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Grey zones and good practice: A European survey of academic integrity among undergraduate students

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ABSTRACT

Good academic practice is more than the avoidance of clear-cut cheating. It also involves navigation of the gray zones between cheating and good practice. The existing literature has left students' understanding of gray zone practices largely unexplored. To begin filling in this gap, we present results from a questionnaire study involving $N = 1639$ undergraduate students from seven European countries representing all major disciplines. We show that large numbers of these students are unable to identify gray area issues and lack sensitivity to the context dependence of these. We also show that a considerable proportion of students have a poor understanding of concepts like plagiarism and falsification, not only in gray zone scenarios, but also in cases of relatively clear-cut cheating. Our results are similar across the faculties and countries of study, and even for students who have attended academic integrity training. We discuss the implications of this for academic integrity training.

KEYWORDS

Academic integrity; questionable practice; Europe; cheating; misconception

INTRODUCTION

Promoting good academic practice is not only important in its own right; it is also a means to increase learning and ensure fair assessment in higher education, as well as a first step toward developing research integrity. The promotion of academic practice is therefore a priority for many institutions within higher education (see e.g. Lerouge & Hol, 2020).

Deviations from good academic practice come in many forms. Intentional plagiarism of longer passages and other forms of academic misconduct are obvious examples. Such serious deviations from good academic practice are likely to also be serious violations of local

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disciplinary rules. As such, they are *non-compliant* practices. However, not all non-compliant practices are serious deviations from good academic practice, and not all deviations from good academic practice are non-compliant. *Questionable academic practices* lie in the gray zone between good academic practice and academic misconduct. Examples include free-riding in group work, discarding a few deviating data points, and providing insufficient information in a reference list.

Questionable academic practices occupy a gray zone in the sense that the single instances of them are less serious than, for example, single instances of academic misconduct. They are also likely to be considered less serious violations of disciplinary rules – if they violate the rules at all. However, prevalent questionable practices may still have a detrimental impact (Martinson et al., 2005).

Questionable academic practices are also gray zone practices in the additional, and important, sense that their severity and incompliance may be context dependent. Consider, for instance, the deletion of data points (discussed in detail in M. Johansen & Christiansen, 2020). In some cases, e.g. if a student deletes a large number of data points simply because they do not fit an expected outcome, intentional deletion of data will be considered misconduct (falsification) and may be sanctioned accordingly. In other cases, the deletion of data points may be acceptable. This could be the case, for example, if the data are deleted due to a likely error in the experiment following fruitful discussion with the instructor on how to improve.

While disciplinary rules and codes of conduct often acknowledge the existence of gray zone practices, they also often fail to make a clear distinction between the contexts in which gray zone practices are acceptable and those in which they are not (Schmidt, 2014). It is therefore not surprising that students can be unsure about what constitutes good academic practice when facing a gray area issue. In fact, such uncertainty may be a sign that the student has a relatively sophisticated understanding of the situation.

The focus in this paper is whether undergraduate students within the European Economic Area (EEA) understand gray zone issues. Grey zones can occur in many different parts of academic practice. *Citation practice*, including good citation practice and avoiding plagiarism, is commonly in focus (see below). However, gray zone issues can also arise in *collaborative practice*, both in group work, and in balancing the potentially very fruitful and encouraged practice of seeking help and inspiration to solve individual assignments with the requirement that individual assignments should be solved individually. *Data collection and analysis*, including the handling of outliers, and the avoidance of falsification and fabrication, also involves many choices where it can be unclear what, in a given context, constitutes good academic practice. (We use the term "data" in a very broad sense here to refer to both qualitative and quantitative data as well as historical sources and works of art and craft that may serve as the empirical basis for academic work. See Supplementary file (S) 3 for details.) Academic integrity issues come up in other aspects of academic work as well, but in this study, we focus on these three aspects.

Although there is a substantial literature on academic integrity that clearly shows that exam cheating is a serious problem in many parts of higher education (see e.g. Curtis & Tremaine, 2019; McCabe et al., 2001; Yang et al., 2013) we lack a good understanding of how students perceive gray zone practices and how teachers and institutions can best prepare them to navigate these. This is partly because the existing literature focuses largely on clearly non-compliant practices (see Childers & Bruton, 2016 and the Discussion section of this paper). The studies that do focus on gray zone issues only examine differences in severity and pay little or no attention to context dependence. Franklyn-Stokes and Newstead (1995), for instance, investigated how students and teachers perceive the relative severity of different "cheating behaviors," including "altering data" and "copying," but without specifying the context in which these behaviors occurred. This is problematic because it makes the results unclear. As mentioned above, the impropriety of "altering data" can depend on why the data were altered, and whether it was done transparently. Similarly, copying a passage into a writing assignment may be more or less seriously wrong depending on whether the passage was pasted into a method section or discussion section.

To what extent gray zone practices are addressed in current academic integrity training efforts in the EEA is unclear. Stoesz and Yudintseva (2018) reviewed tests of academic integrity training, however, the vast majority of the identified studies stem from outside the EEA. They indicate that while severe plagiarism is covered in almost all the reviewed training efforts, collaboration and data are more sporadically covered, and even fewer cover gray zone practises. Not addressing gray zone practices in academic integrity training risks limiting the effect of such training to preventing clear cut cases of academic misconduct (and as argued by Pennock & O'rourke, 2017, it may not even be very effective at that). While dealing with the clear cut cases is clearly important, it falls short of the aim of promoting academic integrity understood as something beyond abstinence from misconduct. Institutions that are committed to an ideal of academic integrity similar to the one outlined e.g. in the Singapore Statement (WCRI, 2010) or the European Code of Conduct for Research Integrity (ALLEA, 2017) should therefore somehow make an effort to also cover gray zone practices in their academic integrity training, and to this end it is clearly valuable to have some understanding of how students perceive these practices.

To improve our understanding of how students perceive gray zone issues, and particularly the context dependence of good academic practice and the application of central concepts like falsification, fabrication and plagiarism in gray zone cases, this study aimed to investigate:

(1) Whether undergraduate students in the EEA have an adequate *understanding* of gray zone issues relating to citation practice, collaborative practice and collection and analysis of data.
(2) Whether they have been *uncertain* about what constitutes good academic practice.

Our main focus will be on mapping overall prevalence and tendencies across the population. However, throughout this paper we shall also highlight any salient differences across countries and/or study-specific backgrounds (the faculty the participant is studying in, the type of data he or she most commonly works with, and his or her attendance at academic integrity training).

MATERIALS AND METHODS

Participants

The study is based on a questionnaire-based survey undertaken as part of the project INTEGRITY (Goddiksen et al., 2023; M. W. Johansen et al., 2022).

Participants included in the study were recruited in seven EEA countries: Denmark, Hungary, Ireland, Lithuania, Portugal, Slovenia and Switzerland (the French speaking part only). We decided to sample and recruit participants at the study programme level, a major reason being that it was difficult (and in most cases impossible) to procure individual student contact information. Further, the share of students in the humanities is, in general, relatively low (ranging from 4% (Hungary) to 22% (Denmark)). A random draw of students would therefore have resulted in insufficient representation (low sample sizes) of humanities students. The disproportional random sampling design at study programme level (described below) remedies this challenge.

In each country, a complete list of undergraduate programmes was compiled. Following the Bologna Process (EHEA, 2015), we defined an undergraduate programme as a programme in the first cycle offered by institutions that also offer Ph.D. programmes (third cycle). Thus, all undergraduate programmes offered by major research universities were included, whilst programmes officially leading to a Bachelor's degree offered by institutions that do not train researchers were excluded. The lists of undergraduate programmes were to the extent possible assigned to the three "faculties" defined in S3: Humanities, Social Sciences (Soc Sci) and STEMM (including the traditional STEM disciplines plus the medical sciences – hence the additional M). From the lists, programmes were randomly drawn (e.g. ten programmes per faculty), and administrators and/or teachers were contacted, informed in general terms about the study, and asked to help us

invite whole classes or even year groups of students who had completed at least one year of their studies (60 ECTS). If the teacher/administrator agreed to help, we sent an invitation e-mail containing a link to the online survey for them to distribute. Alternatively, we provided a link and a QR-code that could be distributed in class. Where students were invited by e-mail, reminders would occasionally be sent out a few a days after the first invitation. In a few cases, the link to the survey was also be distributed via social media – e.g. to Facebook groups for students in a specific year and study programme (details in S4).

In some countries, the recruitment differed somewhat from the process described above. In the French speaking part of Switzerland, a full population recruitment was carried out: university rectors of the five universities in the area were contacted and asked to distribute the survey to all students. In cases where the rectorate was unable to assist (due to internal rules limiting the use of the e-mail list including all students), faculties, and thereafter heads of programmes, were contacted. Similarly, all of the students in all programmes in the nine biggest universities in Lithuania (over 90% of the total undergraduate population) were invited. In Hungary, random selection was conducted partly at the institutional level, and partly at programme level: first, we randomly selected 5 universities per study direction (15 in total). Then we randomly selected 5 programmes out of the total number of programmes offered by the 5 universities, per study direction. Further details of the recruitment process can be found in S4.

We aimed to obtain at least 200 responses per country, with at least 45 responses per faculty. These numbers ensured, on the one hand, that the main faculties were represented in all countries, and, on the other hand, that in most cases there were enough participants to detect both (medium effect size) differences in multivariable regressions where all countries are pooled and within country differences in bivariable analyses (Hibberts et al., 2012). If the initial round of recruitment did not result in a sufficient number of responses, we randomly drew additional programmes (faculties in the case of Hungary) from the relevant lists. The number of additional programmes to be drawn was estimated using the number of responses collected so far.

Data collection

Survey data were collected between February and December 2020. Ethical approval of the study had been obtained prior to data collection (details in S2). Data were collected in nine EEA countries – in addition to the seven countries mentioned above, data were collected in Germany, the Netherlands and the German-speaking part of Switzerland. However, once the data collection ended, we had not achieved sufficiently sized samples according to the criteria mentioned above in the three countries or areas (Germany: $N = 94$, the Netherlands: $N = 96$, German speaking parts of Switzerland: $N = 11$). The final dataset (summarized in Table 1) therefore consisted of $N = 1639$ responses from seven EEA countries with all major academic disciplines represented. Note that although it did not reach the minimum of 45 humanities students, we decided to retain Hungary, as this is the only Central-Eastern country represented in the data and the humanities sub-sample was after all rather high ($n = 36$).

As is evident from Table 1, the response rates were very low, typically at 2–3%, although Ireland reached an estimated 9%. The external validity of the results should be considered in light of this. We address this further in the discussion.

The gender and age distributions of the participants are shown in Table 2.

Unsurprisingly, Bachelor's students are primarily in the 20 years age brackets. The sample consists of more female (63.8–74.5%) than male students (17.6–32.1%). Although there are more female students in all countries, their sample share is somewhat higher than the census data (52%-57%) (details in S5). Some of this can be explained by the fact that humanities study programmes were oversampled, and the fact that there are more female students in humanities programmes (at least, this is what we observed in Denmark, and Ireland where we could break down census data in this detail). But this does not fully account for the difference.

Table 1. Overview of the recruitment process. Numbers in parentheses show the distribution across three faculties defined in S3 and the residual category "Other:" Total (STEMM, Soc Sci, Hum, Other).

	Total undergraduate programmes	Total programmes approached	Programmes agreeing to participate	Estimated number of students in participating programmes*	Total respondents
Denmark	345	66 (29, 15, 22)	38 (17, 10, 11)	7,200	218 (77, 75, 64, 2)
Hungary	167	51 (22, 19, 10)	23 (10, 9, 4)	15,700	292 (167, 61, 36, 28)
Ireland	623	63 (19, 23, 21)	27 (8, 9, 10)	2,500	231 (92, 77, 61, 1)
Lithuania	547	118 (37, 35, 46)	118 (37, 35, 46)	10,500	204 (78, 62, 64)
Portugal	825	288 (52, 89, 147)	117 (17, 45, 55)	11,700	274 (120, 88, 63, 3)
Slovenia	251	128 (44, 21, 43, 20)	92 (23, 11, 43, 15)	9,000	221 (55, 94, 53, 9)
Switzerland	177	177 (46, 32, 99)	71 (24, 12, 35)	11,600	199 (52, 74, 65, 8)
Total	2935	891 (249, 234, 388, 20)	486 (136, 131, 204, 15)	68,200	1639 (621, 531, 432, 24)

*Where exact numbers were not available we estimated using enrollment numbers from 2019 and 2018 assuming a dropout rate of 10% per year.

Just over half of the participants (53%) had attended some kind of academic integrity training. However, there are major differences across country of study (see S6). Of those that had participated in academic integrity training, around 57% had spent one working day or less on it (details in S6).

Materials

Survey development

The text of the questionnaire (presented in S1) was developed in English by the authors. The development process was inspired by the iterative, grounded approach proposed by Charmaz (2006). To understand students' perspectives and experiences with academic integrity we first conducted a qualitative interview study with bachelor students from Denmark, Ireland, and Hungary. The interviews were transcribed, coded, and analyzed as described in Goddiksen et al. (2021), and the questionnaire was then designed by combining our prior theoretical and practical understanding with the results obtained from the interview study. As a major design choice, the questionnaire was designed to probe the participants' epistemic rather than their ethical relation to academic integrity. This choice was grounded in the authors' experience as teachers as well as in the results from the qualitative interview study. As a second design choice academic behavior was mainly examined from

Table 2. Gender and age distributions of participants in each country.

	Male	Female	None of the above	Prefer not to answer	Age 18–20	Age 21–25	Age 26–30	Age 31+
Denmark	32.1%	63.8%	0.0%	4.1%	7.3%	81.2%	6.9%	4.6%
Hungary	27.1%	67.8%	1.0%	4.1%	25.0%	54.1%	5.8%	15.1%
Ireland	26.8%	69.7%	0.4%	3.0%	51.5%	40.7%	2.6%	5.2%
Lithuania	17.6%	74.5%	2.5%	5.4%	37.7%	60.8%	0.5%	1.0%
Portugal	27.0%	68.2%	0.4%	4.4%	53.6%	35.8%	5.5%	5.1%
Slovenia	28.5%	68.8%	1.8%	0.9%	26.2%	62.9%	5.9%	5.0%
Switzerland	22.9%	69,0%	2.9%	5.2%	26.7%	61.4%	5.7%	6.2%
Total	26.2%	68.9%	1.2%	3.8%	33.2%	55.7%	4.7%	6.7%

an individualistic perspective in the questionnaire. Although the interview study gave us reason to believe that there is a strong structural dimension in integrity behavior, we chose to maintain the individual perspective to better align with the existing literature.

Once developed, the questionnaire was translated into the dominant languages of each of the participating countries (a blind back-translation was also made to ensure comparability across languages, see S2 for details). It was then set up as an anonymous online questionnaire using SurveyXact ver. 12.9 (https://www.surveyxact.com/). S2 contains further details of the development of the survey, the translation process and the pilot tests.

Contents of the questionnaire

The questionnaire included demographic details (gender, age, country of study), and study specific details (faculty, type of data the student usually works with, and type of training in academic integrity the student had received). We also developed questions designed to assess participants' understanding of misconduct, gray zones and uncertainty about good practice under the three aspects of academic practice listed in the introduction (i.e. citation, collaboration, and data collection and analysis). These questions are detailed below, and Table 4 at the end of this section provides an overview.

Understandings of Academic Practices. We sought to measure the participants' understanding of non-compliant and gray zone areas in academic practice by presenting them with a series of actions (listed in) and asking, for each action: whether the action is "against the rules and regulations that apply to you"? Actions falling under the same aspect of academic practice – e.g. citation practice – were presented together, but the order was randomized for each participant. Six answer options were given: "Yes, it is a serious violation," "Yes, but it is not a serious violation," "No, it is not against the rules," "The rules are unclear," "It depends on the situation" and "I don't know." While the first three options allowed for investigation into the severity of the actions as seen by the participants, the answer options "The rules are unclear" and "It depends on the situation" allowed participants to indicate that the action was perceived to be in a gray zone, where the information provided was not sufficient to determine whether the action was non-compliant. For each aspect of academic practice, the questionnaire included both actions that the authors found would probably violate local disciplinary rules and actions that were in a gray zone (See Table 3). The specific actions were drawn partly from the literature and partly from the results of the preceding qualitative study (details in S2).

As can be seen from Table 3, to ensure the questionnaire was relevant and understandable to all participants, actions under "Collecting, analyzing and presenting data" were tailored to the type of data the participant primarily worked with (datatypes are defined in S3). The differing actions raised the same issues, but they were phrased in terms that were familiar and relevant to the participant (details in S1). For instance, the first action on data in Table 3 was rephrased as "Not mentioning in an assignment that you discarded one or more interviews that did not fit well with the rest of your interviews when the cause of the deviation was unknown" for participants primarily working with qualitative data. Participants working with historical sources or works of arts and crafts were presented with the same description, except that "interviews" was changed to "material."

Since citation practice remains important in all academic disciplines and is very much in focus as regards good academic practice, we opted to gain a deeper understanding of participants' understanding of gray zone plagiarism. The questionnaire presented participants with a scenario, inspired by Roig (1997), containing an original paragraph of 41 words, and four different examples of how "a friend" could paraphrase it in the introduction of an assignment (See S1). The paraphrases had the following characteristics:

- Paraphrase 1: A direct copy with no citation marks and no reference.
- Paraphrase 2: A few insignificant words had been changed to synonyms. There was no reference to the original.
- Paraphrase 3: Same as paraphrase 2 but with a reference to the original.

Table 3. Actions included in the questionnaire used to assess understanding of non-compliant and gray zone academic practices. The request put to respondents was: "Please indicate whether you believe the following actions go against the rules and regulations that apply to you.".

Aspect	Likely non-compliant actions	Grey zone actions (compliance is context dependent)
Citation practice	*Cit item 1*: Copying an entire page stating a central point from an external source into your own text without quotation marks but including a reference.	
	Cit item 2: Copying one short paragraph stating a central point from an external source into your own text without quotation marks but including a reference.	
		Cit item 3: Changing 10% of the words in a short paragraph stating a central point from an external source and using it in your own text with a reference.
Collaborative practice	*Col item 1*: Paying someone to write an assignment for you.	
		Col item 2: Comparing answers to an individual assignment with other students before handing in the assignment.
		Col item 3: Handing in an assignment that you made with extensive help from another student or family member without mentioning the help you received.
		Col item 4: Let one member of a group do all the writing on a group project while the other members contribute to analysis and literature search.
Collecting, analyzing and presenting data	*Dat item 1*: Not mentioning in an assignment that you replaced a number of outliers in a data set with data points obtained through estimates based on the remaining data points.*	
	Dat item 2: Not mentioning in an assignment that you removed a number of deviating data points from a data set when the cause of the deviation was unknown.*	
		Dat item 3: Not mentioning in an assignment that you removed a number of deviating data points from a data set when the cause of the deviation was known.*

* The cited version was presented to participants working primarily with quantitative data (defined in S3). The versions presented to students working primarily with other types of data are found in S1.

- Paraphrase 4: A more substantial rewriting with a reference.

Given that it is a direct copy, "Paraphrase 1" is strictly speaking not a paraphrase, but for simplicity we refer to all four uses of the original as paraphrases. For each paraphrase, we asked participants to state "whether or not you believe your friend has acted in a way that is acceptable." Answer options were presented on a 5-point Likert scale from 1 "Completely unacceptable" to 5 "Completely acceptable." There was also an option to answer "I don't know."

Uncertainty about what constitutes good practice. Under each aspect, participants were asked whether they had encountered situations where they were unsure about what constitutes good

academic practice within the past year. The response options were: 1 "no," 2 "yes, once," 3 "yes, a few times," 4 "yes many times," and 5 "not applicable."

Data analysis

Analyses were run in Stata/MP 17.0, and in SPSS v. 28.0.

We organize the presentation of the results in two overall sections that follow the research questions laid out earlier.

For research question 1, where we study the degree to which undergraduate students in EEA have an adequate *understanding* of gray zone issues relating to citation practice, collaborative practice and collection and analysis of data, frequencies are reported for all the measures of understanding laid out in Table 4. In order to highlight salient differences across countries and/or study-specific backgrounds, multivariable regressions were carried out. The particular regression techniques employed vary according to the character of the dependent variables being studied. Insofar the 10 measures with non-ordered response options is concerned (Cit item 1–3, Col Item 1–4, and Dat Item 1–3, see Table 4 for details) multinomial logit regressions were run where each of the 10 measures of understanding were inserted as dependent variable one by one. We used multinomial logit regression here because of the non-ordered character of the dependent variables. Response options on the dependent variables were recoded into four categories 1="Yes, it is a serious violation"/"Yes, but it is not a serious violation," 2="No, it is not against the rules," 3="The rules are unclear"/"It depends on the situation" and 4="I don't know." The following variables were inserted as explanatory variables: faculty, gender, age, data type used, training in academic integrity, study country, and whether high school education was completed in another country.

To identify the factors that predict perceptions about good citation practice (paraphrase 1–4, see Table 4 for details), ordered logit regressions were run for each of the four paraphrases (participants giving the response "don't know" were excluded). We used ordered logit regression because the dependent variables here are on an ordered (but not metric) continuum. The explanatory variables described above were inserted in the ordered logit regression.

To assess whether some cases of academic practice were categorized correctly by the participants more often than others, the measures from Table 3 were collapsed into dichotomies indicating correct and incorrect answers (0=incorrect; 1=correct). Specifically, when the cases were non-compliant actions, the response option "Yes, it is a serious violation," "Yes, but it is not a serious violation" were coded = 1, and all other responses were coded = 0. When the cases were gray zone actions, the response options "The rules are unclear" and "It depends on the situation" were coded = 1, and the other response options were coded = 0. To compare the prevalence of correct evaluations within same area, tests of equality of proportions were performed using the *prtest* command in Stata. To compare degree of acceptance of the scenarios on good citation practice, Wilcoxon sign rank tests of the quality of matched pairs (a non-parametric version of paired sample t-test) were performed using the *signrank* command in Stata. The response "don't know" was excluded from the analysis, as it cannot be placed on the underlying acceptance continuum. All tests that were run regarding these comparisons are reported in the Supplementary material S8 Table S8.1.

Turning to research question 2, where focus is on *uncertainty* about good practice, frequencies are reported for all the measures of uncertainty laid out in Table 4. In order to highlight salient differences across countries and/or study-specific backgrounds, multivariable regressions were carried out. The three uncertainty items were inserted as dependent variables in three multivariable regressions. Here, we also used ordered logit regression because the dependent variables are on an ordered (but not metric) continuum. Participants giving the response "not applicable" were excluded from this analysis. The same explanatory variables that were described above were inserted in these three regressions.

We report statistically significant associations (at the 0.05 level), in some instances using verbal descriptions of the direction of the association, and in other instances by presenting predicted probabilities (calculated with the *margins* command in Stata). We treat gender, age, and whether

Table 4. Overview of the understanding and uncertainty measures.

	Understanding of central concepts		
	Variable names*	n	n in multi-variable regression[a]
Citation practice	Paraphrase 1[b]	1639	1519
	Paraphrase 2 [b]	1639	1486
	Paraphrase 3 [b]	1639	1500
	Paraphrase 4 [b]	1639	1481
	Cit item 1[c]	1639	1583
	Cit item 2 [c]	1639	1583
	Cit item 3 [c]	1639	1583
Collaborative practice	Col item 1 [c]	1639	1583
	Col item 2 [c]	1639	1583
	Col item 3 [c]	1639	1583
	Col item 4[c]	1639	1583
Data collection and analysis	Dat item 1 [c]	1355	1310
	Dat item 2 [c]	1355	1310
	Dat item 3 [c]	1355	1310
	Uncertainty about what constitutes good practice		
Citation practice	Uncertainty cit[d]	1639	1519
Collaborative practice	Uncertainty col[d]	1453	1270
Data collection and analysis	Uncertainty dat[d]	1355	1246

* For definitions of the variables see Materials and Table 3.

[a]The sample size is lower in multivariable analysis, because respondents were treated as missing if it was not possible to identify a study direction; if they gave the response "don't know" in the paraphrase questions, and if they responded "not applicable" in the uncertainty questions. Further, respondents were not given the three Dat item questions if they reported that they never work with data as part of their bachelor program.

[b]Answer options: 5-point Likert scale from 1 "Completely unacceptable" to 5 "Completely acceptable" plus "I don't know."

[c]Answer options: "Yes, it is a serious violation," "Yes, but it is not a serious violation," "No, it is not against the rules," "The rules are unclear," "It depends on the situation" and "I don't know."

[d]Answer options: "no," "yes, once," "yes, a few times," "yes many times," and "not applicable."

the participant's high school education was completed in another country as control variables. Details from the multivariable regression results (including omnibus test-statistics, p-values for each explanatory variable, and Nagelkerkes pseudo-r^2) are laid out in S8 (Tables S8.2- 4).

Sample sizes vary across the results reported because participants were only given question batteries that were relevant given what they had worked with during their study to date. For instance, 284 respondents who had so far had no experience with data were not given the questions about data handling. In other cases, participants were discarded in multivariable analysis if their response did not fit into an underlying continuum (e.g. when they answered "don't know"). For this reason, we have also included information about sample sizes in the multivariable regressions in Table 4.

Due to the disproportional sampling design (at faculty level) the reported prevalence of, for example, differing understandings of academic practices should not be interpreted as actual prevalence in and between the seven countries.

RESULTS

The first section presents results on the scenario from plagiarism and the questions concerning the actions summarized in Table 3. The nest section presents results on the frequency of uncertainty about good practice among participants. In each section, we cover the three aspects of academic practice mentioned in the introduction, namely citation practice, collaborative practice, and the collection, analysis and presentation of data. Statistically significant differences across datatypes, faculties and attendance at academic integrity training are described (see S8, Table S8.1 for full statistical details).

Details of national differences (which were generally small and displayed no systematic trends) are presented in S7.

The understanding of central concepts

Citation practice

In the scenario on citation practice, we expected most participants to identify Paraphrase 1 – a direct copy with no citation marks and no reference – as unacceptable. Because the paraphrases are increasingly removed from verbatim copying, we further expected to see an increasing degree of acceptance across the four paraphrases. While the latter expectation was confirmed, the former was not (see Table 5).

Although a single instance of Paraphrase 1 may not, in practice, be considered enough to warrant a plagiarism case, it is, at least *prima facie*, a clear example of a serious and unacceptable deviation from good academic practice. However, a large minority (46.6% when summing "completely acceptable," "acceptable," "neutral," and "I don't know") of the participants did not find Paraphrase 1 unacceptable. In fact, one in four found it either "acceptable" or "completely acceptable" (see Table 5). Participants' evaluation of this first paraphrase was not found to depend on attendance at academic integrity training. Significant differences were identified across country of study ($p < .001$, details in S7). Students within STEMM were generally more likely to deem Paraphrase 1 acceptable ($p < .01$, see Figure 1 upper graph).

Although Paraphrase 2 is arguably as questionable as Paraphrase 1, a larger fraction of the participants found it acceptable ($p < .001$, details in S8, Table 8.2). This trend continues through Paraphrases 3 and 4 ($p < .001$, details in S8, Table 8.2).

Acceptance of paraphrases 3 and 4 did not differ between faculties. However, acceptance of paraphrase 2 did differ ($p < .05$), with participants from STEMM being more likely to deem Paraphrase 2 acceptable (Figure 1, lower graph). It was only acceptance of Paraphrase 2 that was found to depend significantly on attendance at academic integrity training. Participants who had attended a lecture, or an entire course, on academic integrity were less likely to identify Paraphrase 2 as acceptable ($p < .05$ in both cases).

Being a substantial rewriting with a reference, Paraphrase 4 was designed to be at least *prima facie* acceptable. Yet more than one in ten of the participants found it either "unacceptable" or "completely unacceptable."

Grey zone citation practice. Results for the questions about non-compliant and gray zone citation practices are shown in Figure 2.

As described in Materials, the first two actions in Figure 2 are, at least *prima facie*, clear examples of non-compliant practice, whereas the last action will in some cases be compliant and in the other cases not so.

As is evident from Figure 2, a large majority of participants correctly identified the first two actions as non-compliant (86% for an entire page, 78% for the short paragraph). In both cases, small but statistically significant variations were observed across countries ($p < .001$ in both cases, See S7).

Perceptions of the first and third action were found to depend on the type of data the participant was primarily using ($p < .01$ for question 1, and $p < .05$ for question 3). Participants working primarily with qualitative data and quantitative data were, roughly speaking, equally likely to identify both actions as non-compliant, whereas participants working with historical sources/arts or no data were less likely to do so. Participants' perceptions did not differ between faculties. Participants who had attended an e-session on academic integrity were more likely to indicate that the latter action was non-compliant ($p < .05$) (predicted probability of indicating it as non-compliant is 0.58 for those who had attended and e-session, and 0.49 for those who had not).

As shown in Figure 2, more than 80% of the participants were also convinced that a clear answer could be given to the third action – i.e. changing ten percent of the words of a paragraph

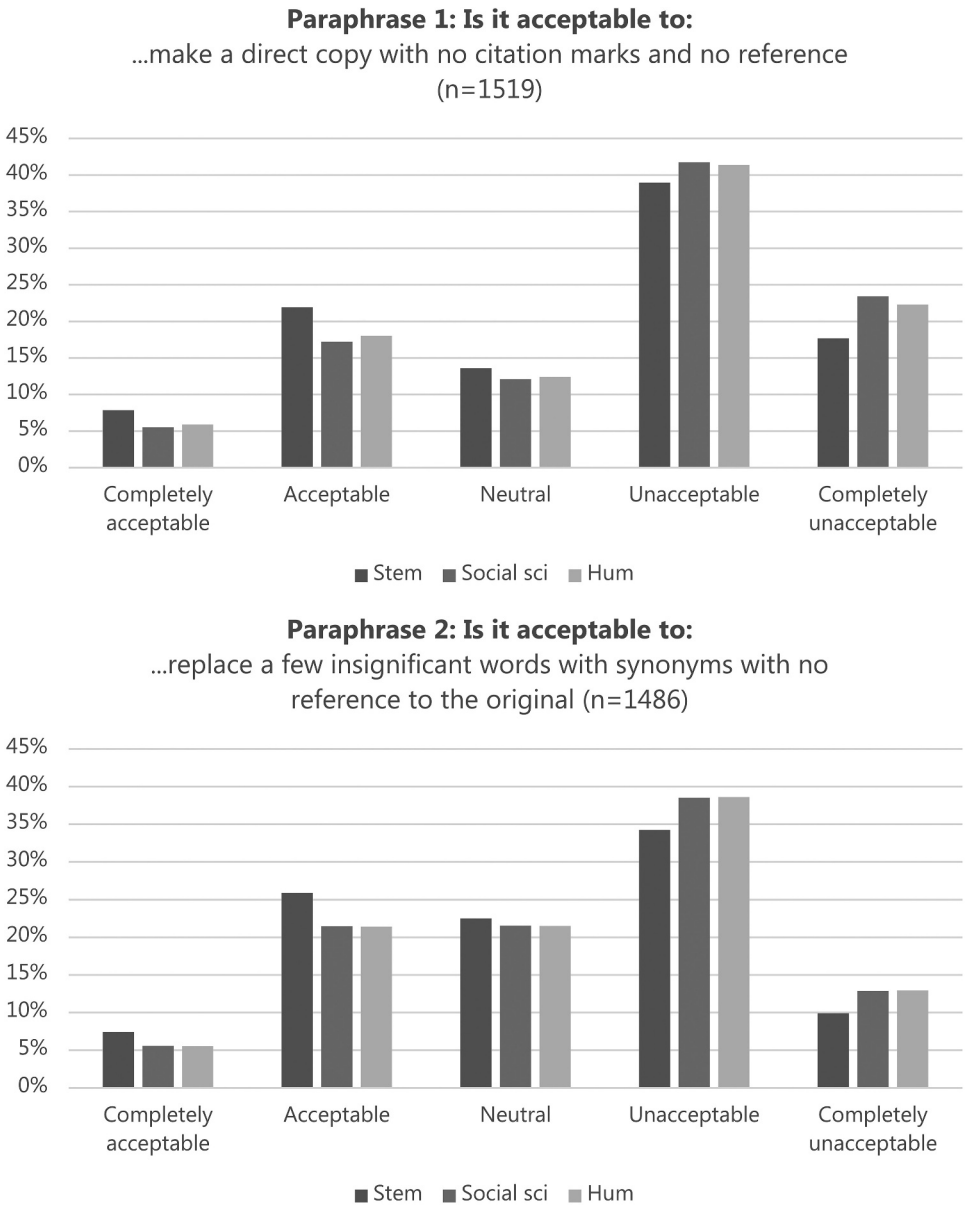

Figure 1. Distribution of participants' assessment of Paraphrases 1 and 2, across the faculties defined in S3: STEMM (dark gray), Humanities (light gray) and Social sciences. Shares are predicted probabilities from ordered logit models.

stating a central point and adding a reference. In practice, however, this kind of action will in many cases lie in a gray zone: the answer will depend on where in the text – e.g. the method section or the discussion section – the paraphrase occurs, and what words have been changed. Only 13% of the participants indicated awareness of this context dependence by answering either "the rules are unclear" or "it depends on the situation." This marks a substantial and significant difference between the share of participants who were able to correctly identify the questionable practice, on the one hand, and the share who did so in connection with the clearly non-compliant cases, on the other (details in S8, Table 8.3).

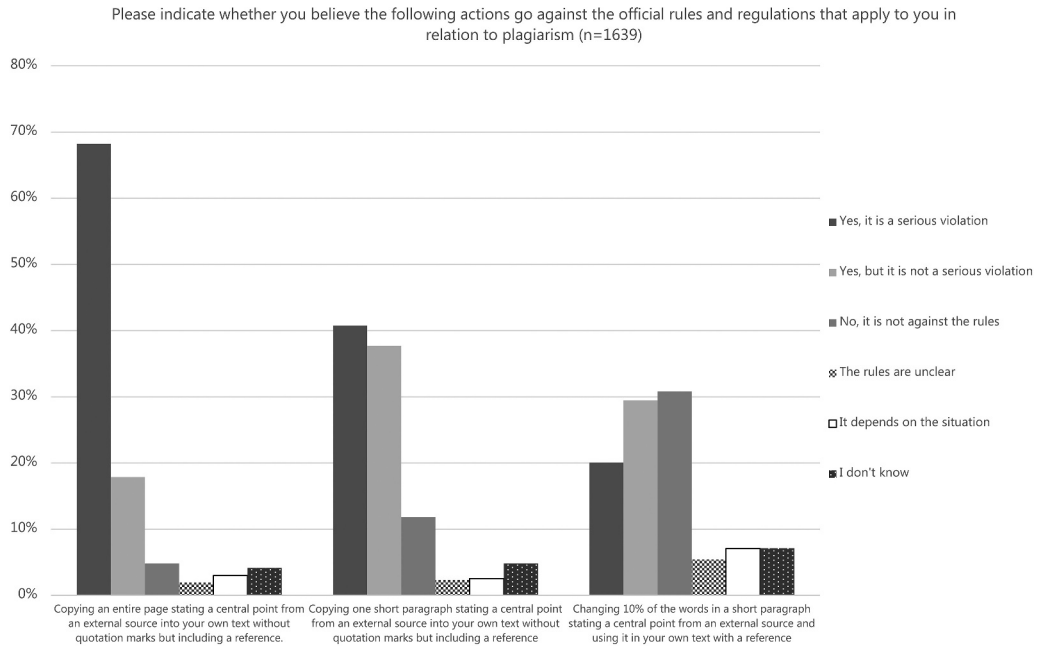

Figure 2. Participants' perceptions of whether specific citation practices are violations of the rules and regulations that apply to them.

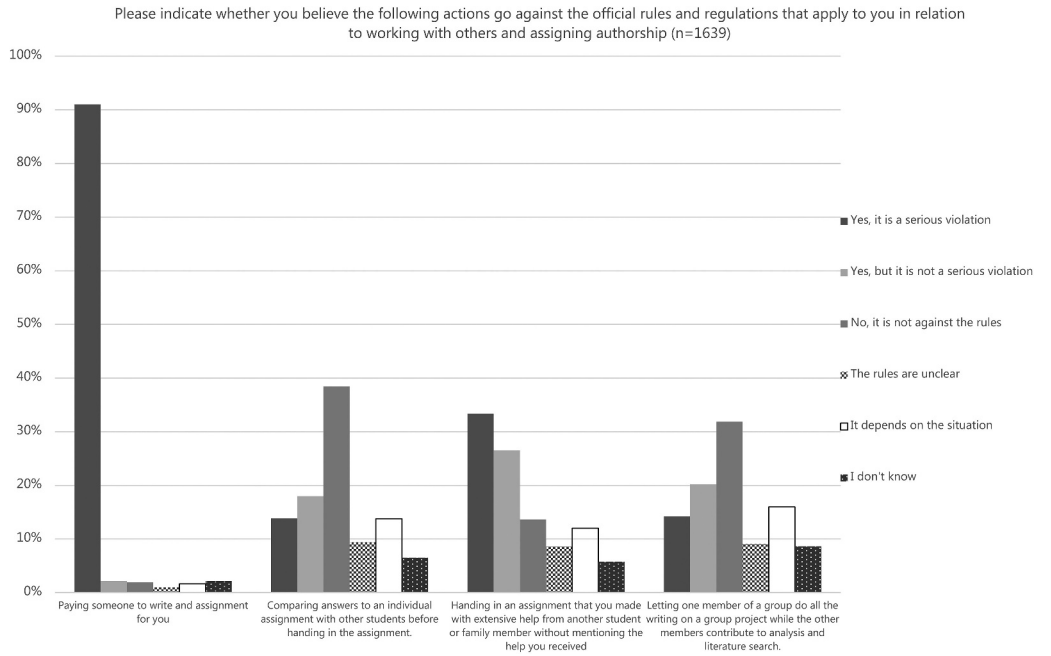

Figure 3. Participants' perceptions of whether specific collaborative practices are violations of the rules and regulations that apply to them.

Table 5. Participants' indication of the ethical acceptability of the four paraphrases ($n = 1639$).

	Completely acceptable	Acceptable	Neutral	Unacceptable	Completely unacceptable	I don't know
Paraphrase 1: A direct copy with no citation marks and no reference.	6.4%	18.7%	12.2%	38.8%	19.8%	4.1%
Paraphrase 2: A few insignificant words had been changed to synonyms. There was no reference to the original.	6.2%	22.0%	20.6%	34.2%	10.9%	6.1%
Paraphrase 3: The same as paraphrase 2 but with a reference to the original.	21.9%	41.5%	16.0%	13.8%	1.6%	5.1%
Paraphrase 4: A more substantial rewriting with a reference.	33.3%	34.8%	13.8%	10.0%	1.6%	6.3%

Collaborative practice

Figure 3 displays how the participants assessed the actions related to collaborative practice.

The vast majority of participants (93%) were able to recognize that paying another person to write an assignment is non-compliant. However, surprisingly, participants who had taken a course on academic integrity were significantly less likely to identify this behavior as non-compliant (predicted probabilities 0.85 for participants who had taken a course, compared to 0.94 for those who had not, $p < .01$).

A majority of the participants believed that there was a clear answer to the remaining three questions – despite their location in the gray zone. Only one in four, or fewer, indicated that these questions lay in the gray zone. Participants were thus much less likely to correctly identify these questions as falling in the gray zone than they were to identify the clear violation as such (in all three comparisons between the first (questionable) action and the second, third, and fourth gray zone actions, test of the equality of proportions: $p < .001$, details in S8, Table S8.4).

Relatively small but significant differences in the answers to the questions were observed across country of study ($p < .001$ for all four, details in S7). Also, participants from STEMM were more likely than participants from other faculties to perceive comparison of answers to individual assignments as compliant (i.e. not against the rules) ($p < .01$), but otherwise no significant differences between faculties were observed. The participants who had attended an e-session on academic integrity were more likely to identify undisclosed help (third action) as non-compliant (predicted probability 0.73 compared to 0.59, $p < .01$).

Collection, analysis and presentation of data

Finally, Figure 4 presents results of the participants' assessment of actions involving the collection, analysis and presentation of data.

A large majority of participants (80%) identified data fabrication ("undisclosed replacement of deviating data with constructed data") as non-compliant. Participants that had attended a lecture on academic integrity were more likely to recognize this (predicted probability 0.84 for participants who had attended a lecture, 0.77 for those who had not, $p < .05$). Significant ($p < .001$) but modest differences were observed across country of study (details in S7).

As further shown in Figure 4, the participants assessed the two actions involving the discarding of data rather similarly, with a majority judging both cases to be a violation of the rules that apply to them. Interestingly, over 40% of the participants identified both actions as serious violations of the rules that apply to them, even though this is arguably only the in rare cases where multiple outliers are discarded with the intention of making a data set fit a specific hypothesis. Only 10.9% of the participants recognized that it is not always clear whether or not it is permissible to discard outliers that occur for a known reason without being transparent about it.

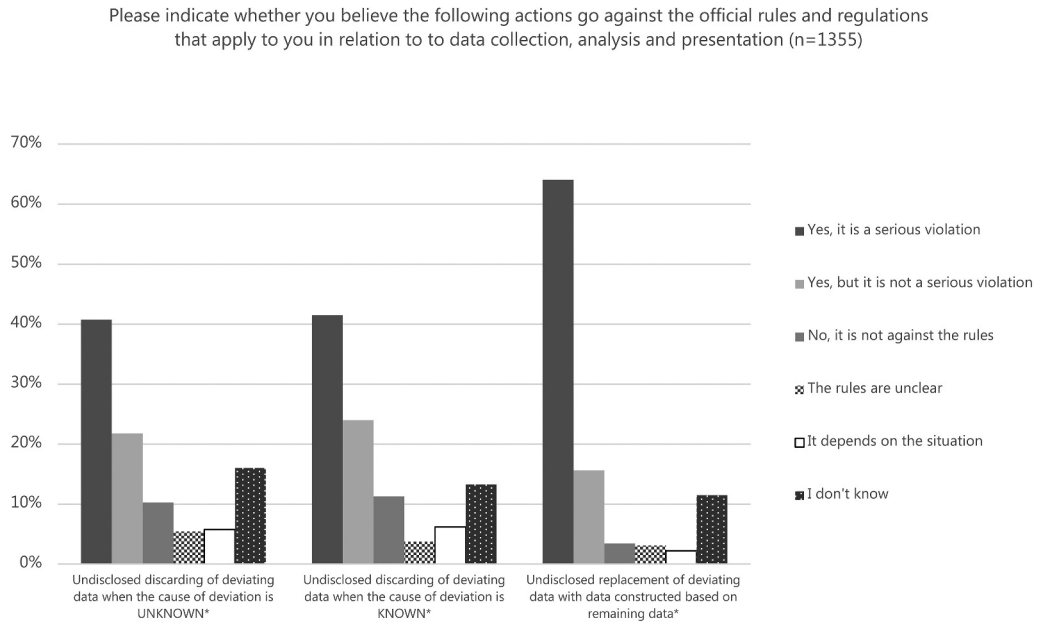

Figure 4. Participants' perceptions of whether specific data handling practices are violations of the rules and regulations that apply to them. *note that the longer description of the action presented to participants depends on the type of data they primarily use (see Materials).

No differences between faculties were observed. Attendance at lectures on academic integrity had a significant impact ($p < .05$). Specifically, this attendance increases the probability that participants will identify any discarding of data as non-compliant (when the reason is unknown, the predicted probability for identifying as non-compliant is 0.66 for those who have attended a lecture and 0.60 for those who have not. When the reason is known, the predicted probability for identifying as non-compliant is 0.71 for those who have attended a lecture and 0.62 for those who have not). Significant differences across country of study were also observed ($p < .001$ for both), as detailed in S7.

Although no significant differences between faculties were identified, assessments of the actions in Figure 5 were found to depend strongly on the type of data the participant primarily works with. Participants working with quantitative data (be they from the natural, social or humanistic sciences) were much more likely to perceive both cases of transparent outlier removal as clearly non-compliant, compared with participants working with qualitative data or historical sources, or works of art/craft (Figure 5).

Uncertainty about what constitutes good practice

Given that the participants generally believe that the disciplinary rules provide clear answers, one might have expected them not to have experienced uncertainty about good academic practice during their studies. However, uncertainty about good practice was common in all three aspects of academic practice, as well as across the different faculties and countries of study. Aggregated results for this are shown in Table 6. Although the frequency with which uncertainties were experienced was high in all countries, there were significant differences in this frequency across countries (details in S7).

Just under half of the participants (46.7%) had experienced uncertainty about ethically correct citation practice within the past year. There were significant differences between faculties ($p < .01$). Students within STEMM were generally less likely to have experienced this kind of uncertainty than their fellow students in other areas (predicted probability for no uncertainty was 0.56 for STEMM

Table 6. Distribution of responses to the three questions beginning "Over the past 12 months, have you been in a situation where you were unsure how to behave in an ethically correct manner in relation to . . . ".

	Yes, more than once	Yes, once	No	Not applicable
Citation practice ($n = 1639$)	27.8%	18.9%	49.4%	3.9%
Collaborative practice ($n = 1453$)	15.7%	13.7%	61.1%	9.5%
Data collection and analysis ($n = 1355$)	26.3%	16.3%	52.7%	4.7%

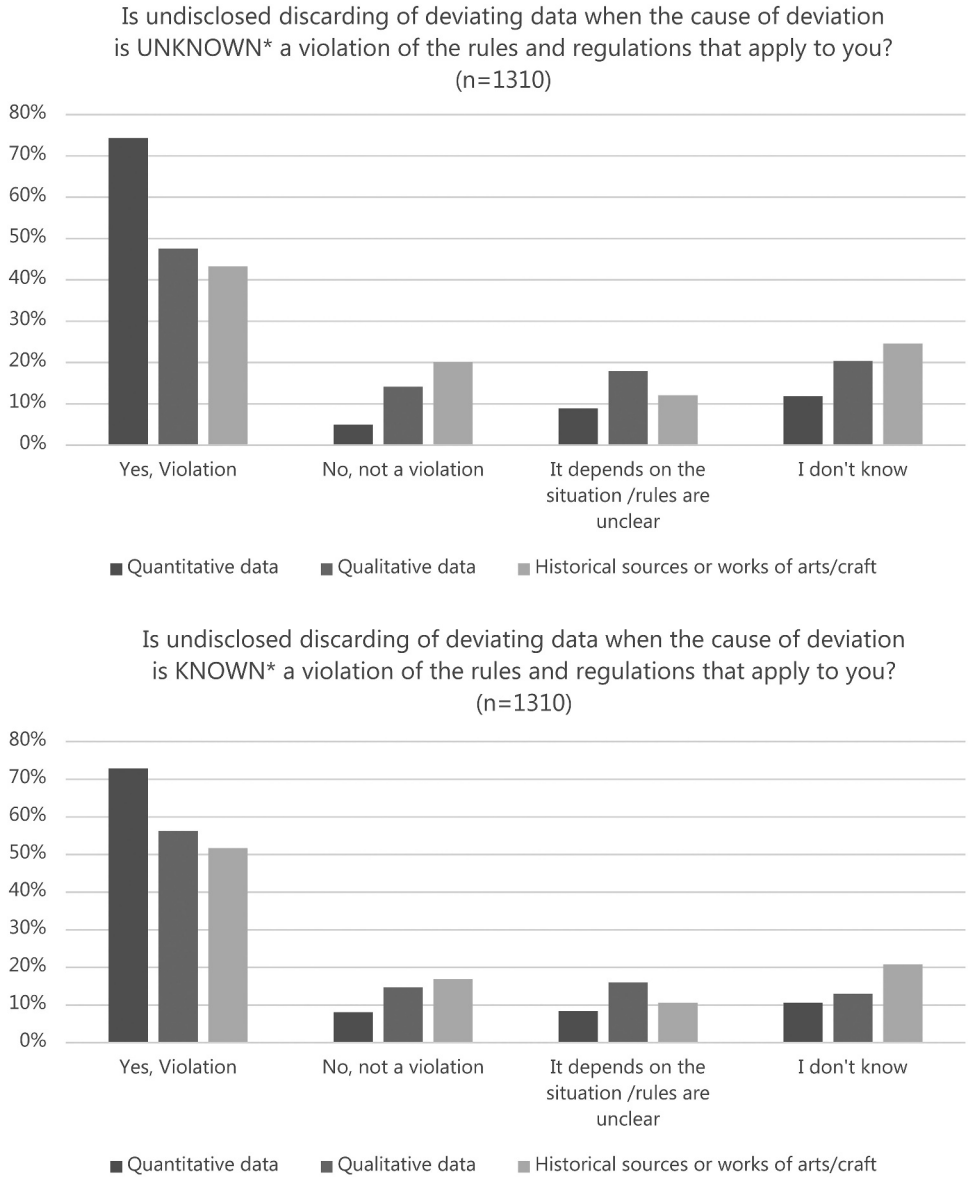

Figure 5. Participants' perceptions of the compliance of undisclosed discarding of data. * Note that the longer description of the action presented to participants depends on the type of data they primarily use (see Materials). **note also that the answer options"yes, it is a serious violation" and"yes, but is not a serious violation" have been merged. Shares are predicted probabilities from mlogit models.

compared to 0.46 for Soc Sci and 0.52 for Hum). Still, even in STEMM a substantial share of the students had experienced uncertainty. Similarly, participants working with quantitative data were less likely to have experienced uncertainty about citation practice ($p < .05$).

Around a third of the participants had been unsure about good practice in collaborative work. Students who had attended an academic integrity course were more likely to have been unsure in relation to this aspect of academic practice (predicted probability of no uncertainty 0.60 for those who had attended a course, and 0.69 for those who had not, $p < .05$).

Uncertainty about good practice in the collection, analysis and presentation of data were also frequent. Just over 42% reported having been unsure about this at least once in the past year. Students who had attended an academic integrity course were more likely to have been unsure in relation to data collection and analysis (predicted probability of no uncertainty 0.59 for those who had attended a course, and 0.50 for those who had not, $p < .05$).

DISCUSSION

We have shown that a substantial share of the participants – regardless of faculty and country of study – had been unsure about what constitutes good academic practice at least once within the past year. Such uncertainties *can* be a sign of the individual's sensitivity to the complexity and context dependence of the many gray zone issues. However, they can also arise from a poor understanding of gray zones, and the absence of relevant training and experience – which our results indicate is generally the case.

The results presented above indicate that the participants in this study were generally not sensitive to the context dependency of good academic practice, regardless of country, faculty and even attendance at academic integrity training. Interestingly, our results revealed that the participants who had attended academic integrity training were more likely to classify two of the five actions in Table 3 that could best be described as being in the gray zone (deleting data based on knowledge of a likely error, and undisclosed help on individual assignments) as non-compliant.

A sizable fraction of the participants, from all countries and across the faculties, were unable to identify more clear-cut instances of plagiarism and falsification. For falsification, our results indicated that these participants were not sensitive to the difference between curating data based on a knowledge of likely errors and deleting data simply because they do not fit with one's expectations. Alternatively, these participants misjudged what is allowed as long as you are transparent about it. Turning to plagiarism, we showed that although a large majority of the students were able to identify a general description of plagiarism as non-compliant, almost half failed to identify a specific description of a copied paragraph with neither quotation marks nor a reference as unacceptable. Furthermore, our results corroborate those obtained by Childers and Bruton (2016) for American students, suggesting that students think of plagiarism mainly as something involving direct copies a text – this, despite the fact that plagiarism is generally defined more broadly as the appropriation of other peoples' work or ideas without giving proper credit (see e.g. ALLEA, 2017). This result is somewhat concerning, as clear-cut plagiarism is one of the most commonly discussed topics in academic integrity training (Stoesz & Yudintseva, 2018).

These results add to the existing literature in several ways. With a few noticeable exceptions (Glendinning, 2016; Hopp & Speil, 2020; Teixeira & Rocha, 2010), most empirical studies on academic integrity have been performed outside the EEA (see Davis et al., 2009 for a review of North American studies; see also Curtis & Tremaine, 2019; Yang et al., 2013). Plagiarism, in particular, has been mapped in detail in several national and institutional settings (reviewed in Childers & Bruton, 2016). As mentioned in the introduction, most existing studies focus narrowly on clear-cut cheating (with Roig, 1997 being a noticeable exception). To these, our study not only adds details from a new geographical area, the EEA, but also a new perspective in focusing on gray zones.

Additionally, our finding that students are unsure not only about correct citation practice, but also about good academic practice in collaboration, and in the collection, analysis and presentation of data,

indicate that the tendency in the literature to focus on citation practice should be supplemented with studies on other aspects of academic practice. While these aspects are covered in some of the literature mentioned above (e.g. McCabe et al., 2001), the literature once again also almost exclusively focuses on clear-cut cheating – e.g. explicitly "unauthorized" help with an individual's exams. Our study therefore nuances this literature and suggests that further studies assisting future efforts to help students navigate gray zones will be of value.

While the random or full population sampling strategies employed in this study sets it apart from similar studies – all the empirical studies cited above seem to be based on convenience sampling, except Teixeira and Rocha (2010) – the disproportional sampling design (the oversampling of students from the humanities) in this study still means that the reported results cannot be directly translated to the student populations in the countries involved, let alone the EEA as a whole. Since our results are similarly patterned across faculties, this design does not seem to affect the overall study findings. However, the very low response rate, along with the skewed gender distribution (overrepresentation of female identifying respondents), is a significant limitation of our investigation, as it is a potential source of non-response bias. In the multivariable analyses, gender differences were in general modest. Thus, we can assume the reported prevalences were not affected very much by the gender differential. The very low response rates, however, could imply that students with a particular interest in the topic (or enthusiasm for questionnaires more generally) are overrepresented in the sample. Personal interest in academic integrity may have many sources, of course, but a likely origin of it is prior acquaintance with the topic through either academic integrity training or personal experience of the issues. If this is the case, there is a risk that our study overestimated the fraction of the student population that has attended academic integrity training and experienced uncertainty. A further risk is that our results give an overestimate of students' understanding of central concepts and the context dependence of integrity issues – at least, if personal experiences with gray zone issues tends to lead to a deeper understanding of the issues probed in this study (something we cannot examine further). Finally, some unclarities in the French translation of the questionnaire (elaborated in S6) mean that there is some uncertainty about how many participants indicating that they have taken a course on academic integrity have actually attended an academic integrity course, and not a just a lecture.

With these limitations acknowledged, our results still have implications on various levels. First, they indicate that students in the participating countries are inadequately prepared to identify, let alone navigate, the gray zone issues that many of them will face during their studies. This may in turn lead to unintentional deviations from good academic practice as well as unnecessary uncertainty and worries for the students. Secondly, students' limited understanding of gray zone issues may affect their reactions to fellow students' deviations from good academic practice.

Academic integrity training has the potential to prepare students to navigate gray zone issues. However, our study indicates that this potential is currently unharnessed within the participating countries. In fact, our results indicate that at least some current forms of academic integrity training are counterproductive to this aim. As mentioned in the introduction, research mapping the contents of academic integrity training for undergraduate students in Europe is currently lacking. It is therefore unclear why current training efforts are in some cases counter-productive to the understanding of gray zone issues. Some studies (Pennock & O'rourke, 2017; Pizzolato & Dierickx, 2021) indicate that factors such as fragmented and excessively "legalistic" training, where students are mainly informed about the disciplinary rules and sanctions, and are shown examples of clear-cut cheating, rather than being encouraged to develop a deeper understanding of the many ways in which cheating and questionable practices can be detrimental to both the students themselves and the aims of higher education. This is backed by recent results on the effectiveness of research integrity training for researchers indicating that training is most effective when participants first develop an informed notion of research integrity before being introduced to rules and codes of conduct (Katsarov et al., 2022). It may still be important to teach rules and codes, but the teaching needs to be part of a wider effort to develop students' understanding of academic integrity.

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DISCLOSURE STATEMENT

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DATA AND MATERIALS AVAIBILITY

The complete raw dataset from the INTEGRITY survey, which includes the raw data for this study, is available here: https://doi.org/10.17894/ucph.66293057-46c5-4d02-a116-dfd597ce5a78. The questionnaire is available as S1.

CODE AVAIBILITY

IBM SPSS, Stata/MP, and Mplus codes are available upon contact with the authors.

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