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## Automated real-live performance-based Assessment of ICT Skills

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### Abstract

In this paper we present 2 approaches for automated performance-based assessment of basic operational word-processing learner's skills. In Section 2 the approaches for interactive ICT skills assessment are analyzed. Two basic approaches for automatic interactive ICT skills assessment could be outlined: simulation-based and real-live performance-based ICT skills assessment. Section 3 deals with VBA based assessment tasks and functionalities of proposed tool for interactive performance-based word processing skills assessment. Also we discuss the possibility for implementation of the tool in e-learning course. In conclusions we consider the possible trends for use and improvement of the discussed approach.

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**Keywords:** Performance based assessment; ICT skills.

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### 1. Problem statement

The assessment of ICT knowledge and skills is an important part of the educational activities in 21-st century schools. The questions about ICT knowledge and skills assessment are: What kind of knowledge and skills to be assessed? What kind of assessment methods to be used? What kind of computer based tools to be carried out for assessment? Wide spread assessment approaches are tests, problem solving and project based methods. Performance-based assessment takes important place in the ICT skills measurement. This method of assessment asks students to "create an answer or product that demonstrates their knowledge or skills" (Stevenson, 2009) "Performance assessment is a measure of assessment based on authentic tasks such as activities, exercises, or problems that require students to show what they can do." (AAC, 2009) In fact performance-based assessment in ICT includes problem solving, portfolio and projects developed by the learners.

The learning and assessment tasks in ICT could be divided in two basic groups:

- operational tasks –relative to mastering of skills for use of concrete software application;
- conceptual tasks – relative to mastering of principal rules for application of different ICT tools.

According to above type of task the ICT skills could be divided in operational skills and conceptual skills. The learners should master operational skills before to master conceptual skills. When the sculpture learns how to chisel, he/she first learn how to hold and work with chisel and hammer.

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Computer based forms of the assessment approaches insure more possibilities for knowledge and skills self-assessment, decrease the time spent by the teacher for checking and evaluation of the ICT knowledge and skills, and provide conditions for implementing of assessment activities in e-learning courses. In fact every e-learning environment provides tool for tests creation and implementation. Every teacher has an opportunity to develop, adapt, use or reuse tests and diversity of test's items in some e-learning environment. The problems regarding to automated computer based assessment of skills for using of software applications and real live problem solving with ICT are not so well decided and are not so easy accessible by teachers.

In this paper we present 2 approaches for automated performance-based assessment of basic operational word-processing learner's skills. In Section 2 the approaches for interactive ICT skills assessment are analysed. Two basic approaches for automatic interactive ICT skills assessment could be outlined: simulation-based and real-live performance-based ICT skills assessment. Section 3 deals with VBA based assessment tasks and functionalities of the developed tool for interactive performance-based word processing skills assessment. Also we discuss the possibility for implementation of the tool in e-learning course. In conclusions we consider the possible trends for use and improvement of the discussed approach.

## **2. Analysis of approaches for interactive ICT skills assessment**

### *2.1. Simulation based interactive ICT skills assessment*

The simulation-based interactive ICT skills assessment and self assessment is a wide spread practice in the world. This form of skills assessment is applicable for each types of assessment - pre-assessment, formative and summative assessment. The simulation-based skills assessment is used by certification and training institutions to assess learner's ICT literacy. This type of ICT skills assessment is provided by Microsoft IT Academy (Microsoft, 2009), International Computer Driving License (ICDL) and European Computer Driving License certification centers (ICDL 2008), Internet and Computing Core Certification (CertiPort, 2008).

Some world leading publishers offers on-line assessment products. "These products include Skills Assessment Manager (SAM) by Course Technology, SIMNET by McGraw-Hill and Train and Assess IT by Prentice Hall. In general all of these products are geared towards the same sets of skills assessed by the Microsoft Office Specialist exams, although they also have online training portions that students may access." (Easton, 2006).

For development of simulation-based assessment ICT task could be used Java programming or authoring tools like Adobe Captivate, TurboDemo, Macromedia Flash, etc. These tools offer a lot of features for creating of simulation-based assessment tasks, but they require special skills from the teachers.

The simulation-based ICT skills assessment tools and tasks are very suitable for formative skills assessment. They are attractive for the learners and teachers. They insure needed environment for interactive performance assessment. The learner receives immediately results from the testing. Unfortunately in most cases teacher has not an opportunity to change content of the tasks and adapt it to the needs of the learners. In some cases the teacher could arrange the assessment from repository of already prepared tasks. If the teacher wish to modify or prepare own simulation-based task he/she needs additional knowledge and skills about the authoring tools. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu.

### *2.2. Real-live performance-based ICT Skills assessment*

The real-live performance-based assessment of ICT skills requires from students to demonstrate their skills in real ICT application. Usually in this type of assessment the teacher receives the solution of the task and checks the performed by the learner document. This type of checking in most cases takes a lot of time.

For automatic assessment of basic operational skills in MS Office application could be used integrated Visual Basic for Application (VBA) modules.

### 3. Findings and results

In our studies we have been implemented 2 types of real life performance based assessment tools and tasks for assessment of word-processing skills assessment. The first approach is based on the VBA technology with macros implemented in the assessment task. The second approach is grounded on the use of tool for automated generation and evaluation of tasks.

#### 3.1. VBA based approach

In multimedia disk at the (Dureva at all, 2006) we have been developed some interactive tasks for real-live performance-based self-assessment (Figure 1).

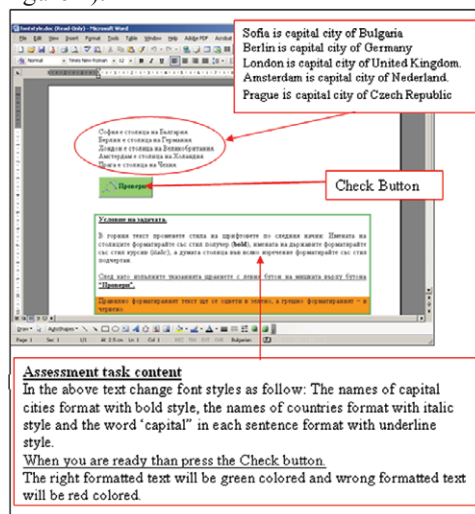


Figure 1. Task with VBA macros for real-live performance based self-assessment.

This type of task is attractive and helpful for the students, but when the teacher wishes to modify condition of the task he/she needs from knowledge about VBA. When we offered such tasks to the teachers they asked us for the possibility to modify them or to create new tasks.

Therefore we began to work on the tool which could help the teachers without special knowledge of VBA or authoring tools to create real-live performance-based interactive assessment tasks. The first steps of development of interactive tool were directed to basic word-processing skills assessment.

#### 3.2. Tool for performance –based word processing skills assessment

##### 3.2.1. Basic requirements and system architecture

The interactive skills assessment tool is developed with Visual Basic 2008 Express Edition and VBA. The tool requires installation of .NET Framework 3.5, MS Word 2003, MS Windows XP on the appropriated hardware.

The tool consists of 2 basic modules – teacher's module for generation and check of the task and student's module for skills self-assessment (Figure 2). The both modules are executable application working respectively on the local computers of the teacher or of the learners.

The teacher's module generates the assessment task in new or existing word document, checks the student's document for right performance of the tasks. The check procedure in teacher's module and self-assessment module in fact retrieve the needed information from the task content in active word document and compare the performed subtask by the students. For each right performed subtask 1 score point is given. After the check the final result in score points and wrong answers colored in red are visualized for the user (teacher or learner). The tool is easy for language localisation. At this moment the tool works in Bulgarian and English languages.

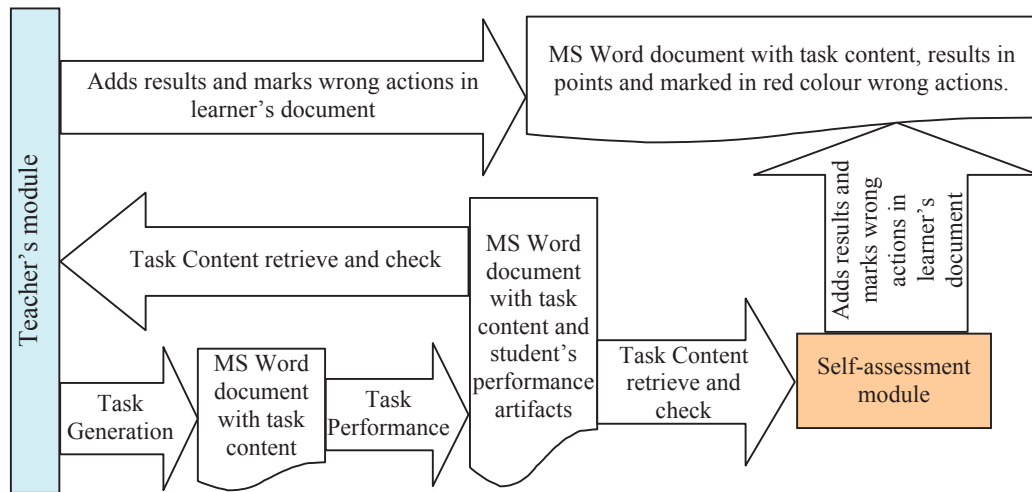


Figure 2. Architecture of the skills assessment tool

### 3.2.2. Functionalities of the modules

The users of the proposed interactive word-processing skills assessment tool are 2 types – teacher and learner.

The teacher could generate the performance-based assessment task in new MS Word document or in existing MS Word document. The teacher could choose the type of subtask – format of symbols and paragraphs, page setup, insert table, insert and format picture (Figure 3). After the task generation the teacher could protect the document. The protection enables learner to modify only the text for assessment and not to change the task content. The teacher could specify the purpose of the assessment – evaluation assessment or self-assessment. In case of self-assessment the teacher has to send unprotect password to the learner.

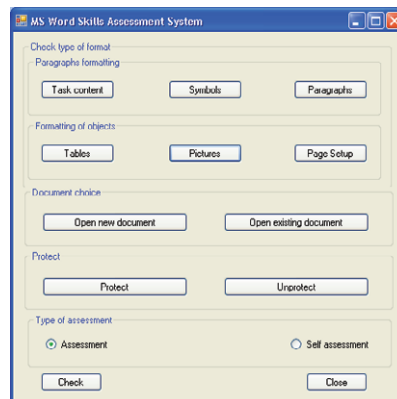


Figure 3. Interface of the teacher's module

In the process of checking of document the teacher should unprotect it. He/she receives the results obtained by the learner in the learner's document. The results are performed in points and wrong subtasks are marked in red colour (Figure 4).

The learner could do the assessment task in real-live MS Word 2003 application. If the task is for evaluation she/he should save the document and give it to the teacher. In case of self-assessment the student should save the document, run self-assessment module and insert password to unprotect the document. The results from checking are score points and red marked wrong performed subtask.

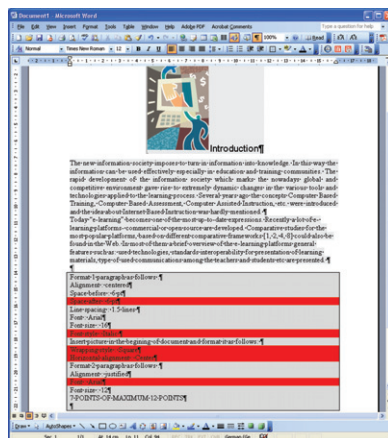


Figure 4. Task after checking

### 3.3. Implementation of the tool in e-learning course

The proposed word-processing skills assessment tool allows teacher to generate different performance-based assessment tasks in word-processing. These tasks could be implemented in e-learning ICT course and could be delivered to the student through e-mail or e-learning environment like an assignment with attached file. The student could download the file with assessment task, do the task and upload the word document with solved task into the e-learning environment. In case of self assessment the learners should start self-assessment module, installed on him/her computer and enter the password that is given by the teacher.

In our pilot study we delivered the tasks through e-learning environment Moodle in the frame of the learning activity - Assignment. The tasks were used for assessment of basic skills, regarding to formatting of word documents – font, paragraphs, images, page setup and table.

## 4. Conclusions

The performed word-processing skills assessment tool provides opportunities for carrying out of performance-based interactive skills assessment. Teachers do not need special skills to develop performed-based interactive assessment tasks especially for formative assessment. This project will be improved toward including of formatting of more objects in MS Word - numbered lists, footnotes etc. The proposed architecture of the module could be applied also to assessment of basic operational skills in spreadsheets.

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