

# Rotatory role-playing and role-models to enhance the research integrity culture

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## Abstract

The Path2Integrity project is a two-component coordination and support action to enhance research integrity cultures. Path2Integrity develops and fosters role-models and rotatory role-play scenarios for secondary school students, undergraduates, graduates, and early career researchers. A Path2Integrity campaign for scientific facts about research integrity and role-models, raises awareness of research integrity within secondary schools and universities. A complementary Path2Integrity handbook of instructions, which contains vivid stories involving research integrity and rotatory role-playing increases students' ability to form judgements about the acceptance or rejection of norms in research. A train-the-trainer program shows how to use the Path2Integrity handbook of instructions, especially how to apply the handbook to the educators' discipline and how to implement it into organisations. Partners from the Consortium have award-winning experience in creating those settings, which allows Path2Integrity to work with educational practices already in existence. Taking into account that different disciplines and different schools of thought are involved, it is the Consortium's paramount concern, to ensure explicitly that the Path2Integrity handbook and campaign are based on optimal and systematic evidence-based decisions.

## Keywords

Research integrity, innovative learning and teaching, role-models, train-the-trainer for research integrity, role-playing and storytelling

## Excellence

\*1This project is dedicated to maximising the quality and societal impact of research and to fostering integrity as an integral part throughout the research and innovation process. Because the European landscape is changing so rapidly, it is essential to emphasise the virtue of integrity and to enable a comprehensible handling of new scientific techniques as well as compliance in the responsible conduct of research. In recent years, the research community has witnessed changes not only within the scientific community (for example new techniques such as nuclear or gene technology, IT, big data or working circumstances such as financing, multiple authorships etc.), but also in the relationship between science and society (for example shaking public confidence in science through repeated misconduct, fraud and illegitimate evidence in research) (Fanelli 2009). Because breaches of integrity in science undermine the quest of new knowledge, counteract societal progress and cause a huge waste of funding and public money (Stern et al. 2014), research integrity needs to be a common European value and practice. As pointed out by the Science Europe Working Group, there are seven reasons why Europe cares about research integrity: “1. Research Integrity Safeguards the Foundations of Science and Scholarship / 2. Research Integrity Maintains Public Confidence in Researchers and Research Evidence / 3. Research Integrity Underpins Continued Public Investment in Research / 4. Research Integrity Protects the Reputation and Careers of Researchers / 5. Research Integrity Prevents Adverse Impact on Patients and the Public / 6. Research Integrity Promotes Economic Advancement / 7. Research Integrity Prevents Avoidable Waste of Resources” (Science Europe 2017). Thus, there is an urgent need to tackle these integrity challenges and teach research integrity more efficiently, since traditional methods do not appear to be good enough.

Promoting research integrity is a key factor of Responsible Research and Innovation (RRI). In line with the EU's commitment to promoting Responsible Research and Innovation and the European Integrity Code from ALLEA and ESF, the project “Path2Integrity: Rotatory role-playing and role-models to enhance the research integrity culture” (hereafter referred to as Path2Integrity) is an excellent way to establish innovative methods for young generations of (possible) researchers. Using these methods, both teaching and learning, promotes a culture of research integrity.

## Objectives

### Overall aims

Over the next three years, the Path2Integrity project will support efficient formal and informal methods and contribute to the establishment of a culture of research integrity by pursuing the following aims:

1. Establish excellent learning paths with research integrity role-models and rotatory role-playing by developing and disseminating a Path2Integrity handbook of instructions.
2. Raise awareness with a widespread Path2Integrity campaign on scientific facts about research integrity (hereafter called RI-facts) and role-models in educational organisations.

By developing a Path2Integrity handbook of instructions, a widespread Path2Integrity campaign, international collaborations on three continents and a robust assessment, the project will result in a successful implementation of excellent learning paths, working on the basis of existing successful educational practices. The Path2Integrity programme will create efficient units for learning research integrity, targeting secondary school students as well as undergraduates, graduates and young researchers (Table 1). It will also address all those who are directly or indirectly involved in research, e.g. educators, senior researchers and other forms of students involved in research.

Table 1.

Parties directly or indirectly involved in research.

| Target groups                          | Path2Integrity campaign   | Path2Integrity handbook   |
|--|---|---|
| <b>Directly involved in research</b>   | senior and junior researchers, university students, research commissions, ombudsmen, technical support, laboratory support etc. | undergraduates, graduates and young researchers<br>academic faculty, currently teaching (hereafter called university lecturers) |
| <b>Indirectly involved in research</b> | administrative faculty, secondary school students, teachers and administrations   | secondary school students<br>school teachers  |

Research integrity is an important element of more innovation, growth and high-quality jobs, meaning a scientific community pursuing research integrity can help guarantee faster achievement of the Europe 2020 goals. Our idea is that a young generation of future researchers dedicated to research integrity will build on the high ethical standards we establish now. Research integrity leads to more efficient, appropriate, useful and reliable scientific evidence for policy-makers, entrepreneurs, and others. It therefore emphasises responsible scientific evidence and better responsible scientific advice, where decisions based on research results lead to a better future (see Chapter 1.3.1 Concept). The Path2Integrity project combines award-winning consortium partners with international excellence (see the attached short curriculum vitae of the WP leaders and of the

international expert advisory board) connected to significant networks such as ENERI, JERRI, EUREC, ENRIO etc. and important stakeholders (referring to learning in secondary schools and universities).

Following on from the overall goals, there will be a concrete method (Table 2) for learning research integrity and a campaign (Table 3) to foster a research integrity culture.

Table 2.

Method for learning research integrity.

The Path2Integrity innovative method for learning research integrity ...

... contains efficient storytelling and rotatory role-playing and leads students to **conduct dialogues on the acceptance or rejection of norms in research integrity.**

Table 3.

Campaign to foster a research integrity culture.

The Path2Integrity awareness raising for research integrity ...

... is an effective **RI-facts and role-model campaign** in secondary schools and universities.

We will publish all outputs of the project open source, promote them on different online platforms for teaching, conduct a training programme for educators and a decentralised training centre as well as apply an autopoietic development unit inside the handbook (see Task 3.3). The following eight specific objectives will be reached to support sustainable change for research integrity and research excellence.

## Specific objectives

### **Objective 1: An up-to-date map on innovative educational methods to learn research integrity (see WP2)**

The map shows positively tested methods from the partners from other teachers and lecturers in the EU and beyond, which are used to teach academic writing and research. The map marks whether the collected methods a) contain research integrity units; b) refer to the “Code of Conduct in research” (ALLEA – All European Academies 2017) and if so, which one; and c) use studentcentred dialogues as a tool.

### **Objective 2: An up-to-date map on curricula, in which research integrity is included nowadays (see WP3)**

The map depicts the curricula chapters in which research integrity is mentioned, describing 10 cases for each country in the consortium, five at the secondary school level and five from university curricula. In cases where research integrity or research ethics cannot explicitly be found in the countries’ curricula, the map will depict associated fields such as academic writing and research. This objective engages schools that are indirectly involved

in research, as well as research institutions and those involved directly in the research, to complete the picture of the curricula map.

**Objective 3: A Path2Integrity RI-facts and role-model campaign and its assessment (see WP2 and WP6)**

The Path2Integrity campaign is an informal educational setting and displays important messages from the European Union on research integrity norms (such as Ethics reviews Article 14 (European Parliament and the Council 2013a), Ethical principles Article 19 (European Parliament and the Council 2013b) etc.), as well as important scientific facts from other SwafS projects such as VIRT2UE, EnTIRE, PRINTEGER, INTEGER, DEFORM, ENERI and places female and male role-models such as Marie Skłodowska Curie and Bertrand Russell for orientation and identification. An assessment accompanies the development of the units and assesses how messages are perceived from different audiences.

**Objective 4: A Path2Integrity handbook of instructions and its assessment (see WP3 and WP6)**

Instructions for vivid storytelling and rotatory role-playing provide formal educational settings. The handbook contains 20 student-centred teaching units accompanied by role-models, significant statements and messages from the campaign. The units are adaptable to different disciplines. The Code of Conduct for research integrity will be provided as an attachment and offered as reference in the units. The first five units are for secondary school students, the following five units are usable in secondary schools and at undergraduate level and the last 10 units are for graduates and young researchers. An assessment accompanies the iterative development (conducted by the consortium partners in schools and universities) of the units and assesses whether the learning outputs outperform learning outputs from lecture-oriented courses. The SwafS cross-cutting priorities of gender dimension and international cooperation play an important part in the development of the handbook of instructions (see WP1 for gender dimension and WP3/ WP5 for international cooperation).

**Objective 5: A Path2Integrity training programme for educators (see WP4)**

Referring to the map of curricula (Objective 2), the training programme for educators envisages and describes a heterogeneous target group (see Task 4.1). Objective 5 provides instructions on how to use the Path2Integrity handbook of instructions, especially how to apply the handbook to the educators' discipline and how to implement it into organisations. Objective 5 is a feasibility study starting with four educators from different countries and cultural contexts and holding close to the knowledge of the SwafS project VIRT2UE.

**Objective 6: The Path2Integrity training centre (see WP5)**

The consortium partners from ENERI, a network of networks (integrating EUREC, ENRIO and ALLEA), is the main partner in the training centre paving the way for wide-spread implementation of the high-performing handbook and campaign in the EU. The training

centre conducts the Path2Integrity training programme for educators with at least 150 educators – 80 school teachers in three different European countries and 70 educators for universities in at least 15 European countries (and one non-EU country), implements decentralised actors across the EU and supports aspects of capacity building. This objective especially targets the SwafS cross-cutting priority of RRI.

### **Objective 7: The Path2Integrity campaign (see WP5 and WP7)**

The Path2Integrity campaign is a multi-media and multi-platform campaign with a clear mission of fostering a European research integrity culture and responsible research and innovation conduct. Texts, images, animations and videos record role-models, messages and statements on research integrity. The campaign targets everyone connected to secondary schools and universities. Facebook, Twitter, Vimeo, Youtube, Instagram etc. are digital distribution channels to be used, as well as the networks ENERI, EUREC, JERRI, ENRIO etc., using each one's analogous distribution channels.

### **Objective 8: The effectivity of the Path2Integrity two components (see WP6)**

The assessment tests the effectivity of the Path2Integrity two-component approach, which combines formal and informal learning settings. 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 of the two-component approach score higher on research integrity knowledge and research integrity reasoning.

### **Relation to the work programme**

The Path2Integrity proposal addresses the topic SwafS-02-2018: Innovative methods for teaching ethics and research integrity as outlined in the Science with and for Society Work Programme 2018–2020. This section explains how the proposal addresses the work programme, the respective strategic orientation and the specific challenge and scope of the topic.

The Science with and for Society Work Programme 2018–2020 (SwafS WP18–20) rightfully claims a strong position within the research and innovation policy of the European Union. Today, far-reaching changes affect our research and innovation systems as well as our society when digital technologies and a global economy result in the numerous societal challenges of our time. In these complex situations, scientific findings are increasingly valuable for maintaining societal cohesion. But without a living culture of research integrity incorporated from the early beginning of a scientific career, ambiguous ethical handling of new techniques, fraud and manipulated research data corrupt the mission of science with and for society. The proposal is fully tailored to address the scope of the programme by developing the Path2Integrity handbook of instructions and the Path2Integrity campaign.

The Path2Integrity two-component strategy will induce changes in all five dimensions of the SwafS cross-cutting priority RRI (Gender Equality (see Task 1.2), Science Education (see WP3 and WP6), Open Access/Open Data (see Task 7.6), Public Engagement (see Tasks 2.1, 3.2 and 5.6) and Ethics, including Research Integrity) of the SwafS programme

and will tackle the United Nations Sustainable Development Goals of Quality Education and Gender Equality. Within the first SwafS WP18–20 strategic orientation of ‘Accelerating and catalysing processes of institutional change’, Path2Integrity will foster a culture of research integrity culture in schools, universities and research institutions through innovative learning paths for research integrity by actively involving quadruple helix stakeholders (1. Research and Education: emphasise on members in secondary and higher education; 2. Public Administration: emphasise on school and university administration; 3. Business: emphasise on publishers; 4. Civil Society: emphasise on foundations for science and education; see especially Tasks 2.1, 3.2 and 5.6).

Table 4 summarises how Path2Integrity plans to tackle the (I) specific challenge and (II) scope of the topic SwafS-02-2018: Innovative methods for teaching ethics and research integrity. More details are provided in the description of the specific work packages and the overall approach.

| Table 4.<br>Summary of how Path2Integrity plans to tackle the (I) specific challenge and (II) scope of the topic SwafS-02-2018.   |   |
|---|---|
| Specific challenge of SwafS-02-2018 (European Commission 2017)  | Solutions by Path2Integrity   |
| <i>To maximise the quality and societal impact of research, integrity should be an integral part of the research and innovation process and more generally within the scientific system, rather than being considered an add-on or a means of creating additional red tape.</i>   | Path2Integrity implements research integrity in its wider context, as an optimal and adequate evidence-based trajectory from reliable research invention/exploration to applied development and innovation. Path2Integrity will lead to 1) a positive identification with research integrity through rolemodels and 2) the ability to conduct dialogues on the acceptance or rejection of norms in research integrity, while avoiding the creation of additional structures of penalisation measures in secondary schools and universities.   |
| <i>The new European Code of Conduct for research integrity is unambiguous: “It is of crucial importance that researchers master the knowledge, methodologies and ethical practices associated with their field”.</i>  | Path2Integrity incorporates the European Code of Conduct for Research Integrity in its handbook and trains educators in using units referring to the European Code of Conduct for Research integrity. More importantly, Path2Integrity educates future researchers with instructions from the Path2Integrity handbook in applying the Code of Conduct for research integrity.   |
| <i>Traditional methods of teaching ethics and research integrity do not appear to be efficient in raising awareness on these issues. There is consequently a need to develop innovative educational methods engaging all those who are involved in research either directly (e.g. young and senior researchers) or indirectly (e.g. pupils at all levels of education, educators and students educated in technical laboratory support studies) involved in research. In particular, the needs of two groups should be addressed: that of adolescents and that of university students and early career researchers.</i> | Path2Integrity leaves well-trodden paths of traditional methods of teaching ethics in its Path2Integrity handbook of instructions by using vivid storytelling and rotatory role-playing as learning methods. With the two-component strategy, Path2Integrity reaches all participants (directly and indirectly) in the R&I system – with explicit attention to future researchers in different disciplines (including engineers and other applied sciences). Furthermore, the Path2Integrity teaching method applies to the needs of both groups: those of secondary school students and those of undergraduate and graduate students and universities, along with early stage researchers. |

| <b>Specific challenge of SwafS-02-2018 (European Commission 2017)</b>  | <b>Solutions by Path2Integrity</b>   |
|--|--|
| <i>On the basis of existing successful educational practices, the action will develop and test innovative, educational, student-centred methods (formal and informal) aiming to promote a culture of research integrity and raise awareness of students and early career researchers.</i>  | The Path2Integrity programme is based on existing successful educational practices, e.g. the award-winning FaceToFace learning pathway from Prof. Prieß-Buchheit. The WP6 team will systematically test the messages of the Path2Integrity campaign and test (as well as select on evidence) highperforming teaching units to learn research integrity, so that the consortium can raise awareness in pupils, students, early career researchers, as well as promote a culture of research integrity for all persons directly or indirectly involved in research.  |
| <i>The above-mentioned Code of Conduct for research integrity will be the reference document to be used as the basis for the proposed methodology.</i>   | In the mapping and development of innovative methods to learn research integrity, WP3 will exclusively adapt instructions with the reference to the Code of Conduct for research integrity for the Path2Integrity handbook (see Chapter 1.3.1 Concept).  |
| <i>Different curricula and educational tools and methods should be developed for two groups: the first group will be composed of secondary school students; the second will be composed of undergraduate and graduate students in relevant fields (including technical education students), as well as early career researchers.</i>   | Path2Integrity will contain instructions for the target groups of secondary students, (under-)graduates and young researchers, which can be implemented in different disciplines. Coburg University of Applied Sciences and Arts is an expert in developing and teaching units, which are transferred to different disciplines including technical education for example in bio-analytics.   |
| <i>The curricula should be interactive, aiming to engage students and early career researchers in a dialogue. Such curricula should be adapted to the age of the students and take into account the gender dimension. The curricula may include, for example, drama, role play, service learning, case studies, debates, position papers and presentations, as well as e-learning methods. These curricula should allow for a plurality of opinions and for nuance, rather than a set of predetermined "right or wrong" answers.</i> | Vivid storytelling and rotatory role-playing will provide ideal methods. Different settings will be provided for the two target groups from different age cohorts. In these settings, students gain the experience of clarifying their preconceptions, if required, as well as learning not to hold onto their opinions in the face of better information; rather, they learn to accept better arguments. They learn to confirm that each participant has understood the terms used, as well as to argue with logical consistency. The SwafS cross-cutting priority of a gender dimension of learning ethics and research integrity will be explicitly supported, tested and evaluated through the complete project duration (see Task 1.2). |
| <i>The work will also cover the design of training programmes for educators that will be responsible for implementing the curricula.</i>   | WP4 will take up the European core – and advanced – curricula on RI teaching developed by the team of Erika Löfström (member of the international expert advisory board) within ENERI and advance the training programme for educators; meanwhile WP5 will conduct a pan-European training centre with decentralised elements  |
| <i>The work should be based (amongst others) on (i) a mapping of other existing innovative teaching techniques and (ii) an analysis of the benefits and potential impact of the proposed methodology compared to existing educational practices</i>  | By mapping an up-to-date summary on innovative educational methods for research integrity, Task 3.1 stipulates which means will be used to teach research integrity in a dialogical manner in different disciplines within the consortium, as well as collects other existing innovative teaching techniques and assesses their benefits and potential impacts. WP6 assesses which units of the Path2Integrity handbook outperform traditional lectures.   |



| Specific challenge of SwafS-02-2018 (European Commission 2017)  | Solutions by Path2Integrity   |
|---|---|
| <p><i>The action will take into account and build on the output of the research projects financed by this Science with and for Society programme that covers training and educational aspects of research integrity (e.g. PRINTEGER, ENERI, project funded via SwafS-27-2017). Close cooperation with the European Network of Research Ethics and Research Integrity is required.</i></p> | <p>WP2 organises a workshop with other SwafS projects such as ENERI, VIRT2UE, PRINTEGER, DEFORM etc. to exchange knowledge on research integrity and innovative learning methods. Path2Integrity will strongly cooperate with the European Network of Research Ethics and Research Integrity (ENERI, through Dirk Lanzerath, the coordinator of ENERI, and a consortium member (Erika Löfström) in our international expert advisory board), as well as with the European Network of Research Ethics Committees (EUREC, a partner of the consortium) and the European Network of Research Integrity Offices (ENRIO, presented by Nicole Föger in the international expert advisory board).</p>  |
| <p><i>In line with the strategy for EU international cooperation in research and innovation (COM (2012)479), international cooperation is encouraged.</i></p>   | <p>Because teaching Research Integrity is always embedded in culture, the consortium will exchange different views inside the EU and beyond. Bringing together five continents in the project provides the exceptional opportunity to reflect on the context of the project and to exchange practices and ideas with others over a three year period. The Foundation for Student Science and Technology Canada (FSST) and María del Carmen Bernal González from Universidad Panamericana, Mexico, already stated their interest in collaborating to organise two workshops with Path2Integrity in their letter of support. Simson Mwale from Zambia Catholic University and Chen Cheng-Chen from University Systems Taiwan suggested the possibility of conducting a workshop in Zambia, Taiwan or Europe. Our excellent international cooperation is displayed in our diverse international expert advisory board, in which everybody already officially stated their support. Task 5.5, Task 3.2 and the project management describe international workshops, skype conferences and networking. Thus, Path2Integrity strongly incorporates the SwafS cross-cutting priority of International Cooperation.</p> |

## Concept and methodology, quality of the coordination and support measures

### Concept

Following from the overall goals of establishing excellent learning paths by developing and disseminating a Path2Integrity handbook of instructions and raising awareness (Table 5) for a research integrity culture, there will be a concrete method for learning research integrity, as well as a campaign to foster a research integrity culture.

|  |
|--|
| <p>Table 5.<br/>Path2Integrity concept.</p>  |
| <p>The Path2Integrity innovative method for learning research integrity ...</p>  |
| <p>... contains <b>efficient</b> storytelling and rotatory role-playing and leads students to conduct dialogues on the acceptance or rejection of norms in research integrity.</p> |
| <p>The Path2Integrity awareness raising for research integrity ...</p>   |
| <p>... is an <b>effective</b> RI-facts and role-model campaign in secondary schools and universities.</p>  |

The overall concept of Path2Integrity in a nutshell:

- a) Theory: Evidence-based formal and informal learning
- b) Model: The two-component approach
- c) Substantiation: The Code of Conduct for research integrity for future attitude and behaviour in research.

**a) Theory: Evidence-based formal and informal learning**

The project Coburger Weg of Coburg University of Applied Sciences and Arts (DE) assessed (with valid, objective and reliable data) that learning research methods including research integrity across disciplines has been a very challenging task (Bender et al. 2016). The team found out that these courses did not reach their target, namely a good understanding of responsible academic research and writing. In four years, the courses on research methods and research integrity failed their target and only reached a satisfactory understanding of responsible academic research and writing. These results confirm the outcomes of the study from Hyytinen and Löfström (2017), reporting a need for pedagogical training in research ethics; however, they conflict at first glance with findings from Löfstrom et al. (2015) that self-reporting by academics disagrees with the statement that academics do not have the competence to teach research integrity.

The key concept of the consortium is the supply of practical educational knowledge. Teachers and lecturers for research integrity are required to make complex didactical decisions. Their teaching habits are often based on experience, usually consisting of single practical examples. Within the concept of evidence-based learning, the consortium is trying to find evidence, based on well-founded results from educational research, to give practice relevant recommendations. Path2Integrity will conduct an **efficiency assessment** with a substantial sample size using a quasi-randomised sample and rigorous statistical methods. In accordance with Objective 4, we will assess whether the formal learning by the Path2Integrity handbook surpasses learning outputs from traditional lectures. Additionally, we assess in Objective 8 whether the two-component approach, using informal learning settings in the campaign and formal settings in the Path2Integrity handbook of instructions, is **effective** in learning research integrity.

Because there are different disciplines and different schools of thoughts involved, the consortium places paramount importance on explicitly ensuring that the recommendations for teaching and learning are based on optimal and systematic evidence-based decisions. To pursue this goal and to handle not yet known obstacles, the project offers a highly qualified and outstanding accompanying evaluation (see WP6).

The assessment of Path2Integrity produces the following indicators:

- **efficiency** - which learning paths outperform traditional lectures for research integrity (Task 6.1),
- **effectivity** - how effective is the two-component approach to promote research integrity (Task 6.4),

- **feasibility**- which messages do men and women as well as different age cohorts perceive from the Path2Integrity campaign (Task 6.2); - what strengths, weaknesses, opportunities and threats does the implementation of the Path2Integrity handbook of instruction in schools and universities present (Tasks 4.5 and 6.3).

Tasks 6.1 and 6.4 will be mainly measure-based (quantitative) assessments. Task 6.1 will analyse the (short-term) efficiency of innovative learning paths in a quasi-experimental design and will assess whether gender-specific outcomes occur. Task 6.4 will analyse the effectivity of the two-component approach in a pre-post design. Task 6.2, on the other hand, will (pre-)test the message of the campaign, focusing on gender-sensitive outcomes, while Tasks 4.5 and 6.3 will be an experience-based (qualitative) feasibility study of the training programme for educators and qualitative feedback from the training sessions inside the training centre. Path2Integrity will therefore collect information with feedback sheets, interviews and questionnaires from trained educators in schools and universities on where the implementation of the Path2Integrity worked and which obstacles and barriers appeared. The different evaluation processes will record answers on which units are effective in learning research integrity. What material raises awareness on research integrity? What qualifications do the educators need? How did different organisations adopt the Path2Integrity research integrity handbook of instructions for learning paths and the campaign material? Which obstacles and barriers occurred? And of the units and materials offered, which did they use? Regarding the organisation-specific adoption process of the Path2Integrity handbook of instructions and the campaign material, what has evolved smoothly and what has not? What have been the main sources of resistance (practical, material, political)? What actions should follow in teaching and learning research integrity in the future?

The project is arranged in four phases, based on its objectives (Fig. 1).

Phase 1: Mapping and Analysis: Accomplish up-to-date maps on a) existing innovative educational methods for learning research integrity and b) on curricula in which research integrity is included (O-1, O-2)

Phase 2: Development: Adapt and assess the Path2Integrity handbook of instructions and the Path2Integrity campaign material (O-3, O-4)

Phase 3: Implementation and Dissemination: Implement the Path2Integrity through a training programme for educators and simultaneously foster the Path2Integrity campaign (O-5, O-6, O-7)

Phase 4: Effectivity: Test the effectivity of the Path2Integrity two-component approach (O-8).

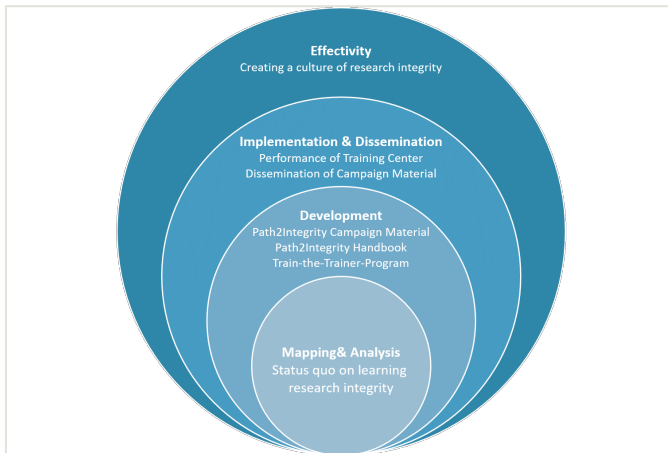


Figure 1. [doi](#)

The four phases of the Path2Integrity project.

### b) Model: The two-component approach

The following model is the basis for the two components of our Path2Integrity approach. The project is based on a constructive social norms approach. This two-component approach anticipates that research integrity can be enhanced by offering different learning paths locally and across borders: on the one hand, RI-facts and role-models; and, on the other hand, vivid storytelling and rotatory role play. These formal and informal learning environments of the Path2Integrity programme will challenge the two groups of students to internalise values of research integrity, comprehensibly handle and judge new scientific techniques and follow behavioural compliance. Both methods follow the shift from a checklist of research ethics providing right and wrong answers to a virtue-based strengthening of the habits of (future) researchers and relevant education and training stakeholders.

Although there is a need to promote research integrity in every age cohort, students aging from 16 to 28 will be the main target group for the formal learning settings. The Path2Integrity handbook concentrates on the age group 16 to 28 because they are at the stage entering the scientific community and are in the process of developing professional values and compliance structures. Experiences shows that the development of outstanding evidence based educational methods do not necessarily lead to its applications. Even reaching individual teachers or lecturers is not enough. As mentioned in the obstacles and barriers chapter below, teaching and learning in organisations is determined by curricula, team and teaching habits, as well as by arrangements regarding space, participant, time etc. Thus – next to developing and testing the innovative methods – Objective 2 raises awareness inside educational organisations to address responsible persons involved directly or indirectly in research, while Objectives 4, 5 and 6 compel to implement the Path2Integrity handbook and systematically assess feasible ways of implementing it in organisations.

### c) Substantiation: The Code of Conduct for research integrity for future behaviour in research

“Failing to follow good research practices violates professional responsibilities. It damages the research processes, degrades relationships among researchers, undermines trust in and the credibility of research, wastes resources and may expose research subjects, users, society or the environment to unnecessary harm” (ALLEA – All European Academies 2017, p.8). Overall, research integrity is a significant benchmark for future behaviour in research to pursue the task of science to gain “knowledge obtained through systematic study and thinking, observation and experimentation” (ALLEA – All European Academies 2017, p.3). The Code of Conduct for Research Integrity formulates principles of research as a common European value and consolidates European excellence to ensure and achieve a better future.

The consortium fortifies research integrity as a European core value; its position is an integral part within a circle of ethical social innovation (Fig. 2), which stands for an optimal and adequate evidence-based trajectory from reliable research invention/exploration to applied development and innovation (Hines 2016). The consortium connects a comprehensible handling of new scientific techniques and compliance in research closely to boost in social innovation. Breaches of integrity and uncertainty in research conduct significantly reduce the impact of research and threaten citizens’ well-being and public goods. When the ethical principles of research conduct (such as reliability, honesty, respect and accountability) are neglected, the negative socio-economic impact can be significant. The Code of Conduct for research integrity will be provided as an attachment in the Path2Integrity handbook. The instruction will offer this Code as reference to debate on the acceptance or rejection of norms in research integrity (Fig. 2).

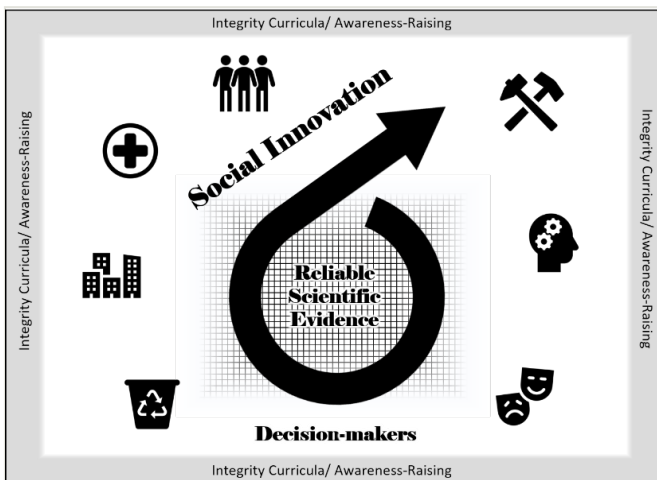


Figure 2. [doi](#)

Reliable scientific evidence and social innovation.

### Summary of the concept:

- Theory: Path2Integrity conducts an **efficiency assessment**, of whether formal learning outputs from the Path2Integrity handbook surpass learning outputs from traditional lectures and assesses whether the two-component approach, which uses informal learning settings in the campaign and formal settings in the Path2Integrity handbook of instructions, is **effective** in learning research integrity.
- Model: The **two-component approach** seeks to enhance research integrity by offering the young generation of (possible) researchers more RI-facts and role-models for orientation and identification, on the one hand and, on the other hand, vivid storytelling and rotatory role-playing to conduct dialogs on research integrity.
- Substantiation: The **Code of Conduct** for research integrity will be provided as an attachment in the Path2Integrity handbook. The instruction will offer this Code as reference to debate on the acceptance or rejection of norms in research integrity.

### Relationships with on-going national and international research and innovation activities, as well as synergies

Research ethics and research integrity are dealt with in the Horizon 2020 legislation. See for example:

- Horizon 2020 Rules for Participation: Ethics Reviews (Article 14),
- Horizon 2020 – Regulation of Establishment: Ethical principles (Article 19) and
- The Model Grant Agreement: Ethics (Article 34).

Work packages 2, 4 and 5 are strongly connected to on-going international research and to other SwafS projects. Objective 3 will reach out to incorporate the results from DEFORM about research malpractice and a financial model covering the risks and losses and other RI-facts from other SwafS projects will be integrated into the Path2Integrity campaign. Furthermore, the consortium will:

- include the newest version of the Code of Conduct for Research Integrity from ALLEA;
- use the established operable platforms in the fields of research ethics and research integrity from ENERI, EUREC, ENRIO and JERRI (accessible through the consortium and international expert advisory board members Dirk Lanzerath – ENERI, EUREC / Nicole Föger – ENERI, ENRIO / Philine Warnke – JERRI);
- closely connect with Virtue-based ethics and integrity of research: Train-the-trainer programme VIRT2UE, which has developed a blended learning course in Research Integrity and trains trainers to facilitate face-to-face sessions designed to foster moral virtues;
- adopt the strategies from NewHorRRizon to disseminate best practices to promote RRI acceptance;
- exchange ideas, practice units and implementation procedures of teaching and learning research integrity with experts from Canada (Dick Bourgeois-Doyle and Jacques Guerette), Mexico (María del Carmen Bernal González), Taiwan (Chen

Cheng-Chen) and Zambia (Simson Mwale), all members of the international expert advisory board; and

- implement procedures from action plans for each key dimension developed by the JERRI project into the learning units.

These SwafS projects will provide cutting edge input for the learning material as well as networking possibilities to effectively achieve the objectives of the Path2Integrity. There will be a special Newsletter issue published on the project website and distributed within the Path2Integrity network to disseminate benefits and insights from the knowledge exchange between previously funded SwafS projects.

VIRT2UE aims to develop a sustainable train-the-trainer blended learning programme enabling contextualised ERI teaching across Europe, which focuses on understanding and upholding the principles and practices of the European Code of Conduct. It aims at a methodology that strengthens the habits, attitudes and the motivations of the actors, to not increase the number of guidelines. Path2Integrity will learn from VIRT2UE's experiences (toolboxes, e-learning channels etc.) and will synchronise the methodology by establishing a joint VIRT2UE– Path2Integrity working group. ENERI is the European Network of Research Ethics and Research Integrity, which has established an operable platform of actors in the fields of research ethics and research integrity (RE/RI).

ENERI is the European network for the entire RE/RI community, combining the Network of Research Ethics Committees (EUREC), the Network of Research Integrity Offices and Ombudspersons (ENRIO) and the Network of European Academies of Sciences (ALLEA). The latter Network prepared the European Code of Conduct. For Path2Integrity ENERI will be a central source of experiences in RE/RI communication and teaching, ENERI will be a platform of testing and dissemination of the materials and innovative methodologies developed in the project (prototype teaching, interviews etc.) and the ENERI ePlatform will also serve as central access point for Path2Integrity's resources and educational materials. ENERI will also assist Path2Integrity in linking its activities to RE/RI communities outside of Europe.

EnTIRE is a mapping project that will make the normative framework governing RE/RI accessible via a dynamic online Wiki-platform. This also includes educational materials. Path2Integrity will provide channels to link the developed training materials with this Wiki-platform as it will be prepared in connection with the ENERI ePlatform. This is to find decentral stored information easily via central access points.

Path2Integrity partner EUREC will care for the bridges of Path2Integrity with VIRT2UE, ENERI and EnTIRE since EUREC is a partner of these consortia.

PRINTEGER is a project that promotes improvement of governance of integrity and responsible research in order to highlight this against the background of the daily operation of researchers and the tensions of a complex research system. Path2Integrity will carefully analyse PRINTEGER's results and will in particular include the case studies on the teaching methodologies.

DEFORM analyses the financial and global impact of research misconduct. Path2Integrity will include these results of the economic perspective concerning the motivational aspect of research integrity. Since misconduct and fraud in science are also huge economic factors, the teaching materials and methods need to consider this financial field separately from the moral point of view. This is to link moral values and economic values in the RI framework and its educational structures.

## **Synergies**

Path2Integrity brings together excellent expertise and international collaborations (of research integrity) to foster innovative and efficient methods to learn research integrity. The aspect of networking is a relevant factor in providing and fostering efficient units. Each partner in the consortium is already strongly connected and each will constantly pursue ongoing collaborations that work on different dimensions of teaching and learning research integrity for input and outreach.

Additionally, the members of the consortium represent important and well-connected experts from relevant disciplines and fields. They all have close connections to national projects concerning learning research integrity or dissemination procedures. From the lead partner, Coburg University of Applied Sciences and Arts, Prof. Prieß-Buchheit won an award for innovative teaching and one of her seminars was labeled best practice example from the Centre for Academic Instruction (see <http://www.einfachgutelehre.uni-kiel.de/allgemein/forschendes-lernenin-der-paedagogik/>). This competence, in combination with the international experience of the University of Southern Denmark and the highly qualified evaluation competence in education from Kiel University, is an excellence foundation. The 3C lawyers from Spain are specialised in ethical compliance, integrity and in behavioural change. They have long and considerable experience in working with international teams (such as working at the Court of Justice of the European Union, elaborating a Policy Paper for a Kosovo Women's Network (KWN) in Kosovo or collaborating with European Women Shareholders Demand Gender Equality (EWSGDGE)). 3C is very well-connected at the European level and regularly disseminates information on ethical and compliant issues within at least 20 EU member states.

All consortium members are included in the dissemination strategies and are instructed to inform all partners as soon as new and relevant network collaborations evolve. FCRi is particularly well-placed as an important stakeholder hub to help generate significant inputs into the dissemination of the campaign and educational resources. Overall, the whole project will be in close contact with European advisory groups. The coordinator is in contact with the European Commissioner for Research, Science and Innovation as well as with ALLEA.

## **Methodology**

The overall Methodology of Path2Integrity in a nutshell:



- a) Learning method: Vivid storytelling and rotatory role-playing to approach research integrity
- b) Instructing: The Path2Integrity handbook
- c) Campaigning: The Path2Integrity RI-facts and role-model campaign

**a) Learning method: Vivid storytelling and rotatory role-playing to approach research integrity**

In different cultures, the motivations to work in research can vary. Thus, there can be differences when and why someone acts against basic principles of research integrity. Vivid storytelling and rotatory role-playing to approach Research Integrity take these intercultural effects into account and promote a reciprocal learning process that crosses various cultures. To broaden the ability to reason for research integrity, Path2Integrity reflects, phrases and expresses different points of view by activating participants to tell and listen to vivid stories about research integrity and to argue for different points of view through role-playing. Through jumping into characters and adopting their point of views on research integrity, this method provides a student-centred confrontation with a multi-layered phenomenon. The stories and role plays reveal that conflicting purposes, power structures, (sub-) cultural habits and knowledge lead debates on research integrity and influence personal implications. Critical analysis of striking stories as well as playing different rotatory roles enable the young generation of (possible) researchers to overcome these obstacles step by step and learn **how to rationally debate for research integrity, listen to statements of others in the debate, be ready to outline knowledge if somebody asks and handle power structures**. Storytelling and role-playing acknowledge conflicting purposes, power structures and (sub-) cultural habits and encourage the young generation of (possible) researchers to become familiar with their own perceptions and to develop rational reasons for research integrity. These methods follow the methodical shift from teaching to learning and concentrate on student-focused units using student–student interactions.

Vivid storytelling and rotary role-playing empower and enable Path2Integrity participants to reflect on different behavioural concepts, acknowledge and consider risks and uncertainty in research integrity and recognise as well as consider conflicts in aims when conducting research. In different steps, the students clarify their preconceptions (containing their own purposes, power positions and own (sub-)cultural habits) and learn not to hold opinions against better knowledge, but rather to accept better arguments. They learn to validate that each participant understands the terms they use and they learn to argue logically in consistent ways.

**b) Instructing: The Path2Integrity handbook**

The Path2Integrity handbook contains 20 student-centred units for learning research integrity accompanied by significant statements and messages from the Path2Integrity campaign. The units are transdisciplinary and participants in cooperation with their educators explicate their own disciplinary dilemma, ideas and experiences with scientific

professionalism and the reliability on conducting research. The Code of Conduct is established as a reference for all units. As previously mentioned, the first five units are for secondary school students, the following five units are usable in secondary schools and at undergraduate level and the last 10 units are for graduates and young researchers.

The development of the Path2Integrity handbook of instructions begins with an award-winning status quo of dialogical teaching and learning (from the partner organisations). The consortium will adapt and develop the instructions for the Path2Integrity handbook by analysing and mapping internationally up-to-date evidence on innovative methods and by continuing to exchange expertise on innovative methods in two Path2Integrity workshops with important stakeholders (see Tasks 3.1, 3.2 and 5.5).

Experiences in the past few years show that young researchers express in safe learning environments their ambiguity by weighing the opportunities and drawbacks of behavioural compliance in research. For example, a report about a research integrity training at the Path2Integrity project partner Kiel University (Fig. 3) describes experiences from the participant Martha\*2. She said that her mentor repeatedly ignored data in a project when it didn't fit well in the hypothesis. She pointed out that in this case this malpractice led to a publishing success in a prestigious journal, but at the same time led to unsurmountable barriers to find a satisfactory answer on their research question. Internally, she felt like a fraud.

| Teaching Research Integrity: Exercise Level 12  |  |
|---|--|
| <p>Step 1: Preparation for the following working unit.</p> <p>In order to teach your students a unit for research integrity, you should select an example from your discipline. To select an appropriate example, you need to choose a situation, in which experts themselves are unsure of how to proceed.</p> <ol style="list-style-type: none"> <li>The following example regarding model procedures in natural science display uncertainty as to how to proceed. "A new approach how to model particle behaviour has been introduced to a researcher at a conference, which is in conflict to the model he uses. Does he have to address this in his next paper and presentation or just let it go, because the model he uses is well accepted within the community?"</li> <li>Likewise, the following example demonstrates a questionable situation with vulnerable populations: „Please let Paul attend your social media experiment, as he needs the money“.</li> <li>In the case of the research field, self-driving cars, an expert stated the following example: "Is it necessary to check the alarm system for distance control before every test run in the city?"</li> </ol> <p>If one of these examples is relevant to your discipline, you are welcome to use it. If not, please select an equivalent example from your discipline. All examples are similar in that they refer to situations in which researchers are pursuing scientific results and are in doubt about how to proceed. Please describe such a situation in the context of your discipline. Please make sure your students can connect to the situation. Display it with one or two sentences. Write it down in the field below.</p> | <p>Step 2: Working unit for your students.</p> <p>Please present the example</p> <hr/> <p>to your students and let them exercise the next steps:</p> <ol style="list-style-type: none"> <li>fill it in with details</li> <li>imagine a conflict happens between two parties in this example</li> <li>imagine the conflict and perform it in a role play</li> <li>describe the conflict and write it down</li> <li>answer the following questions: which norms do the parties refer to in your conflict? Did they explain norms in the role-play? If not, can you imagine which norms justify to the actions of the two parties? Which norms exclude or at least hinder each other? Write the norms down.</li> <li>pick out one norm of which you approve and a second one that you reject</li> <li>describe why you affirm the first, and why you deny the second</li> </ol> |

Figure 3. [doi](#)

Exercise on handling significant ethical issues.

Handling significant ethical issues as shown in the exercise above or in other cases such as the plagiarism case of a former federal minister of Germany, will be adapted for the handbook. The doctoral dissertation by the former federal minister of Germany had a significant amount of unmarked verbal takeovers from foreign texts. The accumulation and construction of the takeovers, even the omission of bibliographical references in footnotes, indicate that the former federal minister of Germany systematically and intentionally used

other writings without crediting the source. The instructions in a unit question whether the former federal minister of Germany can still be a role-model for young scientists. To exercise this case, students tell vivid stories in favour or against accepting her as a role-model. Students then engage in a rotatory role play for and against roles using regulations, codes of conduct in scientific disciplines, conflicting norms and consequences of misconduct and compliance as arguments. The audience is instructed (using systematisation techniques) to find superordinate objectives upon which the students can reciprocally agree. For example, they may agree on a denial of the former federal minister of Germany as a role-model because they agree on the superordinate purpose that a dissertation shall include new insights and be methodologically sound.

### **c) Campaigning: The Path2Integrity RI-facts and role-model campaign**

The Path2Integrity campaign (WP2) differs from the overall dissemination activities performed in WP7 in its special purpose: The campaign's mission is to raise awareness and promote a research integrity culture and a conduct of responsible research and innovation in the EU through RI-facts and role-models. Thus the campaign is focused on the overall aims of Path2Integrity. The dissemination activities, however, will disseminate all relevant project activities and achievements.

Both the formal and informal learning settings from Path2Integrity concentrate on how to handle and judge intentional misconduct, led by personal ambitions and benefits or by high publications demands, as well as unintentional misconduct, evoked by unawareness of the rules or cultural differences and scientific conduct with new techniques, ranging outside the current frame of standardised handling.

The Path2Integrity campaign displays important messages from the European Union on research integrity norms (such as Ethics reviews, Article 14 European Parliament and the Council 2013a, Ethical principles Article 19 European Parliament and the Council 2013b etc.) as well as important messages from other SwafS projects such as PRINTEGER, INTEGER, DEFORM, ENERI on RI-facts. This includes a media analysis from PRINTEGER showing that a "possible cause of misconduct ... is seen in the extreme competition for career, particularly due to the lack of funding and resources, that exacerbates rivalry among researchers" (Ampollini et al. 2016) and places female and male role-models such as Marie Skłodowska Curie and Bertrand Russell for orientation and identification. An assessment accompanies the development of the units and assesses which messages are perceived by different audiences. The campaign uses multi-media and multi-platform, see WP2 and WP7 for more information. (Fig. 4)

### **Summary of the methodology:**

- Path2Integrity learning method is **vivid storytelling and rotatory role-playing** to acknowledge and handle intentional misconduct, led by personal ambitions and benefits or by high publication demands, as well as unintentional misconduct evoked by unawareness of the rules or cultural differences and scientific conduct with new techniques, ranging outside the current frame of standardised procedures.

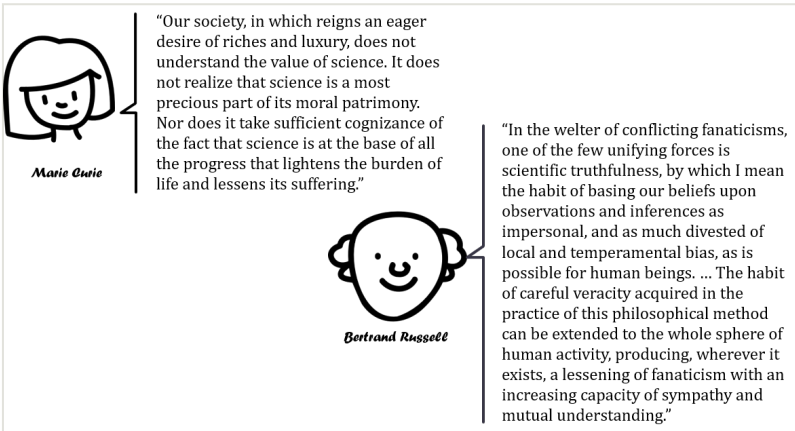


Figure 4. [doi](#)

Quotes from Pierre Curie (2012) Marie Curie: With Autobiographical Notes by Marie Curie, Dover Publication: Mineola New York, p.70 and Russell, Bertrand (2004) History of Western Philosophy, London, p.864. Figures designed by Freepik from [www.flaticon.com](http://www.flaticon.com).

- The Path2Integrity systematically provides **formal** learning environments with the handbook of instructions for secondary students, (under-)graduates and young researchers.
- The Path2Integrity systematically sets RI-facts and role-models to provide vivid stories for identification and orientation, important facts and central European norms on research integrity in **informal** settings.

## Sex and gender analysis

The consortium fully realises that the gender dimension is relevant in the project and will highlight this SwafS cross-cutting priority in this chapter. The consortium will implement tasks to deepen the understanding of men’s and women’s behaviour and attitudes in learning research integrity. The gender analysis will be highlighted in three different parts of the project, described below, and will be taken into account in the whole process of this coordination and support action.

**Eye-level conversations for young women and men (see WP1):** Storytelling and role play are often gendermixed interactions in classrooms, incorporating gender-specific interaction patterns. Because women have less speech percentage and more speech interruptions in gender-mixed discussion groups (Karpowitz et al. 2012, Filardo 1996, Mendelberg and Karpowitz 2014), the consortium includes gender-specific actions in its coordination and support action (see WP1). The Path2Integrity programme will include a separate training unit for young women and young men to exercise eye-level interactions and to minimise gender-specific patterns of speech percentage and speech interruptions (see Task 1.2). The training aims to broaden women’s and men’s habitual language use and to unfold their different emotions connected to their experiences. The training invites young women and men to concentrate on how to speak in a mixed-gender group and how

to successfully outline their own position and let others outline theirs. The training empowers young women and men and educating them in eye-level conversations between genders to allow for gender equality. 3C conducts the trainings before the young women and men participate in a Path2Integrity unit.

**Gender-specific Path2Integrity evidence on formal and informal learning:** In the STEM subjects' different trainings have gender-specific outcomes, therefore the consortium hypothesises that learning research integrity also contains gender-specific effects. The consortium therefore extends its assessment and observes genderspecific data (see WP6). This task opens an important perspective on gender-specific systematisations in training research integrity. The Path2Integrity will give gender-specific recommendations on how to teach research integrity

**Gender-balanced education and further education inside the project:** Excellence at all levels can only be achieved if workforce diversity is increased at all levels to guarantee inclusion of talent and perspective. The consortium will therefore aim to systematically balance women and men in participating and leading this project activity. Equal Employment Opportunity (EEO) and non-discrimination have been – and will continue to be – fundamental principles within the consortium. The Path2Integrity management strategy will be to encourage career progression of all staff, while promoting gender equality, in order to ensure that women and men are given equivalent opportunities to develop their careers and achieve excellence within the project, while allowing women to progress to senior position.

Project partner 3C will be responsible for gender questions and tasks, will lead the above described tasks and will report on the three different parts (see Task 1.2) at the project meetings.

## Impact

Path2Integrity planned work has two overall aims a) to establish an innovative method for learning research integrity and b) to raise awareness in European educational organisations. Relying on the Code of Conduct for research integrity for future attitudes and behaviour in research, Path2Integrity coordinates and supports evidence based formal and informal learning settings. The overall aims will be achieved by actively disseminating two evidence-based components:

1. The innovative method for learning research integrity is a Path2Integrity handbook containing vivid storytelling and rotatory role-playing
2. The awareness-raising for research integrity is an effective RI-facts and role-model campaign in secondary schools and universities

**Path2Integrity intended results** to successfully succeed (major outputs):

- the up-to-date map on innovative educational methods for learning research integrity (Objective 1);

- the up-to-date map on curricula, in which research integrity is included nowadays (Objective 2);
- the Path2Integrity RI-facts and role-model campaign (Objective 3);
- the Path2Integrity handbook of instructions (Objective 4);
- the Path2Integrity training programme for educators (Objective 5);
- the Path2Integrity training centre (Objective 6);
- the dissemination results (press releases, e-newsletter, social network, broadcasting, factsheets etc.) (Objective 7);
- results of the Path2Integrity two-component assessment (Objectives 3 and 4).

Path2Integrity targets the following groups (Table 6).

| Table 6.<br>Target groups.             |  |  |
|--|--|--|
| Target groups                          | Path2Integrity campaign  | Path2Integrity campaign  |
| <b>Directly involved in research</b>   | senior and junior researchers, university students, research commissions, ombudsmen, technical support, laboratory support etc.<br>[1] | undergraduates, graduates and young researchers<br>academic faculty, currently teaching (hereafter called university lecturers)<br>[3] |
| <b>Indirectly involved in research</b> | administrative faculty, secondary school students, teachers and administrations<br>[2]   | secondary school students<br>school teachers<br>[4]  |

### Expected impacts

This project will directly contribute to the expected impacts of H2020 SwafS-02-2018 *Innovative methods for teaching ethics and research integrity* (Table 7).

| Table 7.<br>Expected impacts.   |   |
|---|---|
| Expected impact of SwafS-02-2018: Improve current educational methods |   |
| <b>Path2Integrity outcome</b>   | The Path2Integrity evidence-based handbook for instructions changes the interactional learning and teaching habits of Target Groups 3 and 4 (see Table 2.1) |
| <b>Path2Integrity impact</b>  | and supports the shift from teaching to learning, so that students develop a self-directed and self-determined learning behaviour.                          |
| <b>Impact target groups</b>   | Students in general and educators in general.   |
| <b>How achieved impact can be measured</b>                            | Number of units, in which project teaching rather than lectures are conducted.  |
| <b>Time-based scheduling</b>  | 36 months and further   |

|  |  |
|--|--|
| Expected impact of SwafS-02-2018: Contribute to the establishment of a research integrity culture and to responsible conduct of research and research excellence |  |
| <b>Path2Integrity outcome</b>  | The two components of the Path2Integrity educate effectively and educate Groups 1–4 effectively and efficiently (see Table 2.1) in the SwafS cross-cutting priority RRI  |
| <b>Path2Integrity impact</b>   | and induce sustainable and supportive working attitudes and moral values in good research practices and therefore support research excellence.   |
| <b>Impact target groups</b>  | Students, educators and researchers directly involved in research.   |
| <b>How achieved impact can be measured</b>   | The embedding of research integrity as a compulsory component in academic writing (indicated by research integrity chapters in major academic writing textbooks)   |
| <b>Time-based scheduling</b>   | 36 months and further  |
| Expected impact of SwafS02-2018: Raise-awareness of students and early career researchers  |  |
| <b>Path2Integrity outcome</b>  | Groups 1 and 2 (see Table 2.1) will find orientation and identification through the Path2Integrity RI-facts and the role-model campaign and  |
| <b>Path2Integrity impact</b>   | enhance critical reflection on research integrity.   |
| <b>Impact target groups</b>  | Students and researchers directly involved in research   |
| <b>How achieved impact can be measured</b>   | Number of cases in which student and early career researchers publicly claim the right to conduct sound research.  |
| <b>Time-based scheduling</b>   | 36 months and further  |
| Expected impact of SwafS-02-2018: Improve short- and long-term training results  |  |
| <b>Path2Integrity outcome</b>  | Path2Integrity will ensure more efficient learning paths by assessing efficiency and effectivity of the educational methods (WP6) and foster corresponding recommendations through the training programme for educators, a training centre and open source material. |
| <b>Path2Integrity impact</b>   | This leads to an immediate improvement in teaching and learning results.   |
| <b>Impact target groups</b>  | Students in general and educators in general.  |
| <b>How achieved impact can be measured</b>   | Higher scores in research integrity assessment tests.  |
| <b>Time-based scheduling</b>   | 24 months and further  |
| Expected impact of SwafS-02-2018: Provide more uniform concepts of research integrity  |  |
| <b>Path2Integrity outcome</b>  | Groups 3 and 4 (see Table 2.1) will learn to use the Code of Conduct for research integrity and will learn how to conduct a dialogue on the rejection or acceptance of norms in research integrity.  |
| <b>Path2Integrity impact</b>   | This leads to a dialogical handling of research integrity. Providing the Code of Conduct for research integrity as reference source, the scientific community will deal with research integrity in a dialogical manner, paying attention to cultural adaptation.     |
| <b>Impact target groups</b>  | All persons directly involved in research (and future researchers).  |

|   |   |
|---|---|
| <b>How achieved impact can be measured</b>  | Number of dialogical units in research integrity curricula.   |
| <b>Time-based scheduling</b>  | 36 months and further   |
| Expected impact of SwafS-02-2018: Offer more transparency, openness (cross-cutting impact Open Science) |   |
| <b>Path2Integrity outcome</b>   | The Groups 1–4 (see Table 2.1) will have access to the Path2Integrity material and processes through a collection of all project outputs within RIO Journal ( <a href="http://www.riojournal.com">www.riojournal.com</a> ). |
| <b>Path2Integrity impact</b>  | This will increase the body of knowledge about research integrity and will encourage future projects to also follow the SwafS cross-cutting priority of Open Science and offer more transparency.                           |
| <b>Impact target groups</b>   | All persons interested in teaching research integrity.  |
| <b>How achieved impact can be measured</b>  | Number of clicks on the Path2Integrity open collection within RIO Journal.  |
| <b>Time-based scheduling</b>  | 36 months and further   |

In addition to the expected impact of the Call SwafS-02-2018, Path2Integrity has impact to several other important fields in the European research integrity landscape. Especially the different stakeholder groups of Path2Integrity benefit from our two-component strategy.

**Impact of the Path2Integrity learning method on educational organisations**

Vivid storytelling and rotary role play enable students, (under-)graduates and young researchers to acknowledge conflicting purposes, power structures, (sub-)cultural habits and knowledge. They also lead them to rationally debate for research integrity, listen to statements of others in the debate and to be ready to outline their knowledge about research integrity. This component

- leads educational organisations to reflect their research integrity learning programme.
- improves the teaching and learning climate in the educational organisations and supports better learning environments.

There will be a simple forum to connect participating educational organisations in order to give them an opportunity to exchange ideas and measures in research integrity in the future of the project, based on the Path2Integrity handbook. Until now, educational institutions have had to rely on their own methods and techniques to teach research integrity – with Path2Integrity there is a possibility to exchange knowledge on a common ground. The forum will be introduced to ENERI to strengthen this research integrity through a teaching forum.



## **Impact of the Path2Integrity campaign on the research integrity culture and the conduct of RRI**

The consortium contributes to research integrity and research excellence (European Parliament and the Council 2013b) by achieving a successful implementation of the RI-facts and role-model campaign.

The role-model approach of the Path2Integrity campaign will revitalise the discussion concerning research integrity through its high identifiability experienced by students as well as by educators.

The campaign supports sustainable and supportive working attitudes and moral values in good research practices for new cohorts of researchers, which will increase both well-being and productivity of researchers.

### **Impact on Path2Integrity stakeholder**

The Path2Integrity project impacts the target groups of the teaching methods and the integrity campaign but also involves wider Stakeholder Groups, which are listed in this paragraph:

#### **A) European Network of Research Ethics and Research Integrity (ENERI)**

Path2Integrity provides ENERI with learning materials to disseminate a uniform concept for research integrity. At the same time 1. the feasibility study of the training programme for educators provides practical recommendations and 2. the training centre provides structures, processes, a forum and excellence for future training settings conducted by ENERI.

#### **B) Educational Organisations**

For the Path2Integrity project we concentrate on educational organisations, in which formal teaching and learning research integrity exist or are sought. Path2Integrity targets:

##### **Secondary schools in the EU**

The secondary schools will acknowledge the value and possibilities of research itself. The project will change teaching habits from teacher-centred to student-centred activities, raise teachers' awareness on how important the subject of research integrity is at school level and stimulate discussion on implementing research integrity into secondary school curricula.

##### **Higher education organisations in the EU**

Path2Integrity will directly impact 80 universities (including and emphasising universities of applied science). The project will raise awareness on how to teach research integrity, provide evidence on the effectiveness of student-centred methods and encourage a living

culture of research integrity between all organisation members (students, lecturers and administration).

### **International organisations**

Path2Integrity actively collaborates with two educational organisations in Canada, one in Mexico, one in Taiwan and one in Zambia. The international organisations will use parts of Path2Integrity campaign material and knowledge on how to dialogically teach research integrity in future teaching settings. The organisations will strengthen the dialog between all important stakeholders involved in research integrity from an international perspective, highlighting the importance of the SwafS cross-cutting priority for international cooperation.

### **C) Young generation of (possible) researchers**

Path2Integrity's main target group is the young generation of (possible) researchers. This group is about to enter the scientific community and starts to develop professional values and compliance structures. The young generation of (possible) researchers is divided into three target groups:

#### **Secondary school students**

The project raises awareness on how important research integrity already is for research excellence in general education and fosters orientation on general research integrity questions on future citizens and researchers. Additionally, the project changes – at a more general level – learners' autonomy, critical engagement through joint analysis and discourse, empathy and all learning and development experiences that ensue from participation in establishing a dialogical culture of research integrity.

#### **Undergraduate and graduate students**

The project enables a confident handling and judging of disciplinary research integrity questions and enhances the research quality of the (under-)graduates, for example in their thesis.

#### **Early career researchers**

The project produces wider societal impact by training new cohorts of researchers in research integrity; this will enhance cost-effectiveness of research budget use. It will also create sustainable and supportive working attitudes and moral values in good research practices, which will increase both well-being and productivity of researchers.

International Perspective: The European training centre creates international research integrity practices, which will harmonise and facilitate future international research projects by providing more uniform concepts of research integrity.

## **D) Educators**

Path2Integrity's second main target group is research integrity educators. A specific description of this group will be elaborated in Task 4.1. Until then we work with a simple division:

### **Secondary school teachers**

will gain better knowledge on (teaching) research integrity and effective and innovative teaching techniques and will see the importance of implementing RI in school curricula.

### **University lecturers**

will gain better knowledge on how to teach research integrity and will see the importance of implementing RI in university curricula.

## **Impact on Scientific Community and projects financed by SwafS programme**

The Path2Integrity programme will have a substantial impact on the research done by other projects funded by the Science with and for Society programme – especially the closely attached projects VIRT2UE, ENERI, EUREC and JERRI – in terms of educational recommendations on how to enhance a research integrity culture and a responsible conduct of research. Path2Integrity will generate impact on the current research discussion in research integrity and will raise awareness that adhering to the highest level of integrity is in the interest of all key actors in research and society.

## **Impact on regulations, EU government policy makers**

Path2Integrity works closely with ALLEA, which continuously seeks to improve the Code of Conduct for research integrity conditions under which science and scholarship excel. ALLEA will be informed about all significant feedback loops on how practicable the Code of Conduct is for research integrity, to be a reference document in teaching research integrity to different capability stages. Additionally, we will work with the consortium for a European research integrity framework for non-medicine disciplines, which will soon start its Horizon2020 project.

## **Impact on individual partners of Path2Integrity and on international organisations collaborating in the project**

Coburg University of Applied Sciences and Arts

Path2Integrity will optimise teaching research integrity at the University and will provide extra learning material. The project will initiate a discussion with the administration to stabilise a compulsory course of research integrity at all degree programmes of the University.

Fundació Catalana per a la Recerca i la Innovació

FCRi will integrate the evidence-based recommendation concept into future projects and will enrich FCRi's mission with the campaign materials.

University of Southern Denmark

SDU will incorporate the handbook instructions and lessons learned into its BSc in Public Health curriculum of research methods and well as into MSc curriculum of Public Health Ethics course.

Foundation for Student Science and Technology, Canada

FSST will enhance its knowledge on innovative educational methods and incorporate matching units. Additionally, they will enrich their understanding on cultural differences in research integrity and teaching.

Instytut Badań Edukacyjnych

IBE will further broaden development of research expertise in areas of education and a greater awareness of the background for ethical research issues in general and in approaches to experimental design, will complement similar activities at the institute.

3C Compliance

3C will broaden and deepen the 3C methodology and tools with the experiences from Path2Integrity and even incorporate Path2Integrity teaching units as a sustainable branch within 3C's business model.

Christian-Albrechts-Universität zu Kiel

New interdisciplinary research areas will open for the ZKE. The Path2Integrity results will be integrated directly into ZKE's work both in research and in teaching. Kiel University will become a pioneer in implementing a research integrity culture in teaching

## **Barriers and obstacles**

The specific activity of training is a profession that is often led by traditions and organisation structures. Changing teaching and learning habits in educational organisation such as schools and universities is a lengthy undertaking and can fail.

The consortium admits that individual, organisational and cultural barriers in teaching and learning research integrity are more complicated than they seem at first glance. For example, some teachers are mainly preoccupied with questions about their students instead of with questions as to more efficient educational methods. They are therefore not interested in further educational settings. Also, curricula and course descriptions control teaching and learning and are difficult to change. Curricula are therefore not easy to implement. Some disciplines and countries prefer other topics such as big data or future

design as new central topics for student education and overlook research ethics in students' education. Additionally, there are no binding guidelines for schools and universities to cooperate with a research or coordination project such as Path2Integrity.

Because of these already known barriers, the consortium will invest a large work load into establishing contacts and communication channels to schools and universities (see WP4 and WP5), concentrate on voluntary participation in the training centre to reach motivated and interested teachers and educators who have the strength and assertiveness to try new methods and to eventually start a discussion on implementing research integrity into curricula.xt

## **Measures to maximise impact**

### **Dissemination and exploitation of results**

#### **Dissemination**

A European initiative, such as Path2Integrity, which aims to set new learning paths for research integrity, can achieve its desired impact only if the project obtains the required visibility through targeted and thoroughly planned dissemination, communication and exploitation.

To ensure activities maximising the long-term impact of Path2Integrity:

- A clear regulatory plan will be set up at the beginning of the project;
- A monitoring process will be implemented;
- Outcomes will be widely disseminated;
- Project results will be published across multi-media platforms in all relevant sectors;
- Open access to publication will be guaranteed (gold model);
- Exploitation potential and interest will be clearly documented;
- The Path2Integrity handbook and campaign will get high visibility in relevant target groups such as educators, researchers, politicians and policy makers through a set of dedicated communication skills; and
- Participating organisations will exchange the new methods and findings inside and through their networks.

Dissemination of Path2Integrity activities and results is an important issue and is entirely covered in WP7 of this proposal. During the project, WP7 leader PENSOFT will centrally organise and document all dissemination and communication activities and will coordinate strategy development, provide or arrange for legal support where needed, collect input from all consortium members and compile related documents on the consortium level. The dissemination activities of the project will ensure international visibility and acknowledgment of Path2Integrity.

Due to Path2Integrity being a CSA, our work aims at reinforcing multi-directional schemes of cooperation and knowledge sharing, networking and awareness raising about research

integrity. As a result, we do not expect issues requiring the management of IPR to come up. All results, methods and interactions generated by Path 2Integrity will be open and accessible to the public. Additionally, we do expect some of our partners to publish findings in journals. These Path2Integrity partners will ensure publication of their research results in Open Access journals or ensure open access to their work by paying appropriate fees to the publisher. It is estimated that approximately 8 articles will be produced during Path2Integrity following the open access concept. All references to ongoing or published work originating fully or partly from Path2Integrity will acknowledge funding by the European Commission, and, when appropriate, a statement to the effect that the Commission has not influenced the design or outcome of the work; this will apply irrespective of the medium (print, electronic) used for public awareness.

**Website and online newsletter:** the Path2Integrity website is going to be launched three months after the project start (see Task 7.1). Moreover, a project logo and project templates will be created to ensure consistent professional appearance. A strong design and uniform corporate have a strong impact on the consortium, improve public awareness and allow the project to be better recognised and remembered. A subscription for a Path2Integrity online newsletter will also be possible and further supports the awareness of and/or interest in the project. Public outreach is crucially important, because the consortium recognises the importance of public awareness of science as well as accountability to tax payers. The public presentation of Path2Integrity news on the project website also ensures the visibility of the project within the research integrity community. This approach has clear advantages compared to classical outreach publications, as rapid update cycles and provision of supplementary information through downloads and links are provided.

**Print, promotional media (leaflets, policy papers, briefing papers):** Complementary to digital media, print media will be also used, giving more permanent record of the project's concept and results. This includes project leaflets in the respective national language of consortium partners; posters will be developed after reaching relevant project progress and/or before important workshop conferences. The materials will be also targeted to the general public and will be distributed by all project partners at the public events and at conferences.

It will be crucially important to alert relevant stakeholders (educational organisations, educators and young researchers), policy makers, press and general public of the potential that this project will open and its impact on the field of research integrity. Briefing papers presenting the results achieved by Path2Integrity, along with new opportunities that this project has opened, will be produced in language suitable for these different sectors. These will be written in draft form, sent for peer review, revised into their final form and made freely available as downloadable PDF files on the project website (see Table 8).

| Action   | Target group                  | Use(s)   | Launch                    |
|--|-------------------------------|--|---------------------------|
| <b>Website and blog:</b> Information about the project, findings, documents, partners and status quo   | Groups 1–4 from Table 2.1     | Education<br>Research<br>Administration                    | Month 2                   |
| <b>Path2Integrity handbook (digital and print):</b> Units to learn research integrity  | Groups 3 and 4 from Table 2.1 | Education  | Month 24                  |
| <b>Podcasts and short videos:</b> Campaign for research integrity and information about the Path2Integrity handbook  | Groups 1–4 from Table 2.1     | Education,<br>Policy-making,<br>Administration<br>Research | Month 24                  |
| <b>Conference and symposia:</b> Project results will be presented from every participant at international conferences (especially in Canada, Mexico, Taiwan and Zambia, symposia or related meetings, fostering an active dialogue and direct interaction with others  | Groups 1 and 3 from Table 2.1 | Education<br>Research                                      | Several launches          |
| <b>Outreach event:</b> During the project a mini-conference and conference will be organised providing a platform for timely presentation of results, fostering an active dialogue with important stakeholders   | Groups 1–4 from Table 2.1     | Education,<br>Policy-making,<br>Administration<br>Research | Months 6 and 25           |
| <b>Training centre:</b> Path2Integrity will position a training centre offering training programmes for the learning paths in English, Spanish, French and German and create the opportunity for participants to exchange ideas on teaching research integrity – overcoming the single approach and creating a network for educators | Will be defined in Task 4.1   | Training, skills   | Months 25–32              |
| <b>Open source:</b> Path2Integrity will publish open access material to foster the handbook and the campaign   | Groups 1–4 from Table 2.1     | Training, skills   | Month 2 – the end of 2024 |

Open access strategy: The project will strongly pursue publication of the project's results (in Gold Open Access) under the Creative Commons Attribution License 3.0 (CC-BY) and publication of databases under the Open Data Commons Attribution License (ODC-By). Path2Integrity will adhere strictly to the European Commission (2013) Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020 Version 3.2 (2017)20 and to the EC guidelines on FAIR data management in Horizon 2020. FAIR stands for: Findable, Accessible, Interoperable and Re-usable and insure sustainable data preservation of project's data after the end of the project. All consortium partners have been familiarised with the golden route, namely publishing directly in an open access journal. Additional costs for this route have been calculated and are included in the project's estimation.

Path2Integrity contains the following meetings and events (Table 9).

| Meeting no. | Meeting  | Title  | Expected no. of participants | Leading beneficiary | Project month |
|-------------|--|--|------------------------------|---------------------|---------------|
| 1           | Kick-off meeting   | Learning environments for research integrity           | 25                           | CO                  | 2             |
| 2           | Mini-conference  | (WP3) interdisciplinary meetings                       | 80                           | EUREC               | 6             |
| 3           | Meeting  | WP3 interdisciplinary meetings                         | 30                           | CAU                 | 8             |
| 4           | WP3 Workshop   | Dialogical competencies in learning research integrity | 10                           | CO                  | 10            |
| 5           | Annual meeting   | Summary and outlook                                    | 24                           | SDU                 | 14            |
| 6           | International workshops (with Canada, Mexico, Taiwan and Zambia) | Strength and weakness of the Path2Integrity programme  | 5×25                         | 3C                  | 25            |
| 7           | Conference + annual meeting                                      | Teaching and learning research integrity               | 150                          | 3C                  | 25            |
| 8           | Final meeting  | Path2Integrity lessons learned                         | 25                           | CAU                 | 36            |

### Exploitation of results

The consortium agrees that centralised, early planning of activities that utilise the outcomes can greatly enhance the impact achieved. The Path2Integrity handbook and campaign material reflect an immediate exploitation of results. We foresee a significant need of training schedules for teachers and educators to ensure efficient learning environments for research integrity. The development in the grant scheme is part of the dissemination strategy and produces a product that enables the enhancement of educational methods in the future.

Furthermore, all results of the WPs are intended to drive educational and scientific actions and will thus be openly published and communicated through appropriate measures (open access, publication, data portals and information sheets). Ultimately, the entire Path2Integrity approach is meant to promote a research integrity culture and a responsible conduct of research. Thus, the most relevant exploitable results will be derived from transporting the outcomes to relevant stakeholders, curricula makers, teachers and educators.

Through a set of dedicated exploitation support measures that will be implemented during the project phase, we will ensure that:

- individual exploitation expectations are captured in detail early-on;
- expected contributions from each partner are defined;
- potential benefit for other partners are determined (contribution–benefit matrix);



- a coherent exploitation strategy will be jointly elaborated; and
- stakeholder needs are properly considered and appropriately addressed.

An exploitation workshop (WP1) will be held in connection with the first consortium meeting, at which the exploitation paths and strategies for identified key exploitable results are discussed and agreed upon collectively by all partners. Following the workshop, each key exploitable result will be refined and complemented with an action and time plan. This description will be updated after each reporting period. During the project, WP1 will centrally organise and document all exploitation activities, which will ensure the implementation of integrated rather than individual exploitation efforts, thus maximising project impact significantly.

### **Training centre and training material sustainability plan**

The sustainability of the Path2Integrity training centre will be achieved by decentralising and selecting educators from at least 15 European countries, that are interested in disseminating the Path2Integrity material further on. They will act as decentralised parts of the training centre and – if not already acquainted – be introduced to the network ENERI. Path2Integrity will support these educators in building dissemination capacities.

The sustainability and further development of the Path2Integrity handbook will be achieved by implementing a digital development section for the handbook in RIO Journal with comment and enlargement functions. The section ensures transparency and allows (future) stakeholders to contribute new ideas and develop the units. In the end the digital section is a comprehensive open science sustainability tool. Additionally, the Path2Integrity campaign still will still be available online after the duration of the project.

Path2Integrity introduces a simple forum for participating educational organisations from Task 5.4 to ENERI to incorporate the developed structures and knowledge into an existent network.

### **Knowledge management and protection**

Results of Path2Integrity will be available in short time spans. The project will stringently and openly disseminate its knowledge (following the gold model) as soon as possible. Common knowledge management strategies will drive communication among project partners as well as public outreach of the proposed action. These include:

- cross-project learning;
- best-practice transfer;
- competence management (cross-sectoral competences on integrity of applicants will be defined);
- knowledge repositories (e.g. databases, websites);
- knowledge brokers (the work package leaders take on responsibility for their activities and act as first reference on whom to talk about the outcome of the project);

- social software (wikis, social bookmarking, blogs, social networks (Twitter, Facebook, LinkedIn, YouTube etc.); and
- inter-project knowledge transfer through a password-protected interface.

Since the deliverable outcomes of Path2Integrity, such as campaign material and handbook of instruction, are especially designed for different target groups (public relations, teachers and educators) and for the public, all deliverables of the action will be made public via the website and other media channels. As there are no IPR or patent issues at hand, knowledge protection will not be relevant for the case of Path2Integrity.

## Data management

Longevity and availability of Path2Integrity-produced research, campaign materials and handbook of instruction will be of utmost importance to ensure that results are available to its target audiences. While providing all results openly via its web-based project portal will be one layer of ensuring interested parties can access information and guidelines at all time, the project will add an additional layer to its exploitation plan by launching a unique Open Science Pilot. The implementation of the Open Science and FAIR principles in Path2Integrity will start with the open access publication of the project Description of Work in the Research Ideas and Outcomes (RIO) journal. This will start a unique Pilot project collection for Path2Integrity, similar to the ones already launched for other EU projects, where unconventional research outputs, such as teaching material, policy recommendations, factsheets, inventories, case studies, data management plans etc. can be published in open access. This will ensure that all project outputs are published in open access, with a stable DOI assigned and comprehensively collected in one place. The unique features of RIO Journal also allows for open and public post publication peer review, encouraging discussion among peers and consecutively allowing the publication of updated versions of each article, linked via Cross Mark.

Because Path2Integrity is testing innovative methods, research data plays a superior role. Five tasks (in WP4 and WP6) definitely collect data. Lead beneficiary CO will lead the way in managing the data collected during these actions. In close cooperation, the coordinator will then be responsible for the curation, sustainable archiving and publication of relevant data that matches the planned project outcome and considers the EU General Data Protection Regulation (GDPR), as well as the national regulations on data privacy protection. Data collection will include all data relevant to the Tasks of WPs 2–6:

- data from the needs assessment carried out in Task 4.3;
- data from the efficiency assessment carried out in Task 6.1;
- data from the assessment of the campaign material in Task 6.2;
- data from the qualitative study on the cultural adaptation of the learning pathways Task 6.3;
- data from the effectivity assessment carried out in Task 6.4.

The standards need to be defined by the consortium; social data collection is a challenge due to the large variety of appropriate interpretation methods. The partners need to agree

on a defined data set reduced to a common denominator due to the diversity of the partner institutions. Each partner has to ensure close cooperation with a responsible data protection commissioner. Data curation will be carried out by the coordination team in close cooperation with the in-house data management team, using an existing portal for data exchange and storage. Public data, such as common diagrams about gender-specific conditions, will be communicated to interested network partners and the EU through the website.

Since Path2Integrity will take part in the Open Research Data Pilot, a data management plan (DMP) will be provided in WP1 (Deliverable 1.1). New versions of the DMP will be created whenever important changes to the project occur due to inclusion of new data sets, changes in consortium policies or external factors.

## **Communication activities**

The overall strategy to implement the project's communication activities encompasses four major areas:

### **To systematically identify central target groups and appropriate communication channels**

Dissemination concept. To support systematic management of the project outreach, a dissemination concept will be elaborated at the beginning of the project as a tool to encourage all consortium members, in addition to preplanned activities that are included in the work package 7 (dissemination). WP7 leader PENSOFT specifies the heterogenous target group (see the four groups in Table 2.1), with appropriate measures to address these with targeted key messages and incentives to join the Path2Integrity activities.

### **To develop a corporate identity and promotional material for the project**

Dissemination toolkit. Based on the communication concept, PENSOFT will conceive central design elements (project logo, colour scheme, fonts) to define the overall visual corporate identity of the project. These elements will be adopted for a number of templates to be used for presentations, reports and posters, as well as for meetings and internal documents. Furthermore, PENSOFT will be responsible for the design and production of a set of standard dissemination materials such as project leaflets and posters, which will be provided to all consortium members and other research integrity networks. In addition, all partners will ensure project dissemination on national and international level through specific press, media releases and news articles that will be directed to relevant audiences.

### **To set up a project website and an open science working space**

Public project website and blog. The public project website and blog will be generated and used as the predominant tool to disseminate the concept, project, achievements, related background information and publications, including a condensed overview of the work plan, recent developments, individual partner descriptions, contact details, conferences of interests etc. Content for the website is to be provided by the partners and will be collected

by PENSOFT and uploaded to the website at timely manner. Thus, up-to-date information will be made widely available to teachers, educators and the scientific community. Additionally, PENSOFT will provide an open science working space for all Staff members (M2) (with an intern password secured communication space for confidential information) (Details in Table 10).

| Table 10.<br>Targeted communication measures.                            |                               |  |  |
|--|-------------------------------|--|--|
| Tool   | Target                        | Contribution to impact   | Verification of use  |
| <b>Core activities</b>   |                               |  |  |
| <b>General project website and Internal Communication Platform (ICP)</b> | Project partners, ALL         | Inform and discuss specific topics of common interest; engage interested parties through provision of general information about the project and access to its main outcomes  | Number of users, sessions length and depth   |
| <b>Website information corner</b>  | ALL                           | Provide outputs, fact sheets, role-models and teaching material and campaign material relevant to learn about research integrity   | Number of visits, number of requests, unique visitors and document downloads             |
| <b>Path2Integrity blog</b>   | ALL                           | Provide information and points of view on key issues discussed within the project, written in an engaging popular language.  | Number of visits, comments and subscribers. Social media engagement.                     |
| <b>RIO Journal Open Science pilot collection</b>                         | Groups 1–4 from Table 2.1     | Publish unconventional research outputs, including teaching and campaign material, recommendations, factsheets, posters, infographics, data management plans and more, in gold open access as a part of a comprehensive project collection | Number of visits, number of requests, unique visitors and document downloads, Altmetrics |
| <b>School visits and university visits</b>                               | Groups 1–4 from Table 2.1     | Knowledge transfer about and from the project  | Participants at meetings, feedback forms   |
| <b>Telephone calls</b>   | Groups 2 and 3 from Table 2.1 | Knowledge transfer about and from the project  | Number of information talks on the phone   |
| <b>Presentations at meetings, conferences, webinars</b>                  | Groups 1 and 2 from Table 2.1 | Direct rising of awareness among important stakeholders  | Participants at meetings, feedback forms   |
| <b>Path2Integrity organised workshops and trainings</b>                  | Groups 1–4 from Table 2.1     | Direct rising of awareness about research integrity among stakeholders   | Participants at meetings, feedback forms   |
| <b>Project-relevant mailing lists and networks</b>                       | Groups 1–3 from Table 2.1     | Dissemination and discussion of teaching research integrity and training possibilities   | Account of mailing lists and networks (using ENERI; ENRIO, JERRI, EUREC etc.)            |

| Tool   | Target                        | Contribution to impact  | Verification of use  |
|--|-------------------------------|---|--|
| <b>Podcasts and videos</b>   | Groups 1–4 from Table 2.1     | Introduction of the project; Path2Integrity campaign video and Path2Integrity training video                              | Number of views on YouTube, number of engagements and comments on social media           |
| <b>Social media</b> <ul style="list-style-type: none"> <li>• <b>Twitter</b></li> <li>• <b>Facebook</b></li> <li>• <b>LinkedIn</b></li> <li>• <b>YouTube</b></li> </ul> | ALL                           | Create teaching communities and inform important stakeholders about project developments, results and recommendations     | Number of users, engagement  |
| <b>Supporting materials &amp; publications</b>   |                               |   |  |
| <b>Posters</b>   | Groups 1 and 2 from Table 2.1 | Promotion and raising awareness of the project  | Number of downloads of electronic copies; number of distributed printed copies           |
| <b>Leaflets</b>  | Groups 1–4 from Table 2.1     | Increase awareness about the topics dealt with by the project   |  |
| <b>e-Newsletter</b>  | Groups 1–4 from Table 2.1     | Disseminate ongoing activities, results and other project relevant news, events and results                               | Number of clicks and links opened  |
| <b>Scientific publications</b>   | Groups 1 and 3 from Table 2.1 | Presentation of project research  | Number of visits, number of paper, citations   |
| <b>Factsheets, recommendations</b>   | Groups 1–4 from Table 2.1     | Transferring key results directly to end-users to ensure maximum uptake and re-use.                                       | Number of visits/downloads   |
| <b>Infographics &amp; visuals</b>  | Groups 1–4 from Table 2.1     | Provide easy visual communication for core project outputs to facilitate knowledge transfer (using the campaign material) |  |
| <b>Wider outreach activities</b>   |                               |   |  |
| <b>Press releases</b>  | Journalists, mass media, ALL  | Announcement of significant project results   | Number of press releases issued; number of downloads/visits of particular press releases |
| <b>Publications in specialist and popular media</b>  | ALL                           | Raising public awareness on research integrity  | List of publications or broadcasts   |

## Implementation

### Work plan - Work packages and deliverables

Project overview illustrated in Fig. 5.

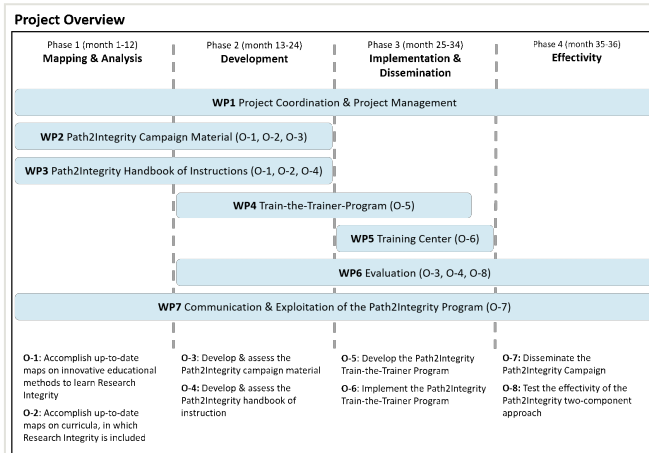


Figure 5. [doi](#)  
Project overview.

Path2Integrity coordinates and supports actions to promote a research integrity culture concentrating on the above mentioned phases; namely, Mapping & Analysis, Development, Implementation & Dissemination and Effectivity. Figure 3.1 depicts the graphical presentation of the work packages, and how they contribute to the different phases. The work to be undertaken by Path2Integrity is divided into four phases:

- Accomplishing an up-to-date overview on information and innovative educational methods is contributed to the WP Path2Integrity campaign material (WP2) and the WP Path2Integrity handbook of instructions (WP3). Both work packages will work together closely and periodically exchange their deliverables so that parts of the campaign can be implemented in the Path2Integrity handbook of instructions.
- Improving and testing the Path2Integrity methods is a collective task contributed to by the abovementioned WP2, WP3 and by the training programme for educators (WP4), as well as by the evaluation team (WP6). The four WPs will continually develop and assess the units until WP6 tests whether the Path2Integrity units outperform traditional teaching units.
- The next step is to implement the Path2Integrity handbook and foster the campaign Europe-wide. This is provided by WP4, WP5 and WP6. Because the consortium assumes that educators and teachers for the training programme for educators are difficult to find and not a homogenous group, WP4 will conduct a feasibility study in cooperation with WP6 on the training programme for educators conducted by WP5.
- To test the effectivity of the Path2Integrity two-component approach, WP6 conducts a pre–post test.

The cross-cutting work packages assure dissemination, exploitation and communication (WP7) and the complete project coordination (WP1).

The first cluster of Path2Integrity work packages (WP2 and WP3) aims to map facts on research integrity and educational methods to teach research integrity, especially through the findings of prior SwafS projects. We consider these collections (from the first cluster) as groundwork for adapting the learning paths and developing campaign material. The second cluster (WP4 and WP5) in Path2Integrity outlines the train-the-trainer idea. Different educational methods have been used in teaching research integrity, yet a systematic and evidence-based dissemination of effective methods is missing. Work package 6 will assess the efficiency of the different units using vivid storytelling and rotary role-playing and those outperforming traditional methods such as lectures will be included in the train-the-trainer programme. As already outlined above, WP6 will analyse the (short-term) efficiency of the innovative learning paths, conduct an experience-based (qualitative) assessment on the adjustment to institutional and culture-specific structures of the training programme for educators and analyse the effectiveness of the two-component approach in a pre-post design. To contribute to inclusive and anticipatory improvement we complete the project with work package 7 and disseminate learning paths with open science techniques. (Details on deliverables and work plan in Fig. 6 and Table 11).

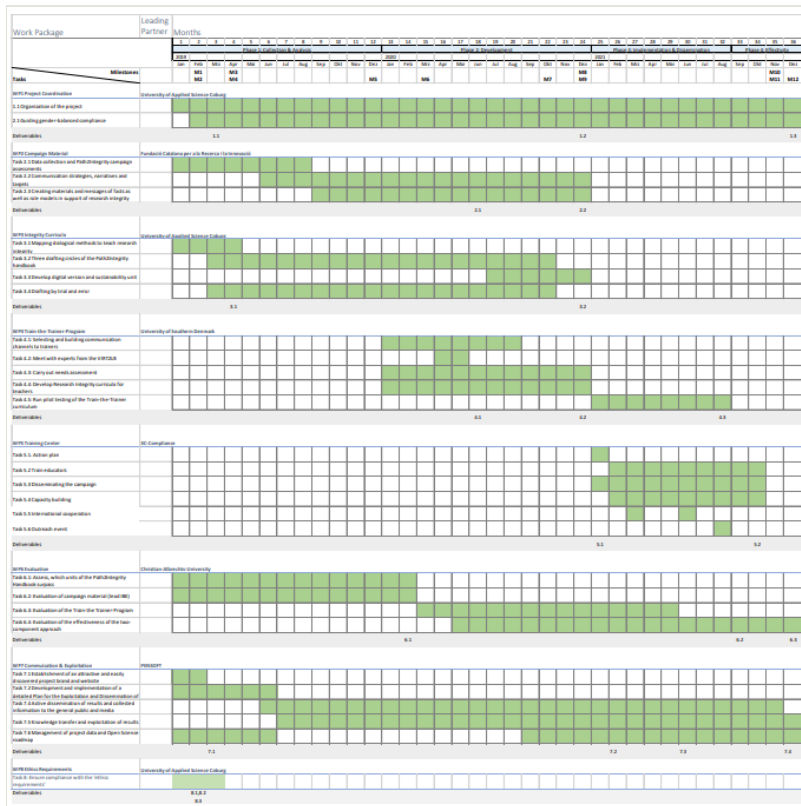


Figure 6. [doi](#)  
 Path2Integrity work plan.

Table 11.

List of major deliverables.

|     |  |
|-----|--|
| 2.2 | Path2Integrity campaign materials for national and international audiences   |
| 3.3 | Path2Integrity handbook of instructions and guidebook containing all collected results and recommendations   |
| 4.2 | Report on the Research Integrity training curricula developed  |
| 4.3 | Final report WP4 with results of the feasibility study and recommendations on the handbook and on the implementation and evaluation of the future training curricula in different contexts |
| 5.3 | Feedback summary report on the trainings   |
| 6.1 | Report on the efficiency assessment (Path2Integrity handbook of instructions and campaign material, including questionnaires and recommendations)  |
| 6.3 | Final report about the effectiveness of the two-component approach (including questionnaires)  |
| 7.2 | Reports on dissemination and communications  |
| 7.3 | Path2Integrity Open Science Collection RIO Journal. A report on status and dissemination   |

## Management structures and procedures

The consortium is comprised of a network of renowned professionals who have agreed to work collaboratively to further Responsible Research and Innovation as well as contribute to Open Innovation, Open Science, Open to the World (Directorate-General for Research and Innovation - European Union 2016). The relationships between the various partners and their obligations and rights with respect to each other and the project will be regulated in the Consortium Agreement. The Consortium Agreement will be signed at the beginning of the project.

## Overall Management Structure

A) The **project coordinator** will act as the direct intermediary between the partners and the European Commission and execute the overall project monitoring and management. The project coordinator shall communicate strategic decisions to the European Union with the support of the management support team.

B) **Work packages (WPs)** will operate as coordinating groups for the major areas of the project. Each contributing partner will report on the WP leader on the they are involved in. The WP leader will report to the coordinator and management support team at agreed intervals. Each WP will put its own management procedures in place as appropriate.

C) **Dissemination and exploitation activities** are integrated in WP7 and lead by PENSOFT to develop a specific dissemination and exploitation plan and to deal with specific dissemination and exploitation issues. SDU, 3C, CO and EUREC will feed information into the activity and decision-making process

D) A **management support team** will be appointed by the project coordinator and provide support for all aspects of the day-to-day management of the project. The team will consist



of a part-time project coordinator and a part-time administrative-financial project manager. It will also be assisted by the scientific transfer office of Coburg University, particularly on legal and contractual issues affecting the project.

E) The **innovation management** will be installed at the kick-off meeting. The project coordinator will initiate a self-administered working group (at least three persons), which meets at least once a year to guarantee that the innovation potential of the project results is identified and activated.

F) An **International Expert Advisory Board (IEAB)** shall further enrich the network and knowledge of the project participants and, based on their expertise be active partners in exchanging cultural views on teaching research integrity.

Members (Table 12): The International Expert Advisory Board will consist of seven experts from three continents representing key aspects of activities inside the project Path2Integrity. The members have been nominated before the initiation of Path2Integrity and all members have written a letter of support. The consortium has succeeded in attracting experts listed in Table 3.2 below to become members of the Path2Integrity IEAB.

| Table 12.<br>Members of the Path2Integrity IEAB. |         |   |  |
|--|---------|---|--|
| Name of the international expert                 | Country | Field of expertise                              | Background   |
| María del Carmen Bernal González                 | Mexico  | Gender aspects in research integrity            | Professor for Personnel Management and Partner of Dalia Empower  |
| Simon Mwale                                      | Zambia  | Research integrity in Africa                    | Director of Peace and Conflict Studies at the Zambia Catholic University   |
| Chen Cheng-Chen                                  | Taiwan  | Ethics education in research integrity          | Vice Chancellor of University System of Taiwan (UST) and Director of UST Office of Research Integrity  |
| Dick Bourgeois-Doyle                             | Canada  | Implementing research integrity                 | Secretary General at the National Research Council Canada  |
| Jacques Guerette                                 | Canada  | Students learning                               | Executive Director of the Foundation for Student Science and Technology, Canada  |
| Erika Löfström                                   | Finland | Teaching research integrity                     | Professor of Education at the University of Helsinki   |
| Nicole Föger                                     | Austria | Guidelines and structures of research integrity | Chair of ENRIO   |
| Philine Warnke                                   | Germany | 5 dimensions of research integrity              | JERRI Coordinator and Coordinator of "Future Thinking and Dialogue" at the Fraunhofer Institute for Systems and Innovations Research Germany |

The IEAB will ensure a high standard of international collaboration and quality of the project by taking part in the annual meetings. The experts in the IEAB panel will advise and actively exchange ideas with the Path2Integrity consortium in terms of cultural differences,

cultural adaptations, ways of communicating, quality of its activities and risks and will further develop strategies for efficient dissemination and probable economic opportunities. All IEAB members will be invited to give their visions and advise.

## Responsibilities and the decision-making process

The project structure is defined in three levels:

- each partner contributes to one or more specific tasks of the WPs defined in the work plan;
- related or integrated WPs may be grouped into sections that define similar aims or approaches;
- the combined sections represent the overall implementation of the project effort.

The management structure for the project reflects these levels of participation to allow all partners to fulfill their objectives and feed information into the decision-making process. The consortium has central decision-making through the management support team and decentralised execution of activities through the partners and work packages. Based on the well-established DESCAs model, this structure has worked very efficiently in collaborative projects funded under FP7 and Horizon 2020, ensuring timely consideration and resolution of strategic and executive issues while being open to input from all partners. Each partner is responsible for delivering the contracted deliverables and achieving the milestones promised for the project. The WP leaders will have a mandate from the management to coordinate the input from each WP reporter and communicate the WP progress to the project coordinator and prepare the contributions of their section for inclusion in the interim and final reports.

The project coordinator and management support team constitute the management. This management will be assisted by the WP leaders.

A) The **project coordinator** will perform all tasks assigned to it in the Grant Agreement. The project coordinator will be the driving force in monitoring overall progress and making recommendations for strategic changes needed to achieve the aims of the project as it progresses. Strategic decisions, in particular those affecting budgets and workloads of partners, will be made by the project coordinator and communicated to the Commission via the project coordinator.

The project coordinator is responsible for the following tasks:

- overall management of the project, including monitoring compliance by all partners with their obligations, with the assistance of the management support team;
- chairing the general assembly;
- preparation of annual review meetings;
- collecting, reviewing to verify consistency and submitting reports (including financial statements and related certifications) from the project partners in a timely manner for transmission to the European Union;

- delivery of all data identified as deliverable items in the Grant Agreement or requested by the European union for reviews and audits, including the results of the financial audits prepared by independent auditors;
- administration and control of the budget through the project manager in accordance with the Grant Agreement;
- reporting on the innovation plan and procedures;
- reviewing and deciding on all budget-related matters as prepared by the management support team;
- reviewing and deciding on structuring and restructuring of the work packages as proposed by the management support team;
- the acceptance of new parties as well as the exclusion of parties;
- any alterations of the Consortium Agreement and Grant Agreement;
- the premature completion/termination of the project.

B) The **work package leaders** will be responsible for the overall management plan of each WP and will outline a schedule of work for the first 18 months, to be approved by the project coordinator by the end of the first month of the project. The WP leaders will be responsible for collecting and collating information for the interim reports with the assistance of reporters from contributing partners and submitting this to the project coordinator. WP leaders will be required to coordinate partners in planning and organising WP meetings at regular intervals during the project and returning meeting reports to the project coordinator.

C) The **exploitation and dissemination activities** are integrated in WP7 and will be conducted by PENSOFT and at least one person from WP2, WP3, WP4 and WP5. They are responsible for their own organisational arrangements, work procedures and time schedule and meet as often as required to effectively deal with the dissemination questions. However, it is expected that this will at least be once per year in person. In addition, the team will meet remotely via electronic mail or telephone/videoconferences. The panel will start a plan for the exploitation and dissemination of results (PEDR) and will update it frequently.

D) The **management support team** will include the principle investigator from each partner and a named deputy. The first meeting will be at the kick-off meeting, to be held within three months of the start of the project; and there will then be one each year in person and at least one additional meeting held remotely. The management support team will provide support in the day-to-day management of the project for the project coordinator and WP leaders and report, on behalf of the project coordinator, to the European Union. The administrative-financial project manager will provide support to all partners on financial management aspects of the project and report. In particular, the management support team will assist the project coordinator in the following tasks:

- preparing the content and timing of all major generic press releases and joint publications by the whole consortium;
- the preparation and final approval of the work plan prior to submission to the European Union;

- preparing the meetings, propose decisions and prepare the agenda of the general assembly;
- properly executing and implementing the decisions of the general assembly;
- proposing budget related matters, including reprioritisation;
- preparing the structure and restructuring of work packages for approval by work package leaders;
- monitoring the progress and effective and efficient implementation of the project, identifying timeline problems, technical limitations, exploitation opportunities;
- preparing, where necessary, any alterations of the Consortium Agreement or the EC Grant Agreement; and
- the premature completion or termination of the project where necessary.

E) **Innovation management** is considered a relevant task by the Path2Integrity consortium. To be able to guarantee that the innovation potential of the project results is identified and respective measures can be taken, the project coordination (CO) will deal with innovation-related activities. While taking into account that a large part of the project activities will lead to results that are to be made freely accessible, it is also expected that the label will have a clear innovative character. Thus, the project work plan foresees that individual exploitation strategies will be collected and depicted right at the beginning of the project in the exploitation session. The project coordinator CO will be in charge of monitoring all innovation-related progress.

Beginning with reporting period 2, the dissemination and exploitation panel will include a table detailing each key exploitable result with potential economic value, the owner of such result, sectors of potential application and an overall plan for the protection and exploitation of the result, to be updated regularly as the project progresses.

### **Critical risks for implementation**

The overall risk and contingency management of Path2Integrity will be conducted by the project coordinator. All WP leaders will be required to maintain risk logs that contain expected risks and an issue log of events that have actually happened. The project coordinator will use this information to identify any issues and potential risk triggers across the different WPs. At 6-month intervals, an evaluation of performance to deliverables will be undertaken, enabling an assessment of the cumulative effect of all failures upon the final set of project objectives.

### **Consortium as a whole**

The Path2Integrity consortium is comprised of eight partners, two representing the school sector, three representing the university sector, one European network for research integrity and a small enterprise specialised in compliance trainings. The partnership contains established as well as new members of the EU. Partners are on different organisational levels, from University and European networks, to SMEs. The different pedagogical, philosophical, organisational and research-led expertise, as well as the different disciplinary fields (law, education, cultural studies, health etc.) of the consortium

members, clearly illustrate the diversity of all partners and their efforts, as well as possibilities to promote a research integrity culture and a responsible research conduct. The very specific kind of partner constellation points out the special focus on providing evidence-based informal and formal learning paths for research integrity in educational organisations to enhance a research integrity culture.

The work package leaders are equally balanced between female and male and represent leading personalities of each area. All partners are aware of the unique possibility of the project to support innovative and efficient learning paths for research integrity. All members comply with the European Integrity Code from ALLEA and ESF.

**Research integrity a teaching content:** Dirk Lanzerath (ENERI), Arja R. Aro (SDU), Peter Krope (CAU) and Julia Prieß-Buchheit (CO) have expertise in systematising the content of research integrity. This excellent team combines different perspectives and sets foci on philosophical input (Dirk Lanzerath), cross-cultural input (Arja R. Aro), dialogical input (Peter Krope) and interdisciplinary input (Julia Prieß-Buchheit).

**Learning research integrity:** The Path2Integrity programme will be based on experiences from Kiel University, which will provide expertise in developing ethic units for school students; the University of Southern Denmark, which will provide experience in developing and implementing Public Health Ethics courses for MSc and BSc students in both Denmark and Saudi Arabia, where research integrity is an essential part of these courses; and Coburg University, with innovative and action-led units concentrating on competencies and being conducted crossdisciplinary in a studium generale for engineering, social work, management studies, bioscience etc. Both SDU and CO developed online resources for enhanced student learning in a blended learning format.

The consortium has experience in group exercises and case-based learning, developing into debates in which students are asked to take on the roles of different sides. The units instruct the use of visualisation techniques such as flipcharts, meta-plan and mind maps; documentation techniques such as SWOT Analyses, decision matrix and systemic structuring; interactional formats such as discussions, debates, workshops, fishbowls, round tables, role play or drama.

Additionally, Erika Löfström (from the international expert advisory board) brings the European core – and advanced – curricula on RI teaching within ENERI to the project. In cooperation with SDU and 3C, these curricula will be advanced for training educators in didactical skills and in student-activated learning.

**Assessing learning units:** In addition to excellent teaching skills, the consortium can offer outstanding expertise in evaluation combining experience from the Instytut Badaw Edukacyjnych (IBE), which conducts evaluation studies in the field of education, the team from the CAU, which specifies in evaluating learning environments, and the team from CO, which provides experience in assessing research integrity units.

**Disseminating efficient learning units:** The Path2Integrity Programme relies on active teaching and learning as well as dissemination activities from the consortium and beyond.

Most of the staff members from the consortium teach actively at universities and can implement the Path2Integrity handbook of instructions in their teaching. Next to this, IBE and Fundació Catalana per a la Recerca i la Innovació (FCRi) are institutions that regularly train teachers. Additionally, the partner EUREC is a leading partner in coordinating REC's and RE activities in the EU. The team is responsible for linking research integrity (RI) and research ethics (RE) actions in the European Network of Research Ethics and Research Integrity (ENERI), in cooperation with ENRIO (European Network of Research Integrity Offices) and ALLEA (All European Academies). EUREC is a partner in several European activities in the field of RE/RI, particularly in promoting training methods and improving the process of harmonisation among ethics committees. Furthermore, the consortium has a written letter of intent from the Hochschule Bayern e.V. stating that they will support the development and training process of the Path2Integrity in Bavaria, Germany.

**Disseminating the Path2Integrity programme:** Deriving from an extensive expertise in science and innovations communication, stemming both from its experience as a scientist publisher and extensive involvement in EU projects as a dissemination partner, Pensoft will be able to transfer essential know-how to the planning and application of communication, dissemination and exploitation within the project. Pensoft has an experienced inhouse PR & Visual communications department alongside a well-trained IT team, who will be able to apply a professional approach not only in actively disseminating project results, but also in building and maintaining the appropriate channels for this (website, internal communication working space, promotional materials, visual identity, social media etc.). As an advocate of open access, Pensoft has also developed a series of tools and guidelines in support of open access publishing and distribution of data. Pensoft is also the publisher of SPARC innovator award winner RIO – an open access journal publishing the full research cycle, from data to final research papers, where the project can benefit from a sustainable Open Science collection, featuring intermediate project results, including data, policy briefs, white papers, posters and more. Pensoft as well as FCRi are specialised in disseminating information. Both have an already established dissemination network and dissemination channels. All partners (especially the networks EUREGC, ENRIO and JERRI) are well connected in their field of expertise, especially in the fields of education, and all partners will use their networks to disseminate Path2Integrity.

**International collaborations:** The international experts advisory board is highly qualified (see Table 3.2) and represents research integrity in different ways in their institutions.

The *Institute of Peace and Conflict Studies* at Zambia Catholic University aims to foster a culture of peace. Ethical values, research integrity and networking play an important role in developing a sound programme there. The University System of Taiwan is a consortium of four top research universities, which established UST Office of Research Integrity to promote research integrity education in its member universities. In the *Women in Senior Leadership Research Centre* at Universidad Panamericana, Mexico, the gender dimension of research and research integrity is discussed, and teaching programmes are disseminated. The Foundation for Student Science and Technology (FSST) is a Canadian not-for-profit organisation dedicated to developing the career potential of exceptional and motivated high school, college and university students for leadership roles in the science

and technology community. Path2Integrity will host workshops together with all **three international partners**:

The first type of workshop or series workshops promotes discussions of different innovative methods and tools to understand and appreciate research integrity and promising learning paths. This activity involves a cross-section of stakeholders from our international partners and can potentially include students, teachers, school board administrators, associations (e.g. Ontario Association of Physics Teachers), provincial education Ministries and others.

The second type is a workshop or series of workshops aimed specifically at teachers and students during which they learn and discuss research integrity using the Path2Integrity handbook of instructions. This workshop is more detailed and how to than the first idea, which focuses more on framework and direction.

Path2Integrity seeks to closely intertwine the consortium and the international expert advisory board, so that cultural exchange on teaching research integrity can develop and constructive advice can be given.

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## Endnotes

- \*1 This text contains unmarked passages copied from other proposals written at Kiel University and Coburg University. This affects primarily the chapter project management. Furthermore, some sentences, words and punctuation marks from the original proposal were slightly changed to increase the readability of this text.
- \*2 The name is anonymised and the report on Martha can be requested at [zke@zke-kiel.de](mailto:zke@zke-kiel.de).