

AC 2009-1050: MEASURING THE EFFECTIVENESS OF A REQUIRED ETHICS CLASS

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Measuring the Effectiveness of a Required Ethics Class in an Undergraduate Engineering Curriculum

The teaching of engineering ethics in the undergraduate curriculum has been of increasing importance since ABET 2000 requirements were instituted for program accreditation. Many undergraduate engineering programs now include a required course in ethics in order to demonstrate that students have an understanding of their ethical responsibility. The engineering programs at the University of New Orleans (UNO) have for several years required a one credit hour course in engineering ethics, taught by faculty in the Philosophy Department. How effective are these classes in “teaching” ethical behavior?

Recognizing that academic dishonesty is a problem at most universities, a survey was administered to several classes at UNO. The survey was based on part of a recent large scale study called the PACE-1 Study, involving a seven section survey of 643 undergraduate engineering and pre-engineering students at eleven institutions, ranging from community colleges to large research universities. The PACE-1 study attempted to determine what is student cheating, how often does cheating occur, why do students cheat, and what methods can be used to reduce or stop cheating. Because of time constraints, the UNO survey was based on the first section of the PACE-1 survey. The UNO questionnaire was a short one-page voluntary survey that was given at the beginning of several large undergrad classes in order to try to determine what behaviors each student deems to be cheating and how many times in a typical semester the student participates in this type of behavior. In addition, the UNO survey asked students if they had taken an ethics course.

One hundred and thirty five students completed the survey. The results of the UNO survey were used to compare the self-reported cheating behavior of non-engineering students with that of engineering students. Additionally, the self-reported cheating behavior of engineering students who also reported having taken an ethics class is compared to those who did not indicate that they had taken an ethics class. These comparisons can be used as a measure of the effectiveness of teaching ethics with respect to a reduction of student self-reported cheating behavior.

Introduction

Academic dishonesty is a problem at most universities, including the University of New Orleans (UNO). The percentage of students who report cheating varies by college major. Recent studies indicate that engineering students more frequently engage in cheating behavior than students of most other majors [1]. At the same time, accredited engineering programs must now demonstrate that their graduates have an understanding of professional and ethical responsibility, the broad education necessary to understand the impact of engineering solutions in a global and societal context, and must be able to take into account economic, environmental, sustainability, manufacturability, ethical, health, safety, and other social and political considerations into their designs [2]. Academic dishonesty indicates that many students will approach their professional

responsibilities once they graduate with attitudes and habits that run counter to expected professional conduct.

For college graduates whose workplaces have strong corporate codes of ethics, employees whose undergraduate school had a code of honor are less likely to report engaging in unethical workplace behavior than those whose undergraduate institution did not have a code. In fact, students in honor code schools report less cheating than those of non-code universities [2]. Clearly there are mechanisms that can help to minimize cheating behavior once that behavior is better understood.

So what is cheating and why do students cheat?

Cheating can be defined as being dishonest or deceitful. For a college student, cheating is behavior that intentionally tries to deceive the instructor with regard to work completed by the student. However, faculty and students differ widely on their beliefs and perception of cheating. Cheating is sometimes defined as only one type of academic dishonesty, but for this study cheating and academic dishonesty will be taken as being equal. It is well documented that the percentage of students self-reporting cheating differs with college major. A survey done by McCabe and Trevino [1] found that 82% of engineering students self-reported cheating, compared to 91% of business majors, 73% of social science majors and 71% of natural science majors. Engineering educators should be concerned with these statistics.

Researchers have typically divided reasons for cheating into three categories: psychological, demographic, and situational. Psychological factors, including social norms, moral obligation, and perceived ability to cheat, have a moderate correlation with a student's likelihood of cheating [4]. Demographic factors such as ethnicity and religious beliefs have little correlation with cheating behavior, while gender and participation in fraternities/athletic teams have a small correlation [3, 5]. Older students tend to cheat less, students with a low GPA tend to cheat more, and cheating is essentially uncorrelated with year in college [4]. Situational factors such as perceived heavy work load, highly competitive academic environment and class size have a moderate to small correlation with a student's decision to cheat [4]. Most engineering undergrads would describe their undergraduate program as one of the most rigorous on campus. The rigors of engineering course studies may contribute to the high percentages of cheating self-reported by engineering majors.

The PACE-1 Survey

One of the most recent cheating studies involved a survey of 643 undergraduate engineering and pre-engineering students at eleven institutions, ranging from community colleges to large research universities, called the PACE-1 Study. This study attempted to determine what is student cheating, how often does cheating occur, why do students cheat, and what methods can be used to reduce or stop cheating.

The PACE-1 survey consisted of seven sections. Section 1 addressed student’s definition of cheating and the frequency in which they engaged in the behavior. Sections 2-5 investigated the psychological and situational factors that might affect student decision about cheating. Section 6 addressed deterrents to cheating and Section 7 addressed student demographics.

Item # and description	Attitude towards cheating			Frequency of Cheating Behavior in a typical semester		
	Cheating	Unethical but not cheating	Neither	0	1-2	3+
1 Copying from another student during a test or quiz	96%	2%	1%	63%	20%	12%
2 Permitting another student to look at your answer during a quiz or exam	73%	23%	3%	54%	25%	15%
3 Asking another student about questions on an exam that you have not yet taken	27%	46%	27%	27%	30%	38%
4 Delaying an exam or turning in a paper late with a false excuse	25%	66%	9%	69%	19%	6%
5 Copying from an unapproved reference sheet during a closed-book test or quiz	92%	6%	2%	68%	19%	7%
6 Claiming to have handed in an assignment when you have not	61%	33%	5%	87%	4%	2%
7 Taking an exam for another student	92%	5%	2%	90%	2%	1%
8 Working in groups on assignments when there is no class policy on group work	6%	20%	73%	15%	19%	60%
9 Copying an old lab report from a previous year	61%	26%	12%	56%	23%	14%
10 Studying with other students for a test	1%	2%	96%	4%	5%	85%
11 Copying another student’s homework when it is not permitted by the instructor	73%	23%	4%	38%	32%	24%
12 Submitting or copying homework assignments from previous terms	52%	31%	16%	58%	18%	17%
13 Witnessed a case of cheating in a class and did not report it to the instructor	9%	60%	30%	41%	26%	27%
14 Storing answers to a test in a calculator or Personal Digital Assistant (PDA)	75%	16%	10%	55%	19%	20%
15 Changed the answer on your test/homework after it was graded and then telling the instructor that there was a grading mistake	92%	5%	2%	88%	5%	2%
16 Paying someone else to take an exam/write a paper for you	87%	11%	2%	89%	3%	1%
17 Working in groups on web based quizzes/tests	41%	29%	29%	66%	15%	12%
18 Working in groups on take-home exams	39%	29%	31%	53%	25%	15%

Table 1 Percentage of PACE-1 students defining behavior as “cheating”, “unethical”, or “neither” and self-reported incidence of the behavior (643 surveyed)

The survey was administered by volunteer faculty and took the majority of a class period. Table 1 gives the results of the PACE-1 Section 1 survey [4], as well as the description of each of the eighteen behaviors surveyed. Most instructors would regard all eighteen behaviors as cheating with the exception of item 10 (studying with others students for a test) and perhaps item 8 (working in groups on an assignment when there is no class policy).

The UNO survey results

Because of time constraints, only Section 1 of the PACES-1 survey was administered to UNO students in the Spring 2007 semester. A graduate student administered the questionnaire, which was designed to only take ten minutes of class time. The protocol used was designed to alleviate student concerns about identification and punishment for self-reported cheating behaviors. Prior to survey distribution, a written script was read to each selected class about the survey, student

rights, and the voluntary nature of the survey. Anonymity was attained by the administering student leaving the room while the students completed the survey and the use of check marks to indicate responses, as opposed to anything handwritten. Completed surveys were placed in one large plain envelop, which was then sealed. Table 2 gives the results of the survey taken by all survey participants.

One hundred and thirty five students completed the survey. The breakdown by college major is 13% business, 4% education, 30% engineering, 30% liberal arts, and 23% science (17 business, 5 education, 41 engineering, 41 liberal arts, and 31 science students). The college designation breakdown is 29% freshman, 33% sophomore, 19% junior, 16% senior and 4% graduate student standing (39 freshman, 45 sophomore, 26 junior, 21 senior and 4 graduate students).

Item # and description	Attitude towards cheating			Frequency of Cheating Behavior in a typical semester		
	Cheating	Unethical but not cheating	Neither	0	1-2	3+
1 Copying from another student during a test or quiz	95%	3%	2%	78%	14%	6%
2 Permitting another student to look at your answer during a quiz or exam	76%	19%	4%	79%	13%	7%
3 Asking another student about questions on an exam that you have not yet taken	24%	49%	27%	42%	39%	18%
4 Delaying an exam or turning in a paper late with a false excuse	21%	62%	16%	64%	27%	6%
5 Copying from an unapproved reference sheet during a closed-book test or quiz	90%	5%	4%	82%	12%	3%
6 Claiming to have handed in an assignment when you have not	47%	41%	11%	88%	7%	4%
7 Taking an exam for another student	93%	4%	2%	93%	3%	2%
8 Working in groups on assignments when there is no class policy on group work	10%	15%	74%	45%	30%	23%
9 Copying an old lab report from a previous year	49%	35%	15%	76%	14%	7%
10 Studying with other students for a test	1%	1%	99%	21%	21%	56%
11 Copying another student's homework when it is not permitted by the instructor	65%	30%	5%	63%	27%	8%
12 Submitting or copying homework assignments from previous terms	44%	44%	12%	76%	17%	5%
13 Witnessed a case of cheating in a class and did not report it to the instructor	13%	56%	30%	65%	18%	15%
14 Storing answers to a test in a calculator or Personal Digital Assistant (PDA)	87%	7%	5%	84%	8%	5%
15 Changed the answer on your test/homework after it was graded and then telling the instructor that there was a grading mistake	93%	6%	1%	90%	5%	4%
16 Paying someone else to take an exam/write a paper for you	90%	7%	2%	98%	4%	4%
17 Working in groups on web based quizzes/tests	41%	33%	26%	67%	20%	11%
18 Working in groups on take-home exams	31%	33%	36%	64%	24%	10%

Table 2 Percentage of all UNO students defining behavior as “cheating”, “unethical”, or “neither” and self-reported incidence of the behavior (135 surveyed)

In general, the UNO survey results are similar to the PACE-1 survey results. There is a close agreement in attitude towards cheating in the two surveyed populations (PACE-1 and UNO). There is less agreement between UNO’s respondents and PACE-1 respondents in the frequency that the students self-report the cheating behavior. UNO students self-report less frequent incidence of cheating across all eighteen behaviors when compared to the PACE-1 students’ reported cheating incidents.

The UNO survey results for engineering students

Of the respondents to the UNO survey, forty one were engineering majors. The class designation breakdown is 20% freshman, 29% sophomore, 22% junior, 24% senior and 5% graduate student standing (8 freshman, 12 sophomore, 9 junior, 10 senior and 2 graduate students) for the engineering student respondents. The results of the survey, limited to engineering student responses, are given in Table 3. There is very little difference in the results of the UNO survey of the general student population when compared to those from UNO engineering majors alone.

Item # and description	Attitude towards cheating			Frequency of Cheating Behavior in a typical semester		
	Cheating	Unethical but not cheating	Neither	0	1-2	3+
1 Copying from another student during a test or quiz	95%	2%	2%	78%	12%	2%
2 Permitting another student to look at your answer during a quiz or exam	76%	17%	7%	80%	10%	5%
3 Asking another student about questions on an exam that you have not yet taken	22%	49%	29%	39%	41%	15%
4 Delaying an exam or turning in a paper late with a false excuse	24%	63%	12%	73%	17%	2%
5 Copying from an unapproved reference sheet during a closed-book test or quiz	90%	2%	5%	78%	10%	5%
6 Claiming to have handed in an assignment when you have not	51%	39%	10%	90%	2%	2%
7 Taking an exam for another student	93%	5%	2%	93%	0%	2%
8 Working in groups on assignments when there is no class policy on group work	10%	17%	71%	37%	24%	34%
9 Copying an old lab report from a previous year	54%	37%	7%	71%	15%	10%
10 Studying with other students for a test	2%	0%	98%	20%	15%	61%
11 Copying another student's homework when it is not permitted by the instructor	78%	20%	2%	63%	27%	5%
12 Submitting or copying homework assignments from previous terms	61%	34%	5%	80%	12%	2%
13 Witnessed a case of cheating in a class and did not report it to the instructor	17%	56%	24%	63%	20%	12%
14 Storing answers to a test in a calculator or Personal Digital Assistant (PDA)	85%	10%	5%	85%	7%	2%
15 Changed the answer on your test/homework after it was graded and then telling the instructor that there was a grading mistake	93%	7%	0%	90%	2%	2%
16 Paying someone else to take an exam/write a paper for you	98%	2%	0%	93%	0%	2%
17 Working in groups on web based quizzes/tests	44%	32%	24%	61%	32%	2%
18 Working in groups on take-home exams	34%	37%	29%	76%	17%	2%

Table 3 Percentage of all UNO engineering students defining behavior as “cheating”, “unethical”, or “neither” and self-reported incidence of the behavior (41 surveyed)

How can cheating behaviors be reduced?

The recent PACE-1 Study found that students were able to rationalize cheating behavior using instructor-based neutralizations such as “the instructor did an inadequate job” or “the instructor assigned too much material” [5]. This correlated well in the study with the students’ belief that it is the instructor’s responsibility to limit cheating and not the students’. This indicates that an individual instructor can minimize cheating in their class. Thus, practical pedagogical methods can be identified and implemented to help students avoid the pressure of cheating. One possible method would be the addition of the teaching of ethics into the curriculum.

A survey of 254 engineering programs by Stephan [6, 7] in 1998 examined the treatment of ethics in those programs using available catalog data. The survey found that seventy-eight percent of the 1996-97 engineering graduates came from institutions that had no across-the-board ethics requirements. Of the surveyed institutions, 68.1% had no ethics-related requirement for all students, 10.2% had at least one course that had some ethics content required, 9.8% had one ethics-related course required, and 4.7% had no available data. Required courses in religion and philosophy were counted as ethics-related.

Since the institution of the ABET 2000 accreditation requirements that include requirements that all engineering graduates possess an understanding of their ethical responsibilities, many more engineering programs now include a stand-alone ethics course or ethics content across the curriculum. The objective of adding these courses to the engineering curriculum is to assure that graduates understand professional ethics. Perhaps an added benefit is that they can also reduce unethical behaviors such as cheating.

Results: do UNO engineering students cheat more often?

Many studies indicate that the percentage of student self-reporting cheating behaviors varies by major. As previously reported in [8], Figures 1 and 2 separate the results of the UNO survey into results by college with Figure 1 showing the percentage of students who define the eighteen behaviors as cheating and Figure 2 showing the percentage of students who self-report indulging in the cheating behavior. Please note that all figures can be found at the end of this paper. The results in Figure 1 do show that engineering majors more often do believe the eighteen surveyed behaviors are cheating than do the other majors, with the exception of item 8 (working with groups on assignments when there is no class policy). A shorter bar than the rest of the majors in the chart in Figure 1 indicates that the students in that major more often believe that item is indeed cheating. From the information in Figure 2, the UNO survey results do indicate that business majors report cheating behaviors more often. However, in looking at all eighteen items surveyed, engineering students report higher than average cases of self-reported cheating only in items 3, 13 and 17 (asking another student question on an exam that you have not yet taken, witnessing a case of cheating and not reporting it to the instructor and working in groups on web based quizzes/tests). Engineering students reported about the average incidents of the behavior in all of the other items.

Discussion of general survey results

Most faculty members do not distinguish between cheating and unethical (but not cheating) behavior. Faculty regard the two as synonymous. However students make a distinction between cheating and unethical (but not cheating) behaviors. Most faculty would regard all items, with the exception of item 10 (studying with others students for a test) and perhaps item 8 (working in groups on an assignment when there is no class policy), as incidents of cheating.

As the results of both surveys indicate, students do not feel the same way. More than 50% of the students who participated in the survey feel that items 3, 4, 6, 8, 9, 10, 12, 13, 17, and 18 are NOT cheating, but are either simply unethical or neither cheating or unethical. Please see Table 1, 2 or 3 for a listing of the description of each item and the exact percentages. Individual

students did not necessarily report high levels of a specific behavior just because the students did not feel an item was cheating. Conversely, just because a student defined a behavior as cheating did not indicate that the students would not indulge in that behavior. Moreover, the survey results indicate that students knowingly conduct acts that they define as being wrong. Will the introduction of an ethics course educate students about what constitutes cheating? More importantly, will an ethics course help reduce cheating behavior?

The impact of an ethics course on cheating behavior in engineering students

Of the forty one engineering students surveyed, twenty six indicated that they had taken an ethics course such as PHIL2244, Engineering Ethics. Fifteen of the engineering student respondents had not yet taken an ethics class. This class is now a required course at UNO for all engineering majors. The breakdown of those engineering students that had taken the ethics course by class designation is as follows: 2 freshmen (6 did not have the ethics course), 7 sophomores (5 did not), 7 juniors (2 did not), all 10 seniors, and neither of the two graduate students.

The comparison of the results of responses of engineering students who have taken an ethics course versus those who have not are given in Figures 3 and 4. Figure 3 focuses on the percentage of engineering majors who define each of the eighteen cheating behaviors as “cheating or unethical”. Figure 4 shows the comparison of the percentages of engineering students who self-reported NO cheating or unethical behaviors. Results given in Figure 3 are striking and clearly indicate that students who have taken an ethics course more often can identify cheating behaviors. For most cheating behaviors, students who had taken the ethics course were approximately twice as likely to identify the behavior as cheating. Similarly, as indicated in Figure 4, students who have had an ethics course are also less likely to engage in (self-reported) cheating behavior. For most of the cheating behaviors in the survey, students who had taken an ethics course were about half as likely to self-report engaging in that cheating behavior. As previously mentioned, cheating is negatively correlated with age but essentially uncorrelated with year in college [4]. This study can not assess the effect of age on cheating behavior, as the survey did not ask for the respondents’ ages.

It was interesting to find that students make a distinction between copying on a test (item 1), copying a homework (item 12) and copying a lab report (item 9). The general trend is that most students believe copying on a test is cheating, but students are more likely to identify copying a lab report or homework as either not cheating or unethical, or neither. Of the 15 engineering students who had not yet taken an ethics course, 14 (34% of the 41 engineering students) identified copying on a test as cheating, but 8 (20%) identified copying homework and 7 (17%) identified copying a lab report as cheating. In comparison, when the 26 engineering students who had taken an ethics course were asked what constituted cheating, 25 (61%) said copying on a test, 17 (32%) said copying homework, and 15 (37%) said copying a lab report was cheating.

Unfortunately, even engineering students who had taken an ethics course did self-report cheating behavior (although at a reduced rate). The following results are for frequency of self-reported cheating behavior in a typical semester. Of the engineering students who did not take an ethics course, 13 (32%) self-reported zero incidents of copying on a test, 11 (27%) reported zero incidence of copying homeworks and 12 (29%) reported zero incidence of copying lab reports.

This compares to the self-reported incidence of cheating for engineering students who have taken an ethics class: 19 (46%) do not copy on tests, 22 (54%) do not copy homeworks, and 17 (41%) do not copy lab reports.

The use of technology, such as web-based testing, also changes a student's opinion of what constitutes cheating. Five (12%) of the engineering students who had not yet taken an ethics course thought that working in groups on web-based exams was cheating, compared to 13 (32%) of the engineering students who had taken the ethics course. Eight (20%) of the no-ethics class students reported not cheating on a web-based exam in a typical semester, while 17 (41%) of the ethics-class students did not report an incidence of web-based test cheating. The results on the survey indicate that having taken an ethics course increased the likelihood that the student would identify the behavior as cheating and reduced the likelihood that the student would engage in that cheating behavior.

Please note that the percentages given in the prior paragraph in parenthesis indicate percentage of the total forty one engineering students.

Conclusion

The study by Carpenter et. al. [5], based on the PACE-1 survey findings, included the observation that students were able to rationalize cheating behavior using instructor-based neutralizations such as “the instructor did an inadequate job” or “the instructor assigned too much material”. This correlated well in the Carpenter study with the students' belief that it is the instructor's responsibility to limit cheating and not the students' and indicates that an individual instructor can minimize cheating in a class. Thus, practical pedagogical methods can be identified and implemented to help students avoid the pressure of cheating.

The results presented herein establish UNO student's perceptions, attitudes, and behaviors on cheating. The UNO study does not address why UNO students cheat. The study found that engineering students report higher than average cases of cheating in three of the behaviors studied: 1) asking another student question on an exam that you have not yet taken, 2) witnessing a case of cheating and not reporting it to the instructor and 3) working in groups on web based quizzes/tests. Engineering students reported about the average incidence of the behavior in all of the other items. Trends in the data suggest that if an instructor educates the students taking a class as to which behaviors are regarded as definite cheating behaviors, there may be an associated decrease in incidents of that behavior.

Additionally, the UNO survey asked each student if they had taken an ethics course such as PHIL2244. It was found that the addition of an ethics class into a student's required coursework has a striking impact on the student's perception of what constitutes cheating. A similar impact was found in self-reported cheating behaviors. Taking an ethics course reduced the number of students by half who self-reported having engaged in cheating behavior. Clearly ethics education has a positive impact on the reduction of cheating in engineering undergraduates.

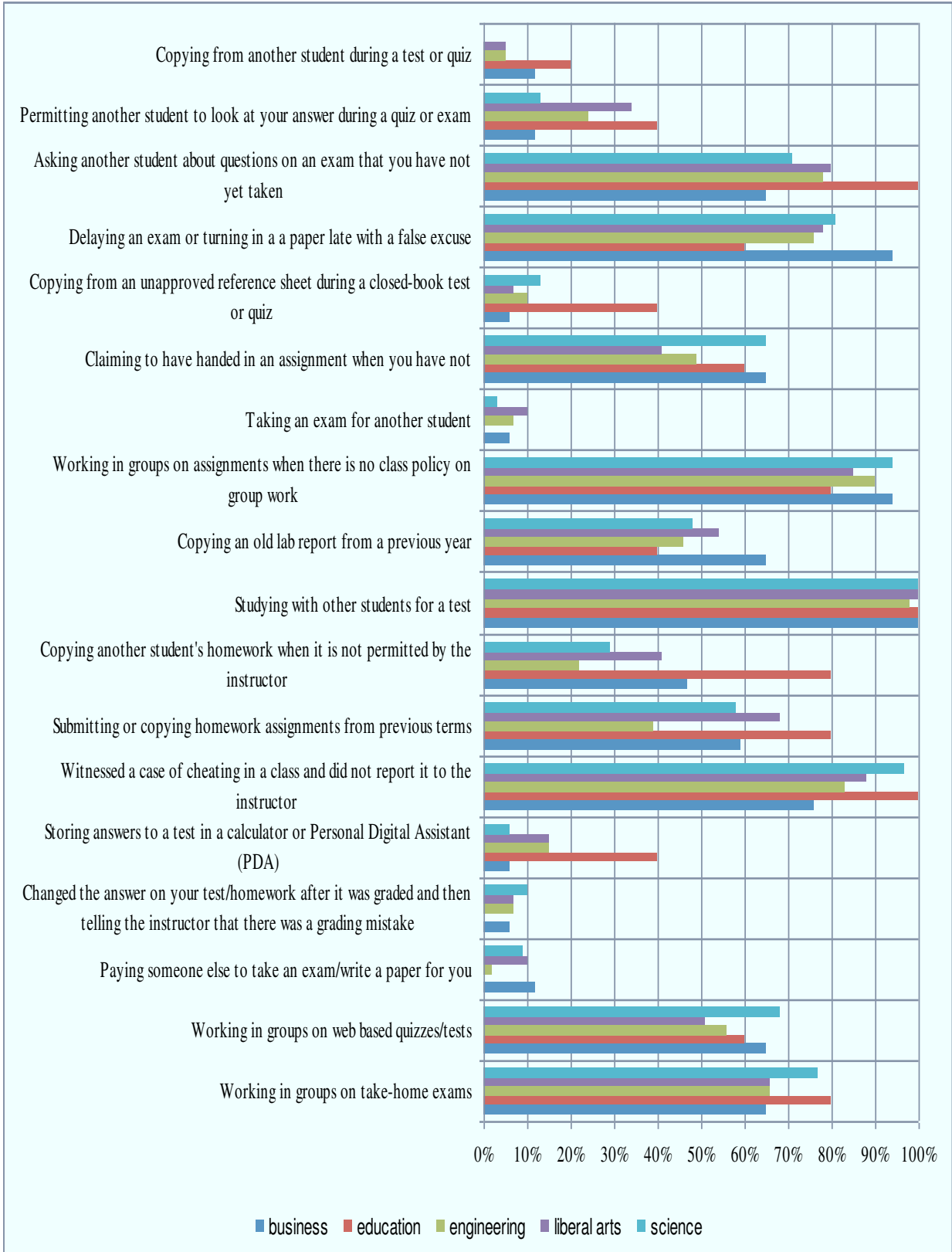


Figure 1 Percentage of students who define behavior as “not cheating”, by college

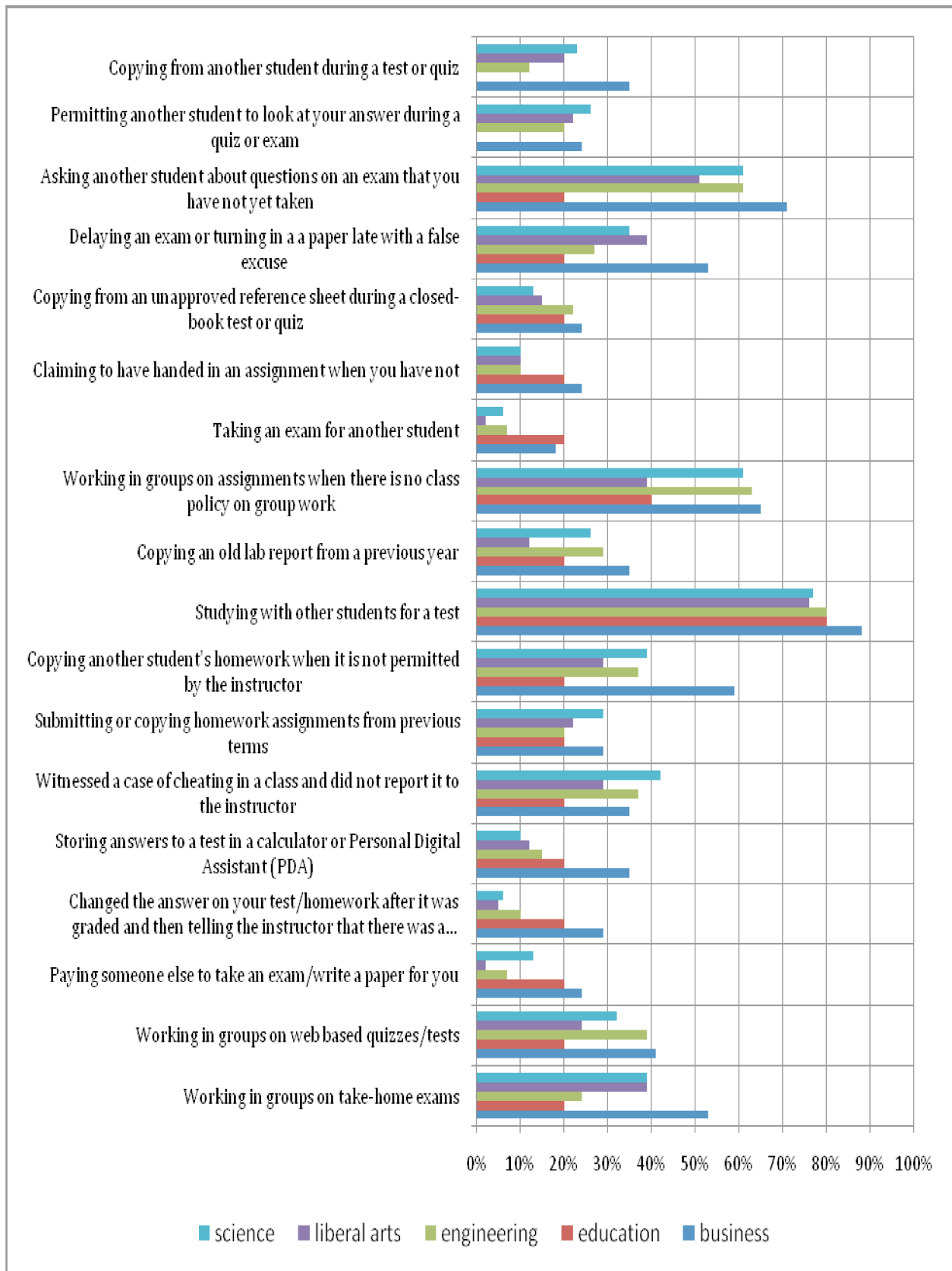


Figure 2 Percentage of students who self-report cheating behavior, by college

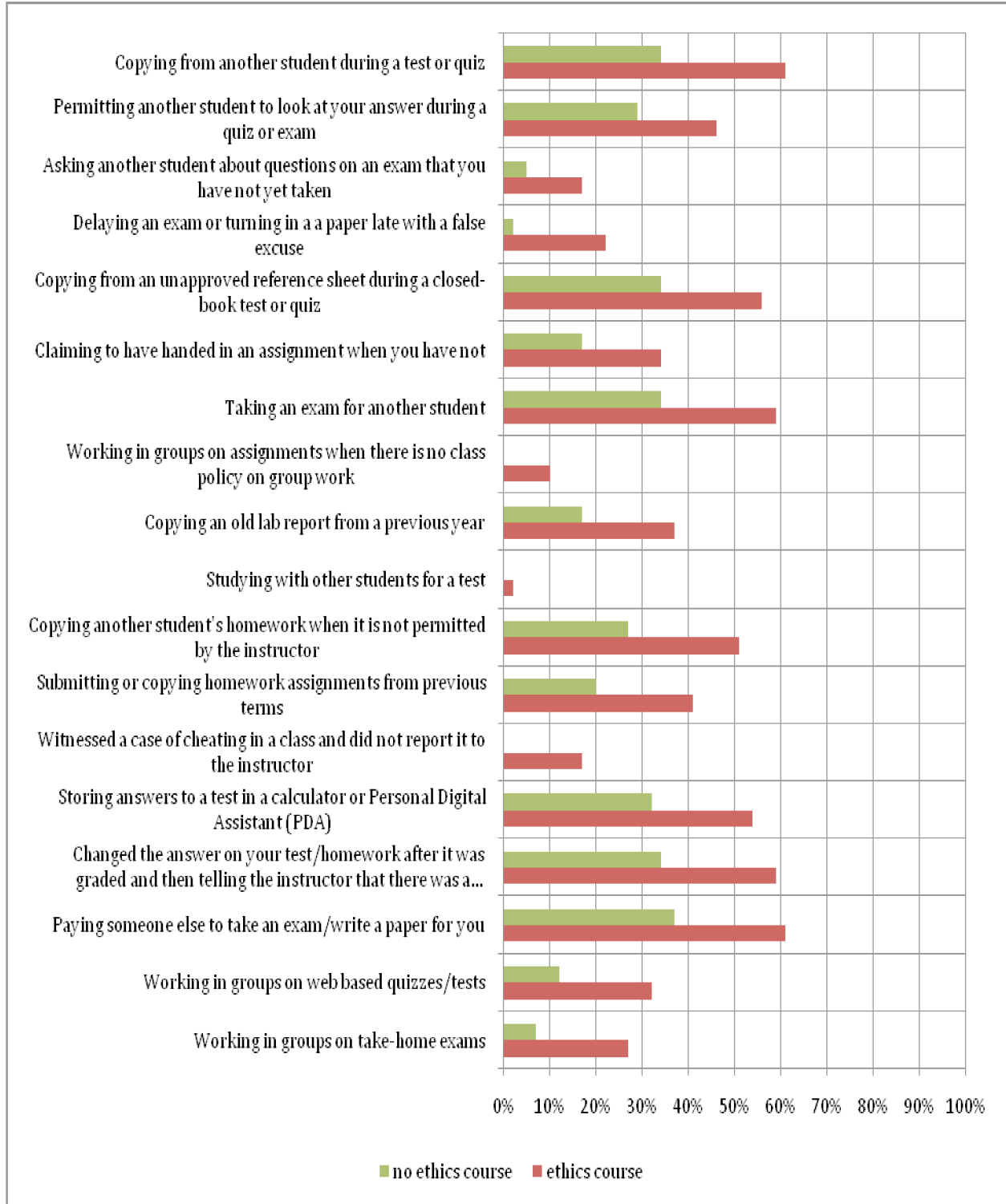


Figure 3 Percentage of engineering students who define behavior as “cheating or unethical”, with or without having taken an ethics course

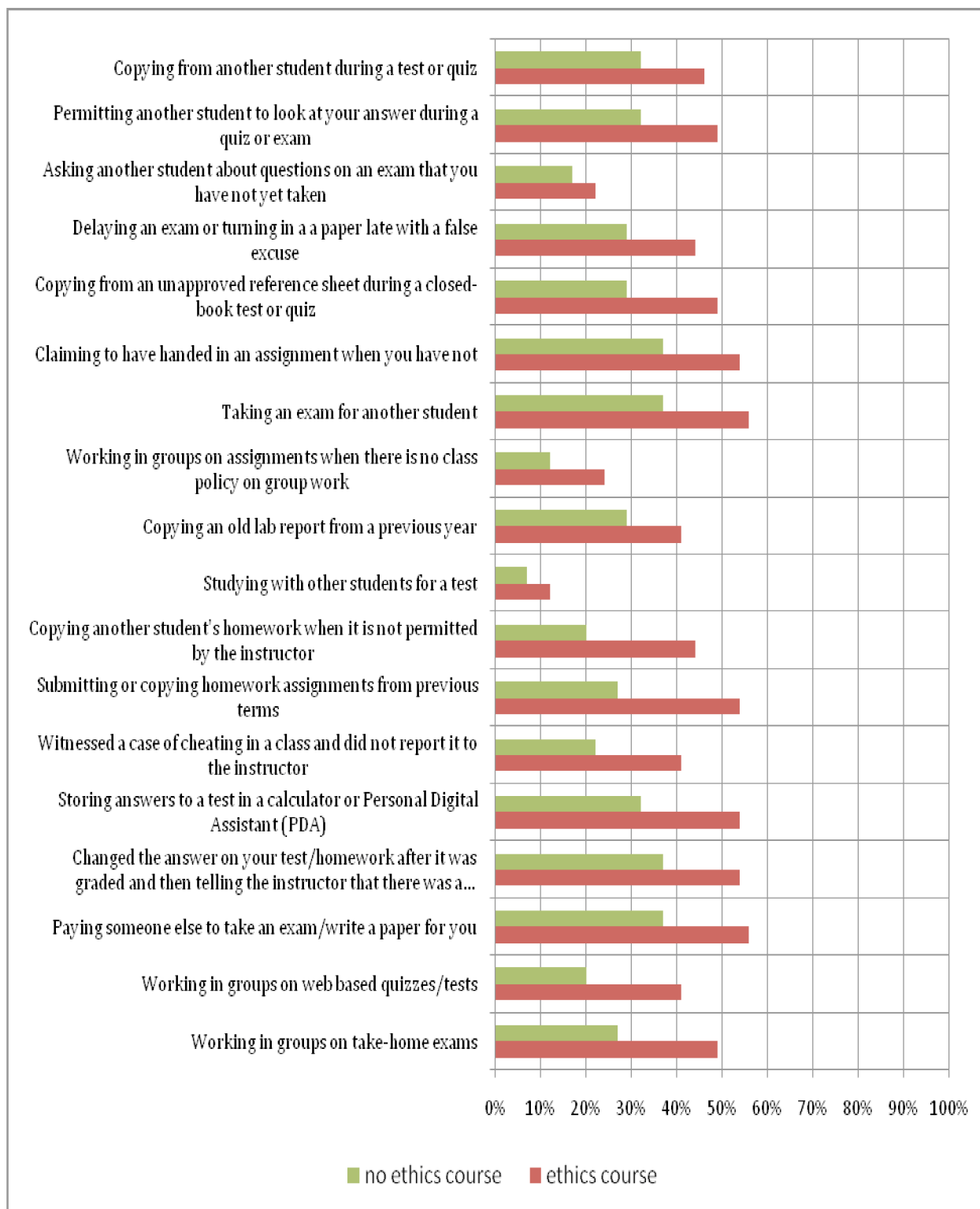


Figure 4 Percentage of engineering students who self-report NO cheating behavior, with and without having taken an ethics course

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