

Beware of High Tech Cheating Techniques and Their Effects on Engineering Education

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Abstract

Cheating is an immoral way of achieving higher graders in the schools by breaking the rules and regulations and gaining an unfair advantage in this competitive environment. This dishonest behavior has been becoming a serious issue with the technological developments in many fields, and threatening the educational systems in engineering, science, fine art, law, nursing, medicine and pharmacies. Approximately, 70% of the public school students in the U.S. admitted that they were involved in direct and/or indirect cheating actions during the exams, homework, term projects, reports, papers and presentations using a variety of cheating techniques. These include all kinds of using cell phones, camera phones, ear phones, MP3 players, graphing calculators, iPad, texting devices, monitoring devices, multifunctional watches, etc. These issues are more curtail for the online courses, which have been gaining much popularity worldwide. In the present study, we have evaluated many of these high tech cheating systems and devices that have been a potential threat to the engineering education, and reported the possible ways of improper use of these items in the colleges. This study offers some opportunities for the faculty members, teachers and lecturers to take actions, prevent such incidences and increase the quality of the engineering education.

Keywords: High Tech Systems and Devices, Cheating, Threats, Engineering Education, Prevention.

1. Introduction

1.1 General Background

"It's important that the research community improve perhaps as quickly as the cheating community is improving," was quoted by Dr. Neal Kingston, Professor in Psychology and Research in Education from the University of Kansas, who also organized a Conference on Statistical Detection of Potential Test Fraud [1]. It is basically true. Cheating has existed and has been an issue since the eternity. The standard testing methods that are adopted in schools and colleges have a high scope for cheating. Students have always come up with innovative and many very amusing ways to dodge the situation and cheat. The buddy method has been the oldest where in one can cheat off the buddy's paper. Some of the other more typical ways include the shirt cuff method where in the student has a variety of data and formulae behind the cuffs of the shirt or taking notes on the desk prior to the exam (Figure 1a and 1b) and cheating off it during the exam, and many also used the big hat method where in the eye is concealed and glancing at the neighbor's paper is easy.

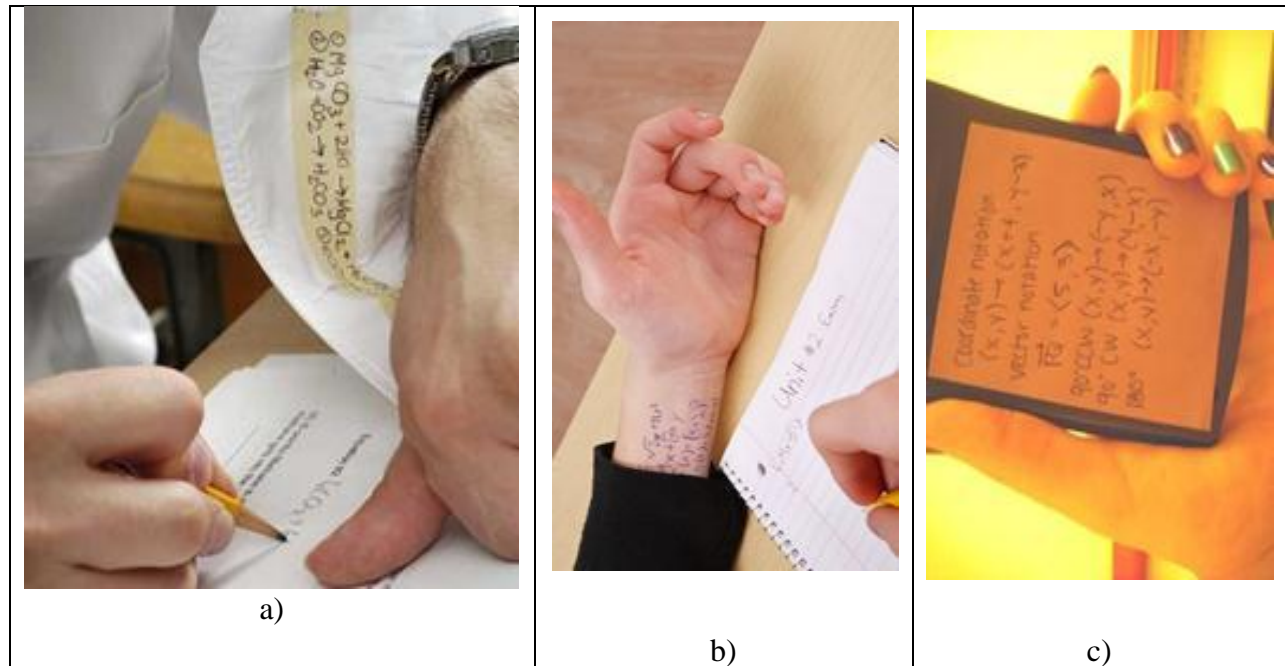


Figure 1: Various cheating ways in the colleges: a) the shirt cuff method, b) the long sleeve method, and c) the calculator cheat sheet method.

1.2 Smart Phone Applications Used by Students in Engineering Field

There are several applications for solving various problems for engineers related to electrical, electronics, hydraulics, and calculus which are commonly used by engineers and engineering students. With an access to the smart phone during the exams, the students can access these applications and solve questions using various methods:

HVAC Professional: Heating Ventilation and Airconditioning (HVAC) is a comprehensive formulator that includes all 200 formulas and 18 charts, as well as the complete the International Mechanical Code. It has a variety of sections including air change, airside, boilers, BTU conversions, ductwork, energy values, heating design, heating requirements, humidity, loads, pumps, steam, temperature, waterside systems, and area calculations [2].

LuxCalc Fluid Prop: This application is used to perform the thermal analysis by mechanical engineers to calculate the thermophysical properties of common fluids found in heat transfer books such as specific heat, absolute viscosity, kinematic viscosity, thermal expansion, etc. [3].

Graphing Calculator: The Graphing Calculator turns the iPad into a high-resolution function plotter and scientific calculator by plotting multiple equations on the same graph [4].

TouchCalc: This is another excellent favourite for analysis in scientific mode, arithmetic mode, logical mode and statistical mode [5].

Mechanical Engineer: This is by far the most favourite of engineering students containing over 300 mechanical engineering formulas and over 300 additional conversion formulas including

bearings, belts, boilers, brakes, clutches, elevators, gears, fluid power, heat transfer, internal combustion, kinetic energy, power plants, shafts springs, and vehicle drive [6].

Engineering Professional: This application is an excellent reference tool for any engineering student by combining over 650 formulas in chemical, civil, electrical, environmental, hydrology, and mechanical engineering [7].

Engineering Unit Conversion: This unit conversion tool is designed for engineers, scientists, and students. It offers dimensional and unit conversions of all kinds that can be used during the exams and other activities [8].

2. Different Methods of High-tech Cheating

As testing methods progressed and the authority grew more and more vigilant, the cheating methods became more and more high tech (hi-tech). As calculators became popular and widely used in school and college education, they also became useful tools for cheating. Some of them are as simple as a bunch of sticky notes behind the cover of a scientific calculator used during the exams (Figure 1 c), while the others involve the use of more advanced calculators that have preprogramming abilities for the equations and drawings. This paper discusses the more innovative and hi-tech modes of cheating used by students during exams and other educational activities.

2.1 Use of Smart Phones, Texting Devices, IPODS and Internet

Smartphones have become a major technological front that many people cannot live without. In year 2012 there were about 155.1 million U.S. smartphone users which accounts for a whopping 49.4% of the U.S. population [9]. It is like a personal computer which fits into everyone's pockets. Almost every student owns a smartphone with access to the internet these days. A survey that was conducted by CourseSmart which is the world's largest provider of e-Textbooks and digital course materials, found that college students can't go long without checking their digital devices, including smart phones, laptops and more [10]. According to the research done by HackCollege.com, almost 57 percent of college students use smart phones and 60 percent of those feel addicted to their phone [11]. The use of smart phones has changed the classroom teaching environment. When the use of smart phones is so wide spread among students, it is not surprising that one of 4 students admits to direct or indirect modes of cheating during an exam or a quiz using a smart phone. What is surprising is that many of them almost 25 percent do not even realize that it is still considered a form of academic dishonesty. They do it out of a habit.

2.2 Use of Tablets

Tablets are not as popular as smart phones for cheating during tests, exams and other educational events. This is primarily because they are bigger and bulkier than smart phone and hence difficult to hide in the classrooms. Tablets or ipads are widely used in a variety of teaching activities mainly due to their friendly user interface and the possibility of having a wide variety of learning based applications for all age groups.

2.3 Is It iPhone or Calculator?

Many students feel pressurized to get higher grades and most of the tests especially in the engineering field require the use of calculators. The students are allowed to get calculators to the exam halls for several mathematic calculations. However, as the authorities get more stringent about bringing in smart phones and other devices, the students become more and more innovative on cheating. On the first look this simple docile gadget looks like a normal scientific calculator but it is very interesting how it slowly converts into an iPhone as shown in Figure 2. The calculator is basically a cover for the iPhone which can be removed in parts and the button 9 works as the home button. It is sold by a number of vendors on amazon and ebay for anything between \$4 and \$50. The students fool the authority into thinking that they are using a normal calculator but instead use a variety of phone applications and the internet to ace their tests.



Figure 2: An iPhone having a calculator top cover.

2.4 Spy-cheat Kits

These kits are widely advertised on the internet especially on YouTube. The YouTube video gives a step by step account of how the device can be used during the exams. It is marketed by IGIS Electronics Technology on www.spycheatstuff.com, and is shipped globally. They are available for as much as €145 (\$186) for the whole set. Some of the products consist of an MP3 player which can record lectures and play it again during the exams. The earpiece that is used is tiny and invisible to the outside world. They are wireless and measure 5x5 mm. They can be in the ear canal like tiny buttons. These ear pieces are magnetic and so can be removed from the ear by taking an iron object like a key close to it. The other set consists of a Bluetooth module which can be connected to any Bluetooth mobile phone, a transmitter and a microphone (3mm). All these can be worn inside our usual clothing. The questions can be dictated to a friend sitting elsewhere simply by calling him through the Bluetooth device, and then he can dictate the answer back which can be heard from the invisible Bluetooth earphones (Figure 3). Similar to this device there are also a Bluetooth pens, glasses and watches which have a microphone attached to the pen and is connected to the similar tiny wireless earphones. It relays all the information to another person who sends back the answers to the examinee (Figure 4).

2.5 Transparent Notes on Watch

It is popularly known as the watch hack on YouTube with over 870 thousand views. Here the data is printed out on a sheet of glossy paper. A sticky transparent tape is put over it and peeled carefully so as to let only the data stick on it. This sticky tape is then stuck on top of a watch and the extra ends are skillfully removed off. This way the student keeps looking at his watch to cheat and nobody suspects anything. Apart from that there are several Hi tech watches available in the market with a small screen. It is internet enabled and the students are provided with answers via watches during the exam.

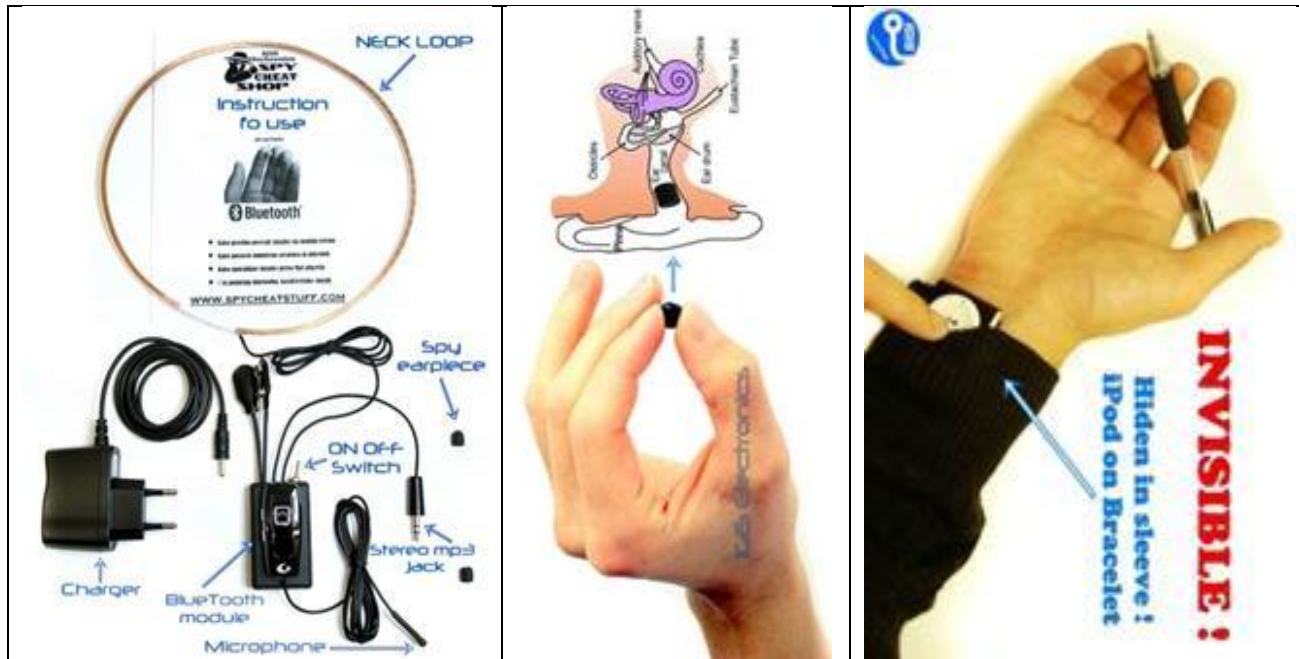


Figure 3: A cheat kit that includes an earpiece a Bluetooth enabled MP3 player under the sleeve.



Figure 4: Bluetooth enabled pens, glasses and watches wit attached microphones.

2.6 Editing Soda Bottle Covers

Soda or water bottles are also very common during exams. Almost everybody has one on their table to watch carefully, because some students came up with this sneaky idea of using these bottles for cheating. They scan the labels of the soda or water bottles and using the Photoshop edit the labels and put in their cheating notes (Figure 5). It is then printed out and stuck back on to the soda bottles, which look very real.

2.7 Hacking Computers

When cheating during the exam became impossible, students have tried to hack the teachers' computers and get the control of their transcripts. Recently, three students from the Prescott high School were caught. They purchased and attached a key logger device to the USB port of several teachers' computers. They got hold of their user ID and password when the teachers logged in. Using this logging ID and password they got access to their grade-sheets and changed their grades to an A. It happened for quite a long time without notice until the teacher realized that the grades of a certain student were very inconsistent with his performance in the class. The students were accused of fraud are presently spending their time in juvenile prisons [12].



Figure 5: Cheating using water and soda bottles during the exams.

2.8 Use of Button Hole Cameras

In a different case of high-tech cheating, the students had button hole cameras attached to the shirts and used mobile applications to deliver photographs of question papers in high resolution to experts at a different location. They then dictated the answers back to the students having internet enabled devices within their clothing.

3. Effects of Cheating for Online Courses

Many courses are becoming hi-tech and online in many fields and this trend will continue in the near future, as well [13,14]. The college students who are taking online courses have the highest tendency to plagiarize by using unauthorized notes/books, completing exams jointly and allowing another person to do the exams and other coursework activities [14]. Since the

instructors cannot control the exams, homework and projects at home, the students basically decide whatever and however they like to complete them. Recently, it was reported that over 70% of the college students who take the online courses have admitted cheating during the exams and quizzes regardless of the instaurations on the uses of books, notes, and other devices mentioned above [14].

Like traditional students, the online students prefer to cheat for a number of reasons, such as ease access of cheating materials, less control and stress, unawareness of online course rules and regulations, improving GPA, desire to have higher grades for various reasons, and so forth. In order to eliminate online coarse cheating events, traditional colleges and online colleges ask students to sign the honor codes, prepare independent open ended questions, and in-class exams in the evenings and at the weekends. Families, colleges and state and government agencies are deeply concerned about these detrimental issues, and have been seeking clear solutions for this academic dishonesty at schools [13, 14, 15, 16].

4. Analysis and Ways to Prevent Academic Dishonesty in Engineering Institutes

According to a study by Harding et al., the extent of cheating in high school is a strong indicator of cheating in college and that engineering students also reported cheating more frequently than other students [17]. In one of the more recent studies conducted by Meade, roughly 74% of engineering students said they had engaged in some forms of academic dishonesty while in college, compared to 67% of science students and 63% of humanities students [18].

It is interesting to note that students often believe that their peers are cheating at a level in excess of their own. The result is that students create a self-fulfilling insight in which they justify cheating in order to keep up with other students [19]. Some other studies have suggested that women tend to cheat lesser than men do, but the data is not consistent and there is no proper relation between cheating and gender. Apart from that students appear to cheat more frequently as they graduate from freshmen to seniors [20]. Older non-traditional students cheat less often than their younger peers [21]. No connection has been found between cheating and religious beliefs according to Nowell, et al. [22]. Some students place the blame for cheating on faculty for irrelevant course material, poor instructional quality and a lack of connection between assignments and course material.

According to the educators, the biggest problem they encounter is plagiarism, with students copying and pasting someone else's work from the internet and not appropriately referencing them. Many times this is unintentional and occurs because they may not be appropriately trained and cannot clearly differentiate between using internet as guidance and using somebody else's work as their own. However, cheating during the examination still counts as a conscious intent of academic dishonesty.

The first and foremost step should be to set expectations. The students should know that the instructor considers cheating in very low regard. Also, during the course of teaching the teacher could be polite but strict and there by earning the respect of the students. Once the teacher earns the students respect, they regard him highly and do not indulge in academic dishonest behaviour. The instructors should balance the homework or study materials. They should also make it

meaningful because many students do not want to put any effort since they feel that it would be of no use to them. Their work assigned should be challenging – not too difficult and not too easy [15].

Varied examination techniques can also be used such as open book exams, multiple choice computer based tests, random questions from a database, stress on case studies and class participation, written assignments and presentations, peer evaluation, and alternate seating. Apart from that students can be encouraged to submit their work electronically for the SafeAssign. The proctors should be well trained and keep a strict watch and look for signals of cheating. There are various signs which are typical in cheating such as wandering eyes, possible sign languages, out of the normal coughing, foot/pencil tapping, bathroom breaks, wearing a cap, dark colour glasses, etc. The signs do not necessarily mean that someone is cheating but they could give a subtle indication. The proctors must watch those signs and be alert at all times. Bottles or any kind of food should either be not permitted or provided by the examining centre. All the calculators should be examined for any hidden programs and any cheat sheets attached to them.

The rise of cell phones and their potential use for cheating has prompted the increased security measures. There is also a concern of students taking pictures of test items and post them on social media sites. Many schools collect cell phones from students during testing periods. But in spite of that there are many who keep two separate cell phones - one that is turned in and the other that is used for cheating. Some schools in Europe have cell phone detection devices in exam centres. They are accurate and it is almost impossible to have an electronic device inside the examination room.

Nowadays, many schools use iPads to conduct interactive exams, but iPads could be a big source of cheating. Apple has now come up with some added controls to Guided Access that lets teachers turn off the ability to use Safari to look up answers while taking a test. One can disable and enable all sorts of custom controls. There is a mode called the ‘Single App Mode’, where a student can only use the application that’s delivering the test. There is also a program called the Cedars’ iPad program by Fraser Speirs, used in some Scottish schools. It starts off by wiping iPads and starting from the scratch. Then everything is switched off, including Safari, YouTube, app installation and iCloud. Mail remains active, but is locked to prevent new accounts from being added. The schools servers also blacklist the MAC addresses of the exam iPads for printing, so a device is connected to an ad-hoc wireless network instead of the internet [16]. Apart from taking very strict and dire measures against defaulters, there should be a way in which the schools and colleges are able to provide counselling and guidance. They should be taught the essence of knowledgeable learning, time management skills, confidence and respecting the system.

5. Conclusions

Academic dishonesty is a stigma in an education system. With the education system going hi-tech, the cheating methods are also going hi-tech, too. They are becoming more difficult to detect and control the hi-tech cheating. The pressure of getting good grades, placements, scholarships, social expectations and competition drive a student to cheat more. Many also cheat because they feel unfairly disadvantaged due to others who cheat undetected. Smart phones are the most

popular tools for cheating nowadays. There are several videos and websites selling cheating kits in the market that are doing very well. From the several websites and blogs written by unanimous students, it is evident that many take pride and consider cheating a hi-tech skill. They get increasingly innovative and have devious means to get a past undetected. Many institutions use cell phone detection devices in examination halls to detect any kind of electronic device, but besides that it is extremely important that instructors set an expectation in the class about academic dishonesty and make their coursework meaningful and challenging, so that the students have a respect for the subject and the authority. Apart from that, it is also encouraged to have alternative grading and testing methods, such as presentation, peer-evaluations, class participation, attendance, and random question sets for students not to consider cheating.

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