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Source / Izvornik: **Science and Engineering Ethics, 2018, 25, 1467 - 1483**

Journal article, Published version
Rad u časopisu, Objavljena verzija rada (izdavačev PDF)

https://doi.org/10.1007/s11948-018-0073-x

Permanent link / Trajna poveznica: https://urn.nsk.hr/urn:nbn:hr:227:562320

Science and Engineering Ethics (2019) 25:1467–1483
https://doi.org/10.1007/s11948-018-0073-x

ORIGINAL PAPER

Attitudes and Knowledge About Plagiarism Among University Students: Cross-Sectional Survey at the University of Split, Croatia

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Received: 18 March 2018 / Accepted: 12 October 2018 / Published online: 24 October 2018

Abstract

Plagiarism is one of the most severe academic integrity issues. This study examined students' knowledge of and attitudes towards plagiarism, tested their ability to recognize plagiarism, and explored the association of study levels and attendance in courses dealing with referencing rules and plagiarism with students' attitudes and knowledge. A cross-sectional online survey was conducted at the University of Split, comprising the students of all schools and study levels (n = 388). Overall, results indicate the students were not very familiar with referencing rules and did not perform well on either theoretical questions or practical examples. However, they demonstrated positive attitudes towards plagiarism avoidance as well as towards compliance with academic integrity with respect to the correct use of research publications. Students' self-reported attendance in courses dealing with referencing rules and plagiarism avoidance was not associated with their knowledge of and attitudes toward plagiarism. These findings are important for a general understanding of students' attitudes, and the relation of practical and theoretical knowledge of plagiarism. Furthermore, the academic community addresses plagiarism not only as an ethical and regulatory violation but also as a direct consequence of a lack of knowledge, and of academic illiteracy. Study programs should be adjusted and long-term policies developed at all academic levels to promote a positive climate among students towards responsible academic writing.

Keywords Academic writing · Plagiarism · Attitudes · Perception · Knowledge

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s11948-018-0073-x) contains supplementary material, which is available to authorized users.

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Introduction

Plagiarism is one of the most severe forms of research misconduct, together with falsification and fabrication (Steneck 2006), and its avoidance is an important aspect of academic integrity (Bretag 2016). Plagiarism in academia potentially transferred to society can be a political issue, causing scandals, resignations, political instabilities, and permanently destroying individual careers. Some authors have discussed cases of doctoral thesis plagiarism of ministers and high public officials (Butler 2009; Tudoroiu 2017). Plagiarism is a concept that is not uniformly defined, understood, or regulated across different social groups, countries, cultures, or institutions, as is evidenced by the volume and variety of research on this topic: more than 2500 papers dealing with plagiarism have been published in journals indexed in the Web of Science database in the last decade. They cover a wide range of issues related to plagiarism, such as perception (Ford and Hughes 2012; Gullifer and Tyson 2010; Leonard et al. 2015), attitudes (Pupovac et al. 2010; Shirazi et al. 2010), contributing factors (Amiri and Razmjoo 2016; Bennett 2005), regulations and policies (Hu and Sun 2017; Nushi and Firoozkohi 2017), applications of software in plagiarism detection and prevention (Halgamuge 2017), methodology of teaching plagiarism avoidance (Curtis et al. 2013), and exploring differences between different groups and cultures on issues related to plagiarism (Kayaoğlu et al. 2016; Ryan et al. 2009).

The most researched topics are those related to attitudes and perceptions of plagiarism (Husain et al. 2017), probably because one of the first steps in combating and preventing plagiarism is the development of awareness and understanding (Ling 2010). A recent review article (Husain et al. 2017), which analyzed research published from 1980 to 2016 related to plagiarism perception, attitudes, and contributing factors, showed that, although attitudes towards plagiarism may vary across different countries and cultures, the common finding on the global level is that the concept of plagiarism is not well understood among students and sometimes even faculty members and that they are not familiar with plagiarism policies. Also, they point out that the frequency of plagiarism is probably underreported in research, and that raising the awareness of plagiarism would probably cause an increase in reported cases on the global level.

Investigating plagiarism in the academic setting is especially important because student plagiarism seems to be one of the few integrity problems that can be successfully alleviated, at least in the short-term, as evidenced by the recent Cochrane systematic review of interventions for research integrity (Marušić et al. 2016).

In Croatia, several cases of plagiarism, like the one of the famous Croatian medical doctor and another, a professor who was accused of plagiarism in two research papers, raised awareness at all levels in Croatian society and even made an impact at the international level (Marušić 2008). Studies published about plagiarism in Croatia (Bilić-Zulle et al. 2008; Đogaš et al. 2014; Grgić 2017; Pupovac et al. 2010; Taradi et al. 2010) have focused on students' attitudes towards plagiarism, and not on the level of their knowledge about plagiarism and their

understanding of the causes of plagiarism. There is only a single study that tested both attitudes and understanding of plagiarism, but due to the small sample size (n = 57), as the author states, it can only be considered as a pilot study (Grgić 2017).

Croatia also took part in the South East European Project on Policies for Academic Integrity (SEEPPAI, ETINED 2017), which is the continuation of the previous project Impact of Policies for Plagiarism in Higher Education Across Europe (IPPHEAE, Glendinning 2013) conducted in 27 European countries. According to the Academic Integrity Maturity Model (AIMM) developed in those studies, Croatia was ranked 19th out of 33 countries (ETINED 2017). The major concerns for Croatia were that students and educators considered plagiarism to be a part of the culture that is unlikely to change; Croatians also often see that influential persons do not receive reprimands for committed plagiarism (ETINED 2017).

Based on generally accepted findings from previous research that a lack of knowledge is one of the main factors leading to plagiarism (Husain et al. 2017), it is important to differentiate between what students think they know and what they actually know about the best practices in academic and research writing.

The aim of the present study was to examine students' knowledge of and attitudes towards plagiarism across all schools and departments of the University of Split in Croatia. The study also tested students' ability to recognize plagiarism in concrete examples and whether the level of study and attendance in courses dealing with plagiarism, proper citing, and referencing were associated with their knowledge of and attitudes towards plagiarism.

Participants and Methods

Participants

This paper presents the results of a cross-sectional study conducted at the University of Split in 2017. The University of Split is the best research-oriented public university in the Republic of Croatia and the 8th best university in New Europe according to the Times Higher Education rankings (Bothwell 2018). It consists of 11 schools, 4 departments, and an art academy. It offers more than 180 study programs at the undergraduate, graduate, and postgraduate level in art, biomedicine, engineering, humanities and social sciences, natural sciences, and an interdisciplinary field of science (University of Split. http://eng.unist.hr/AboutUniversity/History/tabid/381/Default.aspx. Accessed 17 July 2018). The study population comprised all students of the University of Split at all levels of study. The required sample size (n = 377) was calculated using an online sample size calculator (https://www.surveysystem.com/sscalc.htm) from the total number of students at the University of Split (N = 19,120) with a 95% confidence interval (CI) and 5% margin of error. Students were asked to complete an anonymous online questionnaire that was designed using Google forms. The link to the questionnaire was distributed to the schools and departments of the University of Split and the Student Council, and was then forwarded to the students. The survey was open from November 13, 2017 to December

21, 2017. Completion of each question was set as mandatory to eliminate incomplete submissions.

Questionnaire

The questionnaire was composed of five parts: (1) general demographic data; (2) enrollment in courses that cover plagiarism, citing, and referencing; (3) theoretical knowledge of plagiarism and proper referencing; (4) recognizing proper referencing in provided examples; and (5) knowledge of and attitudes toward plagiarism.

General questions included gender, age, level and the year of study, and grade point average. No additional personal data were collected that would impact the students' anonymity.

In the second part of the questionnaire, the students were asked if their courses covered plagiarism, norms of proper citing and referencing and if they thought they were familiar with the features of plagiarism. These questions were dichotomous (yes/no).

The third part consisted of questions about theoretical knowledge regarding referencing rules and plagiarism. The students were provided with 12 statements for which they had to decide if the statement was correct or not. The statements were related to paraphrasing, compiling, referencing others' ideas, referencing tables and figures, referencing general knowledge, using and referencing Internet sources, and copying word-for-word. Statements on referencing personal communications, as well as self-plagiarism (text recycling) were also included.

In the fourth section, students were provided with eight examples for which they had to determine if the sources were properly referenced and cited (yes/no) using the Harvard referencing style. In the introduction to this part of the questionnaire, a brief explanation of the Harvard referencing style was provided, as well as one example of usage. The examples which they had to analyze contained text from an original source (e.g., book, Internet, personal communication, etc.), followed by an example of citing and referencing of the source which was either correct or incorrect. Those examples were constructed to cover the same topics included in the theoretical knowledge section of the questionnaire.

The final section of the questionnaire contained 32 questions on personal attitudes toward plagiarism and its ethicality, the climate of plagiarism in society and in the university, student's practice of referencing, and reporting of plagiarism. Students were provided with statements and asked to rate the statements on a five-level Likert scale, from 1 = strongly disagree; to 5 = strongly agree.

The survey was fully anonymous and was approved by the University of Split Centre for Quality Assurance. Deans of the University schools gave approval for sharing the information about the survey with the students. At the beginning of the online survey, the students were informed about the objectives of the study and confirmed their consent to participate by continuing to answer survey questions. The survey was in the Croatian language, and the English translation is available in the supplementary material (Supplementary material: Questionnaire).

Statistical Analysis

Participant characteristics were presented as frequencies and percentages. Age was presented as a median and 95% CI. Differences in knowledge about plagiarism between participant groups were tested with the Chi squared test.

Differences in attitudes towards plagiarism between participants' groups were tested using the independent sample *t* test. The students' perceived knowledge about referencing rules and their actual application on an example was tested using McNemar's test.

Furthermore, two scales measuring attitudes towards plagiarism and the climate for plagiarism were constructed, using exploratory factor analysis with promax rotation, keeping the items that had eigenvalues higher than 1.

All analyses were done using JASP 0.8.3.1 (JASP Team 2017) with the significance level set at $P \leq 0.05$.

Results

Participants' Characteristics

In total, 388 students (74% women; median age 22 years, range 18–54) from the University of Split took part in the survey. Most students attended undergraduate (n = 155, 39.9%) and graduate (n = 143, 36.9%) university studies, while there were fewer participants from undergraduate professional (n = 17, 4.4%), graduate specialist (n = 7, 1.8%), integrated (n = 55, 14.2%) or postgraduate studies (n = 11, 2.8%). Most of the students reported that they were not very familiar with plagiarism (n = 235, 60.6%). However, 50.5% (n = 196) reported that they had lectures which mentioned at least some aspects of plagiarism and the majority of respondents (n = 307, 79.1%) reported that they attended courses which included information about literature referencing.

Students' Knowledge of and Attitudes Towards Plagiarism

Participants' knowledge about proper referencing of sources in text varied greatly, depending on the source and situation (Tables 1, 2). The percentage of correct answers in the theoretical part of the survey ranged from 25 to 88.7%. The students were well acquainted with the rules regarding referencing of tables and figures, quoting and paraphrasing, using and referencing Internet sources, and acknowledging others' ideas. In contrast, they were not familiar with the concept of self-plagiarism, proper ways of summarizing information, or with the requirement of referencing a personal communication and general knowledge (Table 1). The proportion of correct answers to practical questions related to proper citing and referencing was between 22.4 and 82.2%. In those examples, students performed best in scenarios that included referencing general knowledge and paraphrasing. They did not perform well (under 50%) in the scenario that included an example of quoting, usage

Table 1 Frequencies of participants' answers to the question whether it is acceptable to perform certain procedures when using literature sources

Statements[a]	Correct answers (n, %)
1. It is acceptable to use tables, graphs or pictures without citing the sources (*F*)	312 (81.2)
2. It is not necessary to cite what we heard in lectures or presentations because that was not written down (*F*)	143 (36.9)
3. It is acceptable to paraphrase parts of a text, and then put quotation marks around the text directly quoted, with citing of the source (*T*)	344 (88.7)
4. For information which is considered to be general knowledge, it is not necessary to state the source in which the information was found (*T*)	189 (48.7)
5. It is acceptable to copy and paste text from one's own seminar work into your diploma work, but only if the same sources are stated (*F*)	97 (25.0)
6. We can copy and paste from the Internet pages without citation of that page because everything on the Internet is considered general knowledge (*F*)	361 (93.0)
7. If we use someone's idea in our work, it is not necessary to state its source or author (*F*)	327 (84.3)
8. It is not necessary to cite well-known proverbs because they represent general knowledge (*T*)	191 (49.2)
9. When summarizing parts of the text from another text, it is necessary to state the source only in the reference list (*F*)	135 (34.8)
10. When an author is not stated on a web-page, it is not necessary to state the source (*F*)	307 (79.1)
11. All images can be taken from Internet sources without citations (*F*)	327 (84.3)
12. If we state the source, we can paste and copy parts of the text (*F*)	119 (30.7)

[a]T indicates true statements and F false statements

of Internet sources, and self-plagiarism, while in the remaining cases the percentage of correct answers varied between 59 and 69.1% (Table 2). The comparison of students' scores on theoretical knowledge questions to their scores in practical examples with related content showed statistically significant differences in all cases, indicating that students overestimated their theoretical knowledge about referencing rules (Table 3).

Plagiarism Scales

A total of 32 variables on attitudes were entered into exploratory factor analysis (Promax rotation), keeping factors with an eigenvalue higher than one (Kaiser 1960). The analysis revealed two factors with eigenvalues higher than one (one factor was a boundary and was thus omitted). Only items with factor loadings above 0.3 were kept (Spector 1992). This resulted in 23 items which loaded on two correlated factors ($r = -0.306$). The two factors indicated the existence of two scales: (1) personal attitudes towards plagiarism (Cronbach's alpha $\alpha = 0.87$, 14 items, theoretical range 14–70) and (2) plagiarism climate (Cronbach's alpha $\alpha = 0.77$, 9 items, theoretical range 9–45) (Tables 4, 5). The reliability of the entire scale was $\alpha = 0.86$, and the possible range was from 23 to 115 points. Correlation between scales was

Table 2 Students' answers to the question whether the action described in the scenario is adequate

Scenario[a]	Correct answers (n, %)
It is written in a book: "During the establishment of a proprietary company, it is required to undertake a stakeholder analysis and market testing. Only then a venture plan can be carried out and the company established" Ante wrote: Before the establishment of a proprietary company it is required to undertake a stakeholder and market analysis (*I*)	252 (64.9)
A popular blogger wrote: "All people are sometimes worried, and the most those with more free time. I made this conclusion based on the results of a survey I did several weeks ago" Matko wrote in his seminar essay: A popular blogger concludes from his research that "all people are sometimes worried, and the most those with more free time" (*I*)	145 (37.4)
A book states: Bubonic plague was present in Europe from 1348 to 1666 Maja wrote: In Europe, the bubonic plague ruled from 1348 to 1666 (Cartwright and Biddiss 2006) (*C*)	302 (77.8)
Petar wrote in his seminar essay: Recently, there are more and more complaints from young people about unemployment, which increased by 2.38% in the last quarter of 2015 (*I*)	268 (69.1)
A professor said during his lecture that, according to his experience, there is an increase in the prevalence of people with anemia in Croatia Luka wrote in his diploma work: There is an increase in the number of people suffering from anemia in Croatia (*I*)	229 (59.0)
Ivana wrote in her seminar essay for her sociology course: From the study we performed, it can be concluded that most students learn in the evening, and only 10.2% learns in the morning Ivana then wrote in her seminar essay for the course on research methodology: About 10% of the students learn in the morning, and the rest learn mostly in the evening (*I*)	189 (48.7)
Matej wrote in his seminar essay: The boiling point for water is 100 °C (*C*)	319 (82.2)
A book states: "In documents, the Liburnians are first mentioned in the eighth century BC (year 734) in clashes with Greeks who took away the island of Corfu because Liburnias conquered parts of the Adriatic coast and were the leading force on the Adriatic" Marica wrote: In documents, the Liburnians are first mentioned in the eighth century BC (year 734) in clashes with Greeks who took away the island of Corfu because Liburnias conquered parts of the Adriatic coast and were the leading force on the Adriatic (Batović 2005) (*I*)	87 (22.4)

[a]C indicates correct behavior and I incorrect behavior

r = 0.29 (95% CI 0.19–0.37). On average, students showed positive attitudes both towards plagiarism avoidance (total score of 55.6 (95% CI 54.6–56.6) out of maximum 70; Table 4), as well as towards a climate that discourages plagiarism (total score of 26.8 (95% CI 26.1–27.4); Table 5).

Comparison Between Undergraduate and Graduate Students

There were no significant differences between undergraduate and graduate students in their reporting on having lectures on aspects of plagiarism (47.7% vs 55.2%,

Table 3 Comparison of students' perceived knowledge about referencing rules and their actual application/actions (N = 388)

Knowledge answers	Scenario answers	No of correct answers on rules (%)	Number of correct answers on actions (%)	P^a
It is not necessary to cite what we heard in lectures or presentations because that was not written down	A professor said during his lecture that, according to his experience, there is an increase in the prevalence of people with anemia in Croatia Luka wrote in his diploma work: There is an increase in the number of people suffering from anemia in Croatia	143 (36.9)	229 (59.0)	< 0.001
It is acceptable to paraphrase parts of a text, and then put quotation marks around the text directly quoted, with citing of the source	A book states: "In documents, the Liburnians are first mentioned in the eighth century BC (year 734) in clashes with Greeks who took away the island of Corfu because Liburnias conquered parts of the Adriatic coast and were the leading force on the Adriatic" Marica wrote: In documents, the Liburnians are first mentioned in the eighth century BC (year 734) in clashes with Greeks who took away the island of Corfu because Liburnias conquered parts of the Adriatic coast and were the leading force on the Adriatic (Batović 2005)	344 (88.7)	87 (22.4)	< 0.001
It is acceptable to paraphrase parts of a text, and then put quotation marks around the text directly quoted, with citing of the source	It is written in a book: "During the establishment of a proprietary company, it is required to undertake a stakeholder analysis and market testing. Only then a venture plan can be carried out and the company established" Ante wrote: Before the establishment of a proprietary company it is required to undertake stakeholder and market analysis	344 (88.7)	252 (64.9)	< 0.001
It is acceptable to paraphrase parts of a text, and then put quotation marks around the text directly quoted, with citing of the source	A book states: Bubonic plague was present in Europe from 1348 to 1666 Maja wrote: In Europe, the bubonic plague ruled from 1348 to 1666 (Cartwright and Biddiss 2006)	344 (88.7)	302 (77.8)	< 0.001

Table 3 (continued)

Knowledge answers	Scenario answers	No of correct answers on rules (%)	Number of correct answers on actions (%)	P^a
For information which is considered to be general knowledge, it is not necessary to state the source	Matej wrote in his seminar essay: The boiling point for water is 100 °C	189 (48.7)	319 (82.2)	<0.001
We can copy and paste from Internet pages without citation of that page because everything on the Internet is considered general knowledge	A popular blogger wrote: "All people are sometimes worried, and the most those with more free time. I made this conclusion based on the results of a survey I did several weeks ago" Matko wrote in his seminar essay: A popular blogger concludes from his research that "all people are sometimes worried, and the most those with more free time"	361 (93.0)	145 (37.4)	<0.001
If we use someone's idea in our work, it is not necessary to state its source or author	A popular blogger wrote: "All people are sometimes worried, and the most those with more free time. I made this conclusion based on the results of a survey I did several weeks ago" Matko wrote in his seminar essay: A popular blogger concludes from his research that "all people are sometimes worried, and the most those with more free time"	327 (84.3)	145 (37.4)	<0.001
If we state the source, we can paste and copy parts of the text	A book states: "In documents, the Liburnians are first mentioned in the eighth century BC (year 734) in clashes with Greeks who took away the island of Corfu because Liburnias conquered parts of the Adriatic coast and were the leading force on the Adriatic" Marica wrote: In documents, the Liburnians are first mentioned in the eighth century BC (year 734) in clashes with Greeks who took away the island of Corfu because Liburnias conquered parts of the Adriatic coast and were the leading force on the Adriatic (Batović 2005)	119 (30.7)	87 (22.4)	<0.001

[a]McNemar's test

Table 4 Personal attitude towards plagiarism scale

Statement	Mean (95% confidence interval)
I would feel guilty if I would use other sources in my manuscript and do not cite them	4.1 (4.0–4.2)
I would be afraid to use different sources of information (Internet, scientific articles) in my diploma work without citing them	4.3 (4.3–4.4)
I would be angry if someone would use my results in their work without citing me	4.1 (4.0–4.2)
I do not like individuals who use the thoughts of other people and presented them as their own	4.3 (4.2–4.5)
A person could be caught plagiarizing and have consequences	3.9 (3.9–4.1)
There should be a system for plagiarism check	4.1 (4.0–4.2)
Plagiarism is dishonest	4.4 (4.4–4.6)
I try to get more informed about plagiarism in science	2.7 (2.6–2.9)
When writing my works, I always cite the source if the idea belongs to someone else	4.2 (4.1–4.3)
For each information I use in writing my work, I will search for the primary source	3.5 (3.3–3.6)
If I had doubts about how to cite ideas and authors I would ask my superiors at the University	3.5 (3.3–3.6)
Plagiarism is a theft of others' ideas	4.4 (4.3–4.5)
Plagiarism undermines the value of work of the other members of the community	3.9 (3.8–4.0)
We will learn less by verbatim copying of others' work	4.1 (3.9–4.2)
Total score	55.6 (54.7–56.6)

Higher score indicates the more positive attitude towards avoiding plagiarism

Table 5 Plagiarism climate scale

Statement	Mean (95% confidence interval)
Everything can be considered to be plagiarized because of a large amount of available information nowadays	3.3 (3.2–3.4)
Today, everybody plagiarizes somebody when writing a scientific article	3.1 (3.0–3.2)
Plagiarism in written works is a part of the society we live in	3.3 (3.2–3.4)
In our society, it is not possible to eradicate plagiarism in science	3.1 (2.9–3.2)
I do not pay much attention to the concept of plagiarizing in scientific work	2.6 (2.5–2.8)
I most often use the Internet as a source in my seminar essays without explicitly citing the source	2.6 (2.5–2.8)
I think that our society will continue to foster plagiarism in future	3.3 (3.1–3.4)
I think that plagiarizing scientific papers is of very little concern to me personally	2.9 (2.7–3.0)
The question of academic integrity is an institutional or national policy but not an individual matter	3.1 (3.0–3.2)
Total score	26.8 (26.1–27.4)

Lower scores indicate positive attitude towards climate less enabling of plagiarism. When combining personal attitude towards plagiarism scale and plagiarism climate scale, all items from the plagiarism climate scale must be reversely scored in order to be added and interpreted properly

$\chi^2 = 1.68$; $P = 0.195$), and both groups had similar answers when asked about their familiarity with plagiarism (38.1% vs 41.3%; $\chi^2 = 0.32$; $P = 0.573$). Significantly more graduate students reported that they had attended lectures where they discussed the problems of plagiarism and referencing (69.7% vs 85.3%; $\chi^2 = 10.3$; $P < 0.001$). However, there were no differences between groups in their knowledge of basic referencing rules or the appropriateness of different plagiarism examples. There was no statistical difference between undergraduate (average score = 54.9; 95% CI 53.4–56.5) and graduate students (average score = 56.7; 95% CI 55.2–58.1) in overall attitude towards plagiarism ($P = 0.121$). Furthermore, no statistically significant differences were demonstrated between undergraduate (average score = 26.3; 95% CI 25.3–27.4) and graduate students (average score = 27.1; 95% CI 26.0–28.2) in their attitudes towards the climate of plagiarism ($P = 0.311$).

Comparison Between Students Who Attended Courses Where They Discussed Aspects of Plagiarism and Those Students Who Did Not

Although there were significant differences in responses between students' knowledge of rules and their actual application (Table 3), significantly more students who attended courses where they discussed aspects of plagiarism reported that they were familiar with aspects of plagiarism (24.0% vs 54.7%; $\chi^2 = 38.11$; $P < 0.001$), and that they were more familiar with referencing rules (62.0% vs 95.9%; $\chi^2 = 67.3$, $P < 0.001$). However, there was very little difference between groups in their knowledge of referencing rules (Supplementary material: Supplementary Table 1) and in their assessment of the appropriateness of different plagiarism examples (Supplementary material: Supplementary Table 2). Participants who had attended courses where they discussed plagiarism had significantly higher results ($P < 0.001$) both on the personal attitudes towards plagiarism scale (average score = 57.5; 95% CI 56.2–58.9) and on the reversely scored plagiarism climate scale (average score = 28.2; 95% CI 27.2–29.0), compared to their peers who did not attend that type of course (average score = 53.7; 95% CI 52.3–55.1, and 25.4; 95% CI 24.5–26.2, respectively).

Discussion

This study showed that students at the University of Split were not very familiar with referencing rules that would help them in their written works to avoid accusations of plagiarism. They also did not perform well in theoretical knowledge and the application of that knowledge to practical examples. However, they showed positive attitudes against plagiarism, leading to the conclusion that plagiarism is more likely to occur unintentionally, rather than intentionally, due to a lack of knowledge. This finding was also supported by their attitudes towards plagiarism, which were against the acceptance and approval of plagiarizing practices. Finally, this study demonstrated that neither attendance in courses that include topics related to plagiarism, citing and referencing literature, nor study-level (undergraduate vs graduate), was

associated with students' knowledge of or attitudes about plagiarism. Those findings are important for planning actions and creating a long-term policy on plagiarism both at the university level of the University of Split and the national level in that the findings could be a good example for national policies. Moreover, this is the first study to assess students' knowledge of and attitudes towards plagiarism across an entire university in Croatia, in contrast to previous studies conducted in individual schools or departments (Bilić-Zulle et al. 2008; Đogaš et al. 2014; Grgić 2017; Pupovac et al. 2010; Taradi et al. 2012). As far as the authors are aware, the present study is among the few that surveyed both the theoretical and practical knowledge of plagiarism, and also considered the impact of education in such topics throughout courses at the University.

Theoretical Knowledge

The theoretical knowledge of students about referencing and plagiarism expressed as the percentage of correct answers ranged from 25 to 93%, and for six of 12 questions, the frequency of correct answers was lower than 50%. Although the overall rate of correct answers was not low, the results are alarming as the students did not know basic referencing rules which prevent serious plagiarism. Specifically, almost two-thirds of surveyed students thought that if they compile or paraphrase text from a particular source it is sufficient only to list the source in the reference list and not mention it where the relevant text is mentioned in the document. Furthermore, almost 70% of the students thought that it is allowable to copy-paste text if they add a reference to it, without indicating direct quoting. Therefore, it is an important task for faculty members to double check the possibility of plagiarism in submitted projects, papers or theses. Furthermore, the students were not familiar with the concept of self-plagiarism (25%), or with the requirement of citing personal communications (37%). A previous study (Grgić 2017) conducted among Croatian students reported correct answers in 72% of cases, but the study sample was small (57 graduate students), and the questions were constructed using terms such as "quoting", "citing", and "paraphrasing" without a specific context, so unfortunately those data cannot be directly compared to our study. In the SEEPPAI survey (ETINED 2017), when Croatians students were asked to judge plagiarism severity in given cases, they obtained average or even better than average results in comparison to the other European countries participating in the survey. For example, in the scenario where 40% of a student's submission was taken from other sources and was copied in the student's work verbatim and without quotations, more than 95% of students recognized plagiarism. These results imply that students probably recognize blatant plagiarism but do understand the basics of plagiarism avoidance. Therefore, more in-depth analyses, like those used in the present study, are required to get insight into students' perception of plagiarism in real life situations.

Although they did not employ the same statements on plagiarism, previous research on students from other universities (e.g. Marshall and Garry 2006; Shirazi et al. 2010; Song-Turner 2008; Ryan et al. 2009) report results similar to this study. For example, in the study by Helen Song-Turner (Song-Turner 2008), only

34% of the students considered "cutting and pasting material from various sources and including in the written report and at the reference section listing out the source of the information" (pp. 43) as plagiarism, which is similar to what this study found. Also, in many other studies, students were not well aware of which referencing "errors" were considered to be plagiarism (Ford and Hughes 2012; Gullifer and Tyson 2010; Mu 2010; Smith et al. 2007). Some other comprenhensive research also revealed that there was a disjuncture between students' understanding of plagiarism policies and actual practice as well as a gap between their understanding of plagiarism and the expectations of the institution (Adam 2016).

Discrepancies Between Theory and Application

This study also used real examples to test the ability of students to recognize whether a text was properly cited. The accuracy of answers ranged from 22 to 82%, and for 5 out of 8 questions the accuracy was higher than 50%. Unexpectedly, the results showed that there was a gap between theoretical and practical knowledge. When students' perceived knowledge about referencing rules and the application of these rules on concrete examples were compared, there were statistically significant differences in all question pairs. This finding was the most evident in the example where 78% of students failed to recognize that if one takes someone's text verbatim, it is necessary to use quotation marks. At the same time, the majority of students correctly answered this question in the theoretical part of the questionnaire (89%). A similar finding was observed for the question about referencing Internet sources. Specifically, students were familiar with this issue in the theoretical part, but more than 60% of students could not recognize that the example provided for this topic was not referenced properly. In contrast to the presented discrepancies, in some cases, they performed better on practical examples. Specifically, students were more successful in recognizing the errors related to referencing personal communications and general knowledge than in their theoretical knowledge of this issue. The present study compared the differences between theory and practice using theoretical questions and examples similar to a previous study (Marshall and Garry 2006). The results of this study have important implications for practical management of plagiarism because educators need to be aware that students' theoretical knowledge of referencing rules does not imply that students will be able to apply those rules when they actually write their assignments, thus greatly increasing the possibility of unintentional plagiarism.

Attitudes and Societal Climate

In addition to assessing knowledge on referencing and plagiarism, the study also tested the students' attitudes towards plagiarism avoidance and their opinions on the societal climate regarding plagiarism. In the present study, students showed predominantly positive attitudes towards plagiarism avoidance. Although the same statements were not used, the overall results are in contrast to those from previous research conducted with students in Croatia. Those studies showed that students

consider academic dishonesty as acceptable behavior (Bilić-Zulle et al. 2005; Hrabak et al. 2004; Hren et al. 2006; Taradi et al. 2012), and that students entering the study program come already prepared to plagiarize (Taradi et al. 2010) thus leading to the conclusion that plagiarism is in most cases an intentional act. However, the differences between those study findings, and the findings presented here, may stem from the differences in the sample (an entire university in this study vs. individual university schools) and the time during which the studies were performed (2017 in this study vs. 2002–2012 in other studies).

Impact of the Study Level and Courses Teaching Academic Writing

As graduate students usually have more experience in academic writing and referencing, and considering that they had to submit a bachelors' thesis, it was expected that they would have better knowledge and more positive attitudes. However, graduate students did not perform much better than their undergraduate colleagues. Also, there were no differences in their attitudes either, indicating that the university study level is not an important contributing factor to the perception and practices of plagiarism among university students in Split. These findings support a study that included undergraduate and postgraduate pharmacy students and showed no differences among them in knowledge (Ryan et al. 2009). Although the study by Greg Ryan and colleagues did not report statistical data, the percentages were similar to those in the study reported here. Other studies (Shirazi et al. 2010) showed that both teachers and students lack knowledge of plagiarism, indicating the seriousness of the problem of plagiarism at universities, as well as the need to focus not only on students but on educators as well in all activities related to combating plagiarism.

The importance of training is also evident from the SEEPPAI and IPPHEAE surveys, where more than 80% of educators and students from all countries (including Croatia) agreed that more training on plagiarism avoidance is needed not only for students but also for educators (ETINED 2017; Glendinning 2013).

Since adequate policies and continuous education are important contributing factors for plagiarism avoidance in the academy and in society (Marušić et al. 2016; Roig 2012), this study aimed to explore if students' attendance in courses that discussed aspects of plagiarism affected their knowledge and attitudes. According to our results, the impact of those courses on their knowledge was minor. However, students who attended the courses that discussed plagiarism were more positively disposed toward plagiarism avoidance.

Study Limitations

The limitation of this study was a sampling type which was representative of the student body included in the study, but not to other student populations. This study employed a convenience sampling strategy, therefore the sample was not stratified to include a balanced proportion of students from different study levels, years of study, school, and to equally include students of both genders. The results surrounding the recognition of plagiarism on practical examples may have

also been affected by the Harvard style referencing style that was used (Neville 2010). Therefore, students from technical, biomedical or natural sciences could have been confused because they usually deal with other referencing standards such as the Vancouver style (Marušić 2015). Also, the questionare layout could have impacted the answers. For example, questions that tested students' theoretical knowledge were answered first, and this could have impacted the answers in practical examples and attitudes, which were answered in the second part. One of the potential drawbacks of the methodology used in this study was the issue of multiple comparisons that could have resulted in random differences. However, to avoid this possibility, conclusions were not drawn from marginally significant statistical differences, and where possible, from tested differences in summarized results. Finally, the results may have been influenced by the general limitation of the survey methodology, particularly socially desirable responding, which is particularly relevant for sensitive topics such as plagiarism (Pupovac and Fanelli 2015).

Conclusions

The overall results of the study are crucial in informing the development of strategies for plagiarism avoidance at Croatian universities, but they are also important for understanding plagiarism on a general level. This study showed that students at the University of Split, although they do not endorse plagiarism, are not very familiar with the basics of plagiarism avoidance, including basic referencing rules, which, if ignored, can most probably lead to severe cases of plagiarism. Furthermore, some rules that are related to plagiarism such as non-referencing personal communications and self-plagiarism are almost completely unknown to them. One of the critical issues that stemmed from this study is that courses that teach academic writing and referencing positively affected only students' attitudes but not their (practical) knowledge. This implies that either faculty members are not aware of students' previous knowledge or they are uninformed about the features of plagiarism. The study did not investigate the type of training they received as it has been shown in a recent Cochrane systematic review that training about plagiarism may reduce plagiarism among students when the training involves practical exercises and plagiarism software tools (Marušić et al. 2016). An important step towards plagiarism prevention would be to develop a lifelong learning program for educators in which they are introduced to students' understanding of plagiarism as well as to the most efficient methods for teaching plagiarism avoidance and scientific integrity. Also, faculty members should consider students' plagiarism not only as an ethical and regulatory violation but also as a direct consequence of a lack of knowledge and academic illiteracy. Further, it behooves faculty in the academic setting to understand the reason why students have plagiarized in a particular case (Adam 2016).

Acknowledgements We thank Assistant Professor Shelly Pranić, for her advice on improving the quality of language in the manuscript.

Funding AM is funded by the research grant Croatian Science Foundation ("Professionalism in Health Care"), under Grant Agreement No. IP-2014-09-7672. The funder had no role in study design, data collection, and analysis, decision to publish, or preparation of the manuscript.

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