

What's integrity got to do with it? Second-year experiences of the Path2Integrity e-learning programme

Noémie Hermeking^{a*} and Julia Priess-Buchheit^b

^aHochschule für angewandte Wissenschaften Coburg, Coburg, Coburg 96450, Germany; ^bCoburg University of Applied Sciences and Arts, Wissenschafts- und Kulturzentrum, Friedrich Streib Strasse 2, Coburg 96450, Germany

*noemie.hermeking@hs-coburg.de

Abstract

Organisations in Europe differ significantly in how they promote research integrity (RI). Higher education institutions play a pivotal role in disseminating a culture of RI and responsible conduct of research (RCR). Adhering and strengthening mentoring systems, implementing codes of conduct, and raising awareness are just a few initiatives among many to enhance students' training in RCR. This article describes the Path2Integrity Learning Card (P2LIC) programme, a proactive training programme to foster RI. This programme was further developed in 2020 and the updated feedback loops took place in four countries (Germany, Denmark, Spain, and Poland). We outline the P2LIC development and final design, the trainer feedback on the programme from the second year of operation, and suggest future considerations for RCR training to strengthen research integrity.

Key words: research integrity, responsible conduct of research, higher education, European project, Horizon 2020

1. Introduction

The scientific community is responsible for cultivating the next generation of researchers by training them how to conduct research and how to be a researcher. Research can flourish only if the scientific community succeeds in establishing and promoting a culture of research integrity (RI) that helps to drive society's development and sustain trust in science.

Organisations in Europe that seek to foster an RI culture differ significantly in how they pursue this goal. In addition to strengthening mentoring systems, implementing codes of conduct, raising awareness, and so on, some organisations promote students' training in responsible conduct of research (RCR). Furthermore, these organisations structure their training programmes in various ways. Some conduct them as stand-alone RCR training, and some implement RCR/RI in other courses such as research methods, research procedures, and scientific writing. Others ask that RI be included in each training module taught at their organisations.

The European Code of Conduct of Research Integrity (ECOC 2017) considers the following topics: research environment, training, supervision and mentoring, research procedures, safeguards, data practices and management, collaborative working, publication and dissemination, reviewing, evaluating, and editing. In comparison, Kalichman (2016) derived the following topics of RCR training from



Citation: Hermeking N and Priess-Buchheit J. 2022. What's integrity got to do with it? Second-year experiences of the Path2Integrity e-learning programme. FACETS 7: 110–125. doi:10.1139/facets-2021-0047

Handling Editor: Steven J. Cooke

Received: April 30, 2021

Accepted: October 13, 2021

Published: January 27, 2022

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

Copyright: © 2022 Hermeking and Priess-Buchheit. This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

Published by: Canadian Science Publishing

the National Institutes of Health (NIH) guidelines: conflict of interest, human and animal subjects, mentoring, collaboration, peer review, data management, research misconduct, authorship and publication, scientists and society, and he suggested conflicts of conscience, sabotage, use of statistics, image manipulation, reproducibility, censorship, and scientists as activists as examples for additional topics.

In the past, RCR training programs were often driven by research misconduct cases (Steneck 2013, Bouter 2020) to counteract future misbehaviour. Kalichman (2015) distinguished between reactive RCR training approaches, which give guidance through sanctions and codes of conduct, and proactive RCR training approaches through discussion and designs of codes of conduct. Both training approaches use codes of conduct to outline the norms, rules, practices, and responsibilities in research. In line with Steneck's (2007) notion that responsible conduct in research is simply good citizenship applied to a researcher's professional life, the overall purpose of fostering an RI culture can be described as promoting professionalism in research.

We described one dialogical proactive RI training programme, the Path2Integrity Learning Card (P2ILC) programme. By outlining the P2ILC programme's development and final design, as well as the trainer feedback on the programme from 2020, we show (i) the didactical criteria the P2ILC programme follows by comparing it with predictive modelling tool (PMT) analyses, (ii) the feedback from the e-learning experiences of the second year and synthesizes, and (iii) what should be considered in future RCR training.

2. Fostering research integrity

How research organisations address breaches of professionalism can be described by the two following extremes: (i) an organisation can prevent research misconduct by actively opening the door for (future) researchers into their norms, rules, practices, and responsibilities (proactive approach), or (ii) they can react to the research misconduct by sanctioning and resocialising researchers into the scientific community (reactive approach). In practice, these extremes blur into each other.

Organisations that decide to tackle research misconduct can thus opt to act within these two extremes. In a proactive case, training programmes introduce (future) researchers to the scientific community and emerging research fields. Such training provides learners with new perspectives, research policies, guidelines, and practices. In contrast, training applied to the latter extreme resocialises “mavericks” and endangered “borderliners” into research. Such training readjusts participants to already known but ignored guidelines and practices.

Many organisations and projects have begun to establish training around the proactive extreme (see, e.g., Pennock and O'Rourke 2017; Priess-Buchheit et al. 2020a; INTEGRITY and VIRT2UE),¹ because effective introduction to the scientific community and emerging fields in research prevent cases of misconduct. This proactive approach is also supported by the fact that resocialisation training often fails (Zamble & Porporino 1990), and some observations imply that to resocialise researchers may have a negative effect on the RI culture (Kalichman 2014). Reasons for academic misconduct are manifold and more data are needed to see which RCR training methods have a positive (or negative) outcome. We agree with Casadevall et al. (2016, p. 2) who argued that “the quality of a scientist's output is often a reflection of his/her training, one obvious mechanism to improve the quality of [research] is to improve the training of scientists”.

¹Here are some programme examples from 2020: path2integrity.eu/ri-cluster, cordis.europa.eu/project/id/787580, and h2020integrity.eu/.

The comparison between the two extremes illustrates that RCR training is about being active in knowing, accepting, and adapting (when necessary) the norms, rules, practices, and responsibilities in research. RCR training, therefore, has two main challenges: participants need to (i) learn (about) norms, rules, practices, and responsibilities in research and (ii) actively engage in norms, rules, practices, and responsibilities in research (cf. [Hodson 2014](#)).

2.1. The P2ILC programme

The P2ILC is a proactive RCR programme and tackles RI challenges using the dialogical approach in two ways. First, the dialogical approach determines the overall learning objective of the programme: students “learn how to conduct a dialogue on the rejection or acceptance of norms in research integrity” ([Priess-Buchheit et al. 2020a](#), p. 23). Second, this programme applies the dialogical approach in its methods by using storytelling, role playing, and coming to an agreement. In the P2ILC, programme trainers have three different series of RI learning cards that are targeted to the different student levels. The trainers can select single learning cards from each series matching the educational level of their participants. The learning cards are available online and free of charge. Path2Integrity has also offered workshops, in person and online, where the learning cards are used. The contents and methods of the programme are explained in the “1st year” publication ([Priess-Buchheit et al. 2020a, 2020b](#)) and on the website [Path2Integrity.eu](#).

The P2ILC programme aligns with numerous studies, which document that role play increases classroom participation, reflexive and creative thinking, application of concepts, emotional engagement, and personal accountability ([Löfström 2016](#); [Grose-Fifer 2017](#); [McCarthy and Anderson 2000](#); [Poorman 2002](#); [McWilliams and Nahavandi 2006](#); [Poling and Hupp 2009](#)). Studies have shown that specific exercises promote perspective-taking ([Löfström 2012](#)), and simulation ([Wright-Maley 2015](#)) and role play ([Rosnow 1990](#); [Strohmetz and Skleder 1992](#)) help raise awareness of complexities in ethics; all of these are found in the programme. The P2ILC programme matches with the feedback from many scholars interviewed by [Andorno et al. \(2019, p.15\)](#), who said that the most efficient tool to learn research integrity is “the recourse to case studies combined with discussion. Cases can either be taken from real-life or may be fictitious. ... Specific methods that were mentioned as helpful to improve the quality and efficacy of the teaching [in this study] are role-playing, individual and group presentations by students”.

As described in [Priess-Buchheit et al. \(2020b\)](#), the three series in the P2ILC programme are each supported by a portfolio of tools. For each series, a handbook explains seven to eleven learning sessions that support a culture of RI. The M- and Y-Series learning cards are for graduate and early-career researchers and enable students to rationally lay out their position on good scientific practice as well as the ways they use research in a responsible manner while understanding the research procedures and landscape. At the same time, the specific goal of the S-Series is for undergraduate and high-school students to understand the importance of research integrity’s criteria for society ([Häberlein 2020](#)). Even though the goal of the Y-Series is the same as the M-Series, the Y-Series was specifically designed for early-career researchers. The P2ILC programme is an open educational resource and can be used in secondary schools, universities, or within formal learning settings in adjunct areas.

The P2ILC programme recognizes that RCR training differs across disciplines and needs to be tailored to each target group. The revised version of the programme resulted from several drafting circles using trials and feedback for improvement. A Path2Integrity train-the-trainer programme has also accompanied the P2ILC programme since 2021 ([Palianopoulou and Stock 2020](#)).

2.2. Revised P2ILC programme

The name P2ILC refers to the programme's origin, a European Horizon 2020 project, and explains that this programme uses so-called learning cards, which each describe a RI/RCR learning setting. The programme was designed, evaluated, and revised in 2019 and 2020.

As described in [Priess-Buchheit \(2020c, p. 55\)](#), the aim of this RI/RCR learning programme is to overcome “[t]raditional methods of teaching ethics and research integrity, [because they] do not appear to be efficient in raising awareness on these issues”. Innovative teachings focus on a learner-centric approach in comparison with the more traditional teacher-centred approach of delivering the curriculum (e.g., lectures). In a learner-centric approach, students play an active role in shaping the learning experience.

The P2ILC programme follows a dialogical approach enabling its learners to “rationally lay out their position on good scientific practice as well as the ways in which one would explain and justify their position to others. As opposed to debate, participants are encouraged to build sound arguments by listening actively and (if necessary) countering good arguments” ([Priess-Buchheit 2020c, p. 55](#)).

The P2ILC programme, as an open-education source, allows trainers worldwide to use it for their teaching. Trainers can adapt the P2ILC programme into their different disciplines. The different learning cards and the accompanying handbooks explain the learning objectives for each card in detail.

Path2Integrity specifically tailored the learning objectives to the cards' content and tasks. In 2019 and 2020, the developers integrated many ideas and comments from research ethics and integrity experts (see [Priess-Buchheit 2020c](#)). The P2ILC programme includes innovative methods, easy and fun tasks, and builds on the educational status quo.

While the original P2I programme (2019) concentrated on (responsible) research literacy and contained sessions regarding research procedures, research environment, research publication, data management, collaborative research, safeguards, and more, the revised programme adds sessions to support scientific citizenry. It entails sessions concentrating on reliable research and reliable research results in the S-Series. The umbrella in [Figure 1](#) represents this expansion which took place from 2019 to 2020. The right side below the RI umbrella displays the researchers' fields of actions in the context of RI, and the left side describes society's perspective on RI. The right side displays the field of the learning cards first version (2019), and the left side presents the new learning cards' fields (2020); a new series concentrates on scientific citizenry and contains the above-mentioned new learning settings in which students learn about reliable research and reliable research results from a societal perspective.

In the revised version, the P2ILC programme offers 27 learning sessions and concentrates on both research literacy and scientific citizenry. From 2020 onwards, the revised P2ILC programme has been available in printed folders and as e-learning units ([learning-p2i.eu](#)).

2.3. Characteristics of the P2ILC programme

As [Mulhearn et al. 2017](#) showed in their predictive modelling tool (PMT), RI/RCR training depends on many variables. “The PMT is a sophisticated tool that can be used to develop, assess and improve education for RCR” ([Krom & van den Hoven 2021, p. 2](#)). [Watts et al. \(2017\)](#) designed the PMT by modelling the instructional effectiveness of reasonable conduct of research education in a meta-analytic path-analysis and calculating effect sizes for different didactical factors such as use of guidelines, group activities, and different content fields. [Mulhearn et al. \(2017\)](#) described the

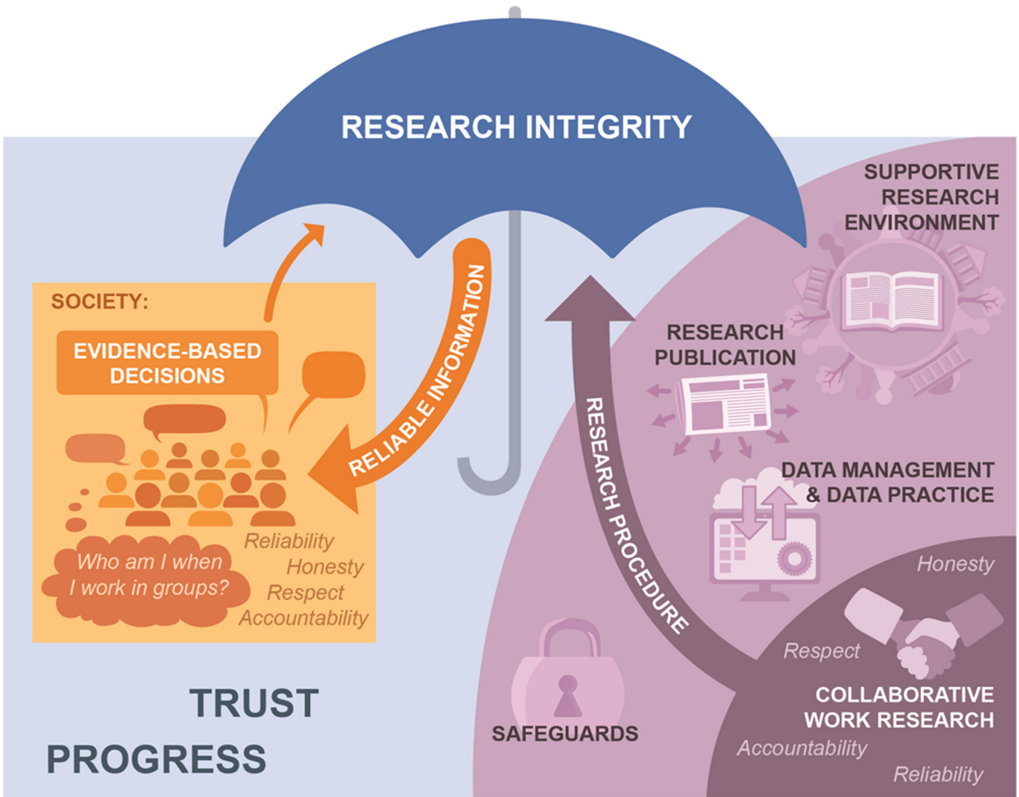


Fig. 1. Topics in the Path2Integrity Learning Card programme (Priess-Buchheit et al. 2020b).

validation and use of PMT. The PMT “allow[s] course developers and evaluators to make standardized predictions about the relative effectiveness of an ethics training course based on the findings of the path model.” (Mulhearn et al. 2017, p. 196–197).

We explain the didactical factors of the revised P2ILC programme in relation to the PMT’s main categories We use the PMT terms to describe the P2ILC programme and mark characteristics of the programme with (+) or (–) to indicate whether they predict a positive or negative effectiveness for the P2ILC training as indicated in Watts et al. (2017, p. 638).

As described in Table 1, the programme contains guidelines, principles, and codes, which students use to argue in favour or against specific scientific practices. The overall learning objective of the programme is to conduct a dialogue that aligns with the PMT variables: ethical awareness (–), consequences (–), motives (+), emotions (+), constraints (+), and forecasting (+).

Table 1 shows the learning content of the M-Series and exemplifies what students learn through specific learning objectives.

As shown in Table 2, the P2ILC programme uses role playing (+), small group discussions (+), and web discussion in the online version (+) next to storytelling and coming to an agreement. Also, students are asked to join large group discussions (–) and readings (–). Trainers select the sessions and tasks according to their students’ expertise.

Table 1. Specific learning objectives of the M-Series.

Examples of tasks
Reflect on research integrity cases
Connect to your own life
Compare citations and prioritise appropriate academic writing
Discuss different forms of peer review
Discuss the importance of reliable sources and correct citation
Engage in role play
Use data management and protection guidelines
Engage in storytelling about rules for appropriate citation
Explain and justify research procedures
Find criteria for a mentor–mentee relationship
Reflect on appropriate data practices and management
Reflect on mentoring in research integrity
Reflect on reaching an agreement

Table 2. Examples of Path2Integrity tasks to learn research integrity and responsible conduct of research.

Series	S0 and S	M	Y
Indirect Target Group	For learners who have no identity in their field of study yet	For learners who (are beginning to) have an identity in their field of study	For learners who (are beginning to) have an identity in their field of study
Group composition	Free	From one field of study	From different fields of study
Aim	Citizen literacy (S0), compliance and research literacy (S)	Compliance and research literacy	Compliance and research literacy
Denomination	Predisciplinary	Disciplinary	Post- or interdisciplinary

Note: The tasks were targeted at trainers who teach groups of between 4 and 35 learners on site or 4 and 300 learners online (recommended age of participants 16–99 years).

Table 3 shows that the programme was designed for trainers who teach between 4 and 35 students onsite or between 4 and 300 students online. It contains the Y- and M-Series for students who are beginning to have an identity in their field of study and the S-Series for students who have not identified their field of study.

Most of the S-Series learning sessions refer to a story called “What happened at LONA Science Center?”. This case is introduced in the first unit and continues across different cards. The PMT predicts a positive influence using this case story on RCR learning because this story is neither realistic (–), complex (–), nor emotional (–), but it is short (+) and creates engagement when you add different cards. The story called “Hannah’s Protocol” in the M- and Y-Series follows the same methods. The P2ILC programme uses many grouped-based activities (–), often by using unspecific (+) fictional cases (+). Considering these details, the PMT sums to a positive practice characteristic for the P2ILC programme. The PMT also predicts that the negative P2I training characteristics, which are marked with (–) above, diminish or counteract its effectiveness.

Table 3. The complete Path2Integrity Learning Card programme (Priess-Buchheit et al. 2020b).

Category ^a	Feedback	Card no.
Blue	Enriching discussions on good research practice.	S0
Blue	Open and in-depth discussions about transparent research.	S0
Blue	More awareness from group discussion.	S0
Blue	Students were not familiar with their research environment before this unit and learned new concepts here, which they found enriching.	S1
Blue	Bringing together different areas of research in the group work was regarded as very enriching by students.	Y4
Blue	Students were poorly acquainted with the rules of authorship and citation [before the session].	S5
Blue	Most of the students had lively discussions and enjoyed the session very much.	M3
Green	Utilising theoretical knowledge in practical examples.	S0
Green	The role-playing was well received by the students. It stimulated questions of how to transfer the topic to apply it to their own research environment/university.	M3
Green	Students expressed that they had not encountered research integrity yet, but quickly recognised its relevance for their studies.	M0
Green	Students were able to relate research procedures to their own field of research.	S2
Green	The participants felt more confident in answering the questionnaire. We had a bigger discussion about misconduct and when it starts. They designed a pledge together, but only a core, as all of them could not agree on some special parts (for instance, are students obliged to follow the same rules as researchers, or do they have the status of trainees. They could not agree on this).	S9
Yellow	Second card: They appreciated the group work from this card. One student was bored by the fact that this course was about scientific work—it seems he had taken many of these courses before. One student had difficulties understanding the tasks.	S2
Yellow	Students felt that they were under-challenged.	S5

^aBlue is based on the awareness of the participants and how they are sensitized to the topic, green is based on the transfer of the learning input, and yellow is based on students' emotions.

How effective one instructional factor is in practice is highly dependent on how this factor supports the programme's overall aim (Krom and van den Hoven 2021). With the overall objective of enabling learners with the ability to rationally lay out their position on good scientific practice, two of the negative P2I training characteristics may change their effect. We think that in grouped-based activities (–), as shown in Fig. 2, and large group discussions (–), students can learn how to conduct a dialogue as the discussion evolves. Furthermore, the negative P2I training characteristic readings (–) are presented in the Y-Series by discovering the relevant codes of conduct and principles to open the door to the self-policing scientific community. Although the PMT indicates readings as a negative effect, the P2ILC programme uses this activity to acquaint learners with the scientific community's norms and values.

3. Feedback and training insights

Taking the feedback from the first year (Priess-Buchheit 2020c), the learning cards were adapted and improved to strengthen their educational impact. As described above, one set of four learning cards has been added to the revised version, making the second set a total of 27 cards. These four cards emphasize citizen literacy (S01, S02, S04, and S05). The revised 2020 version entails 27 learning cards and three tailored handbooks (S, M, and Y) whose purpose is to further foster research education and citizen education.

In the 2020 version, further design adjustments were made. All cards now feature prominent RI role models including internationally recognized researchers (e.g., Maria Leptin, Kristina Bliznakova, Philippe Grandjean).



Fig. 2. Role playing, storytelling, and coming to an agreement as methods to learn how to argue rationally for responsible conduct of research.

In 2020, trainers used the first and second version of the P2ILC programme in (face-to-face and online) the classroom setting and gave feedback. The feedback was collected in four different countries (Germany, Denmark, Spain, and Poland). Altogether 48 workshops were conducted, both in person and online.

3.1. Feedback

The 48 workshops were conducted from January to November 2020. The feedback collected from the 2020 workshops was based on the trainer's perspective. A semi-structured questionnaire was used to better understand what worked well and to pinpoint challenges. Two questions were answered by the trainers "What difficulties occurred? (Which organisational, spatial, personal, linguistic, cultural, religious, or other problems, if any?)" and "what went well? (Which exercises made you and the participants particularly enthusiastic about the topic, and why?)". We evaluated all comments, except for the general remarks from the workshops. Contrary to the first year, the feedback during the second year was collected solely from trainers, lecturers, and teachers who used the learning cards in their settings. The first two years of the learning program were used to continuously improve the program by the evaluation team. Feedback was collected from month 6 up to month 24. In addition to the trainers' perspectives, the participants' perspectives and learning development have been tracked continuously starting in month 25, and this will be discussed in a future paper.

3.2. Analysis

Based on feedback from the first year, a few adjustments were made to the material (learning cards and handbooks). Consequently, since 2020 trainers have been better prepared to deliver the described training on RCR. In addition, during the second year of operation, the COVID-19 pandemic forced trainers and students alike to work or study remotely. New and different challenges arose due to the rapid shift to an e-learning format. While there are certainly benefits to working and studying remotely, the new challenges include a different attention span and finding different ways to engage students to develop different skills and to thrive.

Research suggests that hybrid learning and working will most likely become the new normal ([International Commission on the Futures of Education 2020](#)); therefore, the feedback not only gave insight into in-class teachings but also informed the evaluation of the suitability of the P2ILC

programme when taught online. In this regard, one should note that the material was not originally developed for an e-learning format but was adapted to an online learning programme in 2020.

The feedback collected in the second year of operation contained 100 comments. To ensure clarity throughout, this paper uses the same categorisation in this analysis as was used in the 2019 analysis (Priess-Buchheit 2020c).

Comments were categorized as follows:

- **Ill-fitting comments:** Those that do not fit in with the overall project goal of Path2Integrity or a learning objective of a single learning card—rated as not relevant for further discussions.
- **Interesting comments for a single learning card:** They are rated as relevant to the discussion with the project partners.
- **Justified and valuable comments for the P2ILC programme** (namely, for all learning cards): They require further action to resolve any issues.

The third category “justified and valuable comments for the P2ILC programme” provided valuable insights for the second year of operation. They will be discussed further. In total, 19 comments were chosen.

After categorising the 100 comments, “justified and valuable comments” and “insights for further improvement” contained 18 comments (see [Tables 4](#) and [5](#)). Fourteen comments were chosen for further analysis, as shown in [Table 4](#). Additionally, four comments were added to a separate table to show possibilities of further improvement, as can be seen in [Table 5](#). The additional category “insights for further improvement” was added to assure the longevity of the program in case someone would like to continue this program and use its material over the three years of the project.

The comments from [Table 4](#) were used for further evaluation and grouped into the following three categories:

Yellow: This category is based on students’ emotions. The comments are students’ feelings about the topic in general, including the frustration of being under-challenged.

Blue: This category is based on the awareness of the participants and how they are sensitized to this topic. These comments suggest first reflections about RI and ethics in general and offer a solid basis for further development and promotion of research ethics and integrity.

Green: This category is based on the transfer of the learning input. These comments document that participants applied the knowledge learned to their own academic circumstances and career. Hence, being able to have a greater understanding of the topic and transferring the Path2Integrity input may reveal a learning curve.

4. Results

The yellow category shows that some students did not feel stimulated by the P2I learning session. Some comments suggested that:

- Students felt that they were under-challenged.
- One student was bored by the fact that this course was about scientific work—it seems he had taken many of these courses before.
- One student had difficulties understanding the tasks.

Table 4. Top-rated feedback in the “justified and valuable” category.

Feedback	Card no.
It was difficult to exemplify the difference between academic integrity and research integrity.	S04
More time for final discussion would be needed. We had to close after 90 minutes.	Y2
The time (90 minutes) was too short to go through all tasks and leave room for discussion.	M3
They couldn't get acquainted to the collaborative approach so I stopped and held a micro lecture. That's why it took 3 times 90 min to finish this course. In combination with my micro lectures they loved the sessions and engaged actively in the dialogue	Y3

Table 5. Top-rated feedback for further improvement.

Learning objectives for students with a university degree
Outline reasons in favour of conducting reliable research
Identify, accept, and actively use research infrastructure, rules and procedures
Justify rules for good research practice
Request that research institutions and organisations provide proper infrastructure
Accept ambiguity: be open and unprejudiced
Explain and justify research procedures
Compare and prioritise different research procedures
Adjust research procedures, if necessary
Refer to codes and regulations
Realise that aggressive behaviour hinders research integrity
Establish an environment for complying with research codes and regulations
Switch to help mechanisms by contacting guardians of research integrity, if necessary
Accept and learn to respect others' wishes, aims and goals
Practice understanding and being understood in a dialogue
Learn to discard arguments that cannot be justified
Explain the importance of citation
Weigh criteria for good academic writing
Prioritise appropriate academic writing
Be open, unbiased and accepting of ambiguity
Explain and justify arguments for proper data management
Compare and prioritise different handlings of proper data management
Be ready to choose norms together with the dialogue group and for your target group
Raise self-awareness about your own research integrity
Outline professional values for your own research
Make a research pledge to follow research principles together with the dialogue group

These comments pertaining to students' background knowledge are specifically interesting as research shows that even though participants might feel that they are already knowledgeable about the subject, various authors have pointed out that not all students choose to commit to academic honesty (Levy and Rakovski 2006; Pulvers and Diekhoff 1999) and are not exempt from academic misconduct.

The blue category demonstrates that the students were open to learning about the subject to different degrees and participated in lively discussions. Some comments were:

- Enriching discussions on good research practice.
- Open and in-depth discussions about transparent research.
- More awareness from group discussion.
- Students were not familiar with their research environment before this unit and learned new concepts here, which they found enriching.

This finding supports the P2I approach of including large group discussions (as well as small group discussions) in its training, although Watts et al. (2017) predicted a negative effectiveness in the delivery of this activity.

Dialogue in both small and large groups fosters openness to new insights and discussions with peers and trainers about research ethics and integrity (Löfström (2016)). Role-playing can mimic institutional academic integrity policy making: using researched perspectives to develop pedagogy. This is the first step towards raising awareness and developing an understanding of the subject. Education plays a key role in fostering a better understanding of the importance of this code of conduct. It is essential that students are trained to better understand and engage in obligations and duties that maintain an RCR (see comment M3 in Table 4).

The green category reveals that participants applied the adaptable and transferable P2I learning material to their own discipline. Some comments were:

- The role-playing was well received by the students. It stimulated questions of how to transfer the topic to apply it to their own research environment/university.
- Students expressed that they had not previously encountered the issue of RI but quickly recognised its relevance for their studies.
- Students were able to relate research procedures to their own field of research.
- We had a bigger discussion about misconduct and when it starts. They designed a pledge together, but only a core, as all of them could not agree on some special parts (for instance, are students obliged to follow the same rules as researchers, or do they have the status of trainees? They could not agree on this).

The transfer and application of knowledge and skills implied by these statements shows the effectiveness of the P2ILC programme. In addition, the knowledge enabled participants to adhere to standards that would protect themselves and their research from misconduct as well as the others involved in the research project. Consequently, feedback from the second year implies a learning curve for the participants and, hence, a successful improvement of the P2ILC programme.

The comments were based on in-class and online sessions. Some comments from Table 5 mention some discrepancies in terms of the time allocated for the training and conveyed that 90 min was not enough for a session (Y2, M3, Y3) likely because some material would have been easier to explain

in class and not online. Setting up break-out rooms for online discussions is a good way to engage student-centred dialogues, but it also takes up more time as it requires dividing the group and bringing it back together for further discussions. Technical glitches were all too common, specifically when it was the first time many of the trainers were delivering training in an online format.

Working on an academic pledge and committing to an honour code, along with other forms of ethics education (McIntosh et al 2018), can promote good academic behaviour. Various studies have shown that having students abide to an honour code might be a preventive measure to avoid academic dishonesty (McCabe and Pavela 2000; McCabe 2016; McCabe et al. 2003).

An academic pledge is a specific approach, which some trainers and institutions use in different qualification cycles such as high school pledges for academic integrity or PhD pledges for research integrity. The P2ILC program integrates this approach in its S-, M-, and Y-Series with the task “making a research pledge to follow research principles together with the dialogue group” (see Table 1) and enables trainers to lead participants towards a joint acknowledgement. One comment described how students had difficulties in making a pledge together (see Table 4, S9). Trainers should be prepared to assist the students in formulating their group pledge as the feedback outlines that different stages of qualification define different standards in their pledges for research integrity.

One general remark from a trainer contained a justified and valuable suggestion. The suggested a separate glossary for research ethics and integrity, words that were later found on the learning cards. This might enable both the trainer and the students to become better acquainted with the subject and not get discouraged when they come across some specific terms for the first time. This suggestion was forwarded to the P2I train-the-trainer programme.

Although the focus here was on students and fostering reliable research results, it is also essential that trainers act as role models by exemplifying integrity. Path2Integrity believes that trainers are mentors and act as role models at the same time. According to Wright et al. (2008) good mentorship is essential for good research. Being a good mentor and acting as a role model might very well improve research integrity. In addition, McIntosh et al. (2018, p. 739) exemplified the importance of continuous training evaluation and the urgency for trainers to take part in train-the-trainer sessions to “refresh their knowledge” and to be “prepared with the skills needed to be effective presenters”. Consequently, promoting RCR goes hand in hand with an overall commitment to various other actions implemented by the university. Investing in specific training sessions for trainers is another possible development to contribute to the goal of this programme. It should be noted that for the third year of this project, train-the-trainer initiatives are now available.

5. Conclusion

As our analyses have shown the PMT predicts in sum a positive practice characteristic for the revised P2ILC programme. The feedback counteracts the negative prediction for grouped-based activities (–) and large group discussions (–) and states that these methods support a necessary dialogue on reliable research (results). The feedback from the e-learning experiences additionally documents that trainers specifically need to raise students’ interest for RCR, because students overestimate their knowledge in this field. Also, the dialogical approach seems to enable participants to adapt and transfer what they learned to their own discipline.

Path2Integrity’s findings contribute to the overall knowledge on how to foster RI with training. Path2Integrity’s goal/advocacy is for everyone to commit to achieving research excellence. Even though ethical wrongdoings cannot always be forecast, having this kind of training is beneficial in enabling academics to make informed moral decisions and guarantee honesty and rigor of their

research. There are still limitations to adhering to ethical standards, but efforts show that there is a movement away from the simple use of these ethics as benchmarks. Promoting these standards can ensure personal and organisational commitment to good research and its sustainability in the future. The use of dialogical training units is one way of doing so (Priess-Buchheit et al. 2020a). As shown above, a proactive dialogical RCR programme is one option. The blue feedback supports the concrete overall learning objective to “learn how to conduct a dialogue on the rejection or acceptance of norms in research integrity” (Priess-Buchheit et al. 2020a, p. 23) and its dialogical methods in small and large groups.

Even though Watts et al. (2017) questioned the effectiveness of reading tasks to promote RI, P2I decided that it was important to ensure that students were reading the original code of conduct to have a firm base to build upon. Paving the way towards RI may also be achieved by a common ratification and (or) a set of RI standards. In this regard, Timmers et al. (2020) reviewed 66 European institutional review boards and concluded that research collaborations and efficiency could improve with the implementation of uniform legislation (p. 8), “while acknowledging local cultural habits and moral values between countries” (p. 2). This was also supported by Steneck (2013). That is why Path2Integrity will carry on using readings (–) of codes of conduct to acquaint learners with the scientific community’s norms and values.

By implementing educational tools, such as the Path2Integrity program, students and young researchers are better equipped to navigate within the scientific enterprise. Academic honesty and integrity should not be seen as a mere technical requirement but an obligation that acknowledges the merit of being held accountable to the highest standards so as to deliver research excellence. As Timmers et al. (2020) argued, integrating the cultural setting could be a way to acknowledge local peculiarities and to avoid getting lost in a unifying mist. These ethical principles and guidelines should be in everyone’s best interest. The promotion of good research benefits not just the students, the researcher, and the affiliated institutions but also other important stakeholders. Ultimately, RI is of utmost importance in securing the trust that society places in science at large.

With an abundance of information available to all of us, the erudite use of sources is challenged every day. Consequently, in a world that is becoming more and more globalised, new synergies can only be created if the foundation is built on trust. Adhering to a code of conduct could be one of the ways to move in that direction.

Acknowledgements

Path2Integrity receives funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 824488. This article is written on Path2Integrity Consortium’s work. The authors want to thank Jacques Guerette and Dick Bourgeoise-Doyle for their comments.

Author contributions

JP-B conceived and designed the study. JP-B performed the experiments/collected the data. NH analyzed and interpreted the data. NH and JP-B drafted or revised the manuscript.

Competing interests

Julia Priess-Buchheit is a guest editor of this collection.

Data availability statement

All relevant data are within the paper.

References

- Andorno R, Katsarov J, and Rossi S. 2019. Results of mapping of current practice, Deliverable D3.2, Project: INTEGRITY. [online]: Available from h2020integrity.eu/wp-content/uploads/2019/12/D3.2-Results-of-mapping-current-practice.pdf.
- Bouter L. 2020. What research institutions can do to foster research integrity. *Science and Engineering Ethics*, 26: 2363–2369. PMID: [31965429](#) DOI: [10.1007/s11948-020-00178-5](#)
- ECoC. 2017. The European Code of Conduct for Research Integrity: Revised Edition. ALLEA - All European Academies, Berlin.
- Casadevall A, Ellis LM, Davies EW, McFall-Ngai M, and Fang FC. 2016. A framework for improving the quality of research in the biological sciences. *mBio*, 7(4): e0125616.
- Grose-Fifer J. 2017. Chapter 15: Using role-play to enhance critical thinking about ethics in psychology. In *How We Teach Now: The GSTA Guide to Student-Centered Teaching*. Edited by R Obeid, A Schwartz, C Shane-Simpson, and PJ Brooks. pp. 213–223, the Society for the Teaching of Psychology. [online]: Available from teachpsych.org/ebooks/.
- Häberlein L. 2020. Path2Integrity Target Groups. Deliverable D3.3 EU Horizon 2020 Path2Integrity Project, Grant agreement No 824488.
- Hodson D. 2014. Learning science, learning about science, doing science: Different goals demand different learning method. *International Journal of Science Education*, 36(15): 2534–2553. DOI: [10.1080/09500693.2014.899722](#)
- International Commission on the Futures of Education. 2020. Education in a post-COVID world: Nine ideas for public action. UNESCO, Paris. [online]: Available from en.unesco.org/news/education-post-covid-world-nine-ideas-public-action.
- Kalichman M. 2014. Rescuing responsible conduct of research (RCR) education. *Accountability in Research*, 21(1): 68–83. PMID: [24073608](#) DOI: [10.1080/08989621.2013.822271](#)
- Kalichman M. 2015. Research Integrity: Introduction. In *Handbook of Academic Integrity*. Edited by T. Bretag, Springer, Singapore. pp. 1–2.
- Kalichman M. 2016. Responsible conduct of research education (What, Why, and Does It Work?). *Academic Medicine: Journal of the Association of American Medical Colleges*, 91(12): e10. DOI: [10.1097/ACM.0000000000001442](#)
- Krom A, and van den Hoven M. 2021. A quality checklist for Responsible Conduct of Research (RCR) education: A proposal to complement the Predictive Modeling Tool. *Accountability in Research*. pp. 1–19. DOI: [10.1080/08989621.2021.1887736](#)
- Levy E, and Rakovski C. 2006. Academic dishonesty: A zero tolerance policy professor and student registration choices. *Research in Higher Education*, 47: 735–754. DOI: [10.1007/s11162-006-9013-8](#)
- Löfström E. 2012. Students' ethical awareness and conceptions of research ethics. *Ethics & Behavior*, 22(5): 349–361. DOI: [10.1080/10508422.2012.679136](#)

- Löfström E. 2016. Role-playing institutional academic integrity policy-making: Using researched perspectives to develop pedagogy. *International Journal for Educational Integrity*, 12(1): 235. DOI: [10.1007/s40979-016-0011-0](https://doi.org/10.1007/s40979-016-0011-0)
- McCabe DL, and Pavela G. 2000. Some good news about academic integrity. *Change*, 32(5): 32–38. DOI: [10.1080/00091380009605738](https://doi.org/10.1080/00091380009605738)
- McCabe D. 2016. Cheating and Honor: Lessons from a Long-Term Research Project. In *Handbook of Academic Integrity*. Edited by T. Bretag. Springer, Singapore. pp. 187–198. DOI: [10.1007/978-981-287-098-8_35](https://doi.org/10.1007/978-981-287-098-8_35)
- McCabe D, Butterfield K, and Trevino L. 2003. Faculty and academic integrity: The influence of current honor codes and past honor code experiences. *Research in Higher Education*, 44: 367–385. DOI: [10.1023/A:1023033916853](https://doi.org/10.1023/A:1023033916853)
- McCarthy JP, and Anderson L. 2000. Active learning techniques versus traditional teaching styles: Two experiments from history and political science. *Innovative Higher Education*, 24(4): 279–294. DOI: [10.1023/B:IHIE.0000047415.48495.05](https://doi.org/10.1023/B:IHIE.0000047415.48495.05)
- McIntosh T, Higgs C, Mumford M, Connelly S, and DuBois J. 2018. Continuous evaluation in ethics education: A case study. *Science and Engineering Ethics*, 24: 727–754. PMID: [28616839](https://pubmed.ncbi.nlm.nih.gov/28616839/) DOI: [10.1007/s11948-017-9927-x](https://doi.org/10.1007/s11948-017-9927-x)
- McWilliams V, and Nahavandi A. 2006. Using live cases to teach ethics. *Journal of Business Ethics*, 67(4): 421–433. DOI: [10.1007/s10551-006-9035-3](https://doi.org/10.1007/s10551-006-9035-3)
- Mulhearn T, Watts LL, Todd EM, Medeiros KE, Connelly S, and Mumford MD. 2017. Validation and use of a predictive modeling tool: Employing scientific findings to improve responsible conduct of research education. *Accountability in Research*, 24(4): 195–210. PMID: [28005407](https://pubmed.ncbi.nlm.nih.gov/28005407/) DOI: [10.1080/08989621.2016.1274886](https://doi.org/10.1080/08989621.2016.1274886)
- Palianopoulou M, and Stock C. 2020. Path2Integrity Training Curriculum. Deliverable D4.2 EU Horizon 2020 Path2Integrity Project, Grant agreement No 824488.
- Pennock RT, and O'Rourke M. 2017. Developing a Scientific Virtue-Based Approach to Science Ethics Training. *Science Engineering Ethics*, 23(1): 243–262. PMID: [26818458](https://pubmed.ncbi.nlm.nih.gov/26818458/) PMCID: [PMC5236068](https://pubmed.ncbi.nlm.nih.gov/PMC5236068/) DOI: [10.1007/s11948-016-9757-2](https://doi.org/10.1007/s11948-016-9757-2)
- Poling DA, and Hupp JM. 2009. Active learning through role playing: Virtual babies in a child development course. *College Teaching*, 57(4): 221–228. DOI: [10.1080/87567550903218703](https://doi.org/10.1080/87567550903218703)
- Poorman PB. 2002. Biography and role playing: Fostering empathy in abnormal psychology. *Teaching of Psychology*, 29(1): 32–36. DOI: [10.1207/S15328023TOP2901_08](https://doi.org/10.1207/S15328023TOP2901_08)
- Priess-Buchheit J, Aro AR, Demirova I, Lanzerath D, Stoev P, and Wilder N. 2020a. Rotatory role-playing and role-models to enhance the research integrity culture. *Research Ideas and Outcomes*, 6: e53921. DOI: [10.3897/rio.6.e53921](https://doi.org/10.3897/rio.6.e53921)
- Priess-Buchheit J, Dwojak-Matras A, Metodiev T, and Miller K. 2020b. Path2Integrity Handbook of Instruction. Deliverable D3.2 EU Horizon 2020 Path2Integrity Project, Grant agreement No. 824488.
- Priess-Buchheit J. 2020c. Path2Integrity learning cards: First year experiences of an educational programme to foster research integrity in Europe, *EDUKACJA*, 1(152): 9–21.

- Pulvers K, and Diekhoff GM. 1999. The Relationship between Academic Dishonesty and College Classroom Environment. *Research in Higher Education*, 40(4): 487–498. DOI: [10.1023/A:1018792210076](https://doi.org/10.1023/A:1018792210076)
- Rosnow RL. 1990 Teaching research ethics through role-play and discussion. *Teaching of Psychology* (Columbia, Mo.), 17(3): 179–181. DOI: [10.1207/s15328023top1703_10](https://doi.org/10.1207/s15328023top1703_10)
- Steneck NH. 2013. Research ethics. Global research integrity training. *Science*, 340(6132): 552–553. PMID: [23641099](https://pubmed.ncbi.nlm.nih.gov/23641099/) DOI: [10.1126/science.1236373](https://doi.org/10.1126/science.1236373)
- Steneck NH. 2007. Introduction to the responsible conduct of research. Rev. ed. ORI. [online]: Available from ori.hhs.gov/ori-introduction-responsible-conduct-research.
- Strohmetz DB, and Skleder AA. 1992. The use of role-play in teaching research ethics: A validation study. *Teaching of Psychology* (Columbia, Mo.), 19(2): 106–108. DOI: [10.1207/s15328023top1902_11](https://doi.org/10.1207/s15328023top1902_11)
- Timmers M, Jeroen TJM, Dijck V, van Wijk RPJ, Legrand V, van Veen E, et al. 2020. How do 66 European institutional review boards approve one protocol for an international prospective observational study on traumatic brain injury? Experiences from the CENTER-TBI study, *BMC Medical Ethics*, 21(1): 36. PMID: [32398066](https://pubmed.ncbi.nlm.nih.gov/32398066/) DOI: [10.1186/s12910-020-00480-8](https://doi.org/10.1186/s12910-020-00480-8)
- Watts L, Mulhearn TJ, Medeiros KE, Steele LM, Connelly S, Mumford MD. et al. 2017. Modeling the instructional effectiveness of responsible conduct of research education: A Meta-Analytic Path-Analysis, *Ethics & Behavior*, 27(8): 632–650. DOI: [10.1080/10508422.2016.1247354](https://doi.org/10.1080/10508422.2016.1247354)
- Wright DE, Titus SL, and Cornelison JB. 2008. Mentoring and research misconduct: An analysis of research mentoring in closed ORI cases. *Science and Engineering Ethics*, 14(3): 323–336. PMID: [18615274](https://pubmed.ncbi.nlm.nih.gov/18615274/) DOI: [10.1007/s11948-008-9074-5](https://doi.org/10.1007/s11948-008-9074-5)
- Wright-Maley C. 2015 Beyond the “Babel problem”: defining simulations for the social studies. *JSSR*, 39(2): 63–77.
- Zamble E, and Porporino F. 1990. Coping, imprisonment, and rehabilitation: Some data and their implications. *Criminal Justice and Behavior*, 17(1): 53–70. DOI: [10.1177/0093854890017001005](https://doi.org/10.1177/0093854890017001005)