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Research article

Academic integrity policies against assessment fraud in postgraduate studies: An analysis of the situation in Spanish universities☆

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ABSTRACT

We aimed to analyse the strategies and policies of academic integrity in the face of assessment fraud in postgraduate studies in Spain. To this end, we examined the three strategies most commonly used by higher education institutions to address and prevent dishonest behaviour among students: (1) the use of technological mechanisms to detect plagiarism and identity control on assessment tests; (2) regulatory devices and resources (academic regulations and codes of conduct); and (3) training and awareness-raising activities. We scrutinised the results by means of a questionnaire administered to 102 academic heads of postgraduate studies at 42 Spanish universities. We found that almost all universities have plagiarism detection tools, the majority have academic regulations or specific codes of conduct for postgraduate students that address the issue of fraud or dishonesty. It was also found that specific training programmes on academic and research integrity for PhD students are more frequent than those for master's students, and the least used strategies to deal with dishonest student behaviour are the use of awareness-raising mechanisms and the use of an identity control system for online assessable activities. Moreover, there are some significant differences in the outcomes between public and private universities. Our findings highlight the need for Spanish universities to address the development of a clear academic integrity policy.

1. Introduction

Academic integrity is described as consisting of values of honesty, trust, respect, fairness and responsibility and 'is fundamental to the reputation of academic institutions' (Gill, 2013, p. 103). It is also defined as "compliance with ethical and professional principles, standards and practices by individuals or institutions in education, research and scholarship" (Tauginienė et al., 2018, p. 6–7). However, cheating on tests and assessment work is one of the most visible manifestations of academic dishonesty among students in university systems around the world, and as recent reviews attest, there is a large amount of literature and a great body of evidence (Awasthi, 2019; Eaton and Edino, 2018; Newton, 2018). Approximately 80% of undergraduate and postgraduate university students admit to some form of cheating in their assessment activities throughout their studies (Stoesz and Yudintseva, 2018). Moreover, in recent years, there has been a significant rise in certain forms of cheating: This is the case of payment to third parties for academic work, which has risen, according to comparative data from 65 studies, from a prevalence of approximately 3% until 2014 to just over 15% when considering existing data from studies carried out after 2014 (Newton, 2018; Curtis et al., 2021). It is therefore not surprising that assessment fraud is considered a major problem for university systems worldwide (Foltýnek and Králíková, 2018).

The issue of strategies and policies put in place to address this problem and promote academic integrity has been widely discussed in the literature (Baran and Jonason, 2020; Macfarlane et al., 2012; Minarcik and Bridges, 2015; Sheard et al., 2017; Shephard et al., 2015). The solutions used can be summarised into three broad categories (Comas, 2009): (1) those focused on the use of technological mechanisms for plagiarism detection and identity control on assessment tests; (2) those focused on establishing normative and regulatory mechanisms; and, finally, (3) those aimed at training and informing the university com-

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munity, especially the student body, about what academic integrity is and how not to contravene it.

1.1. Technological mechanisms for detecting plagiarism and identity checks on assessment tests

Since the beginning of the 21st century, the use of computer programmes to detect academic plagiarism in students' work has been spreading, and a large number are available (Foltýnek et al., 2020; Kaur et al., 2021; Naik et al., 2015). These programmes have been useful in reducing the incidence of plagiarism in universities (Ledwith and Rísquez, 2008), but numerous studies have also highlighted their limitations. First, these programmes do not actually determine the existence of plagiarism, but rather identify similarities between texts, which may help to identify certain plagiarised content, but on many occasions, they also identify non-plagiarised texts as problematic or what are known as false-positives (Foltýnek et al., 2020). Second, these programmes are mostly used for 'police' or 'detective' purposes, thus ignoring their educational potential (Mphahlele and McKenna, 2019). A third constraint is that the available plagiarism detection software is ineffective in detecting contract cheating, one of the most common forms of fraud. Hopefully in the future, the potential of stylometry software systems for detecting cases of the buying and selling of academic work will be realised (Ison, 2020), or other methods employed by students to circumvent the control of anti-plagiarism programmes, such as automatic paraphrasers (Rogerson and McCarthy, 2017; Prentice and Kinden, 2018) or automatic translation systems (Akbari, 2020; Jones and Sheridan, 2015). In this sense, it is plausible that certain (technical and methodological) elements of methods harnessed for so-called 'proctored exams' may contain key elements of a 'proctored' approach (Harmon and Lambrinos, 2008; Hollister and Berenson, 2009; Weiner and Hurtz, 2017) to make plagiarism detection mechanisms more effective.

1.2. Training and awareness-raising mechanisms

A second widely used strategy is the student-centred approach, which is based on the assumption that students arriving at universities lack some of the basic skills needed to cope in the higher education environment (Morris, 2010). These skills include know-how related to information literacy, especially regarding the appropriate and ethical use of information (American Association of School Librarians, 2009), as well as a lack of awareness of the principles and standards of integrity in higher education institutions, including responsible conduct for research. This lack of training lies at the root of the spread of unintentional dishonest practices, which are easily avoidable through educational programmes in academic integrity, whether focused on information literacy or on the ethical principles of the institution involved. Thus, many universities have launched training activities in recent years, with different content, characteristics and formats centred on plagiarism and how to cite sources and reference them; student responsibility and the principles of integrity of the institution involved; online or face-to-face courses (compulsory or optional); information campaigns, workshops, and tutorials. These training practices have been examined, with interesting contributions geared toward the definition, design, implementation, and evaluation of interventions of preventive strategies (Perkins et al., 2020; Sefcik et al., 2020; Stephens et al., 2021; Stoesz and Yudintseva, 2018).

1.3. Regulatory mechanisms

Higher education institutions also promote integrity by creating and implementing normative and guiding mechanisms. Basically, two types of arrangements are in place (Dix et al., 2014; Tatum and Schwartz, 2017): (1) regulations that stipulate rules and coercive measures that discourage students from engaging in dishonest behaviour; and (2) codes of ethics, honour or conduct that embody and publicise the principles, values and foundations of the institution involved, which should guide the activities that take place within the institution.

On this issue, the evidence on academic regulations as a preventive factor for dishonest student behaviour is notable. For example, Jordan (2001) found a strong association between being aware of an institution's academic integrity policy and following it. Hence, clear messages and information about institutional policies may help to reduce student misconduct. The existing literature establishes that if a university has codes of conduct or academic regulations that clearly address the matter of academic integrity, if these normative devices have been agreed upon by the members of the institution (students, teaching staff, administrative and service staff), and if, finally, these rules are known by all, a context of prevention is generated that leads to a reduction in the number of dishonest behaviours developed by the student body (Sureda et al., 2016).

1.4. The situation in Spain and the importance of academic integrity in postgraduate studies

This paper is contextualised in Spain and in postgraduate studies. In comparison to other countries, the prevalence of academic dishonesty in Spain is high: 42% of university students admitted the commission of academic misconducts as to compose academic essays by combining personal content with fragments of texts extracted from the Internet and a wide majority (62%) considers that this is a frequent practice amongst the rest of the university students' population (Comas et al., 2010, 2011). On the other hand, it is one of the European countries where university students receive the least training on academic integrity (Foltynek, 2013), and there is a need for more support and training on the subject (Cebrián-Robles et al., 2018). Further, Spain has regulations on the topic that are not well adjusted to suit the current times (Sureda et al., 2016), and the presence of the issue in documents such as teaching guides is scarce (Cebrián-Robles et al., 2016).

Regarding the second aspect of this paper's context —postgraduate studies, which include master's, postgraduate and PhD studies— it should be noted that postgraduate students, as researchers in training, occupy a privileged position in the debate on academic integrity (Mahmud and Bretag, 2013; Selemani et al., 2018). This need coexists with a situation marked by a dearth of preventive strategies and regulatory mechanisms in postgraduate studies to tackle dishonest behaviour at this academic level, as highlighted by Escudero-Nahón and López-Quiroz (2020) in a systematic review on the subject.

1.5. Objective and research questions

Our purpose was to analyse academic integrity strategies and policies to address assessment fraud in postgraduate studies in Spain. In the above context, we posed the following research questions:

- How do Spanish universities deal with academic fraud in postgraduate studies?
- What type of strategies do Spanish universities most commonly employ to deal with dishonest behaviour committed by postgraduate students?
- Are there differences in the policies and strategies adopted in favour of academic integrity depending on the ownership (public or private) of universities?
- How do postgraduate academics rate the measures taken by Spanish universities to promote academic integrity among their students?

2. Materials and methods

2.1. Participants and procedure

We selected the participants by means of non-probability purposive sampling. A total of 102 academic heads of postgraduate studies from 42

Spanish universities took part. For the study's purpose, academic managers include directors, deputy directors, and secretaries of doctoral schools; directors, deputy directors, and secretaries of postgraduate study centres; and vice-rectors responsible for postgraduate studies. All study participants provided informed consent prior to study enrolment following the recommendations of the research project ethics commission.

Table 1. Characteristics of the study participants.

University ownership	Frequency	Percentage
Public	74	72.5%
Private	28	27.5%
Total	102	100.0%
Type of university teaching	**Frequency**	**Percentage**
Traditional	84	82.4%
Online	18	17.6%
Total	102	100.0%
Gender	**Frequency**	**Percentage**
Female	39	38.2%
Male	63	61.8%
Total	102	100.0%
Age group	**Frequency**	**Percentage**
26–48	33	32.4%
49–57	32	31.4%
58–70	31	30.4%
Total	96	94.1%
Lost	6	5.9%
Total	102	100.0%
Professional category	**Frequency**	**Percentage**
Assistant lecturer doctor	8	7.8%
Associate lecturer	3	2.9%
Lecturer	14	13.7%
Associate professor	38	37.3%
Professor	39	38.2%
Total	102	100.0%
Branch of knowledge to which it belongs	**Frequency**	**Percentage**
Social Sciences and Law	35	34.3%
Arts and Humanities	18	17.6%
Health Sciences	17	16.7%
Sciences	16	15.7%
Engineering & Architecture	16	15.7%
Total	102	100.0%
Years of postgraduate teaching experience	**Frequency**	**Percentage**
Between 1 & 3	9	8.8%
Between 4 & 10	22	21.6%
More than 10 years	71	69.6%
Total	102	100.0%
Years of experience in the position of postgraduate responsibility	**Frequency**	**Percentage**
Between 1 & 3	37	36.3%
Between 4 & 10	44	43.1%
More than 10 years	21	20.6%
Total	102	100.0%
Master's final projects supervised (last 10 years)	**Frequency**	**Percentage**
Between 0 & 5	37	36.3%
Between 6 & 15	33	32.4%
Between 16 & 76	32	31.4%
Total	102	100.0%
PhD theses supervised (last 10 years)	**Frequency**	**Percentage**
Between 0 & 1	36	35.3%
Between 2 & 5	36	35.3%
Between 6 & 15	30	29.4%
Total	102	100.0%

First, we carried out a search for the aforementioned personnel profiles on the website of each Spanish university offering official postgraduate studies (N = 70) according to the U-Ranking list of Spanish universities (https://www.u-ranking.es). For each university, we gathered contact details (university, position, first and last name, contact email, and contact telephone number) and stored them in an Excel database. In total, we collected data for 305 postgraduate academic managers from the 70 universities mentioned above. During November 2020, we sent a personalised letter to each supervisor by e-mail, inviting them to participate and explaining the purpose and anonymity of the study; we asked them to participate in the research by sending them a link to access the questionnaire. After 4 weeks, we sent the 305 postgraduate academic managers an initial reminder to complete the questionnaire. After 8 weeks, we sent a second reminder. Finally, after 12 weeks, we sent a third reminder. In mid-March 2021, we closed the questionnaire, obtaining a total of 102 responses (for a response rate of 33.4% and a representation of 60% of the Spanish universities that make up the U-Ranking). Table 1 depicts the sample's characteristics.

2.2. Measures

The questionnaire (annex), which we designed for this study, is based on a questionnaire employed by Sureda et al. (2019), who examined the assessment of the severity and proposals for sanctions for dishonest student behaviour through a panel of experts. We extended and adapted this questionnaire to the postgraduate context and validated it by means of expert judgement, which is 'an informed opinion of people with experience in the subject, who are recognised by others as qualified experts in the subject, and who can provide information, evidence, judgements and assessments' (Escobar-Pérez and Cuervo-Martínez, 2008, p. 29). The validation process was carried out with the participation of 8 national experts in academic integrity studies from June to September 2020.

The questionnaire consisted of 6 blocks of questions on different measures or strategies put in place by universities to deal with dishonest behaviour by postgraduate students:

a) Plagiarism detection devices in master's theses (MTs) and PhD theses

This block of the questionnaire consisted of two sections.

The first section asked: *Does your university have plagiarism detection SOFTWARE?* (Yes/No/I do not know). If they answered yes to the first question, they had to answer three more questions: *What plagiarism software do you use?* (open-ended answer): *Is it compulsory at your university to use an anti-plagiarism programme before evaluating MTs and PhD theses?* (Yes/No/I do not know); *Does your university have an established percentage of similarity allowed in MTs and PhD theses?* (Yes/No/I do not know). If they answered yes to the previous question, they were asked: *What percentage of similarity do you have established?* (open-ended answer).

The second section asked respondents about recording systems: *Does your university have a system for recording the data generated by the plagiarism detection programme?* (Yes/No/I do not know). In the case of an affirmative answer, they were asked: *Do you have data on how many MTs and PhD theses have failed the plagiarism detection process in the last 3 academic years?* If they answered yes, they were asked: *How many MTs? How many PhD theses?* (open-ended answers).

b) Identity control devices or systems in online assessable activities

This block of the questionnaire contained one question: *Does your university have any identity control system for online assessable activities; for example, monitoring or facial recognition systems such as SMOWL and RPNow?* (Yes/No/I do not know).

c) Regulatory arrangements (academic regulations and codes of conduct)

This block contained one main question: *Does your university have a specific academic regulation or code of conduct for postgraduate studies?* (Yes/No/I do not know). If they answered yes, they had to answer a second question: *Does your university address fraud or dishonesty in post-graduate studies?* (Yes/No/I do not know). If they answered no to the main question, they had to answer: *Is fraud or dishonesty in graduate studies addressed in any regulations, codes, or rules of a general nature at your university?* (Yes/No/I do not know).

d) Training devices

This block contained two sections of three questions each. The first section asked*: Does your university have a specific training programme on academic and research integrity for PhD students?* (Yes/No/I do not know). If they answered yes, they had to answer two more questions: *Is this training compulsory or voluntary for PhD students?* (Compulsory/Voluntary/Do not know); and *How many hours does the training consist of?* (open-ended answer). For the second section of the block, the previous questions were repeated with reference to master's studies.

e) Mechanisms to raise awareness of academic and research integrity

This block had one main question: *Does your university have any awareness-raising mechanism on academic and research integrity aimed at postgraduate students (e.g. brochures, videos, network campaigns, posters, etc.)?* (Yes/No/Unknown). If no, the following question had to be answered: *Does your university have any awareness-raising mechanism on academic and research integrity aimed at the general student body (e.g. brochures, videos, social media campaigns, posters, etc.)?* (Yes/No/Unknown).

f) Evaluation of the need to implement measures at the university

This block consisted of 4 statements on the need to implement anti-fraud measures in Spanish universities, to which respondents had to respond according to their degree of agreement/disagreement (Likert scale).

2.3. Data analysis

First, we performed a descriptive analysis based on the frequency tables of all questions in the questionnaire. Second, we compared the results between public and private universities for all variables. For this comparison, we used contingency tables to calculate the chi-square (χ^2) as a measure of variable association, and we employed the corrected standardised residuals to determine the association between variable categories.

3. Results

3.1. Plagiarism detection devices in MTs and PhD theses (Table 2)

Of the 102 graduate school leaders surveyed, 96.1% (98) indicated that their universities had some form of plagiarism detection software or programme, while 3.9% (4) did not know or did not answer. We did not find any statistically significant differences between public and private university heads for this question ($\chi^2 = 0.013$; $df = 1$; $p = 0.911$).

The 98 managers who reported that their universities had some kind of plagiarism detection software were asked which particular programme their universities used (open-ended question). A total of 10.8% (11) said

Table 2. Plagiarism detection devices for MTs and PhD Theses.

Does your university have plagiarism detection software?	Public	Private	n Total	% Total
Yes, it has plagiarism detection software	95.9%$_a$	96.4%$_a$	98	96.1%
No plagiarism detection software	0.0%[1]	0.0%[1]	0	0.0%
I do not know	4.1%$_a$	3.6%$_a$	4	3.9%
Total	74	28	102	100.0%
Is it required at your university to use anti-plagiarism software before evaluating MTs and PhD theses?	**Public**	**Private**	**n Total**	**% Total**
Yes, it is mandatory	58.1%$_a$	71.4%$_a$	63	61.8%
It is not mandatory	33.8%$_a$	14.3%$_a$	29	28.4%
I do not know	8.1%$_a$	14.3%$_a$	10	9.8%
Total	74	28	102	100.0%
** **Does your university have an established percentage of similarity allowed for MTs and PhD theses?**	**Public**	**Private**	**n Total**	**% Total**
Yes, it has a fixed percentage	*23.0%*$_a$	53.6%$_b$	32	31.4%
No fixed percentage	52.7%$_a$	*25.0%*$_b$	46	45.1%
I do not know	24.3%$_a$	21.4%$_a$	24	23.5%
Total	74	28	102	100,0%
(If yes) What percentage?	**Public**	**Private**	**n Total**	**% Total**
I do not know	11.8%$_a$	6.7%$_a$	3	9.4%
10%	5.9%$_a$	13.3%$_a$	3	9.4%
15%	0.0%[1]	13.3%$_a$	2	6.3%
16%	0.0%[1]	6.7%$_a$	1	3.1%
20%	23.5%$_a$	13.3%$_a$	6	18.8%
23%	0.0%[1]	6.7%$_a$	1	3.1%
24%	11.8%$_a$	0.0%[1]	2	6.3%
25%	41.2%$_a$	13.3%$_a$	9	28.1%
30%	5.9%$_a$	26.7%$_a$	5	15.6%
Total	17	15	32	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at $p < 0.05$. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).

** Items where statistically significant differences are found.

[1] This category is not used in comparisons because its column ratio is zero or one.

they did not know or did not remember the specific name of the software. A total of 63.7% (65) revealed that their universities used Turnitin (10.8%, 11), Urkund (3.9%, 4), SafeAssign (1%, 1), Ephorus (1%, 1), and Snowl CM. The rest (8.8%, 9) reported that their universities used Turnitin in combination with other kinds of software such as Urkund, Ephorus, and Unicheck.

Of the 98 managers who said their universities have anti-plagiarism programmes, 61.8% (63) mentioned that it is compulsory to use them before evaluating MTs and PhD theses at their universities, while 28.4% (29) said it is not compulsory at their university, and 9.8% (19) did not know or did not answer. We did not observe any statistically significant differences between the heads of public and private universities on this question ($\chi^2 = 4.091$; $df = 2$; $p = 0.129$).

Of the 102 graduate school heads surveyed, 31.4% (32) said their universities have some percentage of plagiarism similarity allowed in MTs and PhD theses, while 45.1% (46) noted that their universities do not have a set percentage, and 23.5% (24) did not know or did not answer. We found statistically significant differences for this question ($\chi^2 = 9.592$; $df = 2$; $p = 0.008$). Thus, the heads of private universities indicated, in greater proportion, that at their universities, there is an established proportion allowed (53.6% compared to 23%).

Of the 32 postgraduate leaders who revealed that their universities had established percentages of similarity, 9.4% (3) said they did not know (DK), while the remaining 29.6% (29) ranged between 10% and 30%: 9. 4% (3) reported 10% similarity, 6.3% (2) reported 15% similarity, 3.1% (1) reported 16% similarity, 18.8% (6) reported 20% similarity, 3.1% (1) reported 23% similarity, 6.3% (2) reported 24% similarity, 28.1% (9) reported 25% similarity, and 15.6% (5) said their established percentage was 30%.

3.2. Records of data generated by plagiarism detection programmes (Table 3)

Of the 102 graduate school heads surveyed, 33.3% (34) said their university had some system for recording the data generated by the anti-plagiarism programme, 14.7% (15) said their university did not have such a register, and 52% (53) admitted they were unaware of it. We noted statistically significant differences on this question ($\chi^2 = 7.437$; $df = 2$; $p = 0.024$). Thus, private university heads indicated in greater proportion than public university heads (53.6% vs. 25.7%) that their universities have a registration system in place.

Only 5.9% (6) mentioned they had data on MTs and PhD theses that had not passed the plagiarism detection process, while 47.1% (48) stated they did not have this information, and another 47.1% (48) said they were unaware of it. There were no statistically significant differences between public and private universities ($\chi^2 = 5.760$; $df = 2$; $p = 0.056$).

Of the 6 managers who reported having data on MTs and PhD theses that failed the plagiarism detection process, 66.7% (4) indicated that no MTs had failed the test in the past 3 years; 16.7% (1) reported that in the last three years, only 2 MTs had failed the test; and 16.7% (1) revealed that in the past 3 years, 5 MTs had failed the test.

Of the 6 university heads who mentioned having information on PhD theses that had failed the plagiarism test, 83.3% (5) stated that 0 theses had failed the test, while 16.1% (1) stated that 5 PhD theses had failed the plagiarism test.

3.3. Identity control devices or systems in online assessable activities (Table 4)

Of the 102 graduate school heads surveyed, 27.5% (28) indicated that their universities have some form of identity control system for online assessable activities, while 47.1% (48) said their universities do not, and 25.5% (26) were unaware of it.

We found statistically significant differences between public and private university heads ($\chi^2 = 43.902$; $df = 2$; $p < .001$). Thus, a higher proportion of the heads of private universities than those of public universities (75% compared to 9.5%) said they have identity control systems. However, the proportion of heads of public universities who said they were unaware of it was significantly greater than that of private universities.

3.4. Regulatory arrangements (Table 5)

A total of 60.8% (62) said their universities do have specific regulations or codes of conduct for postgraduate students, 23.5% (24)

Table 3. Records of data generated by plagiarism detection programmes.

** Does your university have a system for recording the data generated by the plagiarism detection software?	Public	Private	n Total	% Total
Yes	*25.7%*$_a$	53.6%$_b$	34	33.3%
No	17.6%$_a$	7.1%$_a$	15	14.7%
I do not know	56.8%$_a$	39.3%$_a$	53	52.0%
Total	74	28	102	100.0%
Do you have data on how many MTs and PhD theses have failed the plagiarism detection process in the last 3 academic years?	**Public**	**Private**	**n Total**	**% Total**
Yes, I have data	2.7%$_a$	14.3%$_a$	6	5.9%
I have no data	51.4%$_a$	35.7%$_a$	48	47.1%
I do not know	45.9%$_a$	50.0%$_a$	48	4.1%
Total	74	28	102	100.0%
How many MTs have failed the plagiarism test in the last 3 years?	**Public**	**Private**	**n Total**	**% Total**
0 MTs or don't know	50.0%$_a$	75.0%$_a$	4	66.7%
2 MTs	50.0%$_a$	0.0%[1]	1	16.7%
5 MTs	0.0%[1]	25.0%$_a$	1	16.7%
Total	2	4	6	100.0%
How many PhD theses have failed the plagiarism test in the last 3 years?	**Public**	**Private**	**n Total**	**% Total**
0 PhD theses or don't know	100.0%[1]	75.0%$_a$	5	83.3%
5 PhD theses	0.0%[1]	25.0%$_a$	1	16.7%
Total	2	4	6	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at $p < 0.05$. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).

** Items where statistically significant differences are found.

[1] This category is not used in comparisons because its column ratio is zero or one.

Table 4. Identity control devices or systems in assessable activities.

** Does your university have any identity control system for online assessable activities; for example, monitoring or facial recognition systems such as SMOWL and RPNow?	Public	Private	n Total	% Total
Yes	*9.5%*$_a$	75.0%$_b$	28	27.5%
No	59.5%$_a$	*14.3%*$_b$	48	47.1%
I do not know	31.1%$_a$	*10.7%*$_b$	26	25.5%
Total	74	28	102	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at p < 0.05. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).
** Items where statistically significant differences are found.

mentioned that their universities do not, and 15.7% (16) indicated that they did not know.

For this question, we found no statistically significant differences between public and private universities ($\chi^2 = 5311$; $df = 2$; $p = 0.070$).

Of the 62 managers who stated that their universities do have specific regulations or codes of conduct for their graduate students, 87.1% (54) indicated that these regulations or codes do address fraud or dishonesty in graduate studies, 8.1% (5) said they do not, and 4.8% (3) did not know whether they address these issues.

For this question, we found no statistically significant differences between public and private universities ($\chi^2 = 5.052$; $df = 2$; $p = 0.080$).

Of the 24 graduate school heads who indicated that their universities do not have specific regulations or codes of conduct for graduate students, 37.5% (9) said these issues are addressed in general regulations or codes at their universities, 37% (9) mentioned that this issue is not addressed in other general regulations or codes at their universities, and 25% (6) stated that they do not know if this issue is addressed in general codes or regulations.

We found no statistically significant differences between public and private universities ($\chi^2 = 5.714$; $df = 2$; $p = 0.057$).

3.5. Training arrangements (Table 6 and Table 7)

Of the 102 respondents, 42.2% (43) stated that their universities have a specific training programme on academic and research integrity for their PhD students, 34.3% (35) said their universities do not have such programmes, and 23.5% (24) indicated that they do not know. There was no difference between public and private universities ($\chi^2 = 1.663$; $df = 2$; $p = 0.435$).

Of the 43 postgraduate heads who stated their universities have training programmes for PhD students, 46.5% (20) mentioned that these programmes are compulsory, while 48.8% (21) said that in their universities, these training programmes are optional, and 4.7% did not know. We did not detect any statistically significant differences between public and private universities ($\chi^2 = 4.279$; $df = 2$; $p = 0.118$).

In turn, of these 43 postgraduate heads who indicated that their universities have training programmes aimed at PhD students, 53.5% (23) said did not know how many hours this training consists of.

Of the 102 graduate school leaders surveyed, only 7.8% (8) said their universities have specific training programmes on academic and research integrity for master's students, while 52.9% (54) reported that their universities do not have such programmes, and 39.2% (40) were unaware of them.

We noted statistically significant differences ($\chi^2 = 6.722$; $df = 2$; $p =$ 0. 035). Thus, the heads of public universities indicated in greater proportion than those of private universities (60.8% compared to 32.1%) that their university does not have a specific training programme, or that they do not know if their university has a training programme of this type (57.1% compared to 32.4%)

Of the 8 managers who mentioned that their universities have specific training programmes on academic and research integrity for master's students, 75% (6) responded that this training is compulsory, while 25% (2) said they did not know or did not respond. We did not find any statistically significant differences between public and private universities ($\chi^2 = 1.600$; $df = 1$, $p = 0.206$).

Similarly, of these 8 managers who indicated that their universities have specific training programmes on academic and research integrity for master's students, 87.5% (7) did not know the duration (in hours) of these programmes or did not answer the question. A total of 12.5% (1) indicated that this training lasted for 6 h.

3.6. Mechanisms to raise awareness of academic and research integrity (Table 8)

Of the 102 graduate school leaders surveyed, 21.6% (22) said their universities have some mechanism for raising awareness about academic and research integrity among graduate students (e.g., brochures, videos,

Table 5. Regulatory arrangements (academic regulations and codes of conduct).

Does your university have specific academic regulations or codes of conduct for postgraduate studies?	Public	Private	n Total	% Total
Yes	54.1%$_a$	78.6%$_a$	62	60.8%
No	28.4%$_a$	10.7%$_a$	24	23.5%
I do not know	17.6%$_a$	10.7%$_a$	16	15.7%
Total	74	28	102	100.0%
IF YES, does it address fraud or dishonesty in graduate studies?	**Public**	**Private**	**n Total**	**% Total**
Yes	80.0%$_a$	100.0%$_a$	54	87.1%
No	12.5%$_a$	0.0%[1]	5	8.1%
I do not know	7.5%$_a$	0.0%[1]	3	4.8%
Total	40	22	62	100.0%
IF NO, is fraud or dishonesty in graduate studies addressed in any general regulations, codes, or rules at your university?	**Public**	**Private**	**n Total**	**% Total**
Yes	42.9%$_a$	0.0%[1]	9	37.5%
No	28.6%$_a$	100.0%$_a$	9	37.5%
I do not know	28.6%$_a$	0.0%[1]	6	25.0%
Total	21	3	24	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at p < 0.05. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).
[1] This category is not used in comparisons because its column ratio is zero or one.

Table 6. Training programmes on academic and research integrity for PhD students.

Does your university have a specific training programme on academic and research integrity for PhD students?	Public	Private	n Total	% Total
Yes	43.2%$_a$	39.3%$_a$	43	42.2%
No	36.5%$_a$	28.6%$_a$	35	34.3%
I do not know	20.3%$_a$	32.1%$_a$	24	23.5%
Total	74	28	102	100.0%
IF YES, is this training compulsory or voluntary for PhD students?	**Public**	**Private**	**n Total**	**% Total**
Compulsory	37.5%$_a$	72.7%$_a$	20	46.5%
Voluntary	56.3%$_a$	27.3%$_a$	21	48.8%
I do not know	6.3%$_a$	0.0%[1]	2	4.7%
Total	32	11	43	100.0%
How many hours does this training consist of?	**Public**	**Private**	**n Total**	**% Total**
I do not know	62.5%$_a$	27.3%$_a$	23	53.5%
1	3.1%$_a$	0.0%[1]	1	2.3%
2	3.1%$_a$	9.1%$_a$	2	4.7%
4	0.0%[1]	9.1%$_a$	1	2.3%
5	3.1%$_a$	0.0%[1]	1	2.3%
6	3.1%$_a$	0.0%[1]	1	2.3%
8	3.1%$_a$	0.0%[1]	1	2.3%
10	9.4%$_a$	18.2%$_a$	5	11.6%
12	3.1%$_a$	9.1%$_a$	2	4.7%
15	0.0%[1]	9.1%$_a$	1	2.3%
20	3.1%$_a$	18.2%$_a$	3	7.0%
30	6.3%$_a$	0.0%[1]	2	4.7%
Total	32	11	43	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at $p < 0.05$. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).
[1] This category is not used in comparisons because its column ratio is zero or one.

social media campaigns, posters, etc.), while 51% (52) said their universities do not have such mechanisms, and 27.5% (28) did not know or did not answer. We did not observe any statistically significant differences between public and private university managers for this question ($\chi^2 = 2.222$; $df = 2$; $p = 0.329$).

Of the 52 heads who responded that their universities do not have awareness-raising mechanisms on academic and research integrity aimed at postgraduate students, 82.7% (43) indicated that their universities do not have such awareness-raising mechanisms aimed at students in general, 3.8% (2) reported that their universities do have such mechanisms aimed at students in general, and 13.5% (7) did not know or did not respond. We did not witness any statistically significant differences between those responsible for public and private universities ($\chi^2 = 0.848$; $df = 2$; $p = 0.654$).

3.7. Assessment of the need to implement measures at the university (Table 9)

Only 30.1% (25) of the survey participants believed that Spanish universities take the necessary steps to guarantee academic integrity in postgraduate studies, while 19.3% (16) disagreed with this statement, and 50.6% (42) neither agreed nor disagreed. There were no differences on this issue between public and private university heads ($\chi^2 = 3.579$; $df = 2$; $p = 0.167$).

Table 7. Training devices on academic and research integrity aimed at master's students.

** Does your university have a specific training programme on academic and research integrity for master's students?	Public	Private	n Total	% Total
Yes	6.8%$_a$	10.7%$_a$	8	7.8%
No	60.8%$_a$	32.1%$_b$	54	52.9%
I do not know	*32.4%*$_a$	57.1%$_b$	40	39.2%
Total	74	28	102	100.0%
IF YES, is this training compulsory or voluntary for master's students?	**Public**	**Private**	**n Total**	**% Total**
Compulsory	60.0%$_a$	100.0%[1]	6	75.0%
Voluntary	0.0%[1]	0.0%[1]	0	0.0%
I do not know	40.0%$_a$	0.0%[1]	2	25.0%
Total	5	3	8	100,0%
How many hours does this training consist of?	**Public**	**Private**	**n Total**	**% Total**
I do not know	100.0%[1]	66.7%$_a$	7	87.5%
6	0.0%[1]	33.3%$_a$	1	12.5%
Total	5	3	8	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at $p < 0.05$. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).
** Items where statistically significant differences are found.
[1] This category is not used in comparisons because its column ratio is zero or one.

Table 8. Mechanisms for raising awareness about academic and research integrity.

Does your university have any awareness-raising mechanisms on academic and research integrity aimed at postgraduate students (e.g. brochures, videos, network campaigns, posters, etc.)?	Public	Private	n Total	% Total
Yes	18.9%$_a$	28.6%$_a$	22	21.6%
No	55.4%$_a$	39.3%$_a$	52	51.0%
I do not know	25.7%$_a$	32.1%$_a$	28	27.5%
Total	74	28	102	100.0%
Does your university have any awareness-raising mechanisms on academic and research integrity aimed at the general student body (e.g. brochures, videos, social media campaigns, posters, etc.)?	**Public**	**Private**	**n Total**	**% Total**
Yes	4.9%$_a$	0.0%[1]	2	3.8%
No	80.5%$_a$	90.9%$_a$	43	82.7%
I do not know	14.6%$_a$	9.1%$_a$	7	13.5%
Total	41	11	52	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at $p < 0.05$. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).
[1] This category is not used in comparisons because its column ratio is zero or one.

Table 9. The need to implement measures to ensure academic integrity in postgraduate studies.

Spanish universities take the necessary steps to guarantee academic integrity in postgraduate studies.	Public	Private	n Total	% Total
Strongly/Somewhat disagree	22.4%$_a$	12.0%$_a$	16	19.3%
Neither agree or disagree	53.4%$_a$	44.0%$_a$	42	50.6%
Fairly/Strongly agree	24.1%$_a$	44.0%$_a$	25	30.1%
Total	58	25	83	100.0%
Spanish universities should implement more measures to ensure academic integrity in postgraduate studies.	**Public**	**Private**	**n Total**	**% Total**
Strongly/Somewhat disagree	1.8%$_a$	4.3%$_a$	2	2.5%
Neither agree or disagree	8.8%$_a$	8.7%$_a$	7	8.8%
Fairly/Strongly agree	89.5%$_a$	87.0%$_a$	71	88.8%
Total	57	23	80	100.0%
** **My university implements the necessary actions to guarantee academic integrity in postgraduate studies.**	**Public**	**Private**	**n Total**	**% Total**
Strongly/Somewhat disagree	17.9%$_a$	4.2%$_a$	13	14.3%
Neither agree or disagree	34.3%$_a$	*4.2%*$_b$	24	26.4%
Fairly/Strongly agree	*47.8%*$_a$	91.7%$_b$	54	59.3%
Total	67	24	91	100.0%
** **My university should implement more measures to ensure academic integrity in postgraduate studies.**	**Public**	**Private**	**n Total**	**% Total**
Strongly/Somewhat disagree	*6.3%*$_a$	24.0%$_b$	10	11.2%
Neither agree or disagree	6.3%$_a$	20.0%$_a$	9	10.1%
Fairly/Strongly agree	87.5%$_a$	*56.0%*$_b$	70	78.7%
Total	64	25	89	100.0%

Note: Values in the same row that do not share the same subscript (a, b) are significantly different at $p < 0.05$. Underlined percentages denote cells with residuals greater than 1.96 (positive association), and italicised percentages denote cells with residuals of less than -1.96 (negative association).
** Items where statistically significant differences are found.

In contrast, 88.8% (71) asserted that universities should implement more measures to ensure academic integrity in postgraduate studies, while only 2.5% (2) disagreed with this statement, and 8.8% (7) neither agreed nor disagreed. There were no differences on this issue between public and private university leaders ($\chi^2 = 0.453$; $df = 2$; $p = 0.797$).

Regarding their home universities, 59.3% (54) stated that their universities implement the necessary actions to guarantee academic integrity in postgraduate studies, while 14.3% (13) disagreed with this statement, and 26.4% (24) neither agreed nor disagreed. We found significant differences for this question ($\chi^2 = 14.172$; $df = 2$; $p = 0.001$): Private university leaders were more likely than public university leaders (91.7% vs. 47.8%) to say that their universities took steps to ensure academic integrity in postgraduate studies.

A total of 78.7% (70) felt their universities should take more actions to ensure academic integrity in postgraduate studies, 11.2% (10) disagreed with this statement, and 10.1% neither agreed nor disagreed. We noted statistically significant differences for this question ($\chi^2 = 10.670$; $df = 2$; $p = 0.005$). Thus, public university heads were more likely than private university heads (87.5% vs. 56%) to say that their universities should execute more measures to improve the quality of education.

4. Discussion and conclusions

Practically all Spanish universities have plagiarism detection tools. At least 96.1% stated that their universities use some kind of programme, and no university official indicated that their university does not have one. However, the availability of these programmes does not seem to be sufficient to combat fraudulent practices in postgraduate studies. In this regard, only 61.8% reported that the use of such programmes is compulsory at their universities for the evaluation of MTs and PhD dissertations. Similarly, only 31.4% of those responsible stated that their universities have an accepted plagiarism similarity percentage, and among those that do have such a percentage, there is a very high variability: between 10% and 30%. To promote integrity in the Spanish university system, it would be interesting to be able to agree on the proportion of plagiarism that exists.

The questions on the data records of plagiarism programmes also provide interesting results. For example, only 33.3% of those responsible indicated that their universities have records of data generated by plagiarism detection programmes. These figures can be considered positive given the starting situation from a few years ago, but they also offer room for improvement, where interventions aimed at improving the mechanisms for combating fraud in Spanish postgraduate studies can be focused on.

According to the results obtained, the majority of Spanish universities (60.8%) have specific academic regulations or codes of conduct for their postgraduate students that address the issue of fraud or dishonesty. However, the percentage (37%) of universities that do not have specific academic regulations or codes of conduct for postgraduate students, and that do not address these matters in other general regulations or codes, seems to be high.

In terms of training strategies, specific training programmes on academic and research integrity for PhD students are more frequent than for master's students. While 42.2% of university leaders reported on the existence of such programmes for PhD students, only 7.8% mentioned having this type of training available for master's students.

The strategies least employed by Spanish universities to deal with dishonest behaviour by postgraduate students seem to be the use of awareness-raising mechanisms (21.6% of participants reported that their universities had some kind of awareness-raising mechanism) and the use of some kind of identity control system for online assessment activities (only 27.5% said their universities had such a system). This last shortcoming may be particularly relevant if we take into account that it is becoming a growing fraudulent practice; a clear example is seen in massive open online courses (MOOCs) (Bao et al., 2017; Jaramillo et al., 2020).

The analyses carried out on the strategies used to deal with fraud in assessment revealed some significant differences in the outcomes between public and private universities. Private university heads were more likely than public university heads to report that a certain percentage of plagiarism is allowed at their universities (53.6% compared to 23%); that their universities have a system for recording the data generated by plagiarism detection programmes (53.6% compared to 25.7%); and that they have a greater number of identity control systems (75% compared to 9.5%). On the other hand, public university heads were more likely than private university heads (60.8% vs. 32.1%) to report that their university does not have a training programme. We also noted significant differences between the heads of public and private universities in their assessment of the need to implement measures at the university. Although the majority of university heads think that Spanish universities, in general, should take more steps to guarantee academic integrity in postgraduate studies, when we scrutinised the universities of origin, we found significant differences. In private universities, there is a greater perception of having taken sufficient actions to guarantee integrity in postgraduate studies compared to public universities; at the same time, private universities are more reluctant to execute more measures in this respect. Two possible interpretations of these results are as follows: (1) either private universities have more effective mechanisms than public universities; or 2) public universities are more self-critical than private universities in this regard.

Bearing in mind that the participants in the study are academic heads of postgraduate studies at their universities, the high percentages of responses indicating a lack of knowledge of the questions posed, or a lack of answers to them, are significant. We refer to questions such as having an accepted percentage of plagiarism (23.5%); having records of the data generated by plagiarism detection programmes (52%); having data on MTs and PhD theses that have not passed the plagiarism detection process (47.1%); and having identity control devices or systems in online assessable activities (25. 5%); the existence of any specific training programme on academic and research integrity aimed at PhD students (23.5%); and even the existence of any awareness-raising mechanism on academic and research integrity aimed at postgraduate students (27.5%). In this sense, it is worth considering that these response percentages could be lower, and those referring to more specific options could be higher if the study had been addressed to postgraduate teaching staff not directly responsible for the management of studies and to the student body.

Hence, our findings highlight the need for Spanish universities to address the development of clear policies on academic integrity; this, in turn, must be approached from the different strategic axes analysed here and from an intersectional perspective.

First, the mechanisms examined in this paper (technological and control, regulatory, and training and awareness-raising mechanisms) cannot be addressed in isolation, but must rather be explored as part of a whole, thus taking a systemic view of how to deal with the matter of integrity. This holistic approach to designing strategies for academic integrity in postgraduate studies implies not only focusing on the student body, but also involving the teaching staff. This is a group of faculty who, despite valuing academic integrity, have significant gaps in their knowledge of integrity policies, especially their role (Löfström et al., 2015). Teachers' strictness toward dishonest behaviour can significantly and substantially improve students' attitudes toward academic dishonesty (Chirikov et al., 2020). Indeed, teachers also see their teaching role as extending beyond promoting the learning of content to raising their students' awareness of the importance of academic honesty (Gottardello and Karabag, 2020).

Second, it is critical to stress the importance of not approaching these strategies from a strictly technological angle, and to be clear about what they are intended to achieve. It is about developing a philosophy of academic integrity that centres more on educating and raising awareness than on sanctioning (Boehm et al., 2009), creating a culture of integrity and accountability, about making universities 'ethical communities' (Mccabe et al., 2006), and changing the climate of acceptance of dishonesty (Williams and Hosek, 2008).

Third, we cannot ignore the 'how' either. The creation-adoption of strong, well-adjusted postgraduate integrity policies must be done from a participatory perspective. The university community (teaching staff, researchers, students, and administrative staff) must be actively involved in the design of such policies, precisely because their respect and acceptance of them depend on it. Thus, as the University Ombudsmen of Spanish Universities have already pointed out (Gómez-Ramos et al., 2004, p.52):

> In the event that it is decided to adopt an ethical commitment, all sectors of the university should be involved in the process of drawing it up, and it should result in a concrete, clear and concise document, which, even if it cannot be imposed, can serve as a guide for the members of the university community.

For the optimal implementation of this participatory approach, it may be useful to adopt the methodology proposed in the framework of the IIEP-UNESCO Ethics and Corruption in Education programme, and to follow the Guidelines for the Design and Effective Use of Teacher Codes of Conduct (Poisson, 2009).

In turn, both in the design and implementation of postgraduate integrity policies, evaluation systems must also be guaranteed that allow for constant feedback, and therefore involve the transformation and adaptation of these policies to the constant changes and challenges emerging in our universities.

4.1. Limitations and future research

One of the main limitations of our study was the difficulty of obtaining information from the heads of postgraduate studies at private and online universities (which often coincide). In this sense, the sample obtained faced some constraints in terms of making comparisons between groups according to university ownership. In this sense, future research should strive to obtain samples that allow for comparisons of

results according to university characteristics, such as ownership (public/private) or type of teaching (traditional/online).

In the same way, and from a similar perspective to that already pointed out by Bretag et al. (2011), the design and systematisation of common protocols by the universities would, in fact, not only make it possible to jointly tackle the phenomenon of assessment fraud but would also allow it to be analysed and investigated in greater depth and with greater rigour. In turn, this would certainly prevent such low response rates to the questionnaires administered, because the "voluntarism" of the participants would no longer be called upon since the management of this information would form part of their basic functions.

Another limitation associated with this study is that it provides only a static picture of academic integrity policies and strategies against fraud in graduate studies. It would be useful to replicate the research by collecting information periodically to validate the results and/or to carry out a longitudinal study that would allow the follow-up of the possible development of measures by the universities. This longitudinal methodology would also allow to know if the health crisis situation because of Coronavirus disease (COVID-19) experienced while the questionnaire was been conducted could affect the results obtained.

Finally, based on the difficulties detected in obtaining information from Spanish universities and following the contributions of Eaton (2020), a future proposal that we consider key is to "build research capacity through the development of collaborative research teams, by including individuals from different regions to give them exposure to working on an academic integrity research project as part of a team". In the Spanish context, this strategic line in the design of research should be considered as essential.

Declarations

Author contribution statement

Antoni Cerdà: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data.

Carmen Touza: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Mercè Morey: Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Elvira Curiel: Conceived and designed the experiments; Performed the experiments.

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Data included in article/supplementary material/referenced in article.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

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References

Akbari, A., 2020. Spinning-translation and the act of plagiarising: how to avoid and resist. J. Furth. High. Educ. 45 (1), 49–64.

American-Association-of-School-Librarians, 2009. Standards for the 21st-century Learner in Action. American Library Association.

Awasthi, S., 2019. Plagiarism and academic misconduct A systematic review. DESIDOC J. Libr. Inform. Technol. 39 (2), 94–100.

Bao, Y., Chen, G., Hauff, C., 2017, junio 25–28. On the prevalence of multiple-account cheating in massive open online learning: a replication study. In: 10th International Conference on Educational Data Mining, Wuhan, China [Presentation]. https://files.eric.ed.gov/fulltext/ED596613.pdf.

Baran, L., Jonason, P.K., 2020. Academic dishonesty among university students: the roles of the psychopathy, motivation, and self-efficacy. PLoS One 15 (8), e0238141.

Boehm, P.J., Justice, M., Weeks, S., 2009. Promoting academic integrity in higher education. Commun. Coll. Enterprise 15 (1), 45–61.

Bretag, T., Mahmud, S., Wallace, M., Walker, R., James, C., Green, M., East, J., McGowan, U., Patridge, L., 2011. Core elements of exemplary academic integrity policy in Australian higher education. Int. J. Educ. Integr. 7 (2).

Cebrián-Robles, V., Raposo-Rivas, M., Sarmiento-Campos, J.A., 2016. ¿Ética o prácticas deshonestas? El plagio en las titulaciones de Educación. Rev. Educ. 374, 161–186.

Cebrián-Robles, V., Raposo-Rivas, M., Cebrián-de-la-Serna, M., Sarmiento-Campos, J.A., 2018. Percepción sobre el plagio académico de estudiantes universitarios españoles. Educacion 21 (2), 105–129. XX1.

Chirikov, I., Shmeleva, E., Loyalka, P., 2020. The role of faculty in reducing academic dishonesty among engineering students. Stud. High Educ. 45 (12), 2464–2480.

Comas, R., 2009. El ciberplagio y otras formas de deshonestidad académica entre el alumnado universitario. Universidad de las Islas Baleares (Ph.D.).

Comas, R., Sureda, J., Casero, A., Morey, M., 2011. La integridad académica entre el alumnado universitario español. Estud. Pedagog. 37 (1), 207–225.

Comas-Forgas, R., Sureda-Negre, J., Salva-Mut, F., 2010. Academic plagiarism prevalence among Spanish undergraduate students: an exploratory analysis. Biochem. Med. 20 (3), 301–306.

Curtis, G.J., McNeill, M., Slade, C., Tremayne, K., Harper, R., Rundle, K., Greenaway, R., 2021. Moving beyond self-reports to estimate the prevalence of commercial contract cheating: an Australian study. Stud. High Educ. 46 (8), 1–13.

Dix, E.L., Emery, L.F., Le, B., 2014. Committed to the honor code: an investment model analysis of academic integrity. Soc. Psychol. Educ. 17 (1), 179–196.

Eaton, S.E., Edino, R.I., 2018. Strengthening the research agenda of educational integrity in Canada: a review of the research literature and call to action. Int. J. Educ. Integr. 14 (1).

Eaton, S.E., 2020. Academic Integrity Policy Development and Revision: A Canadian Perspective (Invited Guest Lecture). Online Submission. https://files.eric.ed.gov/fulltext/ED610007.pdf.

Escobar-Pérez, J., Cuervo-Martínez, Á., 2008. Validez de contenido y juicio de expertos: una aproximación a su utilización. Adv. en Med. 6 (1), 27–36.

Escudero-Nahón, A., López-Quiroz, E., 2020. Integridad académica en los estudios de postgrado: una revisión sistemática de la literatura especializada. Educateconciencia 23 (24), 5–29.

Foltynek, T., 2013. Impact of Policies for Plagiarism in Higher Education across Europe. Plagiarism Policies in Spain. Retrieved from. http://plagiarism.cz/ippheae/files/D2-3-09/ES/IPPHEAE/MENDELU/Survey/SpainNarrative/FINAL.pdf.

Foltýnek, T., Králíková, V., 2018. Analysis of the contract cheating market in Czechia. Int. J. Educ. Integr. 14 (1).

Foltýnek, T., Meuschke, N., Gipp, B., 2020. Academic plagiarism detection. ACM Comput. Surv. 52 (6), 1–42.

Gill, J., 2013. Global Corruption Report: Education. https://transparency.bg/wp-content/uploads/2021/07/Global_Corruption_Report_EDUCATION_2013_1_compressed.pdf.

Gómez-Ramos, P., Miñana-Aznar, A., Casas-Ametller, M., 2004. Posibilidad de un código ético de los miembros de la comunidad universitaria. In: Defensores-Universitarios (Ed.), VII Encuentro Estatal de Defensores Universitarios. Defensores Universitarios, p. 76.

Gottardello, D., Karabag, S.F., 2020. Ideal and actual roles of university professors in academic integrity management: a comparative study. Stud. High Educ. 1–19.

Harmon, O.R., Lambrinos, J., 2008. Are online exams an invitation to cheat? J. Econ. Educ. 39 (2), 116–125.

Hollister, K.K., Berenson, M.L., 2009. Proctored versus unproctored online exams: studying the impact of exam environment on student performance. Decis. Sci. J. Innovat. Educ. 7 (1), 271–294.

Ison, D., 2020. Detection of online contract cheating through stylometry: a pilot study. Online Learn. 24 (2).

Jaramillo-Morillo, D., Ruipérez-Valiente, J., Sarasty, M.F., Ramírez-Gonzalez, G., 2020. Identifying and characterizing students suspected of academic dishonesty in SPOCs for credit through learning analytics. Int. J. Educ. Technol. High. Educ. 17 (1), 1–18.

Jones, M., Sheridan, L., 2015. Back translation: an emerging sophisticated cyber strategy to subvert advances in 'digital age' plagiarism detection and prevention. Assess Eval. High Educ. 40 (5), 712–724.

Jordan, A.E., 2001. College student cheating: the role of motivation, perceived norms, attitudes, and knowledge of institutional policy. Ethics Behav. 11 (3), 233–247.
Kaur, M., Gupta, V., Kaur, R., 2021. Review of recent plagiarism detection techniques and their performance comparison. In: Gunjan, V.K., Zurada, J.M. (Eds.), Proceedingds of International Conference on Recent Trends in Machine Learning, IoT, Smart Cities and Applications, 1245. Springer.
Ledwith, A., Rísquez, A., 2008. Using anti-plagiarism software to promote academic honesty in the context of peer reviewed assignments. Stud. High Educ. 33 (4), 371–384.
Löfström, E., Trotman, T., Furnari, M., Shephard, K., 2015. Who teaches academic integrity and how do they teach it? High Educ. 69 (3), 435–448.
Macfarlane, B., Zhang, J., Pun, A., 2012. Academic integrity: a review of the literature. Stud. High Educ. 39 (2), 339–358.
Mahmud, S., Bretag, T., 2013. Fostering integrity in postgraduate research: an evidence-based policy and support framework. Account. Res. 21 (2), 122–137.
McCabe, D.L., Butterfield, K.D., Treviño, L.K., 2006. Academic dishonesty in graduate business programs: prevalence, causes, and proposed action. Acad. Manag. Learn. Educ. 5 (3), 294–305.
Minarcik, J., Bridges, A.J., 2015. Psychology graduate students weigh in: qualitative analysis of academic dishonesty and suggestion prevention strategies. J. Acad. Ethics 13 (2), 197–216.
Morris, E., 2010. Supporting Academic Integrity. Approaches and Resources for Higher Education. Academic Service.
Mphahlele, A., McKenna, S., 2019. The use of turnitin in the higher education sector: decoding the myth. Assess Eval. High Educ. 44 (7), 1079–1089.
Naik, R.R., Landge, M.B., Mahender, C.N., 2015. A review on plagiarism detection tools. Int. J. Comput. Appl. 125 (11), 16–22.
Newton, P.M., 2018. How common is commercial contract cheating in higher education and is it increasing? A systematic review. Front. Educ. 3.
Perkins, M., Gezgin, U.B., Roe, J., 2020. Reducing plagiarism through academic misconduct education. Int. J. Educ. Integr. 16 (3).
Poisson, M., 2009. Guidelines for the Design and Effective Use of Teacher Codes of Conduct. International Institute for Educational Planning. Retrieved from. http://teachercodes.iiep.unesco.org/.
Prentice, F.M., Kinden, C.E., 2018. Paraphrasing tools, language translation tools and plagiarism: an exploratory study. Int. J. Educ. Integr. 14 (1).
Rogerson, A.M., McCarthy, G., 2017. Using Internet based paraphrasing tools: original work, patchwriting or facilitated plagiarism? Int. J. Educ. Integr. 13 (1).
Sefcik, L., Striepe, M., Yorke, J., 2020. Mapping the landscape of academic integrity education programs: what approaches are effective? Assess Eval. High Educ. 45 (1), 30–43.
Selemani, A., Chawinga, W.D., Dube, G., 2018. Why do postgraduate students commit plagiarism? An empirical study. Int. J. Educ. Integr. 14 (7).
Sheard, J., Simon, Butler, M., Falkner, K., Morgan, M., Weerasinghe, A., 2017, july 3–5. Strategies for maintaining academic integrity in first-year computing courses [paper]. In: 22nd Annual Conference on Innovation and Technology in Computer Science Education, Bologna, Italy.
Shephard, K., Trotman, T., Furnari, M., Löfström, E., 2015. Teaching research integrity in higher education: policy and strategy. J. High Educ. Pol. Manag. 37 (6), 615–632.
Stephens, J.M., Watson, P.W.S.J., Alansari, M., Lee, G., Turnbull, S.M., 2021. Can online academic integrity instruction affect university students' perceptions of and engagement in academic dishonesty? Results from a natural experiment in New Zealand. Front. Psychol. 12.
Stoesz, B.M., Yudintseva, A., 2018. Effectiveness of tutorials for promoting educational integrity: a synthesis paper. Int. J. Educ. Integr. 14 (1).
Sureda-Negre, J., Cerdà-Navarro, A., Calvo-Sastre, A., y Comas-Forgas, R., 2019. Las conductas fraudulentas del alumnado universitario español en las evaluaciones: valoración de su gravedad y propuestas de sanciones a partir de un panel de expertos. Rev. Invest. Educ. 8 (1), 201–219.
Sureda-Negre, J., Reynes-Vives, J., Comas-Forgas, R., 2016. Reglamentación contra el fraude académico en las universidades españolas. Rev. Educ. Super. 45 (178), 31–44.
Tauginienė, L., Gaižauskaitė, I., Glendinning, I., Kravjar, J., Ojsteršek, M., Ribeiro, L., Odiņeca, T., Marino, F., Cosentino, M., Sivasubramaniam, S., 2018. Glossary for Academic Integrity. Report. www.academicintegrity.eu/wp/wp-content/uploads/2018/02/GLOSSARY_final.pdf.
Tatum, H., Schwartz, B.M., 2017. Honor codes: evidence based strategies for improving academic integrity. Theory Into Pract. 56 (2), 129–135.
Weiner, J.A., Hurtz, G.M., 2017. A comparative study of online remote proctored versus onsite proctored high-stakes exams. J. Appl. Test. Technol. 18 (1), 13–20.
Williams, M.S., Hosek, W.R., 2008. Strategies for reducing academic dishonesty. J. Leg. Stud. Educ. 21 (1), 87–107.