

# AVOIDING PLAGIARISM IN COMPUTER SCIENCE E-LEARNING COURSES

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## Abstract

*The online knowledge testing and evaluation pose one of the main parts in the area of distance education. Their greatest problem is plagiarism. The authors deal with the term definition of the plagiarism and go into some important facets of the plagiarism prevention and revelation in details. They analyze actual state of the fight against plagiarism in Slovakia and in other countries. They try to classify the kinds of online testing and evaluation activities that are supported in contemporary LMSs in the second part of the paper. They describe their own experience in plagiarism reducing in computer science e-learning courses. Finally, the authors stress out the important role of plagiarism prevention and bring several methods that could reduce the risk of plagiarism in e-learning.*

**Keywords:** plagiarism, programming, e-learning, anti-plagiarism system.

## Introduction

The electronic education (e-learning) and LMSs markedly contribute to the fulfilment of the dreams of many pedagogues, cyberneticists and theorists ((Pressey, Skinner, Crowder, Pask and many others) at the beginning of the third millennium. They were introducing their models in the early 20th century, but they had not sufficient tools to their effective implementation at that time.

E-learning has brought many other automated components to the programmed learning besides the opportunities to study self-paced and to use adaptive components (monitoring of the educational process, assessments, automated tests corrections). The Internet has markedly simplified study materials distribution and has improved communication between student and teacher. The electronic study materials make possible quicker and simpler actualization and multimedia integration.

The distance and blended learning in the narrow conjunction with e-learning represent modern area of the contemporary education. Many pedagogues and “pseudo pedagogues” have built their reputation on it. There were a lot of financial and human resources to the e-learning implementation at the universities invested, but the result of this effort was often very insignificant. The main reason is the finding that e-learning is only other approach to knowledge presentation and it is not a cure for the absence or topicality of the learning content.

When we consider the results of the analysis of the Gartner Group from the university management’s point of view, we can see the position of the e-learning has changed during the last few years.

E-learning has undergone from its state of overestimation to the state of an important but not dominant part of the classical university educational portfolio (Vrana, 2008).

The employment of the LMS has demonstrably improved the motivation and exposition phase of educational process. The distance education potential is often unused in the phase of the fixation and diagnostics at the university level of the education. The usage of repeating, testing and assessing features of the LMS are the main problems that delay effective and complex exploitation of e-learning in the distance education. The efficiency of these features embodies in the sufficient amount of the various (randomly generated) tasks and assignments. Accordingly, the efficiency encounters the problem of human factor and the particularity of the subject. They both require modification, in the limiting case extension of the existing LMS solution. These problems are solvable now and contemporary LMSs are prepared to nowadays situation (Kapusta, 2006) and offer tools for user's modification.

The complex achievement is more exacting. If we concentrate on the university education, we recognize each consecutive testing, final and second exam require a physical presence of the student in the time and place. But it is in the steep conflict with the basic paradigm of the distance education.

The proctor centres provide other worldwide alternative. Their main advantage is being closer to the student, but they increase the study costs at the same time. The greatest problem braking the online testing and student assessment and evaluation is plagiarism – incomprehensible in modern world, but very prevalent and ubiquitous at the universities in the Central Europe. Some solutions (“Testing and Assessment Online”, 2009) could bring certain revival, but they do not represent world-wide acceptable solution.

## Plagiarism

There is a great deal of the term definition of plagiarism in the scholar literature. Many universities have their own definitions of this term in their academic orders and academic ethics memorandums. These definitions are often very similar and vary only in some details.

We introduce the following definition of the plagiarism for the purpose of this paper. The plagiarism is an illegal imitation or transfer of artistic or scientific work without information about its original work or author (Maurer, 2006; “What is Plagiarism”, 2009):

- turning in someone else's work as your own,
- copying words or ideas from someone else without giving credit,
- failing to put a quotation in quotation marks,
- giving incorrect information about the source of a quotation,
- changing words but copying the sentence structure of a source without giving credit,
- copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not (see our section on „fair use“rules).

### *The Plagiarism in the World*

Although the problem of imitation, cheating and plagiarism in general is as old as the mankind, the disclosure of the plagiarism at academic sphere has been sporadic and quietly accepting state in the previous last decades. We know today that the plagiarism is a serious problem. The combat against the plagiarism requires the further education from the beginning.

Teachers in a lot of countries have recognized that the restriction of the plagiarism requires primarily the cultural education from its first potential opportunity. The first step should be the “agreement” between the educational institution and a student. The agreement sets the limits for the plagiarism's definition and the approval in the case of its provability.

Signing the agreement each student agrees with the outcome and penalties in the case of breaking it. The first information about plagiarism has come to the student's mind at the secondary school so that offers to build up correct awareness and later to reduce plagiarism in his/her study and career.

The automated plagiarism detection is realized with the support of the relatively small group of the anti-plagiarism systems. They work on the principles of the text comparison between the examined document and the large database of electronic documents and available web pages. The best known universal anti-plagiarism systems are *iThenticate*, *CopyCatch*, *Urkund* a *Ephorus* a *SafeAssign*. They are able to be integrated into well-known LMSs. The *Plagiarism-detector* offers a very interesting solution. It uses Google database, cuts the examined document to the chunks and than compares them against the database (Maurer, 2006).

There has been developed a specialised system at the Masaryk University in the Czech Republic based on the combination of the National register of the bachelor and master thesis and anti-plagiarism system.

### *The Plagiarism in the Slovak Republic*

The combat against plagiarism is only at the beginning in Slovakia. There were several accusations of plagiarism in the press within last three years, but they were nearly always suppressed. We can indicate in our experience and our knowledge of the well-known order of the plagiarism supporting web sites (Repa, 2009) that these cases are only the top of all.

The plagiarism of the final and qualification thesis is the most protrusive and painful problem in Slovakia nowadays. The vindication of these theses is the necessary condition for successful finishing university study. The problem rises when the student obtains the higher qualification and then pecuniary benefits against this background.

The universities solve legal facets of the authorship of the final theses separately. For example, the students at the VŠM/University of Seattle in Bratislava are preannounced about the fact that their documents, projects and theses will be checked with the anti-plagiarism system, namely with the system TurnItIn (Hvorecky, 2008; Repa, 2009).

The Economic University in Bratislava is the next university that presents the combat against plagiarism (Skalka, 2009). The management of the university is planning the control of the bachelor and master theses in the academic year 2009/2010. They would like to upload to the system seminar works later.

The national project intended to collection and originality evaluation of the theses is starting at this time. The researchers believe this project improves the quality and assures the originality of the theses, because it would be illusion to assume that plagiarism does not exist in Slovakia, as states in (Skalka, 2009).

### *Plagiarism in the University Computer Science Courses*

If we mention the statistics of the revealed cases of the plagiarism at the Department of Informatics UKF in Nitra in more details, we can encounter an interesting paradox – the more exacting requirements of the subject, test or assignment are, the more rare similar solutions exist.

We can generalize this fact with impunity, because the following reasons are common for all areas of the students' activity:

- Difficult assignments usually require understanding the fundamental nature of the problem by the student and its formalisation through the use of the appropriate tools. This is not usually possible without prior student's knowledge and skills. If the student has not the elementary knowledge how to solve the assignment, he does not try to solve it in a general way regardless of its mandatory or optional character.
- Non-trivial solution cheating – difficult assignment is lengthy to mechanical transcription and student is not able to correct mistakes that he has made during this process.

Some students try to replace missing skills and knowledge with the generality of phrases and chunks of program code. They often try to hand in other assignment as they have assigned. We recommend ignoring these partial "pseudo" solutions and predefining criteria for entire right solution. The works ne-

cessitating creative thinking, expression of opinion, information resources analyse are the analogy of the difficult assignments in other subjects.

The final, qualification and seminar theses represent other specific category. But, we can not understand these theses as a direct part of the distance education. Additionally, mentioned problem is out of the scope of this paper.

We can come to the conclusion in the consideration above mentioned text and our own experience that plagiarism is less the problem of the specialized and vocational education than the university education. The vocational education is characterized by solving the non-trivial assignments, often time consuming and easily verifiable in work. Additionally, enough experienced and skilled people take this education or training more often as an inexperienced one and such people do not need special individual help.

The plagiarism, cheating and imitation during the test phase is a routine situation at the everyday education at our schools and universities. It is bewildering because this part of the education disposes the potential to apply the complex model of distance learning and so to achieve high spatial and technical saving and effective utilisation of the manpower.

### **The Plagiarism Elimination in the Distance Education**

As we can see from the aforementioned text, a friction area between student and teacher comes into existence in the diagnostics phase of the learning. The fruitfulness of any kind of the education realization (and mainly in distance education) depends on the elimination of the plagiarism. If we take into account that plagiarism detection and its penalisation is only the consequence of the underestimated role of prevention, we can point out that it is necessary to make provision for heterogeneity and personalization of the learning content and tools for students' evaluation already in the process of e-learning course creation.

#### *The Kinds of the Knowledge Testing and Evaluation in E-learning*

If we concentrate on the opportunities that LMSs offer for distance and blended learning, we find out that we have numerous activities and modules that improve learning, but do not solve the problem of plagiarism themselves. The application of individual tools, activities and methods in a particular LMS in terms of the combat against plagiarism is on the shoulders of the course creator or teacher.

The classical testing belongs to the essential part of the diagnostic phase of learning. The online equivalent of the testing procedure of contemporary LMSs belongs to the most sophisticated parts of such a system. It represents probably the most widely used and the quickest way to test students without prejudice. We should think over the automated support of the test control since the beginning of the e-learning course creation due to the expected time-consuming nature of the control process. For example, the LMS Moodle disposes several variable options for defining the test questions. The details can be found in (Cápay, 2008), we summarize them in brief:

- The question type with one or more correct answers – we recommend to use more than one correct answer and penalties for wrong answers.
- The direct or calculated question type – the student answers to this question in a single word or phrase or in single number.
- The questions with the nested answers – this question type is similar to the direct type of question, but the filling of the correct answer is executed directly in the text of the question.
- The matching question type – student must bind correct pairs of questions and answers.
- The error correction is an infrequent question type, because it can end in misunderstanding the basic relations and connections. This question type has irreplaceable place in the area of the programming languages teaching.

Of course, there are some more specific and more interesting kinds of knowledge evaluation that bring more profit for a teacher at the same time. We describe only these that are suitable for distance le-

arning and have been supported in the contemporary LMSs:

- Team work – it can be organised in the arbitrary form and activity rate:
  - Hierarchical organisation – students are divided into groups with the team leader. It is a time-consuming form of team work and therefore we recommend using it only once or twice in an academic term. If some team-member does not want to collaborate, we recommend students to exclude him. Consequently, the excluded students create another team. The weakness of this approach consists in the insufficient encompassment of the learning content substance due to the averaged knowledge of the team members.
  - Role assignment. The tutor of the course assigns the role to the students. Each student gets the assignment that regards the student's prior knowledge and skills. This approach lays stress on the individual student's knowledge improvement. This approach has also some shortcomings. It taxes the teacher heavily to prepare assignments with variable difficulty and their adjusting to each student.
  - Information gathering about the students from miscellaneous collaborative activities. We assume that students have equal conditions and assumptions to solve assignments in the sufficiently general in scope, examples include dictionary writing or wikis.
- Online discussions (forums) create a separate and content-rich category. They allow the exchange of students' opinions and their evaluation regardless of the subject area. The main advantages of the online discussions are sophisticated management and history archiving.
- Peer-to-peer critical and objective evaluation. It may be in relation to online discussions or can stand for the separate category of the online activities. The students learn from others and find their own limitations.
- The role acting is a very interesting and alternative tool for creating specific groups of students and simulating the real situations, for example customer – supplier, student – teacher, manager – employer, and sympathizer – opponent.
- Problem solving from the students' environment gives students the immediate feedback continually and motivates them to successfully finish the assignment.

#### *The Risk of the Distance Online Testing and Evaluation*

The indisputable risk of any form of knowledge evaluation, especially in distance learning, is plagiarism. We can meet the plagiarism in miscellaneous forms. We try to organize the students' sins to the following categories:

- The utilisation of the disallowed study materials – students are trying to use drawing card or find solutions on the websites. We are witnesses of the situation when the student tries to hand the work of other student unknown to him/her.
- Cheating is the most frequent form of plagiarism. It sometimes takes place with or without the author's agreement.
- The utilization of the advisors or substituent is very serious and unacceptable form of plagiarism. The substituent may be the direct participant of the testing in face-to-face or distance learning and teacher may not know him/her.

#### *The Decrease of Risk of the Plagiarism*

We can see the problem of the plagiarism during testing phase from the two perspectives. From the side of plagiarism prevention:

- Assignment personalisation – each student obtains an original assignment. The assignments must roughly have the same difficulty and they should be controllable and evaluated automatically by the reason of expected more students (Skalka, 2005).

- The restricted access to other application on the testing computer. Less skilled users do not negotiate such a barrier and so they must rely on their own experience. But this solution is relatively easily breakable in the distance education with the parallel usage of another computer.
- Task formulation in such a way that they are not solvable by the mechanical using of existing sources or solved tasks and they require their own creative thinking.
- Permission of the arbitrary access to the known sources can reduce the stress during testing. Its combination with time restriction gives rise to the restriction of the number of available resources. Students need to read through the available resources before test, because they will not have enough time to do this during the test in the future.
- Biometric sensors represent the future of the on-line plagiarism detection. The user will be uniquely determined within the all testing period.

From the side of plagiarism revelation:

- Recording the testing procedure with camera. This procedure guarantees its own accord some level of the barrier. We can say in our experience that we have made decreasing attempts at fraud when we have monitored the testing procedure. On the other hand, if students get accustomed to the monitoring and their attempts go unnoticed; this activity is not worth having.
- Specialized editors that have limited ability to copy or paste text. They are able to uncover the differences between the student's style throughout the term and at the time of the final exam (Vamplew, 2005).
- Reveals the resemblance between referred students' solutions by tutor or by automata. The automata analyses the textual or visual content. Some opportunities have been sketched in (Skalka, 2005), the extent of this problem exceeds the scope of this paper. It is possible to use web browsers or anti-plagiarism system in the case of long documents.

### *Organisation Background*

The distance education and especially knowledge assessment must be supported by the legislative level of the educational institution. Academic order and disciplinary order are basic documents in this area in the case of Slovak universities. It is necessary to qualify the definition of the term of plagiarism and academic ethics in the academic order. It is necessary to define strictly disciplinary actions and penalties in the disciplinary order in the same way.

On the other hand, it is crucial to prepare teachers in compliance with the abovementioned documents. They should not create a ground for further proliferation of the plagiarism as we can see in our days. We flatter to claim the experience of the private Slovak universities that have reduced the plagiarism among students in a couple of exemplary sentences (Hvorecký, 2008).

### **Conclusion**

The experience in reducing in plagiarism in many countries witnesses that this fight is a very time consuming process. Therefore, the teachers endeavour to do prevention by sufficient students' awareness, calling the attention and taking about sanctions in advance already at the secondary schools. In the present, when computers and the Internet provide myriad tools supporting and simplifying plagiarism, tolerance of plagiarism at the beginning of the study leads to the complete acceptance at the next levels of education (bachelor, master and doctoral theses, scientific and artistic works).

It is necessary to give rise students to correct citing from under secondary school level. Students should always refer to the original resource of idea or inspiration. This is a primary but a simple step.

If we fail to prevent plagiarism, but we can reveal it, we must predefine the penalties and sanctions. Each charged person must have the right to attorney and additionally we must distinguish between wilful or isolated (sloppy citing, unlisted bibliographic resource) plagiarism. And the one opened question is what we will do, if we uncover the plagiarism as late as the academic title will be granted.

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