IT in Educational Management: Can it Support Solution of e-Cheating Problem?

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Warsaw University of Technology, Poland
rg@il.pw.edu.pl

Abstract. The paper tries to answer the question – can IT tools help to solve e-cheating problem during the course of information technologies and computer sciences. The scale of e-cheating leads to the situation that dishonest students have better grades than honest ones. None of the simple solutions known from the literature helped to solve that problem, so IT tools were used. The first part of the paper gives a critical review of the literature of the subject. In the second one comparative analysis of results of the two surveys is performed. The first one was based on a survey conducted in United States, the second in Australia. This analysis shows that there are very big cultural differences in students' attitude to cheating in different countries. The third part presents two software solutions of e-cheating problem investigated during research – monitoring software and safe exam browser. Final remarks are accompanied by raising an open question – will these IT solutions be valuable in the coming decade?

Keywords. Cheating · plagiarism · collusion · e-learning.

1 Introduction and Literature Review

Cheating is perhaps as old as education. Mavis [1] wrote about college cheating as a function of subject and situational variables in 1962 and Haines [2] about college cheating as an effect of immaturity, lack of commitment, and a neutralizing attitude in 1986 and also ten years later [3]. But nowadays due to the information and communication technology it is much easier to cheat so it starts to be a crucial problem. There were tens of papers written on this subject. The review can be found in [4]. The answer to the important philosophical question why cheating is so wrong can be found in [5]. According to Bouville cheating can be frustrating for the instructors because it can be interpreted as the direct affront. Instructors can also feel betrayed. But the most important reason is the fact that cheating can influence grades which are an information how good a student is. So finally good and fair students can have worse grades than cheaters.

It is very important to distinguish between different forms of cheating. Johnston in [6] precisely defined plagiarism and collusion as forms of cheating and illustrated this in a very intuitive way (see Fig. 1). Plagiarism is "the submission of material (written, visual or oral) originally produced by another person or persons without due acknowledgement so that the work could be assumed to be the student's own". On the

other hand, "collusion is the term used to describe any form of joint effort intended to deceive an assessor as to who was actually responsible for producing the material submitted for assessment." One should also distinguish unintended plagiarism and improper collaboration which can be treated as elements of poor academic practice.

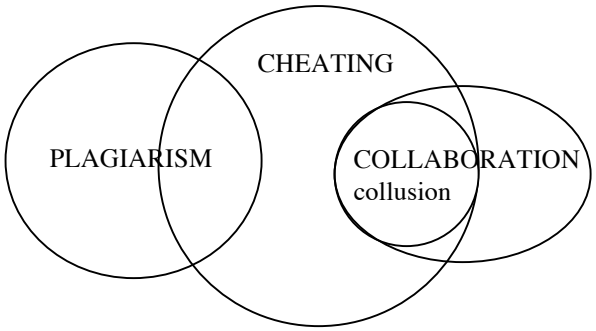

Fig. 1. Plagiarism and collusion as forms of cheating – adapted from Johnston [6].

According to Barret and Cox [7] the line between collusion and collaboration is hazy but at least students are learning something by cheating. A similar problem was investigated by Sutherland [8]. She wrote about crossing the line and raised the fundamental question – collusion or collaboration in the university group work? Dabrovska [9] expanded Johnston's classification of cheating giving various examples of dishonest behavior but the problem of avoiding plagiarism and collusion remained open. Fraser in [10] and [11] presented the problem of collaboration, collusion and plagiarism in a computer science coursework. Mahmood in [12] investigated students' understanding of plagiarism and collusion and gave some recommendations for academics. There are also books written about these problems. Carroll [13] wrote a handbook for deterring plagiarism in higher education, while Culvin [14] wrote a book on plagiarism, prevention, deterrence and detection.

There are only a few papers devoted to technical issues. Ajanovski [15] prepared best a practice document on access control and monitoring for campus computer labs. Keresztury [16] warned instructors, that in the electronic teaching era there are many new cheating methods. Khan in [17] wrote in his paper about new e-cheating technologies. Leister in [18] presented how to prevent unwanted communication in ICT-based examinations by using free software. Omer in [19] described network services application to controlling and developing computer laboratories. Uhrakova in [20] investigated the attitude of students towards electronic and non-electronic cheating. Kumar in [21] examined security issues in the learning management system Moodle. Faucher in [22] presented innovative teaching techniques and the detection and prevention of them. Harper in [23] and in [24] described the problem of high tech cheating in nurse education. None of the solutions from these papers can be directly used during tests in a computer laboratory.

During the last decade different forms of e-cheating were getting more and more popular during the classes in information technologies and computer sciences

described in details in [25] and [26]. This resulted in a ridiculous situation when cheating students in many cases had better grades than honest students. Simple pedagogical hints given by McDowell and Brown [27] like: “use strict controls”, “make the rules clear and have known penalties”, “design assessment instruments that make cheating difficult” and “develop climate that will reduce the likelihood of cheating” did not help to decrease cheating during the last years. So, the main motivation to start this research was a strong will to change this unmoral situation.

2 Two Surveys and Their Results

In order to learn what is the attitude towards cheating among Polish students two surveys were conducted. In order to learn what are the cultural differences between different countries the first survey was based on the survey from Gettysburg in USA and the second was based on the survey conducted in Monash University in Australia. Similar comparative analysis on students’ perception and attitudes towards academic dishonesty between the students in China and United States was done by Zou and Lan in [28].

2.1 Comparison of Results with Gettysburg Survey

This survey was conducted during the first week of classes in October 2015. The total number of responses was 203. The number of students registered for the subject was 221. The total number of the questions in this survey was 24. Answers on 18 of them are presented in two tables. Table 1 summarises results for questions about practice of cheating while table 2 about acceptance of cheating. All results are in percent. Results for Gettysburg are calculated as an average from the years 2008-2014.

Table 1. Comparison of results of surveys – practice of cheating.

Question	Gettysburg			2015 Poland		
	Never	Once	More than once	Never	Once	More than once
Did you ever witness cheating in your high school?	13	10	77	8	5	87
Have you ever reported another student you suspected of cheating?	79	18	3	94	3	3
Have you ever interrupted a student who was cheating?	50	24	26	72	10	18
Did you ever cheat during high school?	60	21	19	30	17	58

Table 1 shows that answers to all questions differ significantly, especially for the last question “did you ever cheat during high school”.

Table 2. Comparison of results of surveys – acceptance of cheating.

Question	Gettysburg			2015 Poland		
	Very dishonest	Dishonest, but I do it anyway	Not dishonest	Very dishonest	Dishonest, but I do it anyway	Not dishonest
Forging a teacher’s signature?	95	4	1	94	3	3
Forging an administrator’s signature	98	1	0	97	1	2
Cheating on a homework assignment	61	34	5	29	56	15
Cheating on a test	95	5	0	39	53	8
Cheating on a midterm or final examination	99	1	0	78	16	6
Fabricating lab data	80	16	4	76	12	12
Completely faking a lab experiment	96	3	1	58	37	5
Plagiarizing a paper or written assignment	99	1	0	58	37	5
Working with another student when instructed to work alone	57	33	9	25	45	30
Signing in for another student who missed class	83	13	4	73	18	9
Lying to protect another student	70	24	6	40	33	27
Lying to get an extension on an assignment	83	16	1	54	33	13
Lying about why you turned in an assignment late	78	20	2	49	35	16
Lying about why you were absent	75	21	4	43	35	21

In table 2 only answers to the two first questions about acceptance of forging signatures are nearly the same. For the rest of the questions there are big differences. For example, cheating during a test is treated as very dishonest by 95% of students in Gettysburg and only 39% of students in Poland. On the other hand, when results “very dishonest” and “dishonest but I do it anyway” are summed up the difference is not so big: 100% vs 92%. These results show that although the perception of cheating as unmoral is very similar in both countries the actual level of cheating in Poland is much higher than in Gettysburg, so some additional treatment should be undertaken. It seems also that this treatment should be focused on reducing the opportunity to cheat rather than on pedagogical issues.

2.2 Comparison of Results with Monash University Survey

This test was conducted during the last week of classes in January 2016. Total number of responses was 179. Number of students attending classes at the end of semester was 201. Questionnaire of this survey is fully based on the questionnaire used in 2000

during the survey conducted in Australia at Monash University and at Swanbourne University which results were published in [29]. The same survey was conducted ten years later and results were compared in [30]. The most important part of both surveys consists of 18 scenarios. For each of them answers are given using a Likert scale [31] with the answers ranging from 1 – acceptable to 5 – not acceptable.

Table 3. Comparison of results of surveys.

Scenario	**Acceptability**			**Practice**		
	Australia		Poland	Australia		Poland
	2000 mean	2010 mean	2015 mean	2000 %	2010 %	2015 %
Showing assignment work to a lecturer for guidance	2.07	2.21	1.68	37	42	67
Posting to an Internet newsgroup for assistance	2.07	2.28	1.77	27	34	68
Two students collaborating on an assignment meant to be completed individually	2.54	3.20	2.65	44	36	54
Resubmitting an assignment from a previous subject in a new subject	2.82	2.99	2.49	27	17	41
Submitting a friend's assignment from a past running of the subject	2.86	3.46	3.03	34	20	32
Copying the majority of an assignment from a friend's assignment, but doing a fair bit of work yourself	2.98	3.37	2.98	31	21	39
Not informing the tutor that an assignment has been given too high a mark	3.08	3.29	2.82	17	16	39
Being given the answer to a tutorial exercise worth 5% by a class mate if the computer you used has problems	3.76	4.29	3.03	7	3	9
Copying material for an essay from a text book	3.81	4.19	3.71	22	10	34
Copying material for an essay from the Internet	3.85	4.28	4.29	23	10	33
Obtaining a medical certificate from a doctor to get an extension when you are not sick	3.94	4.02	3.35	12	3	9
Swapping assignments with a friend, so that each does one assignment, instead of doing both	3.96	4.45	3.37	9	3	37
Copying another student's assignment from their computer without their knowledge and submitting	4.18	4.62	3.94	7	3	7
Copying all of an assignment given to you by a friend	4.30	4.62	3.92	10	3	10

Scenario	Acceptability			Practice		
	Australia		Poland	Australia		Poland
	2000 mean	2010 mean	2015 mean	2000 mean	2010 mean	2015 %
Hiring a person to write your assignment for you	4.51	4.62	3.97	3	1	6
Using a hidden sheet of paper with important facts during an exam	4.59	4.64	4.32	4	2	53
Hiring someone to sit an exam for you	4.65	4.69	4.32	3	0	5
Taking a student's assignment from a lecturer's pigeonhole and copying it	4.72	4.72	4.29	4	2	3

Comparison of results of all surveys is in table 3. In columns 2000 and 2010 are results from Australia and in column 2015 results from Poland. For acceptability mean value of the answers to the question "how acceptable is this scenario" is calculated and for practice percent of students who answered yes to the question "have you ever done this".

What can be easily learned from Table 3 is that in Australia a positive change has occurred among students over the decade with regard to cheating awareness, acceptability and practice. Results of a survey conducted in Poland are much worse than Australia from the year 2000. Especially big differences are in the case of the three following scenarios:

- Copying material from the book or from the Internet,
- Swapping assignments with another person,
- Using a hidden sheet of paper with important facts during an exam. (In the case of questionnaires concerning computer lab tests "a hidden sheet of paper" means using all types of unauthorized materials e.g. files.)

The first problem can be generally solved by means of plagiarism checkers on the university level. The second one should be mainly solved by instructor manually. The third one which can be generally called as using unauthorized materials during exams can be solved by means of specialized IT tools which will be described below. For the last-mentioned scenario – using unauthorized materials – worth mentioning is the relatively small difference in mean values of acceptability (4.59, 4.64 and 4.32) and very big difference in practice (4%, 2% and 53%).

3 Technical Issues

Comparison of results of the two surveys shows that cheating is a serious and important problem in Poland. Moreover, all instructors who have classes in a computer lab and in a typical class know differences in cheating possibilities. It is much easier to cheat in the computer lab when it is not equipped with specialized software. So, in order to prevent cheating two IT solutions were used. The problem of plagiarism in BSc and MSc thesis is solved on the university level while problems of individual instructors should be solved by themselves. But the solution of plagiarism problem is doubtful. There are many sites which offer automatic rewording.

3.1 Save Exam Browser

In order of prevent cheating during multiple choice tests on MOODLE Safe Exam Browser (SEB) platform was used. SEB is the result of a project lead by the Swiss National Research and Education Network and supported by funds from the ETH Board. According to the information from sebexambrowser.org portal "SEB runs on a local computer and it is connected via the internet to a learning management system (LMS). SEB consists of a kiosk application and a browser part, which are running on an examination computer. The kiosk application locks down the examination computer, the browser part communicates via the internet (or a LAN) with the quiz module of a LMS running on a server." This idea is illustrated by Fig. 2. The kiosk application locks down the computer and starts the SEB browser. The SEB browser connects with the URL of the LMS quiz page. The user interface of the LMS is reduced to navigation necessary for the test. Usage of SEB prevents using Google search engine or PDF files during test exams.

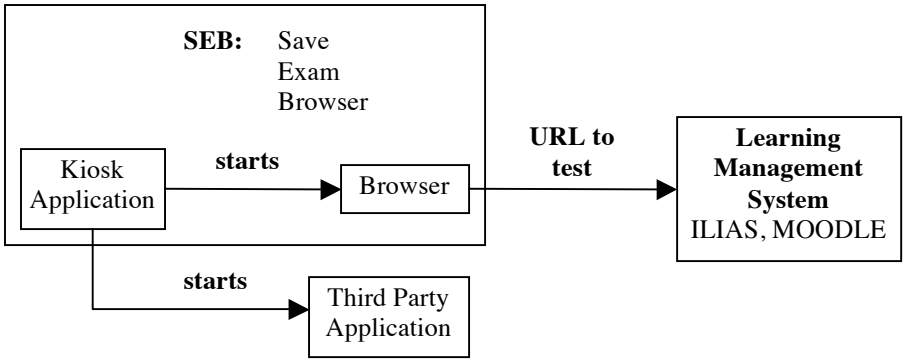

Fig. 2. Schematic illustration of an online exam with SEB and a LMS.
Source: based on picture from safeexambrowser.org

3.2 Lan School Manager Lite

In order to prevent cheating during practical tests LanSchool, classroom and desktop movement software was used. Its lite, free of charge version can monitor up to 3000 students by real time computer thumbnail monitoring. Such thumbnails can be arranged and saved to represent the classroom layout. LanSchool Lite enables also to view the students' active application and last visited website as well as a full screen view of the student's monitor. There are much more capabilities in the full version of this software. Screen Feed option allows to monitor details of students' screens from a distance. Other features like Internet History or Keystroke Monitoring create a safe environment for all students. This software reduced nearly to zero cheating in a form of collusion or using unauthorised materials during practical tests – the only authorised materials were help files.

4 Final Remarks and Open Questions

Results of both surveys show that cheating especially in electronic form (e-cheating) is an important issue in higher education. A full solution to this problem can be obtained only by means of cooperation of all stakeholders of education market – university and faculty authorities, instructors and… students. Cases when students force instructors and authorities to act actively against cheating are more and more often. But on the other hand, none of the technical solutions will work forever so continuous research in this field is necessary.

Two suggested and discussed IT solutions decreased radically levels of cheating. Although the difficulty level of tests was not changed (namely questions and practical problems were in fact the same) in this year nearly 20% of students had to retake a lecture test, while one year ago only 2% of students had to do this. Similar results were obtained for practical tests. In this case retakes did not help too much due to the fact that it is easier to memorize answers on the questions rather than understand how a spreadsheet or computer algebra system works and solve a unique computing problem. So, the final conclusion is: IT can support the solution of e-cheating problem.

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