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Students' mindsets on research integrity—a cross-cultural comparison

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Abstract

Research integrity (RI) has been a focus of society in recent years as a means to create and to keep trust in science. Higher education institutions (HEIs) play a key role in promoting a culture of RI and responsible conduct of research (RCR). The understanding and practice of RI can vary across cultures. This article aims to outline initial insights into university students' RI mindsets based on five RI facets: understanding, importance, value–action gap, enforcement approaches, and training. A qualitative exploratory cross-cultural study was conducted with participants from Germany and Bulgaria via semi-structured guided group interviews. An explicit transcultural agreement regarding the significance of RI was categorically indicated. Intercultural differences between the two European countries were revealed and discussed in reference to understanding RI, the value–action gap, enforcement approaches, and training preferences.

Key words: research integrity, cross-cultural comparison, higher education, trust in science, students' mindsets, qualitative study

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Introduction

Fake news, misinformation, and disinformation as well as fabricated or falsified data pose significant societal challenges in the fight against COVID-19. Research and its potential to develop ecological, political, economic, medical, social, cultural, and ethical solutions is one of society's postmodern cornerstones. Honest and reliable research produces sustainable and traceable conclusions, generating further indispensable developments in our society. Research misconduct, misinformation, and disinformation, therefore, represent a threat to the public, lead to economic and societal disadvantages, and undermine trust in science in general (Mejlgaard et al. 2020).

Unfortunately, an increasing number of higher education institutions (HEI) face severe research misconduct cases and minor misbehaviours (Fang et al. 2012; Fanelli et al. 2015) counteracting their mission to train students to conduct responsible research. Such malpractices not only undermine the HEIs' mission to promote society's trust in science, but also challenge the role of science in society. Cases of misconduct point to the unanswered question: How can HEIs educate their students to promote a culture of research integrity (RI)/responsible conduct of research (RCR) and thus contribute to strengthening society's trust in science?

We assume that learning RI impacts students' RCR (Kalichman 2019) and their trust in science (Priess-Buchheit et al. 2021). RI/RCR training affects how students, (future) researchers, and citizens value research and its findings (Turrens 2005; Plemmons et al. 2020). Learning RI strengthens the understanding of research and innovation co-creation and aims at encouraging students to stand up for sound scientific practices and trustworthy scientific societal impact (e.g., the European Commission's Path2Integrity projects).

Although the importance of RI has been recognised as a transcultural phenomenon across Europe (Mejlgaard et al. 2020), cultural differences significantly impact the understanding and practice of RI. RI stands for a commitment to professional, legal, and ethical responsibilities, values, and principles that regulate research (The European Code of Conduct for Research Integrity 2017, p. 3). Steneck (2007) summarised that responsible conduct of research is simply good citizenship applied to a researcher's professional life. RI "is defined as possessing and steadfastly adhering to professional standards, as outlined by professional organisations, research institutions and, when relevant, the government and public" (Steneck 2006, p. 56). Established professional norms and ethical principles for doing research guide the intellectual honesty in designing, conducting, evaluating, and reporting research. The main purpose of RI refers to researchers not engaging in fabrication, falsification, and plagiarism. Additionally, RI extends beyond that to include the way researchers are expected to behave in their work and their interactions with other researchers (Fanelli et al. 2015).

This article aims to outline initial insights into students' mindsets about RI and responsible conduct of research by considering cultural features. To achieve this, we conducted a cross-cultural comparison between two European countries, Germany and Bulgaria, based on five key RI facets, namely (*i*) understanding of RI, (*ii*) importance of RI, (*iii*) RI value–action gap, (*iv*) RI enforcement approaches, and (*v*) RI training.

The different facets of RI

The European Code of Conduct contextualises the following fundamental principles of research integrity (The European Code of Conduct for Research Integrity 2017, p. 4):

- "Reliability in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.
- Honesty in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.
- Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.
- Accountability for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts."

Learning RI refers to internalizing the abovementioned principles. Students acquire knowledge about how to cite sources correctly, which code of conduct and standards to adhere to, how to work in collaborative research teams, etc. In learning RI, they apply academic integrity and commit to the principles of honesty, trust, fairness, respect, responsibility, and courage in academic settings (International Centre for Academic Integrity 2021).

RI/RCR courses are not standard in Europe's HEIs curriculums. Nevertheless, related courses, such as scientific work, research procedures, or research ethics, include RI in several ways. Accordingly, whenever this article discusses training, the term refers to a learning setting in which RI is one of the intended learning outcomes in practice.

Trainers often point out the challenges in influencing students to improve their knowledge in RI/RCR. Although RI/RCR training is a key pillar in how researchers conduct their research, little is known about the modus operandi. According to Andorno et. al. (2019), a main challenge in teaching RI/RCR is that students do not see the relevance. Students transitioning to HEI have difficulties connecting to RI/RCR because they do not see themselves as (future) researchers. Students in their initial stage of university education seem to have low motivation to learn RI/RCR (Priess-Buchheit et al. 2021).

Although the importance of RI seems to be widely acknowledged (The European Code of Conduct for Research Integrity 2017), research misconduct is handled in various ways across Europe (ENRIO n.d.). Experts suggest a cultural alignment in RI mindsets and practices (Burger and Wolstein 2020; Bonn and Pinxten 2021) and assume that the level of corruption in different countries—according to the corruption perception index (CPI) of Transparency International—corresponds to the respective mindset related to RI. To elaborate appropriate teaching designs for RI training in HEIs, more knowledge is needed about students' RI mindsets.

In this article, we differentiate between an internal and an external perspective on the importance of RI. The internal perspective refers to methodology, status quo of existing knowledge, and procedures to be followed by current and prospective researchers in their disciplines. From the internal perspective, RI is of essential importance for researchers and research organisations themselves. In contrast, the external perspective refers to research and science as a particular system in society, and the focus lies on the social relevance of RI. The internal perspective can be described with the following statements: (*i*) RI is the "quality safeguard" of science and technology, the social sciences, and the humanities; (*ii*) RI protects the reputation and careers of researchers and research organisations; and (*iii*) RI prevents the waste of money, time, and effort. The external perspective, in turn, refers to the following statements: (*i*) RI prevents adverse impact on patients and the public; (*ii*) RI promotes economic advancement; (*iii*) RI prevents avoidable waste of resources (Science Europe Working Group 2015).

HEIs take both perspectives into account and follow the internal perspective by training (future) researchers to responsibly conduct research, and the external perspective by enlightening students about the value of (their future) academic work for society. Time students spend in HEIs is a time of professionalization, during which they practice both perspectives in forms of standards, norms and responsible conduct. In this line of argumentation, we compare what students tell each other about research integrity with what they tell about their own academic behaviour in HEIs.

Goddiksen et al. (2021), McCabe et al. (2001), and Craig and Evans (2015) suggest a link between students' cheating behaviour and justifications of cheating. Studies into how students value academic/research integrity (McCabe et al. 1999; Stephens et al. 2021) document a value–action gap referring to a systematically observed difference between the importance of academic and research integrity reported by students and their reported actual behaviour in academia and in research. To understand differences and similarities in students' mindsets in regard to RI, this article examines how students from different cultures talk about themselves as academicians and what they expect academicians to do.

Value–action gaps are well studied in relation to environmental issues and the promotion of sustainable behaviour. The value–action gap emphasizes the need to overcome the (solely) rational presumption about decision-making. Furthermore, it considers that the decision-making process is influenced by individual, social, and institutional arrangements to bridge the gap between what people think and what people do in situations (Blake 1999; Kollmuss and Agyeman 2002).

Apart from the need for a better understanding of RI and its importance, gaining insights into how to enforce RI makes it possible to introduce tailored interventions in the future. We focus on the broadly discussed pair of terms in the field of business ethics—compliance and integrity. Hereby a consensus has been achieved that compliance and integrity are two sides of the same coin. While compliance refers to external norms and rules (legalist perspective), integrity implies a voluntary self-commitment to principles and moral prescriptions (value-based perspective). Compliance needs value orientation, whereas integrity needs (external) norms (Thielemann, 2005; Schöttl and Ranisch, 2016). In this article, we explore how students would implement RI in terms of the relationship between compliance and integrity. Since RI education research is an emerging field, it is important to understand what the recipients of RCR/RI training associate with the subject.

We consider the following dimensions are key facets to explore RI: understanding, importance, value–action gap, and enforcement approaches. They are fundamental for designing RI learning strategies and for the promotion of RI at HEIs. As a last facet, this article highlights students' preferences with regard to RI training. Trainers can apply different teaching designs in the field of RI, corresponding to criteria such as (*i*) elective versus compulsory course of study, (*ii*) standalone course of study versus integrating RI into existing study courses, and (*iii*) teaching RI at the secondary education level versus at the tertiary education level. Combinations of these criteria result in various teaching designs that are applied in educational institutions. To date, there is no definitive knowledge on what kind of design leads to best results (Watts et al. 2017b; Katsarov et al. 2021).

Comparing students' mindsets in Germany and Bulgaria

The two European countries presented in this explorative study rank on the two extremes of CPI of Transparency International (European Commission, 2020). Trust in governmental structure is high in Germany, and bribes or general corruption only rarely occur (European Commission, 2020). Bulgaria is a postsocialist country characterised by high levels of corruption and low trust levels in public and semi-public institutions (Rothstein 2004; Horne 2017). There is a history of distrust in institutions in Bulgaria; the former communist regime was particularly repressive of human rights and individual freedom (Mishler and Rose, 1997). Not only is Bulgaria's corruption level the highest in Europe, but a large part of the Bulgarian population also sees corruption as a permanent part of their culture. Furthermore, levels of interpersonal trust are also relatively low in Bulgaria (Rose-Ackerman, 2001, p. 438).

To compare the RI culture in Bulgaria and in Germany, we studied the country reports published by the European Network of Research Integrity Offices (ENRIO) and the national information of the European Network of Research Ethics Committees (EUREC). The ENRIO report on Germany describes the "national research ombudsman [. . .] and the network of the local ombudspersons in research institutions" as the national institutional structure for research integrity. In Germany there is "no (legal) obligation to seek the national research ombudsman in cases of suspected research misconduct" (ENRIO n.d.). These ombudspersons are accompanied by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) and other nonuniversity research institutions such as Fraunhofer, Helmholtz Association, Leibniz Association, and Max Planck Society, which actively contribute to and promote a research integrity culture. Germany "has a total of 53 research ethics committees. These committees are established in conformity with state law, the Federal Republic has no competence for that establishment" (EUREC n.d.).

No country report referring to stewards of integrity in Bulgaria exists (European Science Foundation 2019; ENRIO n.d.); therefore, no conclusions can be drawn regarding a network of RI stewards in Bulgaria. The European Network of Research Ethics Committees describes Bulgaria's RI context only in relation to biomedical research: "*Bulgarian Health Act* (Article 203) covering all biomedical

research projects states that biomedical research should be conducted after receiving a positive opinion from the ethics committee established in the health care facility, scientific organization or in other institution where biomedical research is going to be conducted." (National Information Bulgaria, EUREC n.d.). "According to the Bulgarian Drug Law (Article 103), Ethics Committee for Multi-Centre Trials is established under the Minister of Health." (EUREC n.d.).

As described above, students' cultural contexts, e.g., stewardship for integrity and transparency, differ widely between Bulgaria and Germany. However, the two countries align mostly on how their educational system determines RI/RCR in their curriculums. The website Path2Integrity (path2integrity.eu) contains examples of curricula in which both countries include components of RCR training. None of these examples has RCR/RI as standalone courses at the secondary school level. Whereas some German examples include standalone courses for bachelor-level students, in Bulgaria RI topics are integrated into other courses at this level of study. In both countries, examples of standalone courses are listed for master and doctoral degree level.

We assume that there should be an interconnection between a country's level of corruption/transparency and the understanding and importance of RI in that country. By comparing two countries with substantial CPI differences, we aim to explore probable contrasts in the students' mindsets in the field of RI. In summary, the need to promote RI at HEIs is a transcultural mission across Europe. However, trainers must adapt RI training to students' mindsets and practices. We conducted a qualitative study to explore Bulgarian and German students' views on RI, and we focused on the intercultural and transcultural aspects of our RI facets: understanding, importance, value–action gap, enforcement approaches, and training.

Methods

To explore students' mindsets on RI, we conducted semi-structured interviews (Lichtman, 2013, p. 248). A qualitative exploratory data collection approach was chosen, as facets of RI still constitute an emerging research field. We took the social constructivist worldview by looking into the socially constructed complexity of the participants' views and interpreting their meanings about research integrity (Creswell, 2009, p. 8). That is why guided group interviews were preferred to individual interviews. Corresponding to our facets of RI, the interviews followed five central questions aiming to discover the following:

a. What is the students' understanding of the term "research integrity"?

b. What is the students' perception of the importance of RI?

c. Is there a value–action gap concerning RI?

d. How can RI be enforced?

e. How can RI be learned?

Based on these research questions and following the semi-structured interview requirements, the following open-ended general questions had been formulated and discussed with the participants:

a. What does RI mean to you? Can you think of a definition? Can you give examples?

b. Do you believe that RI is important? Why? In which areas of life/research is RI especially important (e.g., health and medicine, technology, business, sustainability)? Can you give examples?

c. Have you ever cheated on exams?

Table 1. Participants in the guided groups' interviews.

Criteria	G-Group	B-Group
Country	Germany	Bulgaria
Number of interviewees	17	10
University	Trier University of Applied Sciences (TUAS)	University of Economics Varna (UEV)
Major	Environmental Economics and Business Management	Business and Management
Level	Bachelor	Bachelor
Study semester	1st and 3rd	2nd
Sex	11 females, 6 males	7 females, 3 males

d. How can RI be enforced? Through legal obligation? Through self-commitment? Can you give examples?

e. Do you think that students should be trained in RI? At school or at the university? Shall a RI course be compulsory or elective? Shall it be a standalone course or shall it be integrated into different disciplines? Shall the course explicitly discuss applied aspects of RI?

The conducted semi-structured interviews consisted of, but were not limited to, these five main discussion questions. Relevant questions that emerged from these interviews were added and discussed.

Interviewees were two groups of university students from Germany (Trier University of Applied Sciences (TUAS)) and Bulgaria (University of Economics Varna (UEV)) (Table 1). The German group included 17 students and consisted of two subgroups. The German "post-subgroup" included students who had participated in a university course on RI prior to the interview; they had taken part in a cross-cultural learning setting called Trust-In-Science (Priess-Buchheit et al. 2021). The students from the German "pre-subgroup" had not previously participated in a RI course.

Dividing the German students into two subgroups did not prove to be significant for the overall results and conclusions of this paper, as the general focus of the paper was on the cross-cultural perspective. Responses related to specific RI facets, where the pre–post subgroup differentiation proved relevant, have been reported. The Bulgarian group comprised 10 students who had not participated in such a course prior to the interview.

We used a self-selected sample for this qualitative research. Bulgarian and German business students from similar bachelor's degree programs were invited to take part in the group interviews. Invitations were sent to all first-semester students enrolled in the "Business and Management" bachelor program at the UEV (18 in total), first-semester students enrolled in the "Environmental Economics and Business Management" bachelor program at the TUAS (60 in total),and third-semester students enrolled in the "Environmental Economics and Business Management" bachelor program at the TUAS who had participated in the Trust-In-Science training (9 in total).

The group interviews were held online via a video-platform from 17 January till 2 March 2021. The interviews with the two German subgroups were conducted separately in German. The interview with the students from UEV was conducted in English, the teaching language of their bachelor program. Each interview lasted between 60 and 90 minutes. The participants signed an informed

consent form before the interview. Participants were free to choose whether to engage in answering a particular question or not. Handwritten notes were taken by researchers during the interviews. The group interviews were also digitally recorded and transcribed afterwards. In this process, the interviewees' names were anonymized. After transcription, the original audio recordings were destroyed to ensure the privacy and anonymity of the interviewees.

The results, discussion, and conclusions reported in this article are based on a cross-cultural comparison between the German group (G-Group) and the Bulgarian group (B-Group).

Results and discussion

The outcomes discussed below refer to the intercultural and transcultural aspects of our facets of RI, as reported by the interviewees: understanding, importance, value–action gap, enforcement approaches, and training. By discussing the results of the semi-structured guided group interviews, we indicate the RI facets corresponding to the five central interview questions. All student groups were asked the open-ended questions presented in the methods section. The broad general questions generated vivid discussions and enabled participants to construct the meaning of the issue being studied. The answers and comments of the two German subgroups were united, as the differences between them were not of relevance to the general results discussed in this paper. Additionally, there were no Bulgarian interviewees who had previously participated in RI training, which limits the possibility to compare pretraining with post-training groups. In this section we discuss commonalities and differences between the G-group and B-group responses. By interpreting these responses, we looked for the complexity of the participants' views rather than narrowing meanings into a few categories or ideas (Creswell, 2009, p. 8).

Understanding of RI

The first facet relates to the understanding of RI. All students considered using sound and trustworthy sources and avoiding plagiarism as a substantial part of RI. The B-Group described the RI concept using expressions such as "using honest and factual methods to carry out research", "giving credit to your sources", and "presenting the facts the way that they are without being biased". While the B-Group focused solely on these concepts of RI, the G-Group expanded the concept by including RI-actors' values, such as being respectful, being accountable etc. Furthermore, some students from Germany described RI as being based on "trustworthiness", and others emphasized "moral" behaviour and "sticking to the norms". While German students recognised ethical behaviour as being an essential part of RI, a more narrow understanding was predominant in the B-Group—their focus was how to conduct responsible research and which methods and procedures shall be applied. According to the G-Group, professional ethics is an inherent part of any researcher; developing ethical competencies is, therefore, crucial. The terms and explanations used by German students with and without RI training differ here—while students with training experience demonstrated a clear understanding, students without any training experience provided diffuse and uncertain responses ("I think RI refers to something like unity in research but I am not certain. [. . .], or it means that research is objective, but this is just a guess").

Importance of RI

The second facet refers to the importance of RI, as perceived by the interviewed students. Within this domain, we distinguished between the abovementioned internal and external perspective. Both groups underlined the immense importance of RI as a factor for sustaining social peace, especially in a global and complex world, where transparency and (scientifically) justified guidelines are needed. The interviewees supported the importance of RI with statements such as "spreading wrong information [. . .] could indirectly cause harm" (B-Group), "in any case, we need to catch up with

RI" (G-Group). All students underlined the utmost social importance of RI. For them, research integrity is related to phenomena like "climate change", "CO_2 pollution", or "COVID-19". "If the environment doesn't exist the way that it should, we wouldn't exist the way that we should. We are still part of the environment" (B-Group). "By key and long-term decisions (like ecology and public expenditure), RI is very important" (G-Group). All interview participants recognized the increasing importance of RI in the context of contemporary global phenomena. This suggests that the external perspective has gained influence, even dramatically, in times of the COVID-19 crisis and sustainability. There is an explicit transcultural agreement when it comes to the societal importance of RI.

Further, we asked the interviewees to prioritise the importance of RI in the following fields of research and everyday life: business, technology, sustainability, law, and medicine. Again, there was a clear consensus between all interviewees in stating that medicine and sustainability are the most essential and vulnerable fields. "When it concerns our lives [. . .] we put it in first place. Anyone who has a self-preservation instinct would do that" (B-Group). "In the case of medicine and security, there is a clear highest level of RI importance" (G- Group). Nevertheless, all interviewees agreed that RI is also essential for the other fields discussed. The interviewees underlined the role of social media and further sources of information (facts and fake news) for the increasing role of RI. "I would say that RI is more important nowadays because people are better informed through social media, but also they cannot differentiate very clearly between fake news and real news" (G-Group).

All interviewees recognised the rising importance of RI over time. "In the years to come, RI will become even more important because even more people will have access to more online platforms" (G-Group). This phenomenon is also related to the diversity and variety of sources: "in the past people just believed in one thing, like their god, their religion or whatever it was, and they really believed in that no matter what, under all circumstances. And after that there come so many scientists saying so much different stuff, so they have to prove their integrity. And from now on you will keep on having more and more information which always presents conflicting, different views. And the researchers have to prove their integrity to make people and society believe in what they're saying" (B-Group).

In summary, all participants agreed that there is a growing importance of RI in all areas of life. The responses show that students focussed on the externally driven perspective of RI, and they almost completely neglected the internal perspective. Nevertheless, we take into account that some of the students' statements referring to the external perspective may implicitly carry methodological aspects or standards that are part of the internal perspective.

RI value–action gap

The third domain explores the value–action gap in terms of the interviewees' declared values and reported behaviour. Taking exams often requires students to follow specific protocols of a research procedure and thus prepares them for doing research. Therefore, we presume that students' reports about cheating on exams can indicate a low level of the individual's research integrity. Moreover, exams and research are both performed in the context of academia, and both have clear and very similar codes of conducts. Also, there are similarities in terms of breaches of their codes such as plagiarism, fabrication, and falsification.

To gather data on students' behaviour during exams, we asked the following question: "Have you ever cheated on an exam?" All Bulgarian participants (100%) openly admitted (by raising their hands) to have cheated on exams. This admission is a remarkable finding when compared with the fact that 100% of the participants from Bulgaria had previously declared RI to be essential. Hence, there is a distinct value–action gap in the B-Group's mindset. This finding is in line with Andorno et al. (2019), according to whom students have difficulties to see themselves as (responsible) researchers.

None of the interviewees mentioned reflecting on the contradiction between their reported behaviour in academia (cheating on exams) and the systemic role of HEIs in providing students with competencies in standardized research methods and procedures. This points to a missing link between their actions and the attributed importance of the external perspective of RI.

Participants of the G-Group who had not previously participated in RI training reported their misconduct, but only as sporadic actions during school years; at the university level, they denied having committed such actions. "At school, I cheated a few times because the setting gave me the opportunity to do so, and the consequences were not so bad" (G-Group). The German students who had participated in a RI training, denied any misconduct at both school and university. They pointed to sanctions and consequences as reasons why they avoided misconduct: "I believe it is linked to the consequences; at school, these are not so bad" (G-Group). Respondents from the RI trained G-Group even mentioned the risk of unwillingly engaging in plagiarism ("I think it could happen by accident . . . "), hence the need for RI training. The observed value–action gap of the G-group is definitively smaller than the one of the B-group.

All interviewees from Germany and Bulgaria agreed that cheating is much worse for a medical student than for a business student "because one day our health will depend on him" or her (B-Group). Hence, when it comes to survival and human life, there is a clear transcultural consensus. One student from Germany claimed that unethical conduct can also be dangerous in business and pointed out that incompetent people in business can lead to thousands of people losing their jobs.

RI enforcement approaches

The fourth observed facet refers to RI enforcement. In terms of the discussion compliance/integrity, there were apparent differences in the German and Bulgarian participants' views. The B-Group voted expressively for the compliance approach: "In a perfect world I can see research integrity being supported by laws and regulations". This corresponds to multiple statements throughout the interview, indicating that Bulgarians do not trust institutions and they believe that people with power would manipulate facts they share with the public to achieve their own interests: "whoever has the real information has the power over society", "[facts] can all be manipulated or not manipulated", "sometimes [scientists] get crushed by powerful people and people who don't want anyone else to know that information", "research integrity isn't solely based also on the actual research but on the person who actually has the power to control what we know," "how do you decide who to trust" (B-Group). The group from Germany divided into two balanced preferences: pro-integrity and pro-compliance. Students with training experience preferred the promotion of a pro-integrity strategy: "I think spreading of information and clarification is most important [. . .] so that the role of RI can be internalised" (G-Group).

RI training

The fifth observed facet refers to RI training. All participants from Bulgaria and Germany agreed that RI training is essential for students. When asked whether this training should start at school or at the university, the B-Group had two perspectives: half of them believed training should be included in schools' curriculums, "because when in school we're still forming our opinions". The other half claimed that training should start at university level, "because people should have formed their own opinion of life" before studying RI. These perspectives reflect the discussion as to whether value-based education shall accompany RI training, whereby value-based education refers to the normative aspects of researchers' behaviour, in addition to the proper application of respective research methods (e.g., proper conduction of a laboratory experiment).

There were distinct intercultural differences within this domain with regards to the design of a RI course. Half of the participants from Bulgaria said that RI training should be a compulsory course; the other half supported an elective course. All students from Germany supported the idea that RI courses should be designed as compulsory courses because RI is of utmost social importance and should "therefore reach all students" (G-Group). Students without training experience from Germany supported the integration of RI into other university courses because "the more specific the content of a particular discipline, the more specific the content of RI learning units". Students with training experience seemed to prefer a mixture of integrative and standalone teaching formats, while "the separate course shall refer to general RI, and in the follow-up integrative course-specific RI content shall be taught" (G-Group). Students from Bulgaria believed that RI should be taught as a standalone course because "we really need time for that subject" (B-Group).

All interviewees from Germany underlined the importance of the applied approach in teaching RI. "Research affects our everyday life! So, we need to learn RI in a practical manner" (G-Group). They emphasized that intercultural exchange is crucial for studying RI. Students with training experience pointed out that an intercultural session is a learning advantage. Surprisingly, only half of the B-Group and even less of the G-Group (ca. 30%) confirmed that they would apply for a RI course.

Conclusions

This qualitative study suggests a strong transcultural element with respect to the utmost importance of RI. All interviewees considered RI as a significant, externally attributed factor for promoting social peace, especially within the context of complex global phenomena, such as sustainability and the current pandemic crisis. Therefore we can conclude that on a global scale research and science are gaining importance as drivers of social stability, especially in relation to universal, complex, and nonlinear problems. Confrontation with such problems requires innovative and reliable solutions from academia.

The comparison of the two groups indicates that students from Germany do not report any academic or research misconduct and refer only to typical peer misconduct at school. They demonstrated a value-based understanding of RI (integrity approach of RI enforcement), whereas the students from Bulgaria adhered to a legalist understanding of RI (compliance approach of RI enforcement). These intercultural differences correspond with the findings about the understanding of RI. The B-Group concentrated on research conduct and lacked the aspect of ethical and moral dimension. This is coherent with their misconduct report at school and university level. The G-Group, on the other hand, had a broad (but diffuse) understanding of RI. They had no systematic understanding and hardly reported any RI misconduct at the school and university level.

In addition to the cultural differences in how students perceive RI and in how they report about their actions when conducting research, the study also finds a cultural difference in how they (would) enforce RI. With their different historical and cultural background, the B-Group preferred the strategy of compliance. Bulgaria is a country where the corruption level is still the highest in the EU. In such a country, students question trust in formal law and institutions. High corruption levels have adverse effects on all aspects of social and economic life. Nevertheless, they also serve as examples to be followed by young people. In contrast, the G-Group had no definitive preferences. Some Germans express preference for the strategy of integrity, whereby they assume that compliance will also do. In turn, this result corresponds to the achieved consensus (compliance and integrity) within the field of Business Ethics, as discussed in the introduction. In total, the G-Group responded with a small preference for the integrity strategy, which is an indicator that they recognise the role of ethical principles within research integrity and that they accept the long-term role of self-commitment.

All our RI facets corresponded to the students' reports about RI training in a consistent way. All interviewees recognised the need for RI training. According to the G-Group, RI should be included in their curriculums as a mandatory study course at school and university levels. Also, there was a consensus among the students from Bulgaria on a need for a course offering knowledge on RI. They disagreed on whether this course should be compulsory or elective or whether it should occur at the secondary or tertiary education level. There is a clear preference for a standalone course of study, as the integrative teaching approach is quite an exception for the Bulgarian tertiary education system. The German students expressed preferences for either an integrative or a mixture of integrative and standalone teaching formats. They explicitly emphasized the need for applied teaching of RI as practice-oriented knowledge incorporating review of scientific experience and real case study discussions. They also underlined that intercultural exchange can be an asset, e.g., international discussion on different RI misconduct case studies.

Outlook

This explorative study discusses the students' mindsets in two different EU countries. However, it is not a representative study, and mindsets of other students in Germany or Bulgaria can differ. It is possible, for example, that some of our respondents had a specific mindset because of their local (not national) or institutional context. Further research is needed to substantiate the study's first findings. It might address topics such as a possible correlation between a country's level of corruption according to the CPI index and its level of RI or possible differences in RI understanding and behaviour between individuals who have participated in RI training and individuals who have not.

Transcultural phenomena such as environmental challenges and the COVID-19 pandemic determine students' mindsets in why RI is important. HEIs (as well as research funding organisations and research performing organisations) and students from Germany and Bulgaria point out the need to foster RI. A global approach to promote RI/RCR (Steneck 2013) via training seems to be in accordance with the students' mindsets.

Cultural differences in how students define RI, how they (would) enforce RI, and how they themselves adhere to codes of conduct point to tailored approaches where students learn about RI by broadening their mindset towards a culture of RI, e.g., by discussing the European Code of Conduct for Research Integrity. Nevertheless, some of the students stated specifically that a cross-cultural learning session can help them to reflect upon themselves and support them to position themselves. Both approaches—culturally tailored and cross-cultural—need to be assessed in future in regard to their efficacy for RCR training.

Referring to the general question posed in the introduction about the role of HEIs in promoting a culture of RI and strengthening society's trust in science, it can be concluded that HEIs can make a significant contribution by introducing RI/RCR training courses, starting with the external perspective of RI and then leading their students towards the internal RI perspective. RI sessions, in which students learn the methods for responsible conduct of research, should be tailored towards the mindsets of learners and should take account of their institutional and regional environment regarding corruption in research. Furthermore, RI sessions in which students learn about the responsible conduct of research can be enriched by a cross-cultural exchange.

Students' actual misconduct in academia has not been of interest for us when exploring the differences in mindsets and their implications for future RI training in HEIs. Our study design focused on students' reports about RI (their actions and values) to examine students' mindsets cross-culturally. We found out that there is a cultural difference in how students described themselves as academicians and what they expect academicians to do. That's why RCR training should take this cultural

value–action gap into account and be very sensitive to the fact that the training effect can decrease when the teaching of principles counteracts the students' mindsets.

As for culturally oriented RI training, Bulgarian students considered RI training in which they can be taught how to do research and how to adhere to regulations to be useful, whereas the German students were most interested in the practical application of RI in specific fields. This points to a cross-cultural observer–participant perspective difference which needs to be explored further.

Competing interests

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

Author contributions

MV, PD, and JP-B conceived and designed the study. MV, PD, and JP-B performed the experiments/collected the data. MV, PD, and JP-B analyzed and interpreted the data. MV, PD, and JP-B contributed resources. MV, PD, and JP-B drafted or revised the manuscript.

Data availability statement

All relevant data are within the paper.

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