TEACHING BY MEANS OF PRACTICAL PROBLEMS SOLVING WITH A SOLUTION GUIDE

Jan Lánský[1], Hana Hoffmannová[1], Renáta Hájková[2]

The University of Finance and Administration,
[1]Department of Computer Science and Mathematics, [2]Department of Languages,
Estonská 500, 101 00 Prague 10, Czech Republic
zizelevak@gmail.com, h.hoffmannova@email.cz, renata.hajkova12@gmail.com

ABSTRACT

The content of the subject Application Software at VŠFS (University of Finance and Administration) includes three basic applications MS Word, MS PowerPoint and MS Excel. The paper deals with the new concept of teaching this subject by means of practical problems solving with a solution guide. We have written two Collections of Practical Problems with a Solution Guide [8, 9] to facilitate the teaching. Each collection includes 11 problems (Word, PowerPoint, and Excel) which correspond to the syllabus of the subject. This paper explains the principles of the above mentioned new teaching method and its comparison with the up to now used classic method.

KEYWORDS

practical problems with a solution guide, Word, Excel, PowerPoint, plagiarism, AUTOPOT

1 INTRODUCTION

Most universities in the Czech Republic have introduced subjects teaching basic MS Office applications. The knowledge of MS Office is crucial for university students while fulfilling assignments in other subjects. The students use MS Word to write seminar papers and later also Bachelor's and Master's degree theses. MS PowerPoint is used to present the results of individual or team projects and also for Bachelor's and Master's degree thesis defence. MS Excel is used in subjects concerned with statistics and finance. The knowledge of MS Office is essential for university graduates if they want to assert themselves in the labour market. The graduates will use MS Office to create a great number of files; they will often use mass correspondence and forms. They will use MS PowerPoint to present the results of their work within the company and a well prepared presentation may also help to gain new clients. The graduate will, on daily basis, work with data stored in MS Excel, analyse and evaluate it.

The University of Finance and Administration provides subjects teaching the applications Word, Excel and PowerPoint. The subjects are included in the first year of Bachelor's degree program for all fields of study (except the field of study Applied Informatics). The course is divided into two one semester subjects. Word and PowerPoint are taught in the subject B_AS1 Application Software 1 in the winter semester and advanced tools of Word and Excel are included in B_AS2 Application Software 2 in the summer semester. In this paper, we will call both the subjects *Application Software* whenever the information applies to both the semesters. The course is included in the full-time and also part-time form of study. This paper is concerned only with the full-time form of study. The course is divided into twelve ninety minute weekly lessons in each semester.

Each lesson of the subject Application Software is divided into three parts – theoretic, demonstration and practical. Application Software is usually taught by 7-10 different teachers and each of them prefers different proportion of the individual parts of the lesson.

- Theoretic part: The teacher introduces the lesson content and motivates the students to learn it, explaining its importance. The teacher explains the use of the acquired knowledge and skills in the study of other subjects and in the students' future career.

- Demonstration part: The teacher demonstrates the practical use of the lesson content in applications Word / PowerPoint / Excel on practical examples. The aim is to introduce most standard situations which could arise while using the subject matter.
- Practical part: The students individually solve complex practical problem or a series of practical problems using the acquired subject matter.

The insufficient number of lessons in relation to the extensive content of the subject is a great problem. The number of lessons should optimally be double or at least a half higher. When we preserved the number of lessons and the course content, the quality of theoretic and demonstration parts and also the demands of the practical part, the following situation arose. Students were not able to solve the whole practical problem during the lesson, as a result they had to finish their work at home and bring the solution to the following lesson for a check. Students had to look up the solution methods in the textbooks, on the Internet and in Help. Some students did not solve the task themselves and resorted to plagiarism instead. The results were poor; the problem solutions were often insufficient. Because the content of the individual lessons is interconnected, the students' poor knowledge increased cumulatively with each lesson. At the end of the semester, many students did not acquire the knowledge and skills necessary for the successful course completion.

We have considered different forms of dealing with this situation. The increase of the number of lessons has been rejected by guarantors of the study programs in question. We have refused to reduce the course content because of the importance of the subject for the students' future career. The teachers have temporarily solved the situation in different ways. Some teachers have substantially reduced the practical or demonstration part of the lesson and some have reduced the course content.

In this paper we introduce the possibility of teaching by means of practical problems solving with a solution guide. This teaching method combines the demonstration and practical part in order to maintain the course content and also the quality of the course. Now we will briefly introduce the development of this teaching method.

We started to think how we could ensure that the students would be able to solve the whole practical problem within the seminar at school. We could slow down the demonstration part so that the students would be able to take quality notes – but then the students would be left with even less time for solving the practical problem. We tried to prepare the notes in advance of the lesson. We printed them and handed them out to the students at the beginning of the lesson. The notes were easy to follow and students sometimes added their own texts. The students were left with sufficient time for solving the practical problem and were able to complete it within the seminar at school. The cheating stopped.

As a result the demonstration part of the lesson changed. The notes included step by step methods of solving the individual practical problems in applications Word / PowerPoint / Excel. Each student could proceed in her / his own pace and was not dependent on the demonstration part of the lesson led by the teacher. The teacher can thoroughly demonstrate only the most difficult parts of the subject matter, which s/he considers to be less understandable even after reading the notes. The other parts of the subject matter could be demonstrated less thoroughly or not at all.

We tested this teaching method in Application Software seminars for six semesters. We officially named the notes "Practical Problems Solution Guide". The practical problems and the solution guide were thanks to the comments of the students continuously adapted and improved. Students filed the practical problems tasks in their notebooks. We had to print the materials for all the students and the amount of printed material become unacceptable. This fact resulted in producing a textbook which includes all the materials. The result of several years of work are two Collections of Practical Problems with a Solution Guide for Application software 1 [8] and Application Software 2 [9].

The paper is divided into the following seven chapters. The introduction describes the current state of the teaching and the problems that need to be solved. The second chapter introduces the textbooks of application software in Czech and

English languages and their suitability for the needs of our seminars. We also describe the teaching methods used to teach application software at universities abroad. The third chapter introduces the Collections of Practical Problems with a Solution Guide [8, 9] we published. The fourth chapter describes the practical application of our newly developed method "Teaching by Means of Practical Problems Solving with a Solution Guide". The fifth chapter discusses the advantages and disadvantages of this teaching method. The sixth chapter introduces the planned automatic testing of the students' knowledge with AUTOPOT program. The seventh chapter summarises this paper.

2 RELATED WORKS

The issue of practical problems with a solution guide for Microsoft Office applications is dealt with also in monographs of other authors.

2.1 Teaching Application Software with the Use of Professional Textbooks Published in the Czech Language

The Publishing house Computer Media in the series "50 problems" published textbooks of practical problems with a solution guide [33, 17]. The practical problems in these publications are selected from different areas of Word and Excel. The textbooks are primarily intended for secondary schools due to their organization and content. All the publications in this series serve the secondary school teachers also as an excellent inspiration for the creation of their own practical problems. We could not use these textbooks for the subject Application Software at VŠFS for several reasons.

The structure of the practical problems does not comply with the needs of the teaching at VŠFS. The time demands for solving the practical problems are not set for 90 minute lessons. One task type is repeated even five times. Because of the time limit, we can afford only brief revision of the subject matter from the previous seminar. The subject matter extent is insufficient for the syllabus of the subject Application Software. The solution guide is too detailed and wordy. We needed much briefer solution guide.

The publishing house Computer Media published also an interesting textbook of practical problems with a solution guide for Excel [16]. Neither this book can be used for the subject Application Software at VŠFS. The structure of the practical problems does not comply with the needs of the subject Application Software. The time demands for solving the practical problem are not set for 90 minute lessons. The practical problem with a solution guide is always followed by at least two detailed exercises. Such a detailed revision is not possible at VŠFS because of the time limits. The extent of the subject matter is not sufficient for the needs of VŠFS. The solution guides are included only with the first practical problems and not with the revision practical problems. This publication is, by its content, also intended mainly for the needs of secondary schools.

The Publishing house Computer Press published the books [22, 23, 24] in the series "Ready-made Solutions". They include practical problems with a solution guide and a lot of advice and directions to facilitate the work with applications. The practical problems in this publication include also topics which could be used at VŠFS. Each practical problem includes also a brief instruction and an introduction to the task. These publications are an excellent source of practical problems, ideas and other inspiration for the university teachers.

These publications are, nevertheless, unsuitable for the subjects taught at VŠFS. Their extents considerably exceed the number of lessons of the subject Application Software and do not correspond to the syllabus. These publications are therefore recommended to the students as complementary literature.

The publishing house Grada published a good textbook of practical problems with a solution guide in Excel [21] in 2009. Each practical problem includes a comprehensible task and a brief and well-arranged solution guide. Neither this textbook could be used at VŠFS. Most of the practical problems are more suitable for secondary schools. This publication is recommended to the students as a textbook suitable to improve the self-study concerning the subject Application Software.

[18, 19] are textbooks written by our colleagues at VŠFS. The colleagues excellently elaborated

the theoretical passages of Word, PowerPoint and Excel. The part concerned with Excel includes also examples of solved practical problems. These textbooks serve the students mainly to acquire theoretic knowledge of the new subject matter.

2.2 Teaching Application Software with the Use of Professional Textbooks Published in the English Language

Office 2010 Bible [34] is a very detailed textbook (1 344 pages), which is suitable even for absolute beginners. It describes the work with applications Excel (author John Walkenbach), Word (author Herb Tyson), PowerPoint (author Faithe Wempen) and Access (author Michael Alexander). The extent of this publication is unsuitable for us. Application Access is not included in the syllabus of the subject Application Software.

Discovering Microsoft Office 2010 [14] is a brief but complex introduction in basic MS Office applications. The textbook consists of selected chapters of Word, Excel, Access and PowerPoint. The instruction method is not intended for university education. The publication is more suitable for independent user work. It cannot be used at VŠFS.

Practical Microsoft Office 2010 [20] is a book written in the form of questions and answers. Individual topics include many pictures with detailed captions and a guide. The final part consists of 30 practical problems for self-study. The textbook also includes CD with videos and animated diagrams. The textbook contains chapters including answers to frequently asked questions on Word, Excel, PowerPoint, Access and Project. The textbook is unsuitable for our purposes – it includes too many details which are intended for beginners. The applications MS Access and MS Project are not taught at VŠFS.

The authors of the publication Microsoft Office 2010: Brief [27] briefly describe the work in the environment of operation system Windows 7. Step by step, they guide the reader through the applications Word, PowerPoint, Excel, and Access. The textbook cannot be recommended for practical seminars of Application Software, it is more concerned with theory than practical problems solving. The operation system Windows 7 is used, but not taught in VŠFS seminars. We do not teach MS Access either.

Microsoft Office 2010: Introductory [28] is a very extensive and complex textbook. The opening chapter introduces the computer and its peripheries. The book also describes the functioning of computer networks and the Internet. Other chapters explain basic work with the operation system Windows 7 and applications Word, PowerPoint, Excel, Access and Outlook. The texts include pictures and photographs. This book is very interesting, but unsuitable for the way we teach: individual chapters do not include practical problems with a solution guide and at VŠFS we do not teach several of the topics included in the textbook.

Discovering Computers & Microsoft Office 2010 [29] is a well-arranged textbook which, in its opening passages, gives a complex insight into the world of information technologies. The authors also guide the students through the operation system Windows 7, present the environment of the Internet browser Explorer 8 and demonstrate the work with Internet and web sites. One chapter is concerned with the correct computer security. Chapters concerning basic applications of MS Office 2010 include MS Word, MS, PowerPoint, MS Excel, and MS Access. The publication cannot be used at VŠFS because of its extensiveness and content diversity. The chapters concerned with MS Office 2010 do not include examples of practical problems.

Upgrading to Microsoft Office 2010 [35]: In the first part, the reader gets acquainted with the work in the environment of the operation system Windows 7. The authors also deal with the use of Help. The chapters Word, PowerPoint and Excel are quite brief. The textbook also includes chapters Outlook, Publisher and OneNote, which are topics not included in the syllabus of the subject Application Software. We do not use this textbook, because the chapters on Word, Excel and PowerPoint are insufficient.

Microsoft Office 2010: Essential [33] is a thin book (62 pages) facilitating the transition from Office 2007 to Office 2010. The differences between these versions are clearly explained in pictures. We recommend this book to students who own Office 2007 at home. We do not use this book in the lessons.

Picture Yourself Learning Microsoft Excel 2010 [5] is a publication intended for all who need a simple guide through the MS Excel application. The texts include pictures and explanatory notes. The structure and partly also the content of the textbook do not comply with the needs of our seminars.

Picture Yourself Learning Microsoft Word 2010 [11] is a good guide through the MS Word application. The texts are intended for beginners an include pictures and captions. We do not use this publication because its content does not comply with the needs of our seminars.

Picture Yourself Learning Microsoft Office 2010 [10] is a valuable source of information for all readers (beginners and intermediate). The author supplemented the textbook with more than 1000 screenshots, which are an excellent help for self-study. The user learns to work with the applications Word, Excel, PowerPoint, Access, Outlook and Publisher. We could not use this textbook at VŠFS because it does not include any practical exercises. The textbook also includes topics which are not taught in the subject Application Software at VŠFS.

Microsoft® Excel® 2010: Step by Step [4] is a textbook designed for Excel skills practice. The topics include: formulas, calculations, data analyses, graphs, contingency tables, the use of the new Excel Web App, the work with database tables, macros and other basic topics. The publication is too extensive for our seminars and the content mostly does not correspond to the syllabus of the subject Application Software, which means that we cannot use it as a textbook.

The publication Microsoft® Word 2010: Step by Step [3] enables the students to learn creating documents in Word. The topics include: the use of styles, sharing, printing and publishing documents, pictures editing, work with SmartArt ® images, diagrams, graphs, footnotes, indexes and contents, team work on one document, creating blogs, web sites, etc. The publication is too extensive for our needs and the content in most cases does not correspond to the syllabus of the subject Application Software, which means that it cannot be used as a textbook.

The book Microsoft® PowerPoint® 2010: Step by Step [2] teaches how to create dynamic PowerPoint presentations. The topics include: creating slides using templates or own design, graphs and diagrams, work with animations, sound effects and other special effects, creating presentations in team via the Internet, publishing presentations on web and other basic topics. Nevertheless this textbook is also too extensive for the needs of VŠFS; it includes details and topics which are not taught in the subject Application Software, which means that we cannot use it as a textbook.

The textbook Microsoft® Office Home & Student 2010 Step by Step [1] covers the work with applications Word, Excel, PowerPoint and OneNote. The topics include: creating documents using motives and templates, text formatting, work with tables, calculations and data maintenance, creating presentations, digital organization of notes, creating tasks list and other basic topics. We cannot use the publication in our seminars because it does not include practical problems which we could use in the Application Software seminars.

The textbook Microsoft® Office Professional 2010 Step by Step [12] includes chapters: Word, PowerPoint, Outlook, Excel, Access, Publisher and OneNote. The student will learn to work with basic functions, will be able to create documents, work with tables, will learn how to maintain her/his e-mails, calendar and organize meetings. The student will work in the environment of a database application and will be able to create a publication in Publisher. The book is extensive and goes beyond our needs not only by its extent and that is why we do not use it in seminars.

The book Beginning Microsoft Office 2010 (Expert's Voice in Office) [7] is a practical guide for MS Office beginners. The author guides the students through the applications Word, Excel, PowerPoint, Outlook and OneNote. Among others, the textbook includes also the work with shared documents online and offline, e-mails and contacts maintenance, meetings organization, notes, tasks planning and many other skills. This book is unsuitable for the seminars at VŠFS. It does not comply with the needs of the subject Application Software, neither topically or by content.

Office 2010 Simplified [31] comprehensibly explains simple use of MS Office 2010. The texts include colour screenshots. The textbook

includes topics: work with files, Word, Excel, PowerPoint, Access, Outlook, Publisher, and OneNote. Neither this publication offers the work with practical problems with a solution guide in Word, PowerPoint or Excel, for that reason we do not use it as a textbook.

We cannot use textbooks written in English at VŠFS because most of the students do not master English language well enough to be able to study from English texts.

2.3 Papers on Application Software Teaching Methods in the World

The paper [25] describes an innovative method for teaching computer science in general high school education, illustrated with the example of introductory programming. Analyzing the literature in CS education research the authors found that creativity is rarely regarded, especially in high school education; although a few authors describe promising results from applying creativity. Authors designed and applied a framework for designing creative CS lessons based on a set of creativity criteria. They conducted lesson on introductory programming which fulfilled the expectations: the students learned with high motivation and interest, the learning objectives were met and the students' picture of CS improved.

The paper [6] deals with a problem teachers of computer software applications face today: What is an effective method for teaching new computer software? The question of what instructional method would prove most effective is the one that affects not only teachers but also IT trainers, as computers and computer software applications continue to be the primary tools of work and leisure. Despite the increase in computer software application use, the associated literature on instructional techniques used to teach computer software is inconclusive in regard to which instructional methods are the most appropriate for teaching new software. This study was designed to help identify the best practices for teaching a new computer software application to junior high students. Five commonly used instructional techniques were used to teach new computer software, Sketchpad, to various samples of junior high technology education students.

The paper [32] describes the following situation. Basic computer skills assessment for incoming freshmen provides an opportunity for placement appropriate to the students' present skill level. At the university, assessment for incoming freshmen was begun at the College of Business in order to ensure that students entering the information systems core course have a set of requisite skills in file management, word processing, spreadsheet, and presentation graphics processing before entering the MIS core course at the College of Business. This paper presents the implementation and placement results of this process for incoming freshmen at a private liberal arts university in the Midwest.

The paper [26] describes the following situation. Despite huge efforts to position information and communication technology (ICT) as a central to the university teaching and learning, the fact remains that many university students and faculty make only limited formal academic use of computer technology. Whilst this is usually attributed to a variety of operational deficits on the part of students, faculty, and universities, this paper considers the wider social relations underpinning the relatively modest use of technology in higher education. The paper considers how the peripheral and limited use of ICT may be challenged by the higher education community. In particular, it concludes by reflecting on current critical thinking about how educational technologists can foster a more expansive and empowered use of computer technology within university settings.

The focus of research in the study [15] is to formatively evaluate a computer literacy course offered by the Educational Technology program at a large south western United States university. In this course, students are given an introduction to computers and software applications they will use in their professional and personal lives. The feelings of both the students and the instructors of the course toward the content taught, the skills learned and the instructional strategies used were measured by the formative evaluation process. The evaluation focused on the following questions: Do the academics and the students agree on the optimal content of a basic computer literacy course? Do the academics and the students agree on the optimal instructional strategies to teach the content?

3 THE COLLECTION OF PRACTICAL PROBLEMS WITH A SOLUTION GUIDE

At VŠFS we wrote two textbooks Collection of Practical Problems for Application Software with a Solution Guide 1 [8] and Collection of Practical Problems for Application Software with a Solution Guide 2 [9]. Each textbook contains 11 chapters presenting the subject matter by means of practical problems with a solution guide. Each chapter includes one comprehensive practical problem and complies with one lesson (90 min).

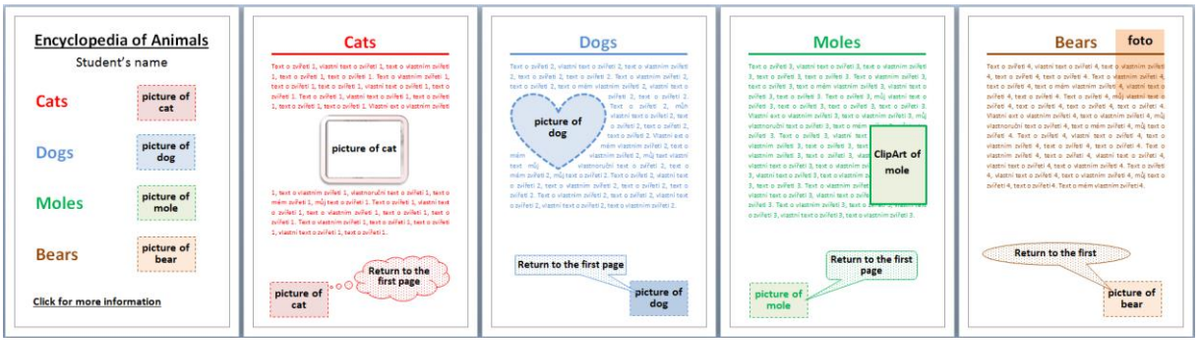
We present the following topics: Word: Revision of secondary school curriculum; Text formatting; Additional text features; Objects; Images and hypertext links; Tables; Styles; Large documents; Work with sections; forms; Templates and revisions; Mass correspondence. PowerPoint: Slides templates and layout; Slide animations and actions; Video, audio and background; Excel: Formats, formulas and work sheets; Absolute address and function; Functions and nested functions; Conditional formatting and graphs; External links and print; Analytical tools, database tables; Contingency tables.

3.1 Practical Problems Instruction

We will explain the structure of individual chapters on a sample lesson concerned with images and hypertext links in MS Word. In this lesson the students create a simple encyclopaedia on a chosen topic.

First, the students are asked to create a directory in their folder on the disc where they will save all files used and created during the lesson. The students choose the topic for the encyclopaedia they will create. The students individually choose and download the texts from the Internet to create the encyclopaedia. Thus we can easily detect cheating attempts, because two students do not accidentally choose two identical texts.

To form the encyclopaedia, the students are guided by 23 steps which form a complex instruction. The encyclopaedia consists of five pages. The first includes the encyclopaedia table of content; each chapter title includes also a picture. Hypertext links lead from each chapter title and a picture to the chapter in question. The following four pages form individual chapters of the encyclopaedia. Each chapter includes title, picture and text and a hypertext link to return to the first page of the encyclopaedia. The pictures have the parameters of their settings rewritten. The sample solution is shown in Picture 1.



Picture 1: Sample solution

In this practical problem, the students first revise the topic of the previous lesson: Inserting text copied from the Internet without preserving its fonts. Setting the type size, colour and type, line spacing, paragraph spacing, text alignment. Inserting the end of the page.

The students learn: Creating a hypertext link from a text and a picture to a part of a document or a web page, setting of its label to the link. Inserting Clip art image from the Internet, hard disc and by drawing. The students also edit the setting of the picture size, picture outlines and its position on the page, text wrapping. Setting the shape fill and the colour of the Clip art.

3.2 Solution Guide, Detailed Explanation of One of the Solution Guide Steps

The practical problem instruction is followed by a brief solution guide, which the students use as needed. We will explain the solution guide on and example of setting of a paragraph first line indention: *Home - Paragraph – dialog box launcher (= small arrow) - Indention - Special: First line - By: set the value - OK*.

This brief solution guide could be presented in detail in the following way. In the *Home tab* in the section *Paragraph* click Dialog *box launcher*. In the dialog box in the section *Indention* in item *Special* choose option *First line* and in the option *By* set the *required value.*

4 THE COURSE OF A LESSON

The students are obliged to prepare for each seminar at home, they have to study the assigned chapter from the textbook [18, 19] in advance. Thus they acquire theoretic knowledge of the subject matter in question.

At the beginning of this paper we divided the lesson (90 min) into three parts:

- Theoretic part: The teacher explains the importance of the lesson content and its practical use.
- Demonstration part: The teacher demonstrates the practical use of the lesson content on practical problems. Students try all steps with the teacher.
- Practical part: The students individually solve complex practical problem from the textbook [8, 9].

The teaching by means of practical problems solving was tested by two teachers, we will call them Teacher 1 and Teacher 2.

According to both the teachers the theoretical part of the lesson takes about 10 minutes. The Teacher 1 devotes 20-30 minutes to the demonstration part and 50-60 minutes to the practical part. The Teacher 2 leaves the demonstration part out and devotes 80 minutes to the practical part. During the practical part in both of the teachers' lessons the students work independently and use the Collections [8, 9] to practice the subject matter.

Teacher 1's students improved their independent work during the semester. Part of the students (about 50-70%) does not use the teacher's demonstration and solves the practical problems independently. They look up the solutions independently in the solution guides [8, 9].

Teacher 1 answers the students' questions during the practical part and oversees whether the students are working on the assigned practical problem (and are not, for example, chatting over the Facebook). The teacher checks the practical problems solutions at the end of the practical part of the lesson and if some students have made mistakes in their solutions, they correct them immediately. It happens only exceptionally that the students are not able to solve the practical problem within the lesson. In that case they finish it at home and present the results to the teacher during the office hours. The students who are absent have to solve the practical problem at home and present it to the teacher during the examination period.

Teacher 2 supervises the students' work during the lesson and continuously checks the practical problem checkpoints for each student. In case of a wrong solution of a part of the practical problem in the given checkpoint the student corrects the given part of the practical problem immediately. As the students do not have the demonstration part of the lesson, they ask the teacher questions which s/he answers. Approximately 2/3 of the students use only the solution guide in the Collection and do not need to ask further questions. In exceptional cases the teacher demonstrates the solution of the given part of the practical example to the student on his computer, but he deletes her/his solution immediately afterwards. If the teacher is asked the same question by three students, s/he answers the question for all the students in the class, or demonstrates the solution on the teachers' computer. There are only few such questions during the lesson. The other students are able to solve the problem very quickly.

Each practical problem begins with the revision of the subject matter from the previous lesson, which means that the students do not usually ask questions at the beginning of the practical part.

The teacher uses this time to check the practical problems solutions of the students who were absent or were not able to solve the practical problem within the previous lesson.

5 ADVANTAGES AND DISADVANTAGES

The Collection includes a brief but detailed solution guide which step by step describes the solution of each practical problem. The solution guide replaces the demonstration part of the lesson, which could be shortened or even left out completely. The students do not have to take notes themselves and can concentrate on the teacher's demonstration. The students also have more time to solve the practical problems individually within the practical part of the lesson.

Some of the students are from abroad (from the former USSR countries) and do not master the teaching language (Czech) and also lack the common secondary school knowledge of the subject matter. The classic lesson would be too difficult for these students and they would not be able to solve the assigned practical problems. They usually do not solve even 20% of the assigned practical problem. Now, when using the method of teaching by means of practical problems solving with a solution guide, they have the possibility to study in their own pace and are able to solve at least half of the assigned practical problem, sometimes they are even able to solve it completely. Their knowledge gradually improves during the semester and is no longer below the average.

The talented students are able to solve the assigned practical problem in half the given time. For these students, we plan to include bonus practical problems which extend the subject matter beyond the subject syllabus.

The Collection of Practical Problems with a Solution Guide is suitable also for students who cannot attend the lessons due to illness. They can solve the practical problem at home. The Collection came useful also in areas we originally did not have in mind. Some students use it at work; it is used by students of the University of the Third Age and also by the university administrative staff.

The teaching by means of practical problems solving with a solution guide has eliminated the students' attempts to cheat. The students' motivation to cheat has decreased because the practical problems can be solved individually and reasonably fast. Because each student works with her/his own text downloaded from the Internet, the possibility to detect potential plagiarism has increased.

The disadvantage is the necessity for each student to have her/his own copy of the Collection of Practical Problems with a Solution Guide. The students sometimes use one copy in a pair. Because the practical problem instruction and a solution guide are on several pages, they have to wait for each other which slows them down.

6 FUTURE PLANS

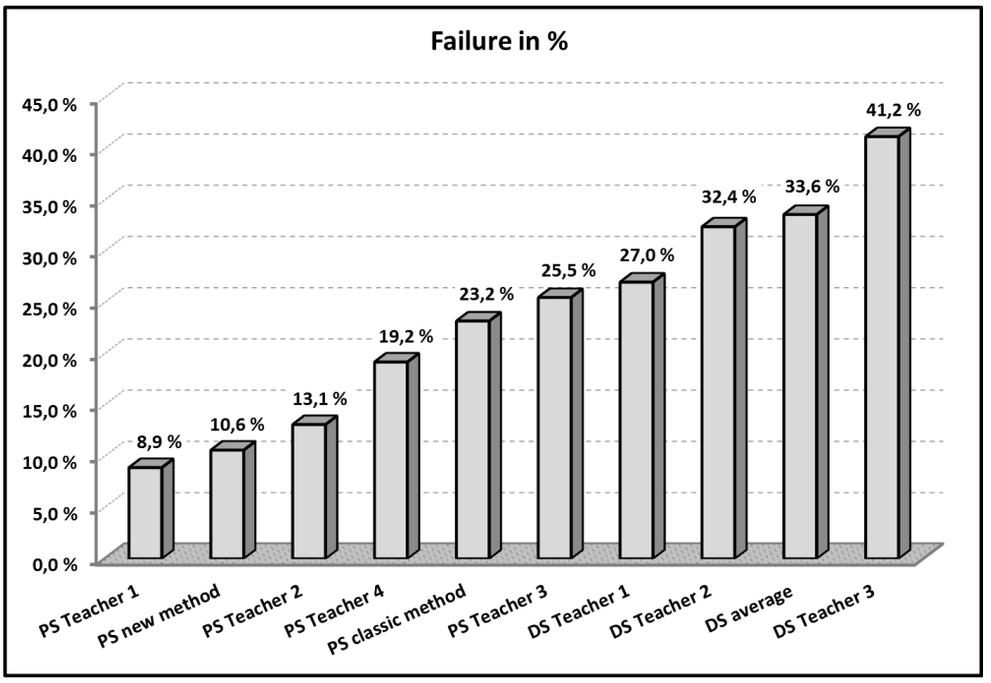
At present, both the textbooks [8, 9] are divided according to the syllabuses of the subjects Application Software 1 and Application Software 2. The Collection [8] consists of eight practical problems in Word and three practical problems in PowerPoint. The Collection [9] consists of four practical problems in Word and seven practical problems in Excel.

In future, we intend to change the subject syllabus so that all the chapters covering Word are included in the first semester. PowerPoint and Excel topics will be included in the second semester syllabus. Accordingly, we will also adapt the content of the textbooks [8, 9]. All practical problems concerned with Word will be included in the first volume of the Collection [8]. PowerPoint and Excel practical problems will be included in the second volume [9]. When adapting and improving the textbooks [8, 9] we will keep cooperating with students. We will also attempt to simplify (where possible) the Collections [8, 9] even further. The adaptations in the Collections [8, 9] will be done already for Office 2013.

Our objective is to balance the knowledge of students taught by our new method of teaching by means of practical problems solving with a solution guide with the knowledge of students taught by the classic method. We will use the program AUTOPOT [13] to test the students' knowledge. This program automatically

generates tests for the subject Application Software and assesses the students' solutions. At present we have been verifying a pilot version for MS Word. The MS Excel version has been in the development stage. The tasks are divided into categories according to their topic and difficulty. The teacher enters the requirements on the number of tasks from each category and the list of students. A unique test is randomly generated for each student fulfilling the requirements set by the teacher. The test tasks are practical. The student has to edit a text, an image or a table according to the instruction as predefined. Some tasks concern general document features. The program automatically assesses the tests completed by students. The program archives the individual students' results and thus enables statistical processing.

The results from the pilot testing of the program AUTOPOT enable mainly the detection of the program shortcomings. Some of the tasks are not assessed correctly. Some tasks need rephrasing. For these reasons, the results of the testing have not been published. The results are shown in the Picture 2. Despite the mentioned shortcomings, we can see much better results of students taught by means of practical problems solving with a solution guide. Only 11% of the students taught by means of practical problems solving with a solution guide (in the graph - PS new method) failed compared to about 23% of unsuccessful students taught by the classic method (in the graph - PS classic method). We also include also classes of part-time students (in the graph - DS average) taught via e-learning whose failure reaches about 34%. We also distinguish individual teachers in the graph (Teacher 1 - Teacher 4).



Picture 2: Results of AUTOPOT pilot testing, PS = full-time study, DS = part-time study

In future we plan further improvements of our method of teaching by means of practical problems solving with a solution guide. We plan more appropriate division of the curriculum into individual semesters. We will obtain feedback thanks to automatic testing of the students' knowledge with the program AUTOPOT.

7 CONCLUSION

In this paper, we have discussed issues we face while teaching the subject Application Software. These are mainly insufficient number of lessons in relation to the extent of the subject syllabus and thus insufficient practice of the taught subject matter. In case of homework the students extensively used plagiarism. The students' results at final tests were poor.

The lesson is typically divided into the theoretic, demonstration and practical part. Within the

theoretical part the teacher presents the subject matter and explains its practical use. In the demonstration part the teacher demonstrates the solution on practical problems and in the practical part the students solve practical problems individually. We wrote a collection of practical problems with a detailed solution guide which resulted in the reduction of the time needed for the demonstration part and left the students with more time for the practical part. We call this approach *Teaching by Means of Practical Problems Solving with a Solution Guide.*

The paper has described the motivation for the development of the new method teaching by means of practical problems solving with a solution guide, the history of its development, the lesson and content and the structure of fundamental documents. We have mentioned the reactions of students and teachers. We have been planning a thorough testing of the students' knowledge with program AUTOPOT. The acquired results will be compared with the results of the students taught by the classic method. At present we have conducted a pilot testing which has shown that the percentage of unsuccessful students taught by the classic method is more than double compared to the students taught by means of practical problems solving with a solution guide.

Acknowledgements

This research was supported by the Internal Grant Agency of VŠFS under project IGA VŠFS 7749.

8 REFERENCES

[1] COX, J., LAMBERT, J., FRYE, C.D., Microsoft® Office Home & Student 2010 Step by Step, Microsoft Press., 2010.

[2] COX, J., LAMBERT, J., FRYE, C.D., Microsoft® PowerPoint® 2010: Step by Step, Microsoft Press., 2010.

[3] COX, J., LAMBERT, J., Microsoft® Word 2010: Step by Step, Microsoft Press., 2010.

[4] FRYE, C.D., Microsoft® Excel® 2010: Step by Step, Microsoft Press, 2010.

[5] FULLER, L. U., FULTON, J., HAYES, D., RILEY, J. A., Picture Yourself Learning Microsoft Excel 2010: Step-By-Step, Course Technology Ptr, 2010.

[6] GEOFFREY WRIGHT, G., SHUMWAY, S., TERRY, R., BARTHOLOMEW, S.: Analysis of Five Instructional Methods for Teaching Sketchpad to Junior High Students. Journal of Technology Education, Vol. 24/1, p. 54 - 72, 2012.

[7] HART-DAVIS, G., Beginning Microsoft Office 2010 (Expert's Voice in Office), APRESS, 2010.

[8] HOFFMANNOVÁ, H., Sbírka řešených příkladů pro Aplikační software 1: Doplněk ke skriptům Aplikační software 1 (MS Office 2010). 1. vydání. Praha: Vysoká Škola finanční a správní, 2012. Edice EUPRESS.

[9] HOFFMANNOVÁ, H.; LÁNSKÝ, J., Sbírka řešených příkladů pro Aplikační software 2: Doplněk ke skriptům Aplikační software 2 (MS Office 2010). 1. vydání. Praha: Vysoká Škola finanční a správní, 2012. Edice EUPRESS.

[10] KOERS, D., Picture Yourself Learning Microsoft Office 2010, Course Technology Ptr, 2010.

[11] KOERS, D., Picture Yourself Learning Microsoft Word 2010: Step-By-Step, Course Technology Ptr, 2010.

[12] LAMBERT, J., COX, J., FRYE, C.D., Microsoft® Office Professional 2010 Step by Step, Microsoft Press., 2010.

[13] LÁNSKÝ, J., LOKOČ, VÁŇA, P., HYSKÝ, D., HÁJKOVÁ, R.: AUTOPOT: A Tool For Automatic MS Word Testing. OEDM-SERM 2013.

[14] MARTIN, E.G., Discovering Microsoft Office 2010: Word, Excel, Access, PowerPoint, Wiley Publishing, 2010.

[15] MARTIN, F., DUNSWORTH, Q.: A Methodical Formative Evaluation of Computer Literacy Course: What and How to Teach. Journal of Information Technology Education, Vol. 6, p. 123-134, 2007.

[16] MATÚŠ Z., Excel v příkladech 2010 + CD, Computer Media, 2011.

[17] NAVRÁTIL P., 50 příkladů v Excelu + CD, Computer Media, 2008.

[18] NOVÁKOVÁ, A.; NULÍČEK, V., Aplikační software 1 (MS Office 2010). Praha: Vysoká škola finanční a správní, 2011. Edice EUPRESS.

[19] NOVÁKOVÁ, A.; NULÍČEK, V., Aplikační software 2 (MS Office 2010). Praha: Vysoká škola finanční a správní, 2012. Edice EUPRESS.

[20] PARSONS, J.J., OJA, D., Practical Microsoft Office 2010, Cengage Learning, Inc; Pap/Cdr edition, 2010.

[21] PECINOVSKÝ J., Excel 2007 v příkladech, Grada, 2009.

[22] PECINOVSKÝ J., Microsoft Excel 2007/2010 - Hotová řešení, ComputerPress, 2011.

[23] PECINOVSKÝ J., Microsoft Office Word 2007 - Hotová řešení, ComputerPress, 2009.

[24] PECINOVSKÝ J., Microsoft PowerPoint 2007 - Hotová řešení, ComputerPress, 2008.

[25] ROMEIKE, R.: Applying Creativity in CS High School Education – Criteria, Teaching Example and Evaluation. Seventh Baltic Sea Conference on Computing Education Research (Koli Calling 2007), Koli National Park, Finland, November 15-18, 2007. Conferences in Research and Practice in Information Technology, Vol. 88.

[26] SELWYN, N.: The use of computer technology in university teaching and learning: a critical perspecti. Journal of Computer Assisted Learning, Vol. 23/2, p. 83-94, 2007

[27] SHELLY, G.B., VERMAAT, M. E., Microsoft Office 2010: Brief, Cengage Learning, Inc, 2010.

[28] SHELLY, G.B., VERMAAT, M. E., Microsoft Office 2010: Introductory, Cengage Learning, Inc, 2010.

[29] SHELLY, G.B., VERMAAT, M. E., Discovering Computers & Microsoft Office 2010: A Fundamental Combined Approach, Cengage Learning, 2011.

[30] SHELLY, G.B., VERMAAT, M. E., Microsoft Office 2010: Essential, Cengage Learning, 2010.

[31] SHOUP, K., Office 2010 Simplified, John Wiley & Sons, 2010.

[32] TESCH, D. B., MURPHY, M., CRABLE, E.: Implementation of a Basic Computer Skills Assessment Mechanism for Incoming Freshmen. Information Systems Education Journal, Volume 4/13, 2006.

[33] VALENZ M., VALENZ M. ml., 50 příkladů ve Wordu + CD, Computer Media, 2007.

[34] WALKENBACH, J., TYSON, H., GROH, M. R., WEMPEN, F., BUCKI, L.A, Office 2010 Bible, 3. vydání, John Wiley & Sons, 2010.

[35] WAXTER, B., COZZOLA, M.T., CLEMENS, B., Upgrading to Microsoft Office 2010, South-Western, 2010.