Path2Integrity Learning Cards: First Year Experiences of an Educational Programme to Foster Research Integrity[1]

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This article outlines the experience gained in the first twelve (12) months of the Path2Integrity (P2I) learning programme, an initiative designed to promote reliable research results and responsible research practices with all students, not only those destined to be researchers. Path2Integrity learning cards are student-centred instructions with a dialogical approach, using role-playing and storytelling aimed at fostering a culture of research integrity. This report shows that feedback gathered in this first year of the P2I programme supported the following three actions. First, the feedback informed distinctions between the different contexts of research education and citizen education. Second, a handbook was prepared to accompany the learning cards. And finally, students will be asked in the future to reflect on the competencies each learning card features. A review of the feedback and actions will be followed by an overview of the implications for the programme itself and for research integrity education in general.

Keywords: coming to an agreement, dialogue, research integrity, responsible conduct of research, role play, storytelling, teaching and learning, training.

1. Introduction

It is important for the research system and society that students learn what reliable research results are (Science Europe Working Group on Research Integrity, 2015). However, studies on students' perception of how to conduct research show that students feel insecure about how to undertake it (Fishman, 2015) and that current training sessions have "ample room for improvement" (Watts, Medeiros, Mulhearn, Steele, Connelly and Mumford, 2017). A few severe cases of research misconduct led to investigations that evidenced a higher estimated occurrence of research misconduct (Fanelli, 2009) and a loss of trust in research. This is why the research system is facing a number of challenges. How can educational organisations

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ensure that students learn the importance of reliable research? And how can educational organisations train students about what it means to be a responsible researcher? These are two challenges from this cluster, which specifically open the field to research integrity education.

The importance of the linkage between research and society is shown in the Horizon 2020 programme of the European Commission, which calls for proposals that foster quality and societal impact of research and emphasise institutional and operational goals regarding research integrity. One call for proposals took on the above-mentioned educational need and addressed research integrity with a specific educational objective. The SwafS-02-2018 call for proposals, Innovative Methods for Teaching Ethics and Research Integrity, named an educational need for innovative approaches.

The Path2Integrity educational programme answered this call and "improve[d] current educational methods, raise[d] awareness of students and early career researchers and con-tribute[d] to the establishment of a research integrity culture. The [developed] innovative methods for teaching research integrity … contribute to the responsible conduct of research and research excellence." (EC, 2018)

This article lays out the Path2Integrity learning cards as an educational programme to foster research integrity. Section 2 explains the learning cards' objectives, methods, target groups, and format. This is followed in section 3 by a report on how Path2Integrity collected feedback on these learning cards and developed them further on in the first year. Taking this development into account, section 4 of this article provides an overview of how the Path2Integrity developments align with the current status quo of teaching and learning research integrity.

2. Learning Cards to Foster Research Integrity

Providing knowledge and experience to this educational task, Path2Integrity designed learning cards (P2ILCs) in 2019[2]. Path2Integrity designed the P2ILCs to overcome "[t]radi-tional methods of teaching ethics and research integrity, [because they] do not appear to be efficient in raising awareness on these issues" (EC, 2018).

Path2integrity offers 20 open-access learning cards for formal learning settings on research integrity. By using the European Code of Conduct for Research Integrity as a reference doc-ument, and by using role-play and vivid storytelling in a dialogical manner, the P2ILCs are interactive. They are designed to work with "student-centred methods … aiming to promote a culture of research integrity and raise awareness of students and early career researchers" (Priess-Buchheit et al., 2020, p. 8). In particular, they "allow for plurality of opinions and for nuances, rather than a set of predetermined 'right or wrong' answers" (EC, 2018).

The centre of this programme is a dialogical approach, which can be described as the opposite of debate (Widdershoven and Solbakk, 2019). The P2ILC programme enables each participant 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, par-ticipants are encouraged to build sound arguments by listening actively and (if necessary) countering good arguments. Through student-centred activities on narrative cases, students "learn how to conduct a dialogue on the rejection or acceptance of norms in research integ-rity (Priess-Buchheit, Aro, Kuzmova, Lanzerath, Stoev and Wilder, 2019, p. 19). Interactive methods support this dialogical approach. "Vivid storytelling and … role-play enable students,

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[2] See https://zenodo.org/search?page=1&size=20&q=priess-buchheitUtrob

(under)graduates and young researchers to acknowledge conflicting purposes, power structures, (sub)cultural habits and knowledge. They also lead them to rationally … [lay out their] research integrity, listen to statements of others … and to be ready to outline their knowledge about research integrity (Priess-Buchheit et al., 2020, p. 20).

The P2ILC programme is in line with the findings from R. Andorno, J. Katsarov, and S. Rossi, whose 2019 study shows that "around half [of 98 scholars] agreed 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 included] role-playing, individual and group presentations by students"[3] (Deliverable D3.2, unpublished).

The P2ILC programme was specifically developed to increase the efficacy of formal learning settings. The programme originally used two learning methods: a) storytelling and b) role-play. In the design process, the method of "Coming to an Agreement" was added in order to create learning situations in which participants focused on reaching a common decision – without being distracted. This is why the first P2ILC programme offers the following three learning methods: a) storytelling, which thus refers to both real-life and fictitious cases, b) coming to an agreement, and c) role-play. The programme fosters not only knowledge about research integrity but also a reflection on the roles that the participants themselves play in reliable research.

2.1. P2ILC target groups

The basic design of the P2ILC programme is to train participants to argue in favour of reliable research results. Research integrity is fostered by providing dialogical learning settings to students and (early career) researchers from age 16 on. "Although there is a need to promote research integrity in every age cohort, students aging from 16 to 28 … [are] the main target group for the formal learning settings. The … [P2ILC programme] concentrates on [participants in] the age group of 16 to 28 because they are at the stage [in which they are] entering the scientific community and are in the process of developing professional values and compliance structures" (Priess-Buchheit et al., 2020, p. 11). Participants receive a sound research education to ensure that misconduct is prevented. Instead of letting students and (early career) researchers walk into an integrity trap, the P2ILC programme fosters an early interaction with research techniques and research values.

The learning cards have three different target groups (see Figure 1):

- **S** cards have been prepared for pre-disciplinary groups, for example, high school students older than 16, or Bachelor's students.
- **M** cards have been prepared for disciplinary groups, for example, Master's students.
- **Y** cards have been prepared for post-disciplinary groups, for example, early career researchers.

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[3] Deliverable D3.2, Results of mapping of current practice, Project: INTEGRITY, Grant Agreement n° 824586, October 31, 2019, not yet published.
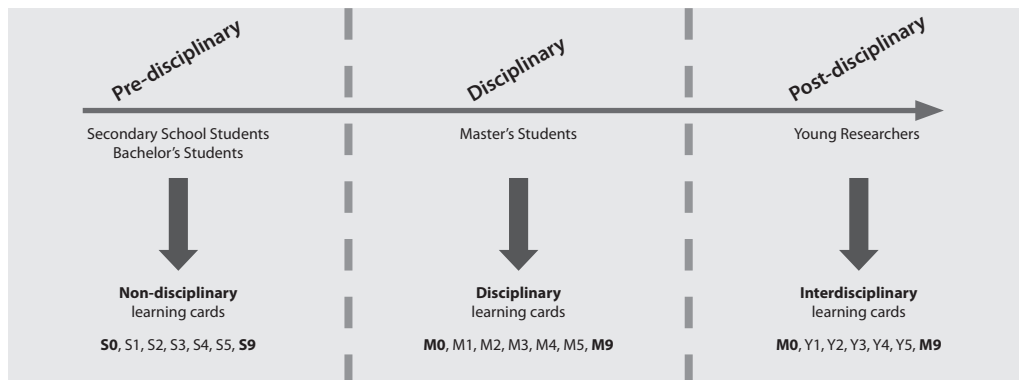
Figure 1: The three target groups of P2ILCs

In each target group, the following research integrity categories from the European Code of Conduct (ECoC) (ALLEA, 2017) are discussed in at least one learning card:

- Research Environment
- Research Procedure
- Collaborative Work
- Safeguards
- Dissemination and Publication

S0 and M0 are introductory cards that easily introduce the participants to the educational programme. On the other hand, S9 and M9 enable a final reflection on research integrity and can therefore be used as final cards in the programme. The other cards are listed at the bottom of Figure 1. They concentrate on one of the above-mentioned categories.

Figure 2: P2ILC M5, Category: Dissemination and Publication

The Path2Integrity programme consists of 20 learning cards. Each learning card consists of two pages (back and front, see Figure 2). The first page of each learning card is an orientation for the trainer (description and background of the unit, learning objectives, and learning stages), while the second page describes the procedure of the session and is used as a copy template for every participant. The instructions are for research integrity sessions of 90 to 120 minutes.

2.2. Principles and structures of the learning cards

The order of the following principles and corresponding components in the learning cards is derived from the reading direction of the learning cards, starting with the first page from top to bottom followed by the second page from top to bottom.

Each learning card aligns to one of the ECoC categories[4]. This orientation is shown in the respective **heading** on each learning card. The heading describes the main topic of the unit and relates to one of the ECoC categories. One example of such a heading is in learning card M5, version 1, "Researchers follow their quest in a careful and well-considered manner! (cf. ECoC 2017, p. 5)" (Priess-Buchheit and Häberlein, 2019, p. 1).

The main learning content of the P2ILC programme is research integrity, which is embedded into a broader spectrum of research ethics and reliable research results as a cornerstone between research and society. This broader spectrum is described in each **description and background** box on each learning card. The box lays out the reasons why this learning card should be taught.

Dialogical competencies are the didactical focus of the learning cards. The **learning objective** box outlines these competencies. This box describes three to five competencies that will be trained in the learning session. Each competency contains the following:

- an action that is needed in order to conduct a dialogue on the rejection or acceptance of norms (for example, describing something to others, active listening, and arguing in favour of something) and
- a subfield, which is of importance to the field of research integrity (such as research procedures, complying with codes and regulations, and academic writing).

Exceptions here are the learning cards numbered 0, 9 and 4; 0 and 9 have no specific research integrity subfield, and learning card 4 is about collaborative work and has a two-level structure. The learning objective box of learning card 4 is different because it prompts students to conduct a dialogue on the rejection or acceptance of norms and the topic (of collaborative work) is as well-structured as a dialogue on the rejection or acceptance of norms. This elevates dialogues on rejections or acceptances of norms to a subfield of research integrity.

Additionally, **general steps of instruction** are included in each learning card:
- introduction to the topic
- outlining the problem
- student engagement with the topic
- reflection

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[4] The headings in paragraph 2 "Good Research Practice" of the "The European Code of Conduct for Research Integrity" list the ECoC categories: 2.1 Research Environment, 2.2 Training, Supervision and Mentoring, 2.3 Research Procedures, 2.4 Safeguards, 2.5 Data Practices and Management, 2.6 Collaborative Working, 2.7 Publication and Dissemination, and 2.8 Reviewing, Evaluating and Editing.

The **learning stages** box outlines these steps with some variations. The headings of the steps result from a combination of the described general steps and specific learning methods. The same headings can be found on the second page as indicators for the beginning of a new learning step. To provide ideal learning opportunities, the P2ILCs explicitly indicate different steps of classroom interaction.
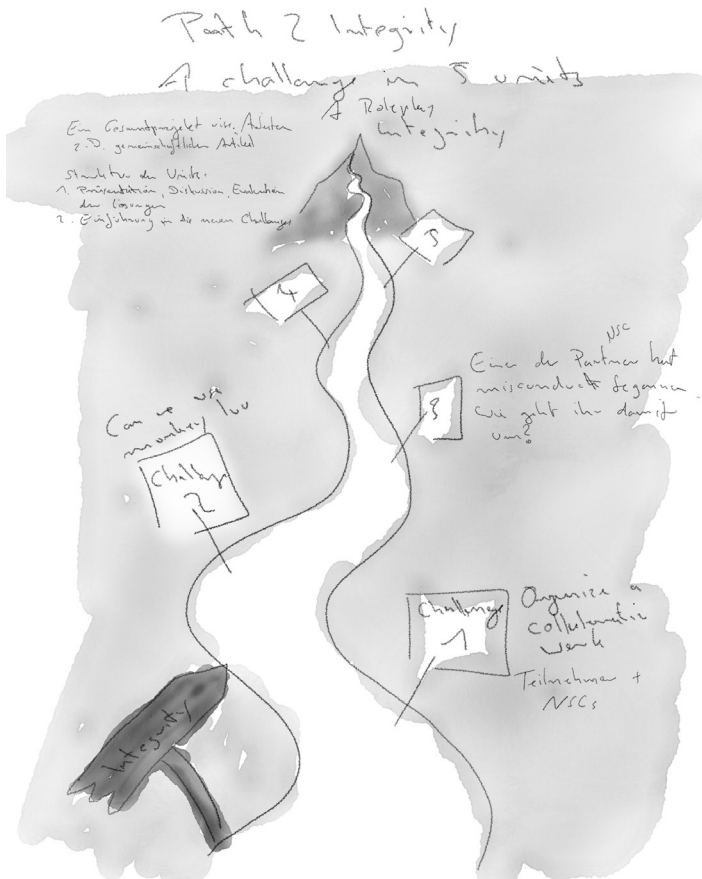

Figure 3: Problem solving by revisiting the same story in different learning sessions

Through the above-mentioned structure of the first page, trainers gain orientation on each learning card. The second page is prepared as a copy template. In P2ILC sessions, every participant has their own learning card (page two), which enables each student to actively contribute to the session.

The P2ILC programme follows the principle of a flipped classroom or pre-lesson preparation (Sahin and Fell Kurban, 2016; Strayer, 2012). The learning cards prompt the participants to become acquainted with the research integrity topic either by preparing at home or before the unit starts during a joint reading session. The participants are introduced to the topic through articles, videos, cartoons, or passages from articles.

Every learning card contextualises the research integrity topic with narrative cases to allow participants to easily understand and connect. In step 2, most of the cards exemplify a topic by using one of two stories. By repeatedly referring to these narrative cases (see Figure 3), the participants feel immediately connected and challenged by being able to identify with the characters in the story through "sympathetic imagination" (Nussbaum, 1997, pp. 85 and 95). Thus, they are impelled to think about how they would react, judge, and handle the situation at hand. Sometimes other narrative cases are provided, or participants are asked to choose their own examples from their disciplines.

The P2ILC programme is interactive and encourages participants to engage in dialogue. The parts on the learning cards marked in pink indicate that participants should engage in storytelling, in role-play or in coming to an agreement. Depending on the topic of the learning card, these methods ask the participants to provide rational arguments, to set common objectives and norms, to establish preconditions for a dialogue, to weigh the pros and cons of different actions, or to ask someone to do something[5] (Klare and Krope, 1977).

Each learning card in the programme ends with a reflection focussing on the overarching main topic of the card. This step brings the narrative beginning together with the personal decision-making and reasoning of the participants into a general discussion or framework.

As mentioned before, the general aim of the P2ILCs is to impart the skills needed on "how to conduct a dialogue on the rejection or acceptance of norms in research integrity" (Priess-Buchheit et al., 2020, p. 19). On the one hand, participants gain knowledge about different fields of research integrity and work, and on the other hand, they form their own personal positions on research integrity. Yellow boxes on the learning cards indicate information that has been prepared for the participants.

Generally, the other parts ask students to reflect on their positions on research integrity and give information about research integrity as a by-product of dialogical exercises.

3. Feedback and Development

P2ILC feedback was collected in 15 workshops with different educational stakeholders. In each workshop, one of the described learning cards was introduced and the stakeholders were asked to go through one learning session and act as participants. After each session, students, teachers, lecturers, ombudspersons, ethics committee members, programme administrators, and others commented on their learning experiences and made suggestions on how to improve the cards. The 90- to 120-minute workshops started in spring 2019 and ended in November 2019. The feedback was collected and informed the second version of the learning cards[6].

3.1. Feedback

Minutes of the meetings recorded the feedback of these 15 workshops. Häberlein and Claas (2020) published this feedback in "Dataset: Feedback on the Path2Integrity learning cards for research integrity" (Häberlein and Claas, 2020). This dataset includes the categories of

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[5] These are the main actions from the 14 rules on how to conduct a rational dialogue as pointed out in Klare, T., & Krope, P. (1977). Verständigung über Alltagsnormen (1. Ed). München: Urban und Schwarzenberg, p. 124.

[6] The Path2Integrity Zenodo repository contains all first and second versions of the learning cards (https://zenodo.org/search?page=1&size=20&q=Path2Integrity).

participants, workshop size, card number, card version, feedback, and country. The feedback for this report was collected from spring 2019 to November 2019 and includes all comments from workshop 1–18 in the dataset[7] except the workshops with general remarks[8].

The participants were students and researchers from different disciplines; lecturers from different universities whose work focusses on research ethics, research integrity and scientific work; ombudspersons and ethics committee members from different countries; and study programme administrators.

3.2. Analysis

This article elaborates on the "first-sight" **justified** and **valuable** comments gathered from the workshop feedback. In total, Path2Integrity collected 51 comments. The comments were immediately analysed and organised in categories.

In an analysis, the comments were categorised as follows:

- **Ill-fitting comments** that do not fit with the overall project goal of Path2Integrity (Priess-Buchheit et al., 2020) or a learning objective of a single learning card – rated as not relevant for further discussions;
- **Interesting comments for single learning cards** – rated as relevant to discuss with the project partners; and
- **Justified and valuable comments for the P2ILC programme** (namely, for all learning cards) – rated as requests to find solutions and implement them in the second version.

Specifically, for the third category, justified and valuable comments, eight comments were collected on "first sight" (see Table 1). The project coordinator and several partners discussed these comments, clustered them (see the three colours in Table 1) and designed three solutions.

3.3. Further development of the learning cards

Based on "first sight" comments numbered one to eight from Table 1 below, Path2Integrity elaborated the following solutions:

Solution one
Comments one, two, five and seven from Table 1 (in yellow) point out that trainers need more information on how to use the learning cards.

The comments are as follows:
- Comment one: "Explain what role trainers have in these exercises."
- Comment two: "Trainers, especially teachers, need more information on the research integrity topics beforehand."
- Comment five: "Specify for which purpose the different learning cards are."
- Comment seven: "Some of the discussion between students will take longer. How should the trainers handle this?"

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[7] See the first column in the dataset (Häberlein and Claas, 2020). Feedback on the Path2Integrity learning cards for research integrity. Research Ideas and Outcomes 6: e58434. https://doi.org/10.3897/rio.6.e58434.

[8] See the third column in the dataset (Häberlein and Claas, 2020). Feedback on the Path2Integrity learning cards for research integrity. Research Ideas and Outcomes 6: e58434. https://doi.org/10.3897/rio.6.e58434.

To provide trainers with more information, from 2020 on, a handbook with examples accompanies the 20 learning cards, which contains more information than the information that can be found in Figure 4 below. The comments show that this material, which was handed out in the workshops, contains too little information and the information given is not easily transferable. Furthermore, the comments led to specific explanations in the handbook, using examples as an easily transferable way to explain the principles and methods of the P2ILC programme.

How to use the learning cards:	Start by reading the learning cards. The front of each card provides an orientation for teachers, while the template on the back guides the class through the learning session
Duration:	The learning units can be adapted to class sessions from 90-120 minutes.
Preliminary work:	Participants should prepare for the unit by doing the first section at home.
Open atmosphere:	Participants should introduce each other and shake hands. Maintain an open and transparent session!
Time management:	Participants learn even without completing each section of the units. To ensure that there is time for reflection, jump to the last step 15 minutes before your session ends.
Support:	Support your participants at all times.

Figure 4: Current short piece of information on how to use the learning cards

Solution two

Comments three, five, six, and eight from Table 1 (in blue) show that designing only "learning cards for research integrity working towards reliable research results" for all target groups is a limiting and confusing practice.

The comments are as follows:

- Comment three: "Explain why a trainer should use this learning card."
- Comment five: "Specify the purposes of the different learning cards."
- Comment six: "Specify which card should be used for gifted secondary school students preparing to enter STEM research."
- Comment eight: "Specifically explain the overarching learning goal for secondary school students."

To provide a clear focus and to display the wide educational range of the P2ILC programme, the handbook integrates **research education** and **citizen education** as two overarching themes. This integration leads to two learning paths, one focusing mainly on the demand for reliable research results and the other focusing mainly on the production of reliable research results.

Table 1: *Feedback that the Path2Integrity team members rated as justified and valuable at first sight.*

Feedback	No	Place
Explain what role trainers have in these exercises.	1	Kiel
Trainers, especially teachers, need more information on the research integrity topics beforehand.	2	Kiel
Explain why a trainer should use this learning card.	3	Kiel
Connect reflection times from the end of the sessions (page two) with the learning objectives of the cards (page one).	4	Brussels
Specify the purposes of the different learning cards.	5	Brussels
Specify the purposes of the different learning cards.	5	Brussels
Specify which card should be used for gifted secondary school students preparing to enter STEM research.	6	Brussels
Some of the discussion between students will take longer. How should the trainers handle this?	7	Brussels
Specifically explain the overarching learning goal for secondary school students.	8	Coburg

Research integrity in the context of **citizen education** will target every citizen, especially secondary school students, and will place the importance and value of reliable research results in a knowledge-based society in the centre of the programme. Most suitable for such training sessions are the so-called S Cards, which are designed for non-disciplinary learning groups.

Research integrity in the context of **research education** will target researchers, early career researchers and students who want to become researchers. This context stresses the importance of obtaining reliable research results. The so-called M and Y Cards are the most suitable ones for such training sessions involving disciplinary and interdisciplinary groups. The second version of the P2ILC programme will provide different folders, short descriptions and handbooks for each context.

Solution three

Comment four (in green) in Table 1, "Connect reflection times from the end of the sessions (page two) with the learning objectives of the cards (page one)", shows that until now, the P2ILC programme has lacked a consolidation structure that spans the entire programme.

To provide a structure in which participants can reflect on their competencies, the second version of the P2ILC programme will add a Learning Journal to the learning cards. This learning journal prompts the participants to reflect on the learning objectives (from page one) with two to three sentences per learning objective after every session.

4. Overview

Notwithstanding the critical feedback seen in the dataset of Häberlein and Claas (2020), researchers from different disciplines, lecturers on research integrity and on scientific work at different universities, ombudspersons and ethics committee members from different countries, as well as study programme administrators have started to work with these cards and highlighted the importance of such a programme. This is not surprising, as the programme responds to current societal challenges such as fake news, or rather, societal misinformation and disinformation, as well as scientific challenges such as severe cases of research misconduct in many (European) countries.

Most of the learning cards in the P2ILC programme provide insight and discuss the responsible conduct of research (RCR), and therefore, concentrate on ideal actions. As Steneck (2006) outlined, RCR is just one pole of integrity in research. The complete picture of integrity in research spans from RCR to questionable research practices (QRP) to fabrication, falsification, and plagiarism (FFP). The narrative cases from the learning cards confront participants with ideal as well as worst behaviour (from RCR and QPR to FFP). Nevertheless, the exercises of the programme follow a positive approach, leading participants to reflect on what role they play in RCR.

In the P2ILC programme, participants are repeatedly asked to explain how to act in research situations. These actions of responsible conduct of research are often easily explained. The P2ILC learning curve thus starts at the moment in which they are then asked to elaborate on why their explanation can be called a "good one".

Path2Integrity validated its learning cards thoroughly in the first year to ensure that they exemplified relevant materials, effectively transferred the subfields of research integrity into the target groups' context and supported suitable reduction and scaffolding. With the feedback from the three above-mentioned categories, the programme developed the improved second version of the learning cards.

Until now, very little has been known about educational programmes in the field of research integrity. Steneck (2013), Marusic, Wager, Utrobicic, Rothstein and Sambunjak (2016) and Löfström (2015) acknowledge that there is not much evidence of research integrity instruction. The advantage of P2ILC is that it is a replicable programme that will and can be evaluated in different settings and will provide research-based insights on ways to foster research integrity from an educational perspective. So far, the major research contribution of the programme has been an approved and validated design for learning sessions for several target groups, which can be used, adapted and discussed in different learning settings. The value of the programme will be enhanced as dissemination and evaluation proceed. "The … [evaluation] tests the effectivity of the Path2Integrity … approach. … In a pre–post test design (with control groups), the valid, reliable and objective assessment tests 12 educational organisations (four schools and eight universities) to see whether participants … score higher on research integrity knowledge and research integrity reasoning" (Priess-Buchheit et al., 2020, p. 8).

The accompanying handbook of Path2Integrity, which was designed as a response to the above comments, emphasises the European Code of Conduct as a reference document. Additionally, the handbook explains that Path2Integrity learning sessions invite their participants to find their roles in the field of research integrity. Kalichman (2015) describes major scandals as catalysts for research integrity programmes. He describes training approaches as either reactive or proactive. The former gives guidance through codes and sanctions, whereas the

latter trains through discussion and designs of codes. Taking the European Code of Conduct as a reference document and the participant's role in Path2Integrity sessions into account, Path2Integrity's educational programme is a mix of both.

The P2ILC programme is the first educational programme in Europe that trains secondary school students from age 16 up to (early career) researchers. The conclusion to provide secondary school students with the overarching theme of **citizen education** and therewith to define another research integrity context for this group is new and needs to be evaluated in further settings.

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