changing your own experiments and course of research because of new information you got from a manuscript you have reviewed is acceptable practice.
	Using review process to get new ideas and collaborations for research is perfectly acceptable.
	Reviewers should not contact the authors even after the publication of the paper.
	Editor should never allow contacts between the reviewer and the author during the review process.
	It is acceptable to show the manuscript you are reviewing to your colleague if you need advice on some issues in the manuscript.
CONSTRUCTIVE CRITICISM	It is sufficient that a reviewer recognises and points to a problem in a manuscript under review.
	The reviewer should identify a problem in the manuscript but also suggest solutions or alternative approaches.
	The reviewer should assess if a paper is suitable for the scope and standards of the journal, and not only its scientific validity.
	The reviewer should check all references in the manuscript.
	The reviewer should always edit the language of the manuscript.
RESPONSIBILITY TO SCIENCE	Participation in peer review is a valuable service to science in general.
	Peer review improves the quality of research.
	Peer reviewers should be given more credit, including some sort of financial payment.
	Peer review is a quid pro quo service and reviewers should not be financially compensated.
	Peer review hinders progress by dismissing innovative research as controversial and not publication-worthy.
	Peer review does not help in improving body of knowledge because it does not prevent papers from being published.

Peer review cards are available on the covers of the journal, ready for you to use. The instructions for the card game can be found in the electronic version of the article.