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COMMUNICATION

Dialogical teaching of research integrity: an overview of selected methods

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Abstract

This communication discusses the dialogical methods of teaching research integrity and ethics as a part of the positive integrity trend focused on supporting ethical behaviour. The aim of this paper is to offer a brief overview of the selected dialogical strategies based on cases that can be successfully implemented in teaching ethical research and when sharing experiences on good scientific practice. We describe such methods as: storytelling, rotatory role playing, and the fishbowl debate, along with the "Dilemma Game" tool, "ConscienceApp" performance, and a flipped classroom idea. These theoretical considerations are based on research conducted as part of a European project under the Horizon 2020 programme.

Key words: dialogical methods, research integrity, teaching tools, Path2Integrity

OPEN ACCESS

Citation: Koterwas A, Dwojak-Matras A, and Kalinowska K. 2021. Dialogical teaching of research integrity: an overview of selected methods. FACETS 6: 2138–2154. doi:10.1139/facets-2021-0045

Handling Editor: Steven J. Cooke

Received: April 29, 2021

Accepted: October 13, 2021

Published: December 23, 2021

Note: This paper is part of a collection titled "Teaching and Learning Research Integrity".

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Published by: Canadian Science Publishing

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Introduction

The ethical and responsible conduct of research is essential for scientists. It protects individual researchers and contributes to the quality of their research, but above all it maintains and strengthens the public's trust in science, guarantees the development of science, and promotes economic growth (cf. Science Europe Working Group on Research Integrity – Knowledge Growth Task Group 2015). Nevertheless, in recent years, the number of incidences of research misconduct has been growing (Fanelli 2009; Bornmann 2013; Godecharle et al. 2018; Steneck 2006). This is a serious threat to science as well as to society and individuals (Bornmann 2013). It is especially relevant in today's post-truth era, where citizens are uninformed or misinformed about the true body of knowledge, have difficulties in identifying fact versus fiction, and perceive doubtful sources of information as credible (Dietram and Krause 2019). "Science is arguably the last metanarrative with any significant cachet in the postmodern period" (Grech 2017, p. 118). Therefore, there is a need to enhance ethical behaviour in the academic community and to teach research integrity (Shephard et al. 2015; Hyytinen and Löfström 2017; Mumford et al. 2006). The dialogical approach is a promising teaching method that encourages questioning and critical thinking (Alexander 2019).

Discussion regarding the effectiveness of implementing research integrity principles in the European scientific community has blossomed in the last three decades, especially after the first World Conference on Research Integrity in Lisbon 2007 and the appearance of the first publications directly addressing the challenge of fostering a culture of research integrity (cf. Steneck 2006; Ferguson et al. 2007; Luce et al. 2012; Mansoor and Ameen 2016; Horbach and Halffman 2017; Forsberg et al. 2018; Kretser et al. 2019; Akbar and Picard 2020). However, there is a lack of common and universal

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regulations or teaching guidelines among universities (Watts et al. 2017). We recognise that there is a need to consider the ways research integrity can be taught and how to disseminate good practices. It is relevant both to the theoretical field and in educational practice.

There are only a few studies on positive research integrity training or on promoting positive behaviours within academia (Caelleigh 2003; Ferguson et al. 2007; Benos and Vollmer 2010; Resnik 2012; Bird 2014). By "positive research integrity" we mean a positive approach in building a culture of research and scientific ethics based on values and good research practices, promoting exemplary behaviours and fostering public trust (McGowan 2009, Kalinowska et al. 2020; Evans et al. 2021). Most studies on research integrity issues still focus on the problem of improprieties. For example, Kornfeld and Titus (2017) and Kornfeld (2018) listed how many scientific publications are devoted to the subject of misconduct and how few of these describe programmes supporting ethical research. Among the few studies on this topic that do exist, we can distinguish those in which scientists pay special attention to the trend of positive integrity teaching strategies and the way to foster a culture of research integrity (Atkinson 2008; Steneck 2013; Löfström et al 2015; Marusic et al. 2016; Gundersen 2017; Hyytinen and Löfström 2017; Watts et al. 2017; Gynnild and Gotschalk 2018;).

In the practical field, universities have insufficient comprehensive teaching programmes of specific actions or awareness-building initiatives (for example, "Integrity in practice toolkit" developed by the UK Research Integrity Office) in the field of research integrity (Ferguson et al. 2007; Watts et al. 2017; Prieß-Buchheit et al. 2020; Evans et al. 2021). Some studies reveal that teachers continue to be confused about the existing integrity policies of their university and their roles in the process of ethical training (Löfström et al. 2015; Shephard et al. 2015). However, most believe that responsibility in conducting research can be explicitly taught by direct explanation, demonstration, and practice (Hyytinen and Löfström 2017).

In this paper, we discuss dialogical teaching approaches to foster ethical awareness in science. We describe common and widely recognised dialogical methods that can be used in positive integrity training. The selection of these methods was based on the results of the Path2Integrity survey that we conducted among academic teachers (see path2integrity.eu/teaching-RI/methods for more information) (Häberlein et al. 2019). This paper is based on the analysed findings of the desk research and the literature review conducted as part of the Path2Integrity project (Prieß-Buchheit et al. 2020). The desk research was aimed at an initial mapping of the methods of teaching scientific reliability and research ethics, as well as recognising the place of the learning process in the system of building and supporting scientific integrity at various universities. We collected information from university websites and the websites of national or international organisations addressing research integrity.

Research integrity issues determine the teaching strategies

Most of the university curricula offer obligatory or voluntary research integrity courses, usually implemented as ethics (bioethics), legal aspects of research, the philosophy of science or, at the very least, methodological courses that include selected research problems of an ethical nature (Häberlein et al. 2019). **Fig. 1** details the topics that are currently discussed during classes in the field of research integrity and ethics.

The educational content of some courses includes such indisputable issues as: the law, academic policies, current regulations, codes of conduct, or the procedures of conducting research as well as issues that are relative and require deeper understanding and reflection (Dwojak-Matras et al. 2020; Schrag 2008).

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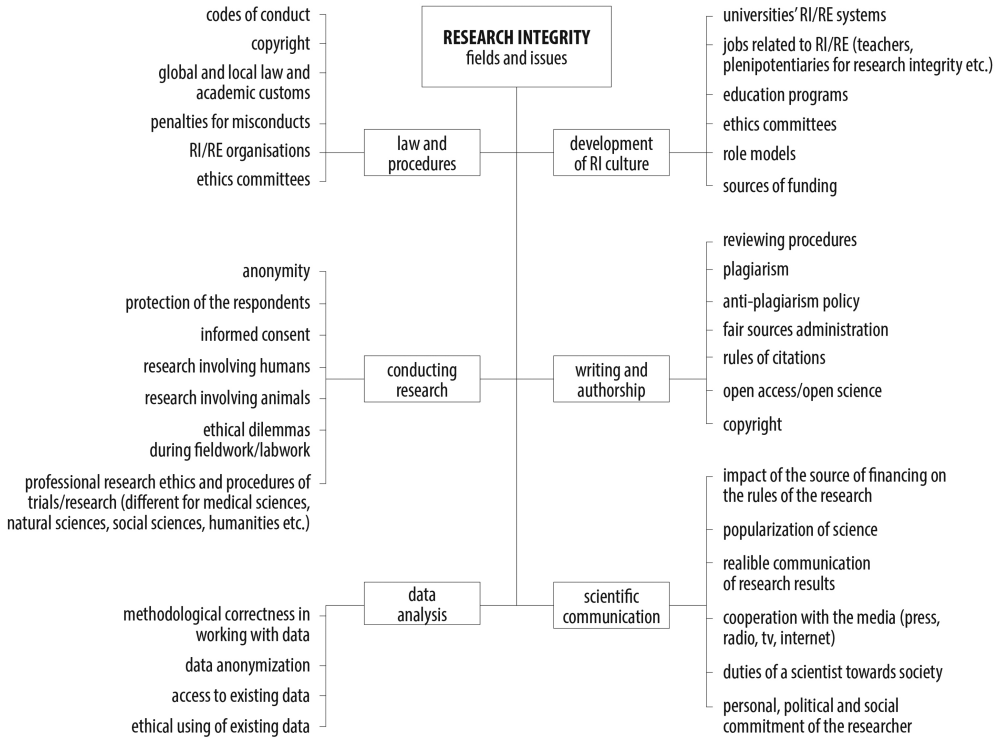

Fig. 1. Topics discussed during research integrity classes.

As an example of the relativity of research integrity issues, we can consider the difficulty in defining "misconduct" (cf. Zuckerman 1977; Steneck 1999; Resnik 2003; Fanelli 2011). The traditional definition of research misconduct, commonly known as FFP, consists of the fabrication of data, falsification of data, and plagiarism in proposing, performing, or reviewing research or in reporting research results. This definition was developed by the U.S. Office of Science and Technology Policy and is used by most research funding agencies. FFP involves infringements of the basic conventions in handling data and acknowledging sources mainly relating to the publication system (Horbach and Halffman 2017). These direct violations of good research practices are considered particularly serious because they incorrectly portray the record of the research (ALLEA 2017). However, scientists have broadened this very narrow and limited definition. They identify various specific improprieties that are contained in the FFP definition (e.g., Rezaeian 2014) or suggest additional ones that could be included, for example sexual harassment, sabotage, deceptive use of statistics, or failure to disclose a significant conflict of interest (Resnik 2019). Researchers are also trying to place misconduct on a continuum, from very serious behaviours to questionable research practices (Rezaeian 2014), which include unethical behaviours not strictly linked to research practices or different forms of sloppiness (Fanelli 2011). However, the broadest definitions may be problematic and are criticised by some researchers because the rules are not clear (cf. Zuckerman 1977; Fanelli 2011). Whether behaviour can be considered abuse is often relative. In many cases, defining good and bad research practices is ambiguous. It may be difficult to assess when a scientist has done something unethical, and it is not that obvious when and how they deserve some type of fine or punishment (Horbach and Halffman 2017; Salwen 2015; Fanelli 2011; Artino et. al. 2019). In other words, the line between ethical and unethical behaviour in science is sometimes blurred and unclear. What is ethical and what is not

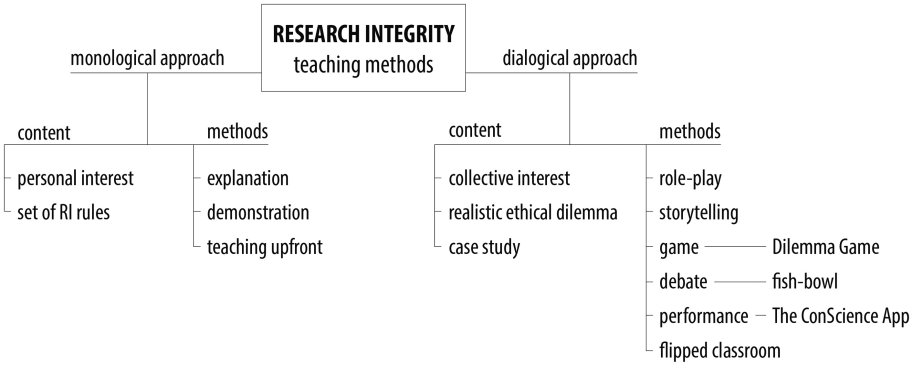

Fig. 2. Teaching methods and content—two approaches.

ethical sometimes may depend on individual experiences and perspectives (e.g., Rawwas et al. 2004; Davis 2003).

Considering the relativity and complexity of the ethical issues mentioned above, teaching should be predominantly based on the dialogical approach. Dialogical teaching includes the range from ontological assumptions to very narrow technical aspects (Alexander 2019). Different scientists considered dialogue from different perspectives, which Lefstein and Snell (2014) called the quasi-paradigmatic dialog concept. For example, Socrates treated it as a form of critique, Freire as empowerment, Vygotsky as a construct meaning in relation to others, and Bakhtin as the interplay of voices. Each approach may be reflected in the teaching–learning process and translated into school practice. The last two concepts have especially attracted the attention of researchers and educators.

Dialogical teaching derives from the idea that each of us is unique and interprets the world in our own way and that we construct our knowledge through dialogue and negotiation in a cognitive partnership. According to Bakhtin (1986), meaning is negotiable, so utterance can be "internally persuasive", developed slowly and step by step as one's own thinking. Dialogue does not lead to a single correct answer or to final knowledge. Learning is based on the method of dialogue in which pupils, students, and young scientists express their own judgements and present rationales for their own theses. The ability to debate enables learners to get to the point of the discussed issue, even if this means changing their opinion about it.

At the opposite end is the monologic approach. In this approach, meaning is always fixed. The speaker has the power and is deaf to the voices or perspectives of others; the utterance is "authoritative" and remains outside the listeners (Bakhtin 1986). The student is not expected to respond to it but to either accept it or reject it. This approach does not support deeper understanding. The monological approach in teaching is teacher-centred, focused on teachers' activities relating to transferring information (e.g., explaining, clarifying, demonstrating, showing, dictating). Students are expected to listen, record, or remember. Its focus is to deliver prepared knowledge to students by transferring exactly what is said and what the students should know (Klus-Stańska 2012). The monological type of teaching is based on direct instruction and the teacher's individual interests. Its main goal is to provide a set of principles and requirements for reliable objective research. (**Fig. 2**)

It seems that as a subject, research integrity is filled with cases and dilemmas that can be better recognised and understood through dialogue and an exchange of ones' reflections (Schrag 2008; Evans et al. 2021). Schrag (2008) emphasised that "the more one engages in ethical reflection, the more habitual it becomes. That reflection reinforces a habit of looking for the ethical elements in a research situation

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and trying to determine the right thing to do" (p. 93). It is crucial to be open to discussion about one's thoughts on moral and ethical issues, as "discussion is a powerful pedagogical tool for encouraging students to be active learners, and they can improve comprehension, motivation to learn, and communication skills, (...) challenge the validity of responses, and offer alternative points of view" (Cummings 2015, p. 24). The main aim of the dialogical method is to create a learning environment where students can share ideas, demonstrate their knowledge and experiences, reflect, and present their opinions and arguments (Klare and Krope 1977; Gadamer 1989; Widdershoven and Solbakk 2019; Prieß-Buchheit et al. 2021). This method, apart from supporting the development of specific skills (for example: comparing, deliberating, recreating, constructing, etc.) and learning dialogue rules in didactics, has cognitive value, which includes the development of deeper understanding, elaborating, learning concepts, and discovering the relationships among them (Diaconu 2008).

Various applications of dialogical teaching

Recent research shows that teachers are proactive and favour dialogic approaches (Hyytinen and Löfström 2017). Teachers suggest that the monologic approach is invariably viewed negatively by students (moralising/moralisation) and does not result in positive outcomes. In teaching research integrity based on the dialogic approach, researchers pay special attention to the effectiveness of case-based methods (Fisher and Kuther 1997; Atkinson 2008; Schrag 2008; Rissanen and Löfström 2014; Gundersen 2017; Tammeleht 2019). In brief, they focus on presenting selected cases to students, asking them to discuss, analyse the main problem or described difficulties, and consider solutions and their consequences (Herreid 1994). The core of this approach is to select or design appropriate examples that "are typically written as dilemmas, which give a personal history of an individual, institution or business faced with a problem that must be solved" (Herreid 2007, p.30). These are commonplace and realistic problems that makes them personal and engaging for the students; the case-based approach illustrates a range of viewpoints, allows students to reflect, and makes it easier for them to relate to the content and its relevance. The main aim is to develop a higher order of skills in learning, such as decision-making, analytical and oral skills as well as critical thinking, rather than learning content and facts (Herreid 2007).

The role of the teacher is to prepare appropriate cases (real or fictious), ask adequate questions, and ensure a good atmosphere and proper approach for the participants—a space for dialogue. The literature contains many available cases, ready to use in the classroom (for example, developed by the Office of Research Integrity 2019, UK Research Integrity Office 2014 or from the seven volumes from the Association for Practical and Professional Ethics (APPE) University of Nebraska-Lincoln available at ethics.unl.edu/ethics_resources/local/appe-case-studies.shtml#volume7). There are also tutorials and tips on how to write cases (Herreid 2007) and questions teachers can ask to promote reflection among students (Gundersen 2017). As a result, teachers engage with students in a way that fuels active discussion or debate around ethical dilemmas and initiates change in what learners think they know and who they are in terms of behaviours. Overall, the goal is to help students build identities and values that will be impervious to the behaviours threatening to undermine scientific integrity. It can be applied in collaborative work in a group, a large group discussion, or as a class debate (Herreid 2007).

Many methods and techniques of working with and instructing students are case based. Based on our findings and common educational practices, we describe selected examples of this approach used in teaching research integrity, such as: storytelling, rotatory role-playing, the "ConscienceApp", the "Dilemma Game", fishbowl debate, and a flipped classroom. **Table 1** summarises and compares these strategies in three main categories. We called the first category "provocation", as it always concerns an influential case—a deliberately chosen and properly presented situation, story, or dilemma that will most likely engage and provoke students. The second category describes the activity they are involved

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Table 1. Summary and comparison of dialogical teaching methods.

Case-based teaching methods	Provocation—teaching tools	Student's activities—moments for reflection	Forms of participation
Storytelling	A story that is read or told	While listening, students ask questions, create new stories, or implement changes to given ones	Pairs or group work, the whole class
Rotatory role playing	Plot/scenario	While being played out by participants (changing roles and perspectives)	Group work or the whole class
The ConScience App	Theatrical act as one case for all	While watching and listening, then during a moderated discussion	A wide-ranging academic audience
The Dilemma Game	Short cases with 4 solutions to choose	While playing the game and then when discussing choices	Individual, group, or class work
Fishbowl	A problem to debate	Depends on the role: while debating or during observation	The whole class
Flipped classroom	A case or problem to read and reflect on at home or before the meeting	While reading, searching for answers. While preparing one's own opinion	Individual or group work

in while participating, when self-reflection and critical thinking are supposed to happen. And the third can serve as an indication for the possible forms of participation—individual, pairs, group, the whole class, or the whole academic audience.

Ethical dilemmas as an educational provocation

Storytelling

Storytelling is one of the oldest educational strategies that has been successfully practised by many parents and teachers, and it is probably the most well-known and one of the oldest pedagogical methods, also used in higher education (e.g., Aiex 1988; Alterio and McDrury 2003; Rinvolucri 2008; Miller and Pennycuff 2008; Nguyen et al. 2014). Good stories continuously teach us much about life, ourselves, or others. For thousands of years, people have been learning basic life values and ways of behaving through tales about culture, values, and history; stories full of various types of characters, both heroes and villains; epic battles; cases of scientific inventions; artistic creations; etc. (Andrews 2010). When this method is properly designed in a meaningful way, it can use everyday practice examples and turn them into learning opportunities—encouraging reflection, a better understanding of the topic, and boosting critical thinking skills (Alterio and McDrury 2003).

Although there is currently no specific literature on storytelling and learning research integrity, teachers use selected stories to influence the attitude of learners and the way they behave in certain situations. It is a unique method that can help listeners understand, develop respect and appreciation for the work of other cultures, and can promote a positive attitude towards people of different countries, races, and religions (Eder 2007; Robin 2015).

Stories have many functions in the educational process, such as arousing students' interest, facilitating the flow of lectures, helping to memorise material, overcoming resistance or anxiety among students, and building relationships between the teacher and students or among the students themselves (Green et al. 2002). "While recognizing the differences of students, storytelling can find ways to build

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community within a classroom and a school by encouraging reflection and identifying commonalities" (Miller and Pennycuff 2008, p. 38).

By using vivid and realistic stories, teachers enable students to imagine how ethical decisions may affect a group of people or themselves and, in terms of the audience, a good and well-selected story serves not only to engage our thinking but also our emotions (Green and Brock 2000).

Listening to the presented case, discussing it, and reflecting on it creates an innovative, rich learning experience for students. Well-chosen testimonies from other students or experienced scientists shed light on the realities that researchers usually experience and that may help both students and young researchers to overcome stereotypical solutions or the beliefs they may have (Green et al. 2002). Stories aimed at drawing attention to specific ethical dilemmas create a controlled, predetermined context for the moral imagination, thus enabling open discussion and individual reflection (Miller 2009). The content of the story should represent the ethical values that are to be known (Driscoll and McKee 2007).

Role playing

Cases and ethical dilemmas can also be presented to students through role-playing. Role-based teaching or drama is an educational method for transferring concepts and behavioural change that involves students in the process of developing a deeper understanding of the different positions in one's case/situation (Culbertson 1991; Comunian and Gielen 2006; Belloni 2008). In role-play, participants play the characters, "identifying" with their emotions and creating stories together to view the issue from the perspective of others who are part of it. "By giving the student access to an 'authentic' activity through which to learn we give them the chance to engage more effectively with concepts and prepare them to become reflective practitioners. We also give them the chance to engage in the culture of a particular activity" (Douglas and Johnson 2010, p.32). The main purpose of role-play exercises is to visualise how different "attendees of the situation" react and actually face the ethical challenges of the exercise. As participants may assume roles other than their actual position, this is also an opportunity to view issues from the perspective of others and to test nontypical ways of behaviour through acting (Culbertson 1991; Löfström 2016).

Role playing can be treated as a type of group game that helps in learning about the emotions of the characters in a given, morally difficult situation. Playing a specific role is the basis for experiencing some of the feelings correlated with the situation, and when the teacher additionally asks questions (Belloni 2008) it strengthens the evoked state of empathy, thus facilitating in-depth reflection of the perceived states. "Simulations and role taking may help students to see the different sides of research ethics, including the aspects that are usually invisible to the research participants" (Löfström 2012, p. 359). It allows students to discover its complexity and also to better imagine the related dilemmas and responsibilities (Comunian and Gielen 2006).

Though there is hardly any evidence of the efficacy of this pedagogical technique in reducing the incidence of unethical behaviours, it should be mentioned that actively involving students and engaging their ethical sensitivity allows them to face the dilemmas of people who have to make various decisions in conducting research (Löfström 2012; Prieß-Buchheit et al. 2020). "Ethical sensitivity is the first step in real-life moral decision-making (...). Without recognising the ethical aspects of a situation, it is impossible to solve any moral/ethical problem" (Clarkeburn 2002, p. 439).

The ConScience App

Another specific example of a case-based strategy is called The ConScience App. The moral and ethical dilemmas are presented through a theatrical piece by professional actors from the theatre

company *Het Acteursgenootschap* (The Acting Society) in collaboration with members of the Young Academy of KNAW (Royal Netherlands Academy of Arts and Sciences)[1]. They are invited to universities interested in the project and this method focuses on challenging scenarios while presenting the daily work of academic researchers. The scenes are usually treated as a starting point for 30–60 min of discussion among colleagues and students on the themes raised in the script, and there is an accompanying instruction manual to facilitate discussions.

The after-play discussion is more effective the more diverse the group of its participants is. The idea is that the audience consists not only of students, but also of representatives of the whole academic community, from PhD students, to young researchers, to professors. A wide-ranging academic audience is crucial because it highlights different points of view while discussing the performance. According to one of the actresses and managing staff of The ConScience App, theatre is a great medium for discussion. It personalises the issues and makes them come alive. She argues that through theatre, the audience can see human complexities and power relationships. The research world is presented as full of passion, excitement, drama, jealousy, and intrigue. Thus, the ethical issues come alive and are not just a set of rules to be studied. Using the case as a theatrical act is an interesting exemplification of the case-based approach that affects more senses and emotions than just reading stories. This play intriguingly addresses various topics relating to research culture and research integrity, naturally building up the cognitive tension that viewers release during the discussion that begins immediately after the presentation.

The Dilemma Game

While focusing on the search for inspiring training strategies, research integrity educators should not miss The Dilemma Game—a card game or online mobile interactive app designed to initiate discussions about research integrity and research culture. The Dilemma Game was developed to focus on professionalism and integrity in research by using many common research cases and scientific dilemmas, thus inviting dialogue on the subject. The game and rulebook are available from eur.nl/sites/corporate/files/dilemmagame-mrg.pdf and can be freely used.

At the beginning, the game was just part of faculty training sessions on research integrity at Erasmus University in Rotterdam (EUR), but it was digitized in 2020 (more information available at eur.nl/en/about-eur/policy-and-regulations/integrity/research-integrity/dilemma-game) and it has been one of the initiatives of the EUR Taskforce on Scientific Integrity. The cases are short dilemmas written on cards (one case per card) with four possible solutions to choose from. The dilemmas present a wide range of research integrity topics such as: research design, data collection, data processing and analysis, data archiving, and access or publication.

The task of the players is to analyse the problem and choose the best option. Afterwards, they are expected to explain their choice based on their own experiences, knowledge, and opinions. After the game, players can also answer such questions as: For which dilemmas did most players change their mind as a result of the discussion? What were the most convincing arguments used in the discussion? For which dilemmas did most of the players agree with the final choice? The challenge is to change the choices of the other participants.

[1]This project was selected by The Royal Society and the UK research and integrity office as one of the highlights in their Integrity in Practice Toolkit. Link to the description of the play: hetacteursgenootschap.nl/producties/the-conscience-app.

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Fishbowl technique

Another good practice is the fishbowl technique. As with other types of moderated dialogue, it is a very successful form of conversation often used when discussing topics within a group of students (Cummings 2015; Young 2007). In a fishbowl discussion, a few chairs are arranged in a circle symbolising the fishbowl. The debaters sit in the fishbowl, and they are the only people who can speak. Others observe the discussion from outside the circle and may actively judge or provide commentary on the debate. If the others want to contribute to the discussion, they usually must swap places with a person from the fishbowl—in an open fishbowl, one chair is left empty and audience members can rotate through, adding their views on the topic. In general, by the end of the 60–90-minute session, just about everyone in the class has spent some time on the panel, posing questions, answering others, describing experiences, and debating points of difference. Taking part in a fishbowl discussion allows students to construct meaning and to exercise the skill of critical thinking (Cummings 2015) and evaluation while exploring ethical issues relevant to their own dilemmas regarding the research process or developing their scientific career. Fishbowl-style discussions are not meant to reach agreement but instead generate an intimate and spontaneous conversation used for creating an atmosphere for open and lively dialogue among the participants. The technique motivates students to practise the skills of expressing themselves and reflection, as well as some community-building capabilities. It can help bring transparency to the decision-making process and increase trust and understanding about complex issues while observing the process of acquiring clues about the given dilemma (Dutt 1997). Also, by using open-ended questions, students better understand what was not known before. It helps them get to the core of the issues as they discuss them (Zhang 2013; Effendi 2017).

Flipped classroom

There is one more method that can play a meaningful role in teaching research integrity—the flipped classroom concept—which is a pedagogical approach that shifts direct instruction from the collaborative learning space "to the individual learning space" (Flipped Learning Network 2014). It describes case-based integrated learning as a teaching method in which teachers usually create or suggest ready-to-use material for the students to read and reflect on at home. Students learn about a topic on their own and then participate in exercises or presentations at school. The flipped classroom is seen as an active, student-centred approach that was formed to increase the quality of the time spent within a class (Hui-Wen and Ying-Hsiu 2016; Zainuddin and Attaran 2016; Tolks et al. 2016). It presents the teaching process outside the traditional classroom when part of or all direct instruction is delivered through videos and other media, while individually listening or reading. Class time is used for engaging students in collaborative, hands-on activities mostly devoted to question-and-answer sessions, exercises, projects, and discussion. As a result of individual study, the classroom is then "transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (Flipped Learning Network 2014). González-Gómez et al. (2016) confirmed that most students seem to perceive the flipped classroom method as positive, noting the ability to pause, rewind, and review lectures as well as also mentioning the increased level of successful individualised learning and increased teacher availability. The flipped classroom method differs from many other blended learning scenarios, as it provides detailed instructions regarding the sequences and process of the learning phases (Tolks et al. 2016). Trainers have to plan activities for both phases, the self-directed learning phase (individual phase) should always precede the classroom instruction phase, and they need to make sure that the phases are not repeated and the same content is not re-used (Raths 2013).

Though the idea of a flipped or inverted classroom is not new, it has been receiving increasing attention recently. The development and prevalence of information technologies supporting remote learning gives this method new meaning and new possibilities (Bishop and Verleger 2013).

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Furthermore, in the Horizon 2014 report, it was classified as one of the most important teaching and learning technologies developed in continuing education (Johnson et al. 2014). Some studies definitely show that the flipped classroom method is very helpful in improving students' self-learning ability, problem solving, teamwork, and communication skills compared with traditional lectures, as it increases both student–teacher and student–student interactions (Li et al. 2020). Many colleges and universities have embraced the flipped learning model, as it provides opportunities for increased peer interaction and deeper engagement with the material. In addition, some studies show that students reported positive motivational beliefs towards the flipped classroom model (Ying and Tompson 2020).

Conclusion

This overview is focused on pedagogical methods that are identified as dialogical, student-centred, motivational, and tailored interventions with great potential for fostering ethical behaviours and responsible ways of thinking. The described teaching strategies are selected as the most promising and actively engaging, so the sensitive issues of research integrity are well-captured and internally reflected on. This communication can be treated as a basic guide for teachers—a dissemination of a valuable toolkit in teaching ethical issues. Continued studies and evaluation on applying all the above-mentioned methods are needed to collect empirical evidence on promising, effective, and profound research integrity learning experiences.

Funding

This work is a part of the project Path2Integrity. Path2Integrity receives funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 824488.

Acknowledgements

The authors would like to thank Professor Julia Prieß-Buchheit for her support and valuable comments and Lisa Häberlein for her positive, inspiring attitude and all the tips regarding the selection. We are also grateful to the other members of our project consortium and board of experts for their constructive feedback and comments during our desk research for the WP3 task.

Author contributions

AK and ADM conceived and designed the study. AK, ADM, and KK performed the experiments/collected the data. AK and ADM analyzed and interpreted the data. AK, ADM, and KK drafted or revised the manuscript.

Data availability statement

All relevant data are within the paper.

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