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Perfection lies in little details

Dear readers,

Michelangelo Buonarroti, an Italian sculptor, architect and painter of the High Renaissance, said that “details make perfection, but perfection is not a detail”. And while we are not saying that the ICTE Journal is as perfect as the sculpture of David, we want it to be as good as possible. And you can help us achieve that goal by paying attention to the little details when writing your papers. One of the little details that can take the ICTE Journal a step closer to perfection is following the citation guidelines, which we sometimes fail to do. Therefore, we would like to remind you that the ICTE Journal strictly follows the ČSN ISO 690:2011 norm. If you use the <http://www.citace.com/> citation generator, you can be certain that your citations follow the norm.

Another shortcoming – and this is especially true for the Czech authors – is an insufficient number of sources (especially of original international publications). There is a simple rule: in order for the ICTE Journal to be included in prestigious bibliographic databases such as Web of Science or Scopus, the authors of papers have to cite from those databases. We believe that together we can remedy this imperfection and thus take a step toward perfection.

The following articles await you in the current issue of the ICTE Journal:

The first paper “Is Python an Appropriate Programming Language for Teaching Programming in Secondary Schools?“ is trying to find out which programming languages are appropriate for the teaching of programming in high school. The paper is particularly aimed at the increasingly popular programming language – Python.

The second paper “The Development of Learning Competences through Wiki Tools“ deals with the development of learning competencies through the use of wiki in the teaching of social sciences and English. The goal of the experiment was to show to what extent the students are active when creating and sharing wiki materials and to implement wiki tools into individual home education.

The third paper “Bebras Contest for the Blind Analysis of Tasks for the Blind Pupils at Lower Grades of Secondary Education” describes the experience regarding the informatics competition Bebras. This competition has become an integral part of the teaching of informatics in 30 countries all over the world. However, several problems had occurred that made the participation of children with disabilities difficult. Therefore, the authors created modified tasks for blind children, compared their results with the results of healthy children, and proposed ways to create tasks that would suit the needs of blind children.

The fourth paper “Adaptive Testing in Practice” deals with the issue of diagnostics and evaluation of education. Taking feedback and the results of adaptive testing into account can help teachers improve their teaching. The paper contains the results of one such testing.

The fifth paper “Teachers and Technical E-safety: Knowledge and Routines” deals with assessing the competencies of the elementary school, high school and university teachers regarding Internet safety, the use of safe passwords, malware protection and data backup. The results of in-depth interviews and observations were very interesting as they provided the authors with information not only about teachers’ knowledge and skills, but also about the motives and reasons for their actions.

The Appendix is an account of the 10th annual methodological-scientific conference “Informational Technologies in Science Community”, which was aimed at the mobile technologies in education.

The Department of Information and Communication Technologies not only issues the ICTE Journal, but also organizes the annual (September) conference in Rožnov pod Radhoštěm. Even though the deadline for applications and abstract submissions has already passed, I am positive that the organizers will be glad to accept quality papers. You can register for the conference at <https://konference.osu.cz/icte/>. The organizers believe that the conference proceedings will be included in the Thomson Reuters’s Conference Proceedings Citation Index Database.

Pavel Kapoun,
Executive Editor

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IS PYTHON AN APPROPRIATE PROGRAMMING LANGUAGE FOR TEACHING PROGRAMMING IN SECONDARY SCHOOLS?

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Abstract

A variety of programming languages are used to teach fundamentals of programming in secondary schools in Slovakia. Nowadays, we observe a new trend, the Python language gaining ground. In our paper we evaluate the interviews, in which we asked teachers with years of pedagogical experience, what the reasons for selecting a particular programming language where. By analysing the responses we learn about their experience with teaching programming and create a list of the important elements in the selection of the most suitable programming language for secondary school students. We will seek an answer for the question whether the Python programming language is appropriate for all secondary school students.

Keywords

teaching programming, programming language, Python, secondary school

Introduction

Nowadays a huge amount of programming languages is available, so an often raised question is, which is the best programming language is for teaching programming fundamentals for all students in secondary schools. The current trend shows that more and more universities choose the Python language for teaching basic programming courses. These incorporate world-famous institutions such as Michigan State University (CSE, 2014), Massachusetts Institute of Technology (Guttag, 2013), New York University, Carnegie Mellon University and the University of Cambridge. At the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava there is currently an ongoing introductory course of programming in Python for the first year students of Applied Informatics (Blaho, 2014). Should secondary schools also react on this trend of teaching in Python? Is python an appropriate programming language for all of the secondary school students?

Secondary schools in England, the Czech Republic and Hungary also run introductory courses for programming and some of them have already switched to teaching programming in Python. Python is currently used for teaching programming in some secondary schools in Slovakia as well. However, this teaching takes place either completely without textbooks and methodologies, or by methodologies developed by the teachers.

The Python programming language

The Python programming language was created by Guido Van Rossum in 1989. It is an interpreter programming language developed as an open source project. Python supports object-oriented programming, procedural and also functional programming. It is a cross-platform language, which means that programs written in Python run under many operating systems including Microsoft Windows, Linux and Unix systems like Mac OS X, with almost complete support of the standard and third-party libraries, by simply copying the source code of the program. (Summerfield, 2010)

Attractive features of the language Python are the easy readability of the code, its clean syntax and that it is more intuitive than the other languages. The following features make Python suitable for users:

- punctuation characters are not used to surround code blocks or separate commands, but some of them are used to indicate the following block of code, or to index data structures
- whitespace has a special meaning – it indicates the following block of code by which the user is encouraged to write a code that is easy to read
- it supports many ways to structure the program, it is up to the user to pick the best one – this feature allows the teachers to choose a sequence of topics most suitable for their goals

One of the benefits of the Python language is also the number of existing libraries available for free, but their use is not mandatory. Beginners have no need to know the libraries, their functions and features to learn the basics of programming. Many basic programming courses integrated the libraries into the curriculum gradually. The most important libraries for teachers could be the **`Tkinter`** graphical library, the **`Random`** library to generate random values, and the turtle graphics library called **`Turtle`**, which allows the students to create attractive and interesting programs.

Another benefit for the students is the fact that Python is not intended exclusively for educational purposes, but they may later use it during their professional career, as it is used in many areas of information technologies. It is used for example in web development, network administration, computer games programming, data processing and a number of programs has an integrated support for Python scripts (e.g. Blender, Photoshop). (Briggs, 2012)

Nevertheless, working with variables in Python is atypical. When assigning a value to a variable, the reference to the value is assigned. Further assignments change the associated reference. Variable types are not declared and during runtime the type of the assigned value can change.

Comparison of Python and Pascal (Delphi)

According to Stoffová and Czakóová (2012), programming was taught at secondary schools (grammar schools) particularly in the Pascal programming language, in the Delphi and Lazarus development environments. At secondary technical schools they focused on languages designed for creating applications and websites like C, C ++ or C#. The survey described below also shows that Pascal (Delphi and Lazarus environments) is widespread in schools, and the majority of survey respondents currently teach programming in this language.

To compare the syntax of Python and Pascal I have chose an example from a science textbook for secondary schools: Programming in Delphi and Lazarus (Blaho, 2012), which teachers in the survey identified as the most used material for teaching programming. I used two short parts of a program for visual representation of Pythons syntax and how it differs from the syntax of Pascal.

In the Pascal programming language the keywords `begin` and `end` are used to indicate a block of code. In Python a block of code is indicated by whitespaces (usually about 4 spaces). Statement terminators are not used in Python either, as statements are newline terminated, but a semicolon may be used alternatively. A colon is used to indicate a block of statements following branching or looping statements as well as function definitions.

```
import tkinter
g = tkinter.Canvas()
g.pack()

r = 10
y = 30
for i in range(1,11):
    x = 30
    for j in range(1,i):
        g.create_oval(x-r, y-r, x+r, y+r, fill='red')
        x += 2 * r
    y += 2 * r
```

Tab. 1: Example of the program written in Python

```
procedure TForm1.ButtonClick(Sender:TObject);
var
   x, y, r, i, j : Integer;

begin
   Image1.Canvas.Brush.Color := clRed;
   r := 10;
   y := 30;
   for i := 1 to 10 do begin
      x := 30;
      for j := 1 to i do begin
         Image1.Canvas.Ellipse(x-r, y-r, x+r, y+r);
         x := x + 2 * r;
      end;
      y := y + 2 * r;
   end;
end;
```

Tab. 2: Example of the program written in Pascal (Delphi)

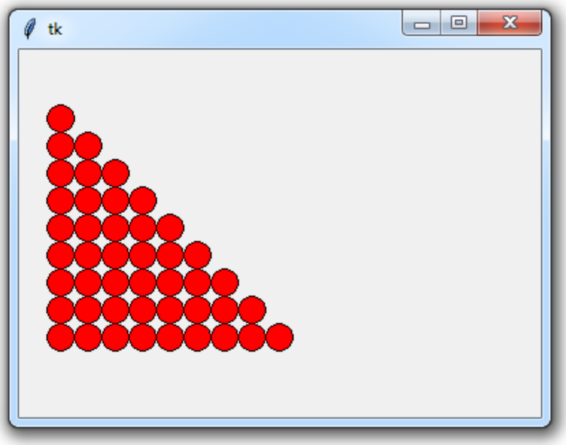

Fig. 1: Example for nested loops (drawn by the program above)

Methods of research – pilot study

The topic of my dissertation is the Python programming language as part of computer science education. This article is based on my pilot study in which I am getting familiar with this topic on a theoretical level. I acquired the data described in this paper by collecting and studying literature on the topic.

Survey

To determine which language is appropriate for teaching programming fundamentals in secondary schools, I needed the opinions of experienced teachers. I implemented a survey in which I asked computer science teachers in secondary schools for their opinions on programming languages. The survey questions were answered by 33 teachers from Slovakia, who teaches programming at secondary (grammar) schools or secondary technical schools in big cities. The country was approximately equally represented with minor variations. These teachers have 13 years of computer science teaching experience on the average. Here is a summary of their responses:

What features should an ideal programming language for teaching programming in secondary schools have?

In their answer teachers mostly emphasized the importance of simple, well understood and intuitive language syntax. According to them, the language should be clearly and logically structured and illustrative, so that the teaching could focus more on the development of algorithmic thinking than on teaching the rules of the programming language.

For the pupils, positive motivation is important and therefore a relatively quick feedback associated with graphical output from the written program as well. It is also necessary that the language promotes right programming habits, supports object-oriented programming and has strong motivational properties. Many teachers mentioned the need for easy debugging and syntax highlighting in programming environments. They also emphasized the importance of a methodology and traditions in computer science education.

What features of programming languages limit or complicate the process of teaching programming?

Most teachers identified as the most limiting feature of a language its difficult and strict syntax with long statements. As negative features they identified also abstractness, clumsiness and poor clarity of a language, which has too complicated and illogical structures. According to one teacher: „ *... when pupils learn to program, they're learning a new foreign language. They must learn not only the right words, but also the right syntax – where to put dots, semicolons, which parentheses to use ... and of course the order of these elements is also very important. If I wanted to simplify the answer to this question: the less such elements a programming language includes, the more attention could be paid to the 'logic' of programming*“.

Teachers' responses indicate that a poor quality debugger is also limiting and they identified as a negative feature also when the language allows to run code with semantic errors. The need to add a type to variable declarations, pointers, challenging environments and keywords in English were also identified as complicating features, since some students are not learning English. The lack of textbooks also limits teachers and schools mostly prefer freeware or open source software.

Which textbooks, books and materials do you use for teaching programming?

Most of the teachers mentioned the textbook of programming in Delphi - *Informatika pre stredné školy: Programovanie v Delphi a Lazaruse* (Blaho, 2012). Beside this textbook they use their own materials as well as other ones from the internet, their school, national education projects and the Faculty of Mathematics, Physics and Informatics of Comenius University in Bratislava. 22 out of 33 teachers are teaching programming in the Pascal language (Delphi and Lazarus environments), the other teachers are teaching in Turbo Pascal (8 teachers), C or C++ (7), Java (2) or Python (1). The sum of the taught languages is more than 33 because many of the teachers, especially the ones at secondary technical schools, are teaching programming in more than one language.

The survey also shows that 12 teachers out of 33 are planning to switch to another programming language in 5 years and 6 of them stated that their language of choice is going to be Python. I also asked teachers for their opinion on the Python programming language. Approximately half of the asked teachers knows this language, but most of them categorized their knowledge as weak – they saw some program code or heard feedback about the language, though they never wrote any program in it. Teachers in the survey marked Python as a simple to understand clear programming language with wide range of usage. According to them, Python is practical, quick, easy to read, applicable and "*super to teach and learn*". There were also answers like it is a "*one among many*" language and "*it's similar in structure to Pascal".*

Interview with selected teachers

I decided to take interviews with two teachers, who have many years of experience in teaching computer science and programming and with whom we talked more about their views on the ideal programming language and the limiting features of programming languages.

The interviews were conducted in the context of a qualitative research using the method data collection of a structured interview. The research sample consisted of two computer science teachers. I started the research by selecting respondents, whom I asked questions from the survey during the interview. I recorded the interviews and later transcribed them and analysed the obtained data.

The respondents were asked two questions:

1) What features should an ideal programming language for teaching programming in secondary schools have?
2) What features of programming languages limit or complicate the process of teaching programming?

The first respondent was a computer science teacher with 17 years of experience, who teaches at a school for highly gifted pupils. He is teaching programming in Python already the 4th year already and in the interview he shared his experiences and opinion on why he chose this programming language.

He described his views on the above questions, by dividing the programming languages into three groups, while for the languages he described the features that are ideal or limiting for a first programming language for the pupils.

For the Pascal programming language he emphasized mainly the negative features, like that there are two types of loops (repeat and while) and that Pascal is actually not often used in practice.

For the C language, in which the pupils learn the programming fundamentals, he mentioned as positive aspects its speed, and that the language is an interface between high and low level languages. As a negative aspect he considered the freedom of formatting the code. He knows from his experience that pupils do not format the code written in C well, which is consequently difficult to read.

We had a long conversation about the Python language. The respondent emphasized the positive aspects of Python:

+ Indentation
+ Minimal overhead
+ Intuitive
+ Does not burden pupils with formalities (such as Form.create, etc.)
+ Scripting language, OOP, functional – universal language supporting different ways of programming
+ Interface – useful in practice

The only disadvantage, as the respondent believes, is that the types of variables are not declared, and the type of the value can change during runtime. According to the respondent, this can be quickly explained to the pupils and "*it does not cause such a mess as it could*".

The second respondent was a computer science teacher with 15 years of experience and received a dissertation in Technology Enhanced Learning. He teaches programming in Pascal using Delphi at a secondary (grammar) school. The respondent answered to the above questions extensively, while he justified his point of view with examples from his pedagogical experience. According to him, the ideal programming language should have the following features:

Positive:

+ Routing – for the student to have an idea of the program he writes
+ Error notification
+ Libraries – a set of libraries that are not mandatory to use
+ Develops critical thinking – finding an optimal solution for the problem
+ Graphics – motivation for the pupils
+ Examples having a natural context – interactive games, not pure math
+ A language close to practice
+ Gradual uncovering of the curriculum (language options – the degree of abstraction)

Negatives:

- Examples with mathematical context
- Definition of the variables in an another part of the code
- Lot of code needed to make the program do something meaningful
- License for development environment
- Untyped variables
- Complicated environment

Choosing an appropriate programming language

The selection of the first programming language is very important in terms of obtaining the correct programming habits by pupils as well as the acquirement of appropriate algorithms. The first programming language will affect the success of students in using and creating algorithms and proposing solutions to problems, see (Atteq et al., 2014). The national education curriculum includes the thematic field *Procedures, problem solving, algorithmic thinking*. The standard content of the course in this field includes in addition to algorithms, also problem analysis and program debugging, also programming language features like syntax, program execution and logical errors. According to the standards of performance, pupils should be able to solve problems using algorithms and be able to write them using the commands of the programming language. They should also understand the complete programs, analyze the problem, propose an algorithm to solve a problem and verify the correctness of the algorithm, see (ŠPÚ, 2008).

Many experts compare and evaluate programming languages in their works. Mareš in his paper (Mareš 2015) emphasized the following requirements for the first programming language:

1) **directness or linearity** – easy to code without the need for terms and structures that the user does not know yet
2) **transparency** – easy readability of the code, even for someone who can program but does not know the language.
3) **resistance** – detect errors when executing the program, easy debugging
4) **abstraction** – to choose the level of abstraction by the pupils' skills
5) **development environment** – quality development environment corresponding to the complexity of the educational curriculum.
6) **history of language and practicality** – it is good if the language in which programming is taught is used in practice in the world and is close to the other languages to facilitate subsequent learning of other programming languages
7) **continuity** – it is worth to continue the programming language they encountered in primary school, and also to take in account that many students will meet with other languages in their further studies
8) **availability** – licenses, development environment should be available for free to all pupils on all commonly used devices and operating systems

9) **literature** – methodologies, books and textbooks are needed for educational purposes for the language taught at the school
10) **teachers** – it is necessary that teachers of computer science know the programming language used to the necessary level to be able to teach the curriculum and also to find errors in pupils' programs fast enough

The above mentioned criteria for the choice of the first programming language for courses of programming fundamentals are broadly consistent with the criteria by other professionals from the world. Zelle (2015) Grandelle et al.(2006), Ateeq et al.(2014), Krpan and Bilobrk (2011) and many experts are dealing with this subject in their research. In these publications they compare different programming languages with Python, such as Java and C ++, while in their conclusions Python is considered to be the most suitable language for introductory programming courses. Furthermore, they mention their positive results from programming courses conducted in Python.

Conclusion

„Programming is hard, but we should strive to make it no harder than it needs to be"

Zelle John M.

In this paper I described the various opinions of teachers and experts on the required features of the first programming language in secondary schools. Most of the reviews seem to agree that we want to focus on teaching algorithms, developing problem-solving skills, and we want students to learn particular skills, which they will later use in their study and practice. Therefore we are not focusing on teaching a programming language, but to teach programming fundamentals. A language, which is suitable for this purpose must allow students and teachers to concentrate on algorithms and acquired competencies without encumbering them with the language syntax and a complicated development environment. From the survey and interviews we found out what are the demands of teachers on the first programming language.

Although the Python programming language is not fulfilling all the requirements of teachers and specialists, but compared to other languages it satisfies the most of them. The problem with the Python programming language is mainly the lack of methodologies and textbooks for secondary schools in Slovak language. Therefore in the course of my research, I will try to answer the following question: what topics, algorithms and competencies should we teach in secondary schools and how to choose the sequence of topics and the methodology.

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The Development of Learning Competences through Wiki Tools

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Abstract

This paper reports on a pre-research included in a pedagogical experiment carried out at a Secondary School in Prague. In particular, it focuses on learning outcomes and overall experience concerning the development of learning competences through the use of a wiki in Social Science lessons and realized through the content and language integrated learning (CLIL). Although the main objective of the pedagogical experiment was to enhance English communication skills, the inevitable part of the experiment was to implement wiki tools into autonomous home learning, mainly to create such a learning environment which supports English communication, and particularly to examine the wiki potential for the development of learning competences. Moreover, the pedagogical experiment was supposed to show the extent of students' effort to create and use wiki materials for their learning and cooperation. In the first part, various aspects of implementing learning competences into the learning process are dealt. In the second part, the general concept of a wiki (wikispaces) is introduced, including the practical usage for enhancing learning competences. Followed by research questions and research methodology, where three stages of the teaching and learning process involved in the experiment are introduced, the final part of the paper deals with the outcomes and summarizes their beneficial contributions to a wiki-based pedagogy.

Keywords

pedagogical experiment, learning competences, wiki, wiki-based pedagogy

Introduction

Each secondary school in the Czech Republic is reflecting the national curriculum which among others sets key competences adapted to European Union (EU) legislation (Recommendations, 2006). These key competences, divided into general and specialized ones, are individually elaborated into the school curriculum. Each competence is supposed to be implemented into learning objectives. One of the key competences is the competence to learn. Before carrying out the pedagogical experiment, a survey was made among teachers from an experimental school concerning their awareness of learning competences. The teachers were asked two questions:

1) Are learning competences included in your subject curriculum?
2) Do you promote learning competences during teaching your subject?

Out of 34 respondents, 20 respondents answered ´yes´ to the first question and 29 respondents answered ´yes´ to the second question. Consequently, we asked the respondents providing the ´yes´ answer to the first question to give three examples of activities which relate to learning competences. Their given examples revealed that only eight respondents were aware of knowledge, skills and abilities which represent learning competences. Twelve respondents gave examples of learning objectives concerning their subjects instead of learning competences.

Above all, having the importance of foreign language competence in mind, these results motivated us to modify the wiki environment not only for learning a second language, but also for enhancing learning competences.

Learning competences

In the Czech school curricular documents there is a slightly different approach to the construct of learning competences than in educational literature. Lokajíčková (2013, 324) states: “That learning competences are not always a synonym to the construct of learning to learn, as it is used mainly in English written literature.” and she suggests “Learning competences are considered to be dispositions for managing the situations for learning, while learning to learn is regarded as a process which accompanies learning.” Lokajíčková understands the concept of learning to learn to be super-ordinate to the concept of learning competences.

In our experiment we applied the Czech school curriculum approach where learning competences represent the capability to apply or use a set of related knowledge, skills, and abilities required to successfully performed tasks in a defined learning objective. In the Czech school curriculum learning competences are defined as follows (RVP, 2006): the higher secondary education graduate should:

- have a positive attitude to learning and education,
- know different learning techniques;
- be able to create suitable learning’s conditions and learning environment,
- put different ways of working with a text into effect (learning and analytical reading), know effectively how to look up information and process it; be reading literate,
- listen to different oral presentations (explanation, lectures, speeches etc.) with understanding and be able to write down notes from different media sources,
- use different information sources including other people’s experience as well as their own,

- follow and evaluate their own learning progress and accomplished tasks and be able to accept other people's assessment of their learning results,
- be aware of future possibilities and opportunities in their education, specifically in the field of their specialisation.

Above mentioned learning competences are more similar to generic skills defined by Petty (2014). Petty calls them mini key competences which include synthesis, analysis, evaluation, study skills and affective and social skills. Both learning competences and generic skills reflect skills and abilities which are cross-curricular and enhance desired quality for being competitive on the labour market.

Wiki environment

Recently, many articles on using a wiki technology as a means of fostering computer-supported collaborative learning (CSCL) have appeared on a task-designed research e.g. Bradley, Lindstorm and Rystedt (2010), or Kessler (2010). They investigated what wikis could do as a means to enhance group interaction, when students were encouraged to participate in constructing a text and exchanging peer responses; or Castaneda and Cho (2013) whose students found wiki writing helpful in improving their writing skills. To more theoretical research, which provides insight into pedagogical methodology applied in a wiki, the term of so called wiki-based pedagogy, used by e.g. Hewege and Perera (2013) focused on exploitation and functionality of wikis in curriculum design and sat the implications of a wiki-based pedagogy, which assumes an "emancipator", partial-"constructivist" paradigm of learning. At the same time Cress and Kimmerle (2008) suggested a model analyzing processes which take place in the social system of a wiki as well as in the cognitive systems of the users. The model also describes learning activities as a process of externalization and internalization.

Above mentioned examples of using wikis show the great potentiality of wikis in educational environment.

There are two main reasons why a wiki (wikispaces.com) was chosen as the main online collaborative platform. Firstly, as defined by Larusson and Alterman (2009, p. 372), "The basic wiki has several properties that make it ideal framework for composing different time and place environment. Applications engineered within the style of wiki interactions can support a variety of learning activities ranging from tightly to loosely coupled collaborations. Wiki-based collaborative applications can also support metacognitive tasks, like reflection or self/co-explanation." Secondly, a wiki is considered to be a user-friendly tool.

Research design

From the feedback of students who use wikis in their language lessons we learnt that managing wiki pages was easy for them. They used it as a tool for both synchronous and asynchronous communication and appreciated teacher's feedback to their contributions. The possibility of tracking student's learning progress and enabling students to use their learning preferences makes a wiki the right tool for our experiment.

Research question

The purpose of this study is to examine students' opinions on implementing wiki activities into their autonomous home learning. Several wiki-based tasks were designed to support learning competences as defined in the school curriculum, which include several sub-categories: wiki as a learning environment, evaluating and self-evaluating skills, cooperation, and creativity. Thus, the following research questions were defined:

1) Do students use wiki materials for their learning?
2) Do students consider doing tasks on a wiki as an important part of their learning?
3) Do students think that their evaluating and self-evaluating skills are improved by working on wiki tasks?
4) Does working on a wiki support their creativity?
5) Does working on a wiki enable them to use different sources for self-expressing?
6) Does working on a wiki make them cooperative?
7) Do students think that team working on a wiki support their learning?

Research sample and methodology

The pedagogical experiment was carried out at the Secondary School for EU Administration (SSEUA), Prague, Czech Republic. The school has more than 800 students. To support meaningful communication in English and enhance English communication skills, one class of 29 students (at the age of 16 – 17) was taught Social Science in CLIL (the experimental group), whereas in the second class of 30 students other than CLIL methods were applied (the control group). Both classes were supported by the use of a wiki environment. The students were exposed to one a 45-minute lesson a week during the school year 2013/14, totally 32 hours per year. In both groups the students were divided into ten groups of three students for the whole course. During the course students worked both individually and in teams. They were also assessed individually or collectively depending on given tasks. Each student had unlimited access to learning materials, provided by the teacher, which were displayed on the wiki and class collaborative web pages. The team web pages and student's portfolio page were accessed only to the members of each group.

The teaching and learning processes were designed both to promote maximum communication and to enhance learning competences. The whole process consists of three stages. The first stage includes presenting new knowledge or information to students by the teacher with the help of the wiki platform, a text-analysing activity or an expert group activity. This stage refers to Neo-behaviourism (Zounek and Sudický, 2012) where the teacher is a guarantee of transferring basic knowledge to students, so that they are able to gain an insight into the whole issue.

The second stage represents active learning (Constructivism) (Zounek and Sudický, 2012). Students are responsible for seeing the issues in context and developing their own experience. This stage is structured into two phases. In the school phase students work in pairs or teams on activities which encourage them to use general classroom communication skills as well as learn or practise one sub-competence from learning competences e.g. they solve higher cognitive tasks, plan, organise and check outcomes of their projects or take notes from different media sources. Within the home phase, the students from both groups work in the wiki environment. Each student has their own portfolio page, where they submit their homework, usually based on a concept of comparing ready-known information (pre-concept) with "just-learnt" information or give an opinion on related issues. The wiki-based home tasks try to reflect the preferences of student's learning style. The students in both groups are asked to choose at least one of the three tasks, which might include activities based on visual, auditory, verbal or logical modality. The students give a short assessment or self-assessment on a current learning issue and their performance during a lesson. This should help them to improve their functional language for class purposes as well as to extend their learning competences. In the experimental group the wiki-based activities are in English and the students are encouraged to use for communication only English language.

The third stage deals with creating student's own learning space/environment via the Internet. This process refers to Connectivism, where a network of connections helps to distribute knowledge and that is the reason why learning gains the power to construct and exceed those networks (Downes, 2012), which supports the idea of creating learning groups on the Internet. Students work in teams of three students on a team/collaborative wiki page. The whole team contributes to their page after each lesson. Students should post their reflection on a lesson as well as they should add some materials concerning their interests or needs. The team members can see each other portfolio pages, so that they can be inspired while working on their tasks at home. They comment team member's contributions and react to their comments. They summarise the team's contributions and evaluate their team approach. The whole communication is supervised by the teacher, who posts their own comment and assesses the content of the page from subject-content and in the experimental group as well as from the foreign language points of view. This supervision should help students stay focused on learning and develop not only academic and general functional language, but also to learn how to work in teams or look up additional materials on the Internet. Last but not least, students have to manage their learning and accomplish tasks on a wiki to a pre-defined deadline.

Research findings

Reflecting the teacher's subjective feedback the analyses of team and portfolio pages, plus post-course questionnaires as well as the focus-group discussion show that wiki-based tasks might develop student's learning competences. This conclusion was based on a partial subjective qualitative analysis, not published yet, but it served as the background of further steps.

To measure perceived students approaches to wiki-based tasks, the students completed a post-course questionnaire, which consists of 30 items scored on a six-point Likert scale from 1 meaning 'I strongly agree with this item' to 6 expressing 'I strongly disagree with this item'. All displayed questions in Table 1 are selected from 30 items divided into three groups (general learning skills, cooperation/collaboration and wiki environment).

QUESTIONS	YES answer (%) 59 respondents	YES answers (%) 29 CLIL respondents	YES answer (%) 30 no CLIL respondents
1. Do students use wiki materials for their learning?	56 (95%)	28 (97%)	28 (93%)
2. Do students consider doing tasks on a wiki as an important part of their learning?	45 (76%)	24 (83%)	21 (70%)
3. Do students think that their evaluating and self-evaluating skills are improved by working on wiki tasks?	39 (66%)	20 (69%)	19 (63%)
4. Does working on a wiki support their creativity?	44 (75%)	25 (86%)	19 (63%)
5. Does working on a wiki enable them to use different sources for self-expressing?	48 (81%)	26 (90%)	22 (73%)
6. Does working on a wiki make them cooperative?	53 (90%)	27 (93%)	26 (87%)
7. Do students think that team working on a wiki support their learning?	36 (61%)	16 (55%)	20 (67%)

Tab. 1: Summary of respondents' attitudes

To make the data clearer, in Table 2 the students' attitudes are interpreted by using the basic descriptive statistics. Evaluation criteria are described below:

- 1.00–1.50 means that the students had very positive attitudes toward a wiki.
- 1.51–2.50 means that the students had positive attitudes toward a wiki.
- 2.51–3.50 means that the students had partially positive attitudes toward a wiki.
- 3.51–4.50 means that the students had partially negative attitudes toward a wiki.
- 4.51–5.50 means that the students had negative attitudes toward a wiki.
- 5.51–6.00 means that the students had very negative attitudes toward a wiki.

QUESTIONS	29 CLIL respondents				30 no CLIL respondents			
	Mean	S.D.	Var.	Mode	Mean	S.D.	Var.	Mode

1. Do students use wiki materials for their learning?	**2.10**	**1.11**	**1.22**	**2**	**2.03**	**0.98**	**0.97**	**2**
2. Do students consider doing tasks on a wiki as an important part of their learning?	3.06	0.68	0.46	3	3.23	1.20	1.45	3
3. Do students think that their evaluating and self-evaluating skills are improved by working on wiki tasks?	3.20	1.08	1.13	3	3.13	1.09	1.18	3
4. Does working on a wiki support their creativity?	2.77	1.23	1.51	2	3.33	1.19	1.42	3
5. Does working on a wiki enable them to use different sources for self-expressing?	2.53	1.03	1.05	2	2.70	1.19	1.41	2
6. Does working on a wiki make them cooperative?	2.27	0.93	0.86	2	2.43	1.09	1.18	2
7. Do students think that team working on a wiki support their learning?	3.53	1.23	1.51	3	3.4	1.05	1.12	**3**

Tab. 2: Summary of descriptive statistics

From all of the above, it can be said, that more than 75 % students consider wiki-based tasks important for their learning and more than 90 % students used displayed materials on a wiki for their learning. It is similar to Su and Beaumont (2010) results who found about 59 % students perceived that R&D wiki helped to develop their initiative in learning independently. More than 70 % students stated that a wiki supports their creativity and promote different ways of expressing themselves. Implementing wiki environment into lessons had an impact on about 88 % of students' cooperation, and 60 % of them think that cooperation on a wiki had an impact on their learning. Similarly to Kam, Katerattanakul (2014) whose study reveals that synchronicity and group-awareness promote team-based learning. Although the students expressed the positive impact of a wiki on their learning, the impact on their cooperation and collaboration is ambiguous, which can be clearly seen in Tables 3 and 4.

Table 3 shows responds to respondents' overall attitudes to wiki environment. The questions are taken from the above mentioned post-course questionnaire.

QUESTIONS	**YES answer (%) 59 respondents**	**YES answers (%) 29 CLIL respondents**	**YES answer (%) 30 no CLIL respondents**
1. Do students consider wiki-based learning interesting?	48 (81%)	26 (90%)	22 (73%)
2. Do students want to carry on working on a wiki?	39 (66%)	23 (79%)	16 (53%)

Tab. 3: Summary of respondents' overall attitude to wiki environment.

Table 4 shows the students' attitudes interpreted by using the basic descriptive statistics. Evaluation criteria have already been described above:

QUESTIONS	**29 CLIL respondents**				**30 no CLIL respondents**			
	Mean	**S.D.**	Var.	**Mode**	**Mean**	**S.D.**	Var.	**Mode**
1. Do students use wiki materials for their learning?	**2.77**	**0.72**	**0.51**	**3**	**3.03**	**1.33**	**1.77**	**3**
2. Do students consider doing tasks on a wiki as an important part of their learning?	2.70	0.9é	0.81	2	3.50	1.63	2.65	2

Tab. 4: Students' attitudes.

Table 3 outlines the answers to the research problem if wiki environment can support learning competences. More than 80 % students find wiki-based learning interesting. This attitude is supported by focus – group discussions, where students expressed their motivation to learn new technology or do new things. Surprisingly, this motivation was gradually wearing off in no CLIL group (the control group), but not in CLIL group (the experimental group), although both groups did the same wiki-based tasks. The difference was mainly in working language and extra Internet materials (podcasts, clips, videos, resources etc.) which are in English and rarely in Czech. The next reason for worn off motivation was setting a deadline, which was for a few students frustrating. In both groups were students who do not find not only wiki environment, but also the whole idea of learning anything by means of Internet contributory. These conclusions reflect the difference between 79 % CLIL students who want to have more CLIL subjects to 53 % no-CLIL students.

Discussions and conclusions

This study explored the pedagogical implications arising from the integration of a wiki into an existing curriculum of a subject in Social Science. The research problem of the study was: “Can a wiki environment support learning competences?”

First of all, we discussed the construct of learning competences. Reflecting the set criteria for learning competences, which students in Czech higher second education should reach, we focused on cooperation, evaluation and self-evaluation, and learning skills. We tried to implement a few wiki-based tasks dealing with learning competences into a running experiment on a wiki. Consistently with a previous researches (Hewege and Perrera, 2013), findings of this study may shed light on how wiki tools might support learning competences within collaborative learning.

The students most appreciate the fact that they can express themselves in many different ways (graphs, mind maps, pictures, videos etc.), which might reflect their learning styles as is outlined in (Šimonová and Poulová, 2012). The students are in favour of giving feedback not only by the teacher but as well by their peers – team members. According to Schaaf, Baartman, Prins, Oosterbaan and Schaap (2013, p. 243) “feedback and reflective thinking are fundamental for learning.” As we could not find any relevant studies on creativity development supported by a wiki, we suggest this area for a future research. Most students express their positive attitude to cooperating in teams on a wiki, even though sometimes it was very challenging. Although there are a few studies, e.g. Kam and Katerattanakul (2014), which consider synchronicity the most important aspect of collaborative learning, there seems to be enough studies, e.g. Coll, Rochera and de Gispert (2014), which find asynchrocity especially in self- and peer-assessment fundamental. Nevertheless, there are a few students who do not like working in teams, and they consider the whole idea of using the wiki neither motivating, nor contributory to their studies.

In conclusion it can be stated that the pre-research experiment approved the idea of implementing a wiki platform into teaching/learning process. Next step will be to specify wiki-based tasks which are predominantly focused on learning competences, and integrate them into a wiki environment. As mentioned above, learning competences are an inevitable part of school curriculum, however, there are not still fully integrated into teaching and learning process as they should be.

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BEBRAS CONTEST FOR THE BLIND ANALYSIS OF TASKS FOR THE BLIND PUPILS AT LOWER GRADES OF SECONDARY EDUCATION

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Abstract

The Bebras contest has become an essential part of school informatics in 30 countries all around the world. However, not all pupils can participate, especially some pupils with special educational needs. We have been doing a research in the area of teaching computer science with focus on the blind pupils (Jašková, 2013). We think that also these pupils should develop their informatics skills. Because the Bebras contest offers number of interesting informatics tasks, we have decided to explore the possibilities of making this contest available also for the blind pupils. The tasks used for this category of pupils were adjusted from the original ones suggested for intact pupils. In the article we present some of them with the description of adjustments that were needed to be done in order to make these tasks available for the blind pupils. We also compare the results of both, intact pupils and the blind pupils. Finally we analyse factors that can have an influence on success rate of the blind pupils and we offer some recommendations for making the suitable tasks.

Keywords

Bebras contest, algorithmic thinking, visual impairment

Introduction

In this paper we describe our experiences with execution of informatics contest Bebras (Degienė, 2005) for the blind pupils. We describe the tasks and realisation of the contest. We focus in detail on tasks adaptations. The original tasks of categories Little Beaver / Benjamins are listed as well. We analyse all tasks and interviews with pupils and based on this analysis we propose improvements of tasks (not simplification but better intelligibility). At those tasks that we have not been changed significantly we compare success rate of the blind pupils to success rate of intact pupils. We discuss reasons of difficulties in solving some specific contest tasks.

The tasks

When looking for appropriate contest tasks we decided to use the contest tasks currently included in categories Little Beaver (Tomcsányiová et al., 2011) and Benjamins. At first, we chose those tasks that could be used for the blind pupils without changes. There were not many of them. Other ones needed just a little adaptation because they contained important information in the form of picture which is not accessible for the blind people (webaim.org).

Now we provide to each contest task its original version and the version adapted for the blind pupils. The order of listed tasks proportionally depends on amount of adaptations that had to be done.

Photographs

This task does not contain any graphical information so we could use its original version.

Jane wants to print her photographs. Which device must be connected to the computer?

- Speakers
- Data projector
- Printer
- Microphone

Fig. 1: Contest task Photographs

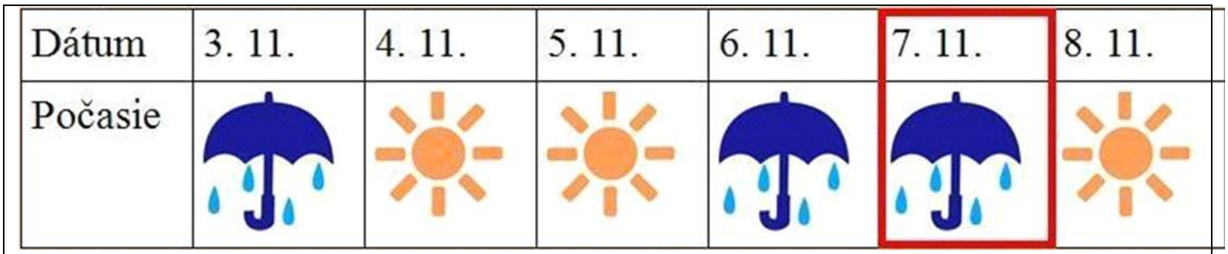
Places to play

The picture shows the original task.

Beaver is deciding where he wants to play according the following rules.

- When it is sunshine today, but it was raining yesterday, he wants to swim in the river.
- When it is sunshine today and it was sunshine yesterday as well, he wants to play in send on the river bank.
- When it is raining today, but it was sunshine yesterday, he wants to play with meccano at home.
- When it is raining today and it was raining yesterday as well, he doesn't want to play at all.

Following table illustrates the weather in previous days.



Dátum	3. 11.	4. 11.	5. 11.	6. 11.	7. 11.	8. 11.
Počasie						

Where did the beaver play on November 7th?

- on the river bank
- at home
- he didn't play at all
- in the river

Fig. 2: Contest task Places to play

This task contains graphical information, however not important for getting to the solution. We have not used it in task for the blind pupils and we used the open question instead of the multiple choice task. The following picture shows the adjusted task.

Beaver is deciding where he wants to play according the following rules.

- When it is sunshine today, but it was raining yesterday, he wants to swim in the river.
- When it is sunshine today and it was sunshine yesterday as well, he wants to play in send on the river bank.
- When it is raining today, but it was sunshine yesterday, he wants to play with meccano at home.
- When it is raining today and it was raining yesterday as well, he doesn't want to play at all.

Where did the beaver play on November 7th, if it was raining that day and day before too?

Fig. 3: Adjusted contest task Places to Play

Cabins

In original task there were used colours and their overlapping. This was inappropriate for the blind pupils. In addition to that this task was interactive. The eventual colours of windows pupils could set by clicking on the picture of boat.

Boat glasses are either clear or lightly tinted. When looking through two such glasses one will see either clear, lightly tinted or darkly tinted glass as shown below.

Captain installed windows with either clear or lightly tinted glasses into one side of his new yacht as shown below.

Windows on the other side are shown below.

A fisherman standing at appropriate place on land could see through all corresponding pairs of windows installed on both sides of the yacht. What colours did fisherman see on the windows?

Drag the colours to colour the windows on the following picture.

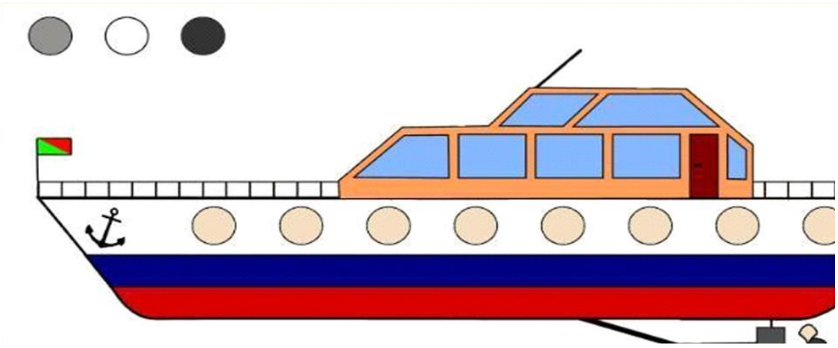


Fig. 4: Original contest task Windows

This task required more changes than other tasks. Our effort was to keep the nature of the problem as close as possible to the original version.

There are 6 cabins on the boat. In each cabin there are 2 radiators – one at the left wall and one at the right wall. The temperature inside each cabin depends on the state of radiators inside.

- When both radiators are switched off, it is cold inside the cabin.
- When one radiator is switched on, it is warm inside the cabin.
- When both radiators are switched on, it is hot inside the cabin.

One day there were switched on radiators at left wall in cabins 1, 4, 6 and radiators at right wall in cabins 5, 4, 3, 1.

What is the temperature in the cabins 2, 4, 6?

Fig. 5: Adjusted contest task Cabins

Coloured snake

In the original task is snake created of coloured blocks. The picture shows the original task.

Jane was playing with building blocks. She created the following snake.

Then she decided to create the new snake taking the blocks either from the left end (L) or from the right end (R) of original snake. This block she always put to the right end of new snake. When she took all the blocks from original snake and put them to the end of new snake she gradually received the following snake.

In what order was Jane taking the blocks?

- R,L,R,R,R,L,L,R,L,R
- L,R,L,R,L,R,R,L,R,L
- L,R,L,L,L,R,R,L,L,R
- R,L,L,L,L,L,R,L,R,L

Fig. 6: Original contest task Coloured snake

Because this task was visually oriented, we have used a snake that consisted of numbers. We also used shorter snake for better memorability (Pasch, 1995). We have created the following task.

Jane was playing with numbers. She created the following numeric snake.

7,9,1,3,5,8

Then she decided to create the new snake for her brother taking the numbers either from the left end (L) or from the right end (R) of original snake. This number she always put to the right end of new snake. When she took all the numbers from original snake and put them to the end of new snake she gradually received the following snake.

8,5,7,3,1,9

In what order was Jane taking the numbers?

- R,R,L,L,R,R
- L,L,R,R,L,R
- R,R,L,R,R,L
- L,R,R,L,R,R

Fig. 7: Adjusted contest task Numeric snake

Analysis

In this part we analyse pupil's solutions of particular contest tasks aforementioned in previous part. We compare success rate of the blind and intact pupils solving the tasks for category Benjamins.

Contest took place at special school for the blind and partially sighted pupils. Group of contestants consisted of seven blind lower secondary school pupils. One of them was fifth grader, one sixth grader, one seventh grader and four of them were eighth graders. Some other pupils could not participate because of attendance issues (longer absence). Contestants were either totally blind, or with low vision - they have heavy visual disorder and have to use special aid to learn. We have to consider whether they are congenitally blind (from their birth) or they have lost sight later and they still have some visual imagination left.

Pupils got 40 minutes to solve all nine tasks (Allman, 2009). Tasks were provided in a form of text document. There were the instructions and important rules at the beginning. Each task contained also the area for the notes that could be helpful for pupils.

There is a graph of success rate of intact pupils in contest category Benjamins on Figure 8, where tasks used for the blind pupils are marked by red. The number of participants in this category was 21466. On Figure 8 we provide graph of success rate of the blind pupils to comparison. For each task we provide a table to show dependency of success rate on age, degree of visual disability and frequency of work with computers. We also discuss suitable adjustments of tasks to improve their intelligibility for the blind pupils. At this stage we interview pupils in order to find out problematic parts of tasks.

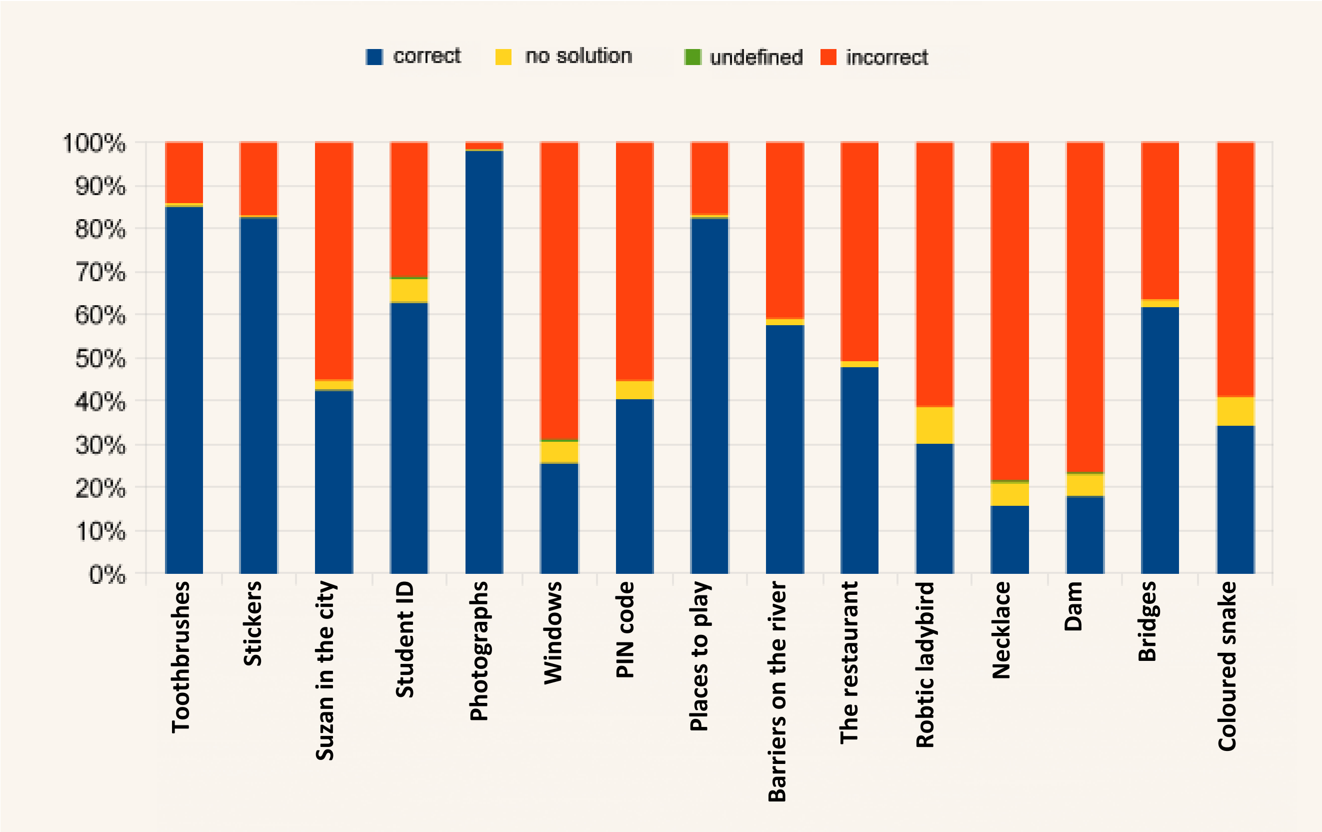


Fig. 8: Graph of success rate in category Benjamins 2014/2015

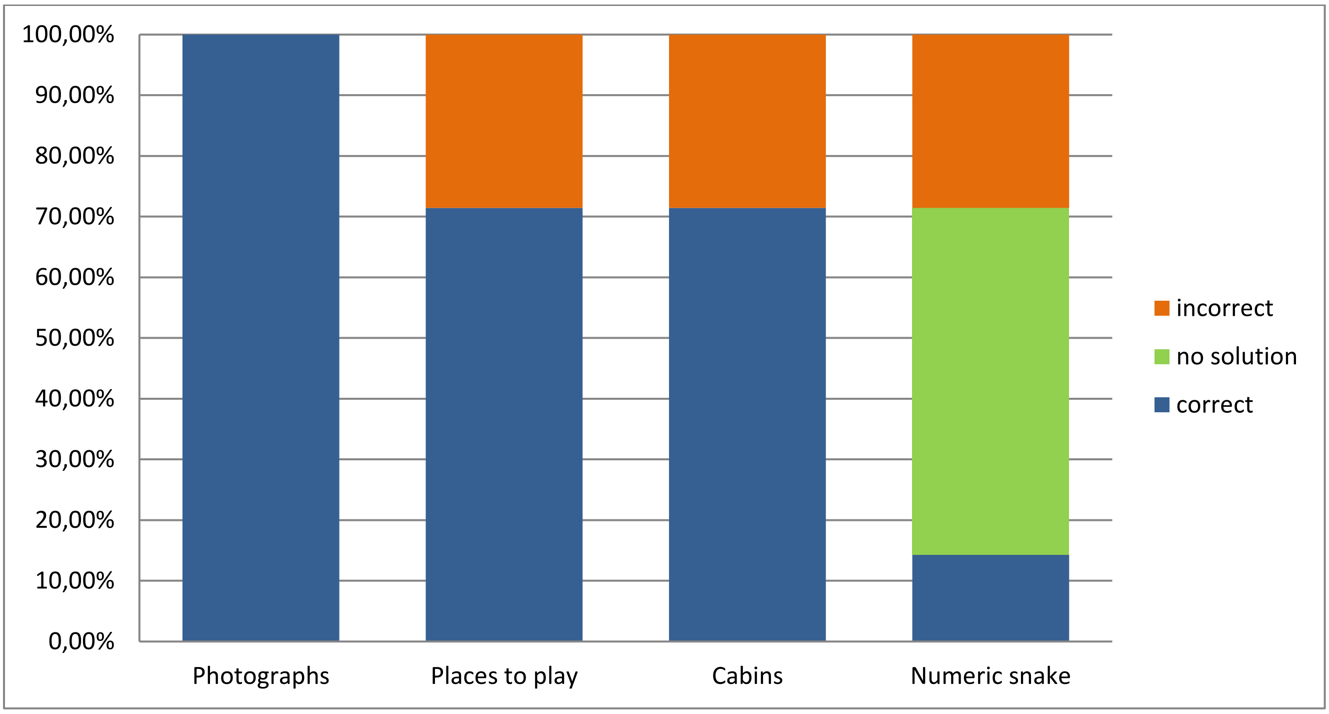


Fig. 9: Graph of success rate in category Blind

Photographs

This task used in its original version without any adaptations, had very high success rate in category Benjamins. In category Blind it had success rate of 100%. We consider this task as easy for pupils.

Places to play

When we compare the success rate of the blind pupils and success rate of intact pupils, we can see that success rates are almost the same. In category Blind there were two incorrect answers. During our observation in class, we haven´t seen any significant problems. Pupils with incorrect solutions don´t use computer very often. One pupil (listed as last in the Tab.1) works with screen reading software only a short time, so she still has some problems to use it. She uses screen magnifier with very high level of magnification. It is difficult for her to keep the track of information. Therefore she was able to solve the contest tasks slowly and with difficulties.

Places to play			
Grade	**Level of visual impairment**	**PC frequency**	**Solution**
6	blind later in life	daily	correct
8	partially sighted	daily	correct
8	congenitally blind	occasionally	correct

8	congenitally blind	occasionally	correct
8	blind later in life	daily	correct
5	partially sighted	occasionally	incorrect
7	congenitally blind	occasionally	incorrect

Tab. 1: Places to play – Dependency of success rate on age, level of visual impairment and frequency of work with computers

Cabins

Cabins			
Grade	**Level of visual impairment**	**PC frequency**	**Solution**
6	blind later in life	daily	correct
8	partially sighted	daily	correct
8	congenitally blind	occasionally	correct
8	congenitally blind	occasionally	correct
8	blind later in life	daily	correct
5	partially sighted	occasionally	incorrect
7	congenitally blind	occasionally	incorrect

Tab. 2: Cabins – Dependency of success rate on age, level of visual impairment and frequency of work with computers

There were two incorrect answers in category Blind. On the other hand, the original task in category Benjamins seems to be quite difficult and only quarter of participants had correct answer. Some didn´t solve this task at all. In the category Blind, the task was easier, but we think, it was adequate for pupils. During our observation we haven´t seen any problems with this task.

Numeric snake

When we compare success rate of visually impaired pupils to intact ones in Benjamins category, it is obvious that there is higher percentage of visually impaired pupils that did not solve the task. It may mean that the task was too difficult, or incomprehensible. While watching pupils during the contest we noticed that they had troubles to orientate in the text when they were moving between the original numeric snake and a new one. We also think that difficulty of the task depends on length of snake. Visually impaired pupils need to remember the sequence of numbers and it is a risk of losing this information while moving through the text. We consider modification of this task to make it more appropriate. The sequence of numbers needs to be shorter and the snakes – old and a new one could be in lines following each other. This will help pupils to focus on the core of the problem and better understand the process of making the new snake (executing L and R commands). However, it is necessary to say, pupils had a chance to use the area below the task for their own notes and they could copy the snakes so that they follow each other. Only one pupil did so.

Numeric snake			
Grade	**Level of visual impairment**	**PC frequency**	**Solution**
8	partially sighted	daily	correct
6	blind later in life	daily	no solution
7	congenitally blind	occasionally	no solution
8	congenitally blind	occasionally	no solution
8	blind later in life	daily	no solution
5	partially sighted	occasionally	incorrect
8	congenitally blind	occasionally	incorrect

Tab. 3: Numeric snake – Dependency of success rate on age, level of visual impairment and frequency of work with computers

Order	Score	Grade	Visual imagination	PC frequency
1	36	8	yes	often
2	23	8	yes	often
3	21,34	6	yes	often
3	21,34	8	no	occasionally
4	18,68	8	no	occasionally
5	5,68	7	no	rarely
6	2,69	5	yes	very rarely

Tab. 4: Overall results – Dependency of success rate on age, level of visual impairment and frequency of work with computers

Table 4 shows the overall results achieved by the blind pupils. It is obvious that those of them who use computer often and have very good computer skills were the most successful. We noticed as well that pupils with good results are able to use visual imagination. It is therefore possible that visual imagination is desired for solving most tasks.

Conclusion

In the paper we presented our idea for a new category in the Bebras contest dedicated for the blind pupils. We explained the way we select tasks and adapt them for the blind pupils. We described the procedure we used to execute the second run of the contest as well as the results of our analysis aimed at suitability of selected tasks. By analysis of pupils solutions of tasks, we can say, that there is some dependence on level of visual impairment and frequency of using computer, but it´s necessary to do extensive qualitative research. We plan to realise and analyse interviews with pupils to find out whether pupils really understood the tasks. We would like to check out the tasks with more contestants from other special schools (in Slovakia and Czech Republic). We offer our experiences to anyone who would like to implement the same category in his/her country.

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ADAPTIVE TESTING IN PRACTICE

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Abstract

Testing as such is important for diagnostics and evaluation. It is used as feedback by both the pedagogues and the ones being tested. The more a teacher learns from the test results, the better is their chance to correct, clarify, or modify the test itself; i.e. to carry out the changes in their instruction or the education process. The more a student learns from the test, the better is their chance to thoroughly learn and master information, and to clarify problematic issues of a particular curriculum. Moreover, their motivation to further study is growing as they deal with more demanding tasks. Adaptive testing carried out in a suitable LMS offers such possibilities.

This paper is aimed at the introduction of basic principles and rules of computerized adaptive testing. Moreover, it provides information about the process and results of computerized adaptive testing, which was experimentally carried out on the sample of 53 ninth-grade pupils at the Porubská elementary school in Ostrava.

Keywords

computerized adaptive testing, Barborka 4 LMS, mathematics, experiment, repetition with tutorial mode.

Computerized Adaptive Testing

Basic Principle

The theory of computerized adaptive testing (TCAT) is derived from the theory of adaptive education (TAE) where the process of the Virtual Teacher is proposed – automatically controlled program of personalized education based on pupils' learning characteristics. According to the theory of adaptive education the instruction is carried out by the adaptive Barborka 4 LMS, which was developed by a group of informatics within the scope of the cooperation of the Faculty of Electrical Engineering and Computer Science of the VŠB-Technical University of Ostrava and the Department of Information and Communication Technologies of the Pedagogical Faculty of the University of Ostrava. The rules and author's principles of computerized adaptive testing have been incorporated into this system.

The main principle of the TCAT is the division of tasks into several levels of difficulty from the least to the most demanding. By solving the tasks gradually a student realizes their knowledge and skills; tests the boundaries between knowing and not knowing; can be notified of their mistakes or offered additional instruction concerning a particular part of the curriculum (they are offered a tutorial in the form of a reference to a study material); and in the case of complete not knowing they are provided with an entire solving process including a correct result (Help).

A detailed algorithm for computerized adaptive testing (including both the reference and Help) was described in detail in the article "Evaluating Student's Knowledge Through The Use of Adaptive Testing" (Prextová, 2014). The author's principles and adaptive rules emerged from the created algorithm, which can be seen – in the form of flowchart – in the following picture:

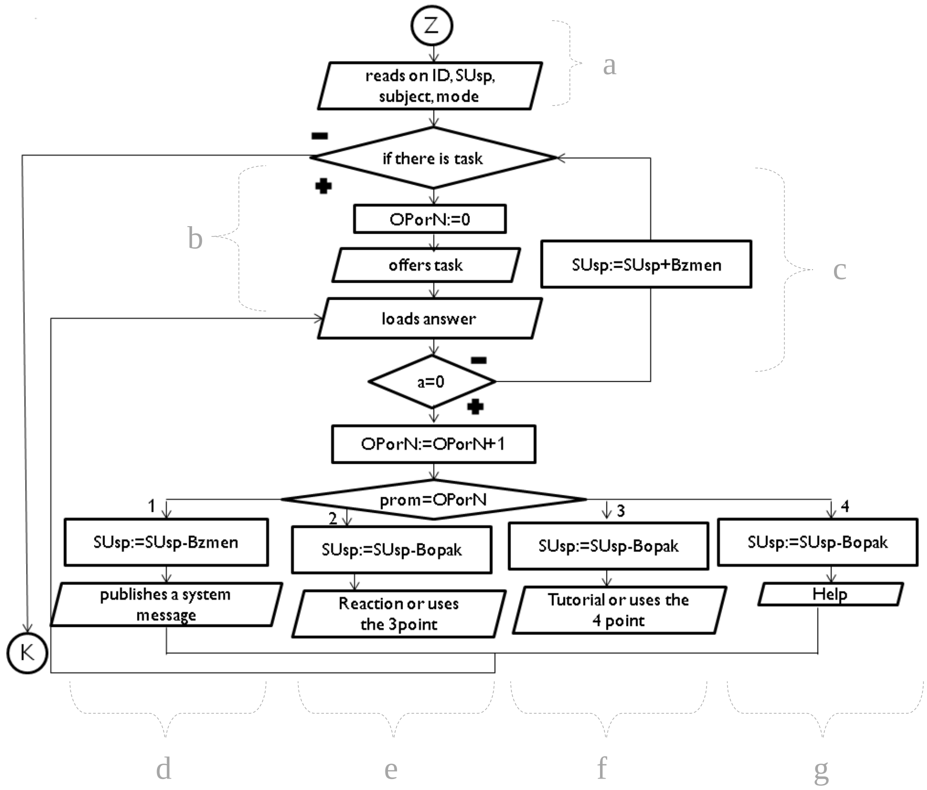


Fig. 1: Algorithm of Computerized Adaptive Repetition with Tutorial

a. Reads an ID of a current student.
    - Loads the current SUsp value.
b. On the basis of a student's choice of subject, a lesson or the repetition mode, the algorithm controls the education process in this mode according to the following procedure of repetition with tutorial: If there are tasks in the sequence of tasks of a selected subject (lesson), then
    - the algorithm calculates a student's current Obod value from their current SUsp value,

- the Virtual Teacher uses the ChooseTask procedure and offers a student a task with the Obod difficulty corresponding to the current SUsp,
- loads a student's answer and evaluates it.

c. If the answer is correct, it raises the SUsp value by the Bzmen value.

d. If the answer is not correct at the first try, it publishes a system message on the incorrectness of the answer and offers a student the second try option; it reduces the SUsp by the Bzmen.

e. If ihe answer is incorrect at the second try, then:

- it reduces the SUsp by the Bopak,
- if there is a Reaction to an answer (expected incorrect answers or generally incorrect answers), it offers the Reaction to a student or uses the 3 point.

f. If the answer is incorrect at the third try, then:

- it reduces the SUsp by the Bopak,
- if there is a reference to a particular tutorial reference as a contextual instruction in any of the previous layers, it offers such a layer to a student or uses the 4 point.

g. If the answer is not correct at the fourth try, then:

- it reduces the SUsp by the Bopak,
- if "help" exists, it provides a student with a detailed solving process including the correct result and invites them to write the correct result down, or simply tells a student the correct result.

Author's Principles

The author's principles for the creation of testing tasks can be divided into two groups.

As far as the *instruction* is concerned, the author can:

- Set the level of difficulty by assigning points for each testing task from the <*l, n*> interval; where *n* is chosen by the author according to how many difficulty levels they intend the test to have (for our testing we used 5 levels of difficulty);
- For each task, set a group of equivalent tasks, which differ in their numeric values, opposite symbols, etc.;
- For each task, set not only correct answers but also Reactions (based on the author's experience – at which point they expect a half-correct or incorrect answers to occur);
- For each task, set Reference (the author refers to one of the Barborka 4 LMS layers with the so called tutorial – a study material for a particular task);

- For each task, set Help (it is a special layer of the Barborka 4 LMS that contains an entire solving process including a correct result).

As far as the rules are concerned, the author can:

- Define the relation between the difficulty of a level and the speed of a tested pupil's success rate change (how correct or repeated incorrect answers will change a pupil's success rate value);
    - If the author prefers not to set the relation, the implicitly set relation will be used.

Note: At the start of testing each pupil's quality – success rate value – is registered. This value is then dynamically modified (increased/decreased) in relation to how they advance through the test and the answers to particular tasks.

Rules

The requirements for computerized adaptive testing were incorporated into the mentioned Barborka 4 LMS (Takács, 2014). These are elementary rules of the if-then type, which determine:

I. The relation between a pupil's success rate and the level of difficulty;

II. The change of a pupil's success rate for correct and incorrect answers;

III. The change of a pupil's success rate for repeated incorrect answers;

IV. The reaction of the Virtual Teacher to a pupil's correct answer:

If the answer is correct, publish a system message on the correctness of the answer

V. The reaction of the Virtual Teacher to repeated incorrect answers:

If the answer is incorrect one time, publish a system message on the incorrectness of the answer.

If the answer is incorrect two times, then:

a) Publish Reaction; if it is not available, omit it and continue to b).

If the answer is incorrect three times, then:

b) Display the layer with the Reference to tutorial; if it is not available, omit it and continue to c).

If the answer is incorrect four times, then:

c) Display Help; if it is not available, omit it and display only the correct result.

If need be, a new rule can be added or an existing rule can be modified.

Elementary School Experiment

Creation of Testing Tasks and Questions

The subject of the experiment for verifying computerized adaptive repetition with tutorial was Mathematics for elementary schools – final revision as a preparation for the high school entrance examination. The set of test tasks – questions and tasks from the subject Mathematics for the 9th grade – was divided into the following thematic areas: *Number and variable; Terms and formulas; Data, graphs, and tables; Functions; Plane geometry; Space geometry*.

For each area 25 theoretical questions and practical tasks were created. The theoretical questions test definitions and theorems while the practical tasks test particular life situations. For each task two equivalent tasks were created – they test the same issue but differ in the way they are formulated, numeric values, or in the offered variants of answers (450 test tasks altogether). All tasks refer not only to the individual study materials (Reference), but also to a particular solving process of a particular test task (Help).

In order for the experiment to be carried out properly, it was necessary that the set of tasks corresponded with computerized testing. At the same time, the individual tasks had to be divided into different categories of difficulty – this was necessary in order to fulfill the requirement of adaptivity. On the basis of *formal classification*, the tasks were divided into: automatically inevaluable and automatically evaluable (it is the second group that is suitable for adaptive testing). Based on the taxonomy of learning tasks by Dana Tollingerová (1970) and following a detailed analysis, a *content classification* with five categories, which represent the five levels of difficulty (with level 1 representing the most demanding group), was created. The final set was made of tasks fulfilling both classifications.

Adaptive Testing System

Because computerized adaptive testing cannot be carried out without a suitable system, the already mentioned Barborka 4 LMS was used. The subject Mathematics was incorporated into the system. The subject consists of individual lessons – thematic areas. Each lesson has five frames; each frame has five test tasks of various levels of difficulty. Each task also has:

- Reference with tutorial thanks to which a pupil gains access to the current study material;
- The complete solving process (the so called Help) with the correct answer.

The option of assigning Reaction to half-correct and incorrect answers was not used.

Realization of Experiment

Before the experiment started, several hypotheses were formulated the content of which could be summarized as follows: *How the use of a computerized adaptive system in practice helps increase pupils’ level of knowledge*. The individual hypotheses were aimed at finding out the impact of the adaptive testing system on individual thematic areas and thus evaluating the overall influence of the adaptive system on the entire subject (Mathematics).

The Porubská 832 elementary school in Ostrava agreed to take part in the experiment. The school has three 9th grade classes (70 pupils altogether). Eventually, 53 pupils took part in the experiment, 19 of which were boys and 34 were girls. Before the experiment started, each student was assigned a unique identification number under which they went through the entire experiment. The experiment took place near the end of the academic year when all the pupils had already taken the high school entrance exams and their final Mathematics grades could no longer be changed. Therefore, the experiment results could not influence their school grades and they were motivated only by taking part in the experiment, testing the adaptive system and having the opportunity of being part of the process that would enable the next generation of pupils preparing for the high school entrance exams to work with the system.

The experiment consisted of three parts. In the first phase a pre-test was carried out. To verify the efficiency of all six thematic areas, six samples of pre-test were created. Each sample consisted of nine tasks. The first five tasks were of the medium difficulty (group 3) while the last four tasks were of the 1, 2, 4, 5 difficulties. The process of assigning a particular sample of pre-test to a pupil was random.

In the second phase the electronic adaptive system using the Barborka 4 LMS was launched. All pupils who took part in the pre-test were registered in the system. They were instructed on how to work with the system. A thematic area (lesson) on which a pupil focuses in the system is selected according to which of the six samples of pre-test they took. Throughout the course of one week, the pupils had the opportunity to work with the system, test themselves, and improve in the tasks, which they found problematic.

In the third phase a post-test was carried out. Again, six samples we created, which contained nine tasks equivalent to the pre-test tasks (the first five tasks were of the medium difficulty (group 3) while the last four tasks were of the 1, 2, 4, 5 difficulties). The post-test was filled out by the same 53 ninth-grade pupils. The process of assigning a particular sample of post-test to a pupil depended on the pre-test sample.

Experiment Results

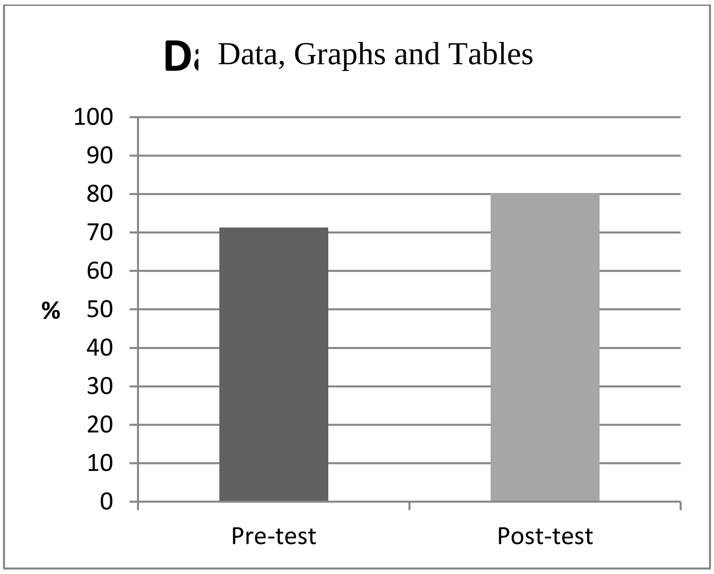
The experiment brought results which were analyzed and processed into tables. Moreover, graphs were added to the tables. A t-test was used to compare the pre-test and post-test results and to find out their statistical importance. The following are the most interesting results which emerged from the experiment. Each hypothesis is supported by a table and the overall pre-test value, which either denies or confirms the respective zero hypothesis.

Data, graphs and tables

As far as the thematic area Data, graphs, and tables is concerned, what is the difference between the pre-test and post-test in the level of knowledge in the experimental group?

H_0: As far as the thematic area Data, graphs, and tables is concerned, there is no statistically important difference between the pre-test and post-test in the level of knowledge in the experimental group.

H_A: As far as the thematic area Data, graphs, and tables is concerned, there is a statistically important difference between the pre-test and post-test in the level of knowledge in the experimental group.



Graph 1: Comparison of Pre-test and Post-test Results

	Post-test	*Pre-test*
Middle value	722,222	641,667
Dispersion	24444,4	37031,3
Observation	9	9
Hypothetical difference of middle values	0	
Difference	8	
t Stat	**2,82675**	
P(T<=t) (1)	0,01113	
t krit (1)	1,85955	
P(T<=t) (2)	0,02226	
t krit (2)	2,306	

Tab. 1: Analysis of Statistical Importance

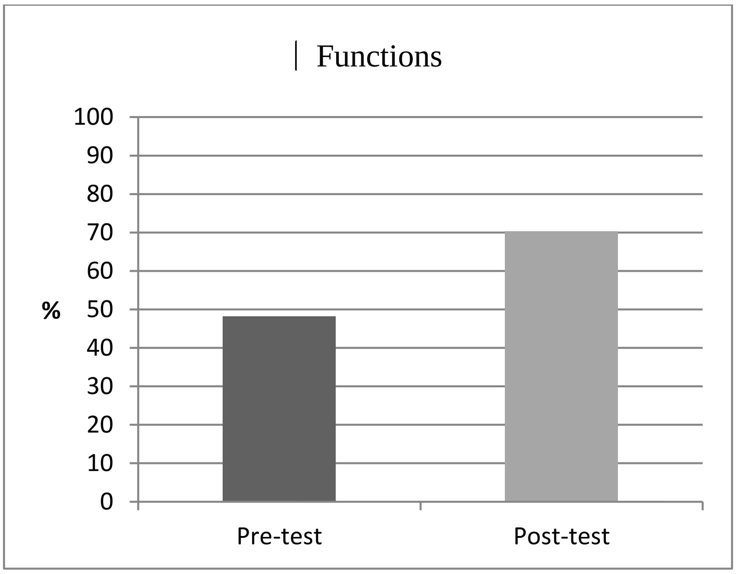
The table shows that out of the maximum success rate of 900, pupils' success rate in the pre-test is 641.667 and in the post-test 722.222. On the basis of the calculated t-test value T = **2.82675**, we can deny the H_0 hypothesis and confirm the alternative H_A hypothesis. Within the scope of the Data, graphs, and tables thematic area, there was a statistically important improvement in pupils' level of knowledge.

Functions

As far as the thematic area Functions is concerned, what is the difference between the pre-test and post-test in the level of knowledge in the experimental group?

H_0: As far as the thematic area Functions is concerned, there is no statistically important difference between the pre-test and post-test in the level of knowledge in the experimental group.

H_A: As far as the thematic area Functions is concerned, there is a statistically important difference between the pre-test and post-test in the level of knowledge in the experimental group.



Graph 2: Comparison of Pre-test and Post-test Results

	Post-test	Pre-test

Middle value	633,3	434,329
Dispersion	8816,39	18843,1
Observation	9	9
Hypothetical difference of middle values	0	
Difference	8	
t Stat	**9,75008**	
P(T<=t) (1)	5,1E-06	
t krit (1)	1,85955	
P(T<=t) (2)	1E-05	
t krit (2)	2,306	

Tab. 2: Analysis of Statistical Importance

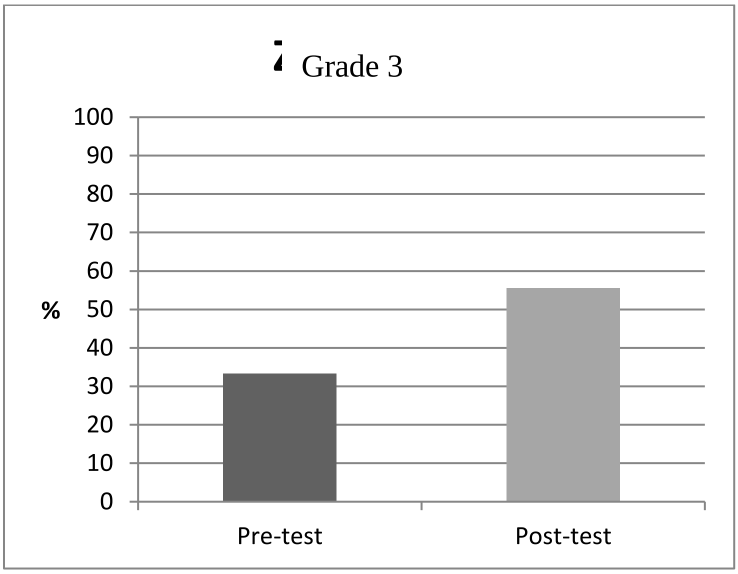
The table shows that out of the maximum success rate of 900, pupils' success rate in the pre-test is 434.329 and in the post-test 633.3. On the basis of the calculated t-test value T = **9.75008**, we can deny the H_0 hypothesis and confirm the alternative H_A hypothesis. Within the scope of the Functions thematic area, there was a statistically important improvement in pupils' level of knowledge.

Grade 3

As far as Mathematics is concerned, what is the difference between the pre-test and post-test in the level of knowledge of the pupils with the mid-year grade 3 in the experimental group?

H_0: As far as Mathematics is concerned, there is no statistically important difference between the pre-test and post-test in the level of knowledge of the pupils with the mid-year grade 3 in the experimental group.

H_A: As far as Mathematics is concerned, there is a statistically important difference between the pre-test and post-test in the level of knowledge of the pupils with the mid-year grade 3 in the experimental group.



Graph 3: Comparison of Pre-test and Post-test Results

	Post-test	*Pre-test*
Middle value	450	323,936
Dispersion	7875	23413,1
Observation	11	11
Hypothetical difference of middle values	0	
Difference	10	
t Stat	**3,47156**	
P(T<=t) (1)	0,003	
t krit (1)	1,81246	
P(T<=t) (2)	0,00601	
t krit (2)	2,22814	

Tab. 3: Analysis of Statistical Importance

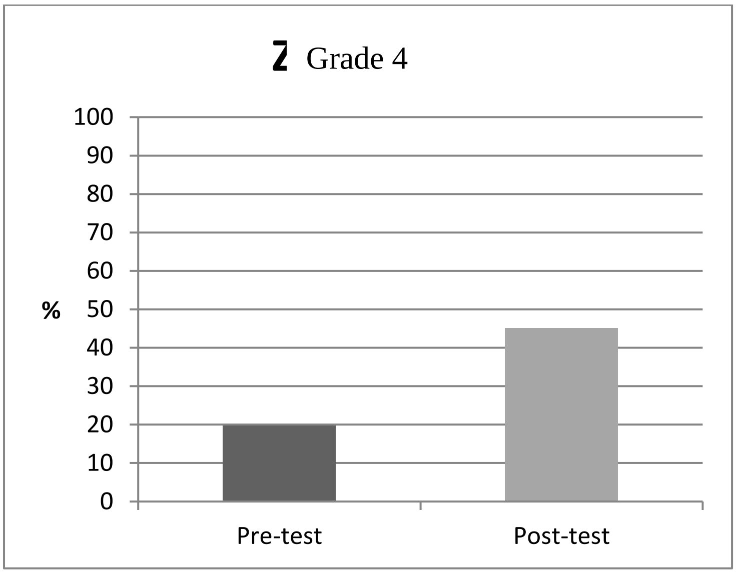
The table shows that out of the maximum success rate of 900, the success rate of the pupils with the grade 3 in the pre-test is 323.936 and in the post-test 450. On the basis of the calculated t-test value T = **3.47156**, we can deny the H_0 hypothesis and confirm the alternative H_A hypothesis. Within the scope of Mathematics, there was a statistically important improvement in the level of knowledge of the pupils with the mid-year grade 3.

Grade 4

As far as Mathematics is concerned, what is the difference between the pre-test and post-test in the level of knowledge of the pupils with the mid-year grade 4 in the experimental group?

H_0: As far as Mathematics is concerned, there is no statistically important difference between the pre-test and post-test in the level of knowledge of the pupils with the mid-year grade 4 in the experimental group.

H_A: As far as Mathematics is concerned, there is a statistically important difference between the pre-test and post-test in the level of knowledge of the pupils with the mid-year grade 4 in the experimental group.



Graph 4: Comparison of Pre-test and Post-test Results

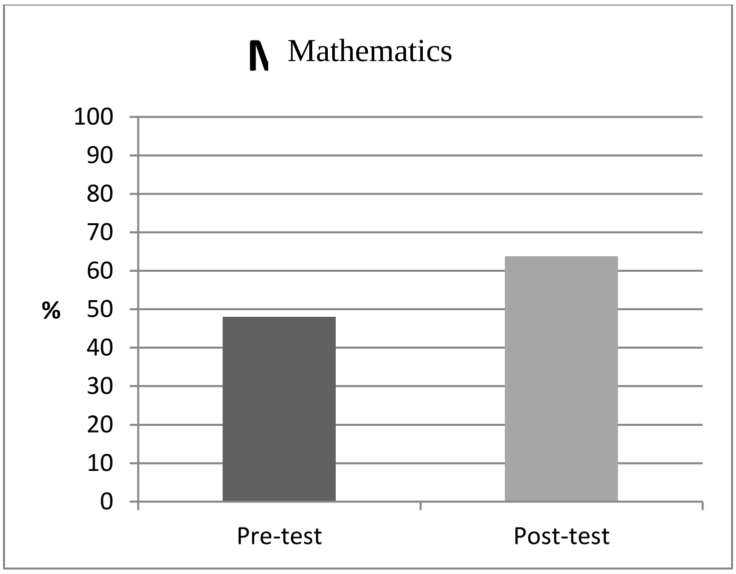
	Post-test	*Pre-test*
Middle value	406,25	177,5
Dispersion	24322,9	21691,7
Observation	4	4
Hypothetical difference of middle values	0	
Difference	3	
t Stat	**16,1123**	
P(T<=t) (1)	0,00026	
t krit (1)	2,35336	
P(T<=t) (2)	0,00052	
t krit (2)	3,18245	

Tab. 4: Analysis of Statistical Importance

The table shows that out of the maximum success rate of 900, the success rate of the pupils with the grade 4 in the pre-test is 177.5 and in the post-test 406.25. On the basis of the calculated t-test value T = **16.1123**, we can deny the H_0 hypothesis and confirm the alternative H_A hypothesis. Within the scope of Mathematics, there was a statistically important improvement in the level of knowledge of the pupils with the mid-year grade 4.

Conclusion

The experiment results show that in each of the six thematic areas there was a statistically important improvement in the level of knowledge of the experimental group pupils. Although the differences between the pre-test and post-test in individual topics differed, in each and every case they denied the zero hypothesis and confirmed the alternative one. As can be seen in the following graph, there is an improvement of the level of knowledge of Mathematics as a whole.



Graph 5: Entire Subject Comparison of Pre-test and Post-test Results

The experiment showed that the proposed algorithm for the Repetition with tutorial mode and the proposed adaptive rules contribute to the improvement of pupils' knowledge. The improvement is most noticeable in the initially less successful pupils.

Positive factors:

- Motivation – Motivate using adaptive testing to better results and reinforcing knowledge (by taking small steps).
- Individuality – Respect for the knowledge level of each student. The student gets the question whose difficulty depends on the responses to the previous task.
- Elimination of stress – The student is not frustrated that he cannot answer any questions.
- Immediate feedback – The provision of immediate feedback (study material – Tutorial or Help).

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ICT TEACHERS AND TECHNICAL E-SAFETY: KNOWLEDGE AND ROUTINES

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Abstract

The article looks at how competent ICT teachers in primary, lower secondary and high schools are as regards the issues of Internet safety, the use of secure passwords, protection against malware and data back-up. Specific knowledge and routines are described whilst discussing the ways teachers are influenced in these areas.

In-depth semi-structured interviews have been carried out with chosen ICT teachers. Teachers were presented with several situations from the issue in question and the way they reacted in given situations was observed. Data gained from the interviews and the triangulation that had been carried out was processed through open and axial coding.

The results of our investigation show that teachers do usually try to behave in a relatively safe way but their reasons for such behaviour differ greatly. The main external determiners include reactions to a certain negative experience, active self-study of the issue and organised instruction (not only at high schools and universities but voluntary attendance of courses). Factors preventing teachers from behaving as safely as possible have been identified. It may be due to working or teaching limitations. Teachers might lack professional knowledge or there could be a problem with security, perhaps being time-consuming or difficult to remember passwords.

Keywords

ICT teachers, e-safety, routines, secure passwords, antimalware protection, data back-up, open coding, axial coding

Introduction

The issue of e-safety is of primary importance to both researchers and the general public. According to Barrow and Heywood-Everett (2006), e-safety is concerned with the protection of the user and his ICT against the negative elements that may arise while using ICT. Livingstone and Haddon (2008) summarised and categorised risks, ranking all of the following negative features as elements of e-safety: exposure to illegal content, exposure to potentially harmful content, encountering sexual/violent/racist/hate material, misinformation, (problematic) user-generated content, challenging content (e.g. suicide, anorexia, drugs, etc.), contact with strangers, cyber-bullying, advertising/commercial exploitation, illegal downloading, gambling, giving out personal information, invasion of privacy and hacking. As the area of e-safety is relatively broad, this article will deal with a narrower area of so-called technical e-safety. This area includes the issues of malware, sharing personal data, identity theft, the drawbacks of email communication (spam, hoax, phishing) and computer crashes (Šimandl, 2013).

The following text will briefly deal with studies concerning the knowledge and routines of ICT users as regards e-safety, with an emphasis on technical e-safety. It is based on our previous research which is described in (Šimandl, Zelenka and Sadil, 2013).

Knowledge and routines of ICT users

A lot of studies have taken an interest in children and young people's knowledge and routines as regards e-safety. Cranmer, Potter and Selwyn (2008) say that primary school pupils are vulnerable at their age, aware of very few strategies to protect themselves from prevailing danger. In addition, many pupils struggle to understand the issue and are unable to assess danger in a rational way. Lower secondary level pupils lack the ability to comprehend and critically evaluate online content and manage their online behaviour (Symantec Corporation, 2010). Beránek (2009) claims that pupils are aware of real e-safety threats but they lack basic safety regulations and refuse to accept "adult rules". This seems to coincide with the opinion that users are most likely to feel that they will never be affected by problems of technical e-safety nature (Lang et al., 2009). McCormick and van Otterloo (2011) mention children aged as young as 10 to 13, claiming their online activity closely mirrors that of an adult, with them forced into complex social situations that require adult reasoning – well before they are ready.

Most adults are aware of the risks of using ICT but many of them do not know how to cope with the dangers or what good e-safety practice is. Many end users do not use technologies to reduce the risk of data loss or leak of confidential information, such as data backup, coding of content in confidential outgoing emails or checking incoming emails with an antivirus program (Lang et al., 2009; Steganos GmbH, 2008; Garrison and Posey, 2006; Symantec Corporation, 2009). Choosing and handling computer passwords seems to be a problem (Lang et al., 2009; Garrison and Posey, 2006; Teer, Kruck and Kruck, 2007), with only a few mobile devices adequately protected by passwords (Get Safe Online, 2010). While personal computers are likely to be protected by firewall, antivirus, antispyware and automatic operating system updates (Teer, Kruck and Kruck, 2007; Get Safe Online, 2010), only a small number of smartphone owners considered installing an antivirus program (Ponemon Institute, 2011). The need to focus on this issue is emphasised by the fact that most ICT users admitted to having experienced a cybernetic attack like a malware attack, phishing attack or identity theft (Get Safe Online, 2009).

The role of the school and teachers in avoiding e-safety risks

Due to the lack of knowledge, understanding and skills among various groups of adult ICT users (Byron, 2008; Becta, 2006), parents cannot be relied on to educate their own children in e-safety matters (Becta, 2006). According to Becta (2006), one of the basic conditions for eliminating e-safety risks is education and training. Livingstone and Haddon (2009) claim that schools are best placed to teach children the digital and critical literacy skills required to maximize opportunities and minimize risks. Schools should focus on education aimed at the safe and responsible use of ICT (Byron, 2008) and should carry major responsibility in teaching them the appropriate behaviour and critical thinking skills to enable them to remain both safe and legal when using the Internet and related technologies (Becta, 2005; Becta, 2007).

The role of the teacher seems to be crucial to ensuring children's e-safety. Teachers are required not only to provide children with knowledge of technical e-safety issues but also to bring them up to be responsible ICT users. Teachers are expected to set good examples for students with respect to such ICT issues as privacy, copyright, data backup, and virus protection (Buettner et al., 2002).

Despite the emphasis placed on schools and teachers, there has been no significant investigation into teachers' technical e-safety knowledge and routines, an exception being research concerning teachers' use of social network sites and their virtual friendships with pupils (Šimandl, Zelenka and Sadil, 2013). According to Livingstone and Haddon (2008), there is a need for research focused on the teacher's e-safety literacy and his ability to teach these topics (Spielhofer, 2010). It is also important to clearly define how teachers can be supported to teach this topic (Spielhofer, 2010). Teachers themselves claim their ICT colleagues should be responsible for e-safety education (Papavasiliou, 2009) so it would be suitable to focus on them. Furthermore, the urgent need for research of this kind within the Czech school system is supported by the fact that not even a quarter of all ICT teachers are actually qualified to teach the subject (Rambousek et al., 2007).

Study of the knowledge and routines of ICT teachers as regards technical e-safety

Due to the lack of evidence on the knowledge and routines of teachers in the matter of technical e-safety, we have carried out research in this area. Its aims are as follows:

- To map the current professional knowledge and routines of ICT teachers in the area of technical e-safety
- To analyse significant factors determining how such knowledge and routines are acquired by ICT teachers

Methods

The research was designed and carried out as qualitative. According to Ferjenčík (2010), quantitive research is usually confirmatory and has a deductive character while qualitative research is more explorative and heuristic with an inductive focus. However, we have not found any theory on the acquisition of e-safety knowledge and routines (the lack of scientific evidence in this area has been discussed above). Therefore, we consider the qualitative approach more suitable.

Research participants

Participants chosen for the research were primary, lower secondary and high school teachers of Informatics, Information and Communication Technologies, ICT and other similar subjects. The research involved questioning 13 participants. These were chosen according to several factors – qualified to teach ICT, type of school (lower secondary or high school), length of service, size of towns teachers work in, age and gender.

Three research participants were chosen as qualified high school ICT teachers with relatively little experience in schools (approx. five years). Two participants were chosen as teachers teaching ICT for their first or third year but not qualified to do so, each with a very different approach to ICT self-study. Another two participants were chosen from trainees having completed lifelong education studies for ICT coordinators. Although neither of them is a qualified ICT teacher, they have long-term experience of teaching ICT at high school, interest in the field and further education in it.

In order to include participants with experience at lower secondary schools in the research, two lower secondary school teachers were approached. They had already cooperated through short-term training programmes before. Both teachers taught in schools in smaller towns. Another participant was chosen due to his position as headmaster. Three teachers not qualified to teach ICT were added to the list of participants. For these three, there was no evidence of them having attended courses or training concerning ICT. These participants were chosen particularly on grounds of age, which ranged from around 35 to 65.

Data collection

Data collection involved individual meetings with each research participant. A semi-structured in-depth interview formed the basis of each meeting. Each interview lasted about 50–70 minutes. Research participants were informed of the aims of the study and assured anonymity. They were subsequently requested to take part in the research and to agree to have their interview recorded on a voice recorder.

The triangulation concept was incorporated into data collection (Švaříček, 2007b). Research participants were asked to fill in a short didactic test, based on case study questions. The aim of this test was to find out participants' knowledge of technical e-safety and how they would react in specific situations. The teachers were given a printed e-mail with a hoax message and asked for a practical example or written description of how they would react to this message. Following the principles of triangulation, so-called follow-up and confrontational questions were included in the interview (Švaříček, 2007a), adding depth and explaining any possible difference in how teachers behaved and how they replied during the interview.

Data analysis

Analysis of acquired data was based on the open coding method. The analysed text was divided into units and these units were allocated a certain code that represents a certain type of reply and differentiates it from the others (Šeďová, 2007). Codes from the generated list were subsequently grouped into categories according to internal similarity (Strauss and Corbin, 1999). Open coding was followed by axial coding, which aimed to create associations between categories and subcategories via the paradigmatic model (Strauss and Corbin, 1999). The principle of constant comparison was included in the process of overall analysis (Šeďová, 2007). The aim of this comparison was to find differences within data sources relating to one research participant and within data concerning various participants.

Ensuring quality control of the research

Besides using triangulation for data acquisition (as described above), researcher's logs were kept, capturing ongoing metainformation as research was carried out. Efforts were made to preserve the consistency of questions posed to research participants by making a written list of them and the coding of several of the first interviews was checked to preserve the consistency of data coding.

Results

Analysis of the interviews identified several categories related to teachers' knowledge and routines in the area of technical e-safety and how they are shaped. The basic categories are External influences on routine, Internal influences on routine, Personal relation to ICT, Barriers to protection, Specific protection routines, Drawbacks of protection and Subjective assessment of knowledge & routine. These categories are linked via mutual relationships, as shown in Fig. 1.

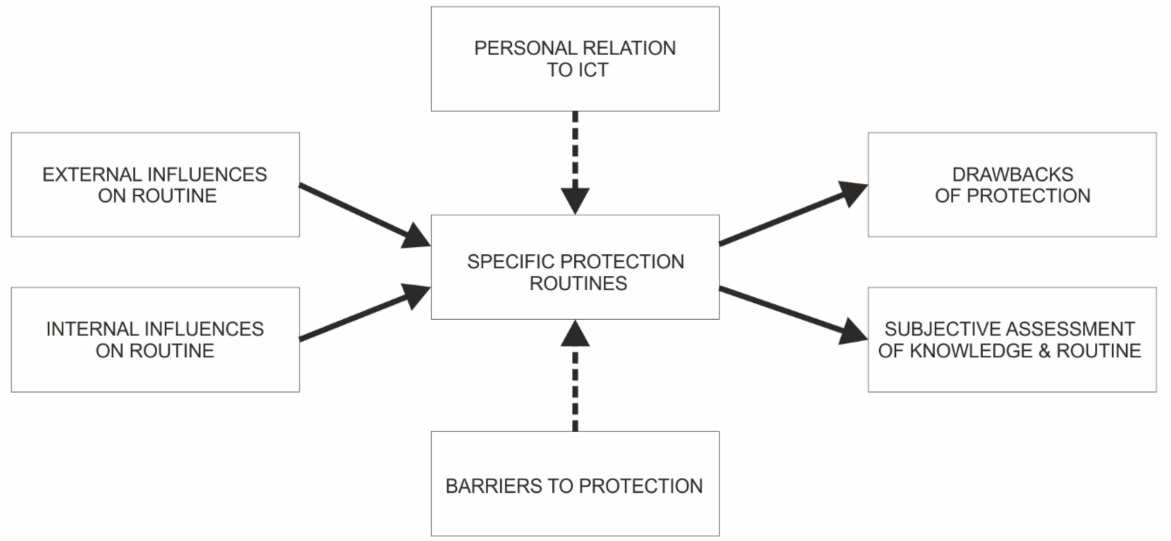

Fig. 1: Relationships between categories in the model of forming knowledge and behaviour of ICT teachers

The central category in the model is *Specific protection routines*. This category deals with ways teachers protect themselves against negative elements while using ICT. Methods of protection are mainly affected by the causal categories *External influences on routine* and *Internal influences on routine*. Whereas external influences relate to the outer world (for example attended instruction or experience), internal influences concern the teachers' personality and their view of the world, for example (lack of) trust, the role of the teacher, etc.

The category Specific protection routines is to a certain degree influenced by the categories *Personal relation to ICT*, which deals with the teachers' relationship to the teaching of ICT subjects and to ICT itself and *Barriers to protection*, which include influences preventing teachers from protecting themselves as much as possible in specific situations.

Teachers' subjective opinions of their own knowledge and routines in the area of technical e-safety have been captured in the category *Subjective assessment of knowledge & routine*. The category *Drawbacks of protection* concerns the negative consequences that teachers encounter from the methods of protection they use. The following text goes on to describe individual categories.

External influences on routine

ICT teachers' behaviour is directly influenced by the external world. External influences can be divided into areas of experience, self-study, organised instruction and administrators' warnings.

Experience. A significant factor influencing teachers in the area of technical e-safety is previous experience, particularly something negative experienced as a result of disregarding rules. One of the teachers accounted: "*I was really gutted to lose a unique piece of work which I never managed to piece back again since then, so I started to protect myself in such a way. If it hadn't happened, I wouldn't be so thorough.*" Teachers can be influenced by situations encountered while doing their job (e.g. as school network administrator) or by problems that close friends or acquaintances have run into. However, behaviour will not be influenced by a negative experience alone. Teachers also need to be aware of the mistake they have made and the amount of damage they have caused.

> ***Case study 1.*** *During the research, we recorded the case of a teacher whose school computer became infected. As the computer could not be used for everyday work, the IT department had to be informed. They discovered the problem had been caused by a virus, which they removed. The teacher remarked that he was not aware of a specific mistake that might have sparked the incident and blamed it on an unspecified lapse of attention while working on the Internet, which, he added, can happen. In his words, a teacher's behaviour would not be influenced by this incident.*

Experience does not only lead to safer behaviour but may also incite teachers to disregard recommended procedures if they are restricted by such procedures and not aware of any clear benefits from them. The following citation concerns the need to regularly change passwords: "*I did it but then I got them mixed up. New password – old one – new one – old one (…), so I just kept using the same one*."

Self-study. ICT teachers educate themselves in the area of technical e-safety. Important sources for them are ICT textbooks, specialised ICT literature and the Internet, going on specialised websites in the aim of understanding a certain area or solving a specific problem. If they do not have enough time for this study or are unable to understand the problem, they ask more experienced colleagues or renowned ICT experts to explain the matter to them: "*I find a lot on the Internet and have people around me who understand it as well, so I try to understand the stuff myself and if I get to the point where I don't know, I might refer to them*".

Instruction. Organised instruction influences teachers in the area of technical e-safety. Teachers not qualified to teach ICT acknowledge the benefits of in-service training and courses. Teachers qualified to teach ICT do not speak much of the influence of university classes. Their remarks are not convincing and any instruction of the topic seems to have been confused with other sources of information.

> ***Case study 2.*** *During the interviews, we were surprised by the speed and accuracy at which one of the newly-qualified teachers recalled the rules for creating computer passwords. We asked her whether she had gained this knowledge at high school or university and she replied: "No, I first read about that in a textbook that I bought myself when I started to teach ICT".*

Case study 2 might hint that, at certain universities, lessons of technical e-safety for pre-service teachers are underestimated or overlooked. In that case, these qualified ICT teachers would be forced to study the issue of technical e-safety subsequently, just like their non-qualified colleagues.

Warnings from administrators. Teachers regard calls to carry out certain actions as prompts for safe behaviour. These prompts come from the computer network administrator, operating system administrator or online service administrators. For example, one of the teachers stated: "*Sometimes I get a message (telling me to change my password) from the school (...), so I do it everywhere. If I'm on doing it anyway*." While some of the teachers accept the content of these calls and try to behave accordingly (see citation above), others do what is required of them but are not fully convinced it is the right thing. Take the example of creating a computer password that is long and sophisticated enough to meet the service provider's demands.

Unintended opportunities. Some teachers get into unplanned situations and use them to gain knowledge and inspiration on how to stay as safe as possible. That might be from news in the media or it could be from a research interview, as shown in case study 3.

> ***Case study 3.*** *Whilst researching, we met a teacher who was curious during the interview, replying to our question on whether he had thought up a defence strategy against spam: "(...) I have no defence strategy because it doesn't worry me. And if it doesn't worry me, I don't do anything about it. But if something like that exists, tell me about it".*

Internal influences on routine

ICT teachers' behaviour is affected by influences originating from their personality and view of the world. The teachers' personality influences the decisions they make: trust or distrust, caution and fear, pragmatism or scrupulosity, thought and awareness of the role of the teacher.

Trust vs. distrust. Teachers distrust strangers on the Internet, worried about possible danger, whereas they usually trust companies who they have had a positive experience with. Distrust of strangers can be in the form of an unwillingness to trust information provided on an unknown website or to have oneself registered in return for providing certain data. They are willing to overcome this distrust provided the given service has been critically acclaimed by somebody they know well. Teachers partly distrust renowned services, worried about security issues and possible misuse of confided data: "*I wouldn't save my personal data there (in a cloud). I have tried to remove nearly all my photos and I just have a few there and I would never put any data on Google or Microsoft.*" On the other hand, they trust these services as regards their confided data being protected against loss or damage. As for trusting the technical security of their computer against threats (antivirus, antispyware and others), teachers differ in opinion. Some believe their security will stop a perspective threat: "*I trust the antivirus program would let me know if there was a virus in it.*" Others are more careful and do not want to limitlessly rely on technical solutions.

Teacher's approach. Teachers adapt their behaviour to ensure professionalism. In fear of losing authority or in an effort to keep work and private life separate, teachers try to keep a certain distance from pupils. Some teachers try to be cautious with their pupils in fear of coming under threat from them: "*I'm afraid (...) and especially at school because our current students are hackers. They can get into a lot of things and I believe they could even get into my email if they wanted.*" For many teachers, teaching ICT provides the motivation to improve their technical e-safety knowledge and take an interest in new trends: "*Of course, it is motivation for me to search for it because I am an ICT teacher*."

Pragmatism vs. scrupulosity. While some teachers admit to behaving pragmatically, others claim they behave scrupulously. Take the example of registering for unknown online services, where some of them are, in their own words, willing to enter false personal details, whereas others reject such behaviour: "*(...) I tend to consider whether I need to make the registration at all or not. And if it is absolutely essential, I usually give true information (...)*".

Thought. Teachers do not make decisions on their actions formally on the grounds of generally valid precepts but make efforts to think about a specific problem and try to find a way to meet their own needs or demands from their social circle whilst remaining safe: "*Like a colleague puts his travel albums there (publically on Google+). I don't see anything wrong with that but it has to be differentiated, there has to be a limit.*" As some security procedures are restrictive (see chapter Barriers to protection for details), they are not used in all situations by teachers, who try to think about the value or confidentiality of data to be protected or, being exposed to a potential risk, elect an appropriate strategy according to that. The following statement illustrates the intensity of data backup: "*Photos are (...) probably the most important thing I make backup copies of. Maybe I make more backup copies of them than of documents, which should probably be vice versa.*"

Fear of consequences. A motive for safe behaviour is fear of the consequences of a possible incident if rules are disregarded. Teachers are worried about their privacy and possible abuse of their personal data, identity abuse, fraud, the loss of data stored in the computer and the effects of a virus.

Personal relation to ICT

The category Personal relation to ICT expresses the teachers' approach to the teaching of ICT subjects and to ICT itself. This area covers a discussion of how given teachers became ICT teachers, how they perceive their role and in what ways they use ICT outside the classroom.

Relationship to ICT teaching. Teachers either qualified or not qualified to teach ICT were questioned as part of our research. Teachers not qualified to teach ICT usually stated that they had started to teach ICT because there was no other more suitable candidate in their school: "*Because it also had to be taught at school and other teachers were not keen on it, I kind of studied it and got into it.*" Teachers not qualified to teach ICT have different opinions on whether university study leads to a good understanding of technical e-safety and the ability to teach this topic. Some of them do not consider the absence of a university ICT education a handicap for them and they feel it might be compensated by long-term experience in the field. Others do not agree with this opinion and feel they are disadvantaged: "*Well, they (newly qualified ICT teachers) are definitely more in the know about that. Because they have been doing it from scratch, from the foundations and they have the latest possible information. Whereas we get to know stuff like in reverse (...)*".

Relation to administration and using ICT. The teachers who were approached for the study differ in their relation to ICT administration. While some administer their computer by themselves, others state that they are not computer administrators but users. Differences can also be found in their relation to school ICT administration. While some, in their own words, are responsible for ICT administration at school, other teachers stated that they are not involved in this activity and ICT at school is administered by other people.

There are disparities in the extent teachers use ICT outside the classrooms. Some of the teachers, in their own words, use the Internet quite rarely and communication via ICT is not one of their strengths while others use a whole range of Internet services and actively use social network sites.

Barriers to protection

In the matter of e-safety, teachers' behaviour is affected by influences which prevent them from protecting themselves as well as they can (for example pressure on publishing personal information, lax approach or lack of time). These influences originate in their external environment, their personality and lack of expertise and abilities.

Lack of expertise prevents teachers from making funded decisions in a specific situation, where their interpretation of a problem can be inexact and they can be put at risk. Take the following citation concerning a teacher's computer getting infected by a virus: "*(...) because there was a (window), I wanted to display the content so I clicked on something and it went off. So it must have been (a virus) because instead of displaying some content, it started to do something in my computer*". Lack of expertise and ability is demonstrated both by the inexact use of terminology (for example "*the cross for clicking is sometimes fake*") and by the teachers' explicit remarks: "*I don't involve myself in this because I know I am incapable*".

External obstacles. Teachers perceive obstacles which originate from their external environment and which their e-safety principles are confronted with. These obstacles include pressure from around them to publish personal information. Take the need to state one's e-mail address on the school website or when registering for various services. Another obstacle is the need for rapid communication with pupils, due to whom some teachers decided to abandon their principle not to enter into friendships with their pupils on social network sites: "*...mainly (I entered into a friendship) because of a competition, because we needed to be in touch with them and I didn't want them to call me. So I chose Facebook, that we would work it out on Facebook (...)".*

Some teachers do not feel good about the imperfection of technical solutions and the possibility that the means of prevention they use could fail. One of the teachers summed this up by stating that "*Any machine is merely a machine and has many faults.*"

Internal obstacles. Teachers are prevented from the safest possible use of ICT by obstacles that originate from the type of person they are, the way they feel and the amount of time they have. Teachers can find themselves in risky situations because they are in a hurry or tired or when they, in their own words, lose concentration: "*When I'm tired, I don't really think much and I start to do things automatically, so mistakes are more likely to happen*". Teachers abandon ideal methods of protection because they become lax and lack time: "*... my other passwords are like that because they're easy to write, so I don't have to tap in the alphabet plus twelve numbers (...)*". A similar obstacle to security is the amount of remembering that is needed, which leads to rules concerning computer passwords being disregarded.

Teachers are aware of disregarding rules and defend their decision by explaining that higher security is not needed due to the type of data they have: "*If I had the feeling that I have something private there, then I probably would... It's the type of stuff that if someone read it, it wouldn't be the end of the world...*"

Some teachers stop being cautious when the potential threat comes from someone close. Take the words of a teacher regarding opening suspicious e-mail attachments from people he knows: "*I trust acquaintances and friends in this respect when they send me something by mail.*"

Drawbacks of security. If teachers decide to behave in the safest possible way, some security obstacles become security drawbacks. Take the time demands of security, being deprived of certain information (for example on social network sites), forgetting a strong password that has been regularly changed or important messages being marked as spam by an antispam filter.

Specific protection routines

The central category of our model concerns specific ways ICT teachers protect themselves against the negative effects of using ICT. It is made up of both procedures for prevention and procedures for dealing with consequences. The following text covers general methods of protection and goes on to look at individual areas of technical e-safety (i.e. data loss, malware, computer passwords, unwanted mail and privacy administration).

Teachers' reactions to a specific problem can be very different. Some try to resolve a situation on their own, searching for initial help on the Internet, whereas others turn to local ICT specialists with requests for advice. In the same situation, other teachers would ask an ICT specialist they know for direct intervention without any prior efforts to solve the problem by themselves: "*Because I'm not such an IT geek who can get by on his own. And especially when these people are around you (...), so you don't do it by yourself.*" If they are not familiar with suitable local ICT specialists and are unable to solve a problem on their own, they turn to specialised companies.

Making backup copies. Teachers use a wide range of media to make backup copies of data – external hard disk, USB flash disk, cloud service (an e-mail inbox or a type of data storage like DropBox), CD or DVD. Many of them make backup copies of their data in various ways, most often choosing an external hard disk as primary backup medium. Some teachers see printing or including in an online photo gallery as a specific backup method for photos: "*Because I have already sent them (certain photographs) to rajče.net, so at least they wouldn't get lost there. (...) True, they wouldn't be in five megabyte format, but I would simply have the photos*".

While some claim that they make backup copies of their data at regular intervals, others make backup copies of data they have just been working on or have edited: "*I make backup copies whenever I work on something. If I am working on something and it's finished, I make a backup copy. If I haven't been working on anything, what should I make a backup copy of?*"

Protection against malware. Our study has discovered two basic approaches to antivirus protection. While some teachers actively carry out antivirus checks, others rely on the fact that the antivirus itself will inform them of any threat. Both groups base their antivirus protection on antivirus software with a regularly updated virus database. Where teachers are warned of a threat (from a file or website), they accept this advice and delete the file or go off the suspicious website.

There are disparities in how teachers behave when surfing the net. Some try to avoid high-risk websites but others go on them aware of the possible threat: "*I know there could be a possible threat, but even so I have a look when I need to or when I'm interested in it. Yeah, it often warns me that the website contains some dangerous material so I usually close it.*" Among them, there is a group of teachers who do not avoid websites with high-risk content but go on tried and tested sites where they have not experienced malware as yet. We have not spoken to any teachers who have been on high-risk sites using a virtual computer environment or similar approach.

Account security. As a rule, teachers use several various passwords to secure their accounts. For access to services dealing with highly confidential information (particularly Internet banking), they use a unique password which they do not use for any other service. Some teachers use one common password for access to mutually related services, whereas others claim they choose a different password for each service. As a rule, for those services that are not considered important by individual teachers, they use one common password for the security of all these services. On the other hand, we have met examples of teachers who, in their own words, use one single password or a few very similar passwords for all services.

Teachers usually use a relatively long password for important services. While some, in their own words, make up passwords that meet recommended parameters, others create passwords by connecting several words and not including all advised symbols. However, we have also met an example of a teacher whose passwords contained some of his personal details.

As far as regularly changing passwords is concerned, teachers' opinions differ. While some do not change their passwords at all, others claim that, for important services, they regularly change them several times a year. To prevent themselves from forgetting passwords, some teachers create lists of them and some teachers share their passwords with members of their family.

Protection against unwanted mail. Most teachers prevent the delivery of spam to their e-mail inboxes but some teachers see spam as an unavoidable feature and do not seek protection against it. Those who block spam try not to publish their e-mail address on websites or modify the address to stop spam robots using it. Some teachers set up a second e-mail account to use when registering for online services but not for everyday communication. On receiving an unwanted e-mail, teachers usually delete this message or mark it as spam. Where an unwanted business offer is received, some teachers try to unsubscribe from further receipt of a given company's offers.

Where a hoax is received, teachers make a decision based on the seriousness of the message. If the content of the message concerns them directly, they, in their own words, usually try to verify the message with independent sources. If the message warns of a general threat (for example, the alleged health risks of everyday food items), many teachers refuse to verify such a message: "*I don't even study whether or not it can be true because like in that situation I always lose. Whether it's true or not, don't bother about it. Because you can't verify it.*" For most teachers, principle sources for verifying messages are civil service information portals and sources searched for via an Internet browser; only a few teachers mentioned services monitoring hoaxes (e.g. Hoax.cz). Teachers generally refuse to pass on hoax messages but some admit to passing on an important message after having thoroughly verified it.

Protection of privacy and use of social network sites. Most teachers try not to publish personal information or photographs on the Internet and if they do, they claim that they publish materials which they consider fitting. The typical approach is to publish selected personal photographs or information about their private life only for a narrow circle of people, both on social network sites and off it. Take a teacher who remarked: "*I use Picasa to store my photos so, when I'm on another computer, I can show them to others*."

ICT teachers use social network sites to different degrees. While some use social network sites often, others are either occasional users or completely reject it. Some teachers are passive users of social network sites, looking through content placed by their friends but not creating content themselves. However, not all teachers behave in this way. Some publish personal information, as shown in Case study 4.

> ***Case study 4.*** *During the triangulation process, we were searching for information on research participants in the part of Facebook accessible to the public and we found photographs in a business card layout in the profile of one of the teachers. The photograph portrayed the given teacher with his dog and his car was standing in the background with a clearly visible registration number. Apart from the teacher's full name, his address and*

mobile phone number had been inserted into the photograph. Other photographs also contained information about the teacher's private life (his interest in cycling, ownership of a certain breed of dog, and car registration number). Although the stated information cannot be considered confidential, the teacher's approach greatly differs from those teachers who try not to publish any information about their person on social network sites, not even in their circle of friends.

Some teachers try to cancel social network site and community server accounts which they no longer use, due to efforts to control personal information that has been online and to remove traces of any previous activity. One of the teachers accounted: "*I know there can still be something from the past even though I have tried to cancel sites like Spolužáci.cz and other similar ones. (…) And I don't want anyone to access this information about me.*"

Subjective assessment of knowledge & routine

Part of our research has investigated how teachers subjectively evaluate their technical e-safety knowledge and routines. As a rule, teachers called themselves laymen, learning gradually and saying that they knew "enough" about the issue for their own needs and the tasks they are required to do. One of the teachers stated: "*I am as able as I need to be at a particular moment. If I needed to expand on anything, I would have to devote more time to it and look into it more (...)*". There were also opinions expressing fear of a lack of knowledge, personal experience and ability to cope with perspective safety issues: "*I have never had a bugged computer and I am really lucky it has never happened to me. Because there were loads of obstructions and difficulties and who knows if I would be able to manage that (...)*". On the other hand, we also met teachers who called themselves specialists rather than laymen, feeling they had become experts in the matter.

Although teachers usually know the principles of safe behaviour, some admit to disregarding them: "*I teach students about changing passwords and using long ones but I get the feeling that I don't keep to that myself. Despite knowing it in theory.*"

Conclusion

There has been a great deal of discussion regarding the key role of schools in meeting the need for an e-safety education program aimed at children and teenagers. However, there has yet been no investigation of the professional knowledge and routines of teachers, not even of ICT teachers. Teachers in the area of technical e-safety should not be seen as mere theorists but also as personalities who can greatly influence pupils through their own example.

Our research has identified the routines and knowledge of teachers in the area in question. Teachers usually try to behave safely but there are very differing reasons for such behaviour. In terms of safer behaviour, teachers are influenced both by external factors (e.g. a negative experience they might have had or a course they might have attended) and by their personality and view of the world (e.g. their awareness of the role of the teacher). However, teachers are also affected by influences that prevent them from behaving in the safest possible way. This might be due to workload or teaching, not having time for security measures or the lack of expertise in e-safety. Our research has largely dealt with each type of influence separately but they clearly coincide with each other – either having a synergic or opposing effect or mutual influence.

Future research will need to reveal what kind of mutual relations exist among the above mentioned influences and what the most significant determiners of knowledge and routines of ICT teachers are. If we succeed in understanding how technical e-safety knowledge and routines are formed, we will be able to improve the quality of pre-service teacher education and in-service teacher training.

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MOBILE EDUCATION

Relation from X Konferencja Naukowo-Metodyczna im. dr Janusza Trawki (10th Janusz Trawka, Ph.D., Scientific & Methodological Conference) in Katowice entitled: Technologia informacyjna w społeczeństwie wiedzy (Information technology in the knowledge society)

Elżbieta Bowdur
Association Computer and Matters of School KISS

Another jubilee conference entitled: 'Mobilna Edukacja' (Mobile Education) took place on 21 November 2014. The host of the Conference was Wyższa Szkoła Techniczna w Katowicach (Katowice School of Technology) while its organiser was Stowarzyszenie Komputer i Sprawy Szkoły KISS (Association 'Computer and Matters of School'). The honorary support was provided by Śląskie Kuratorium Oświaty (Silesian Department of Education), the Silesian Voivode and the chancellor of Katowice School of Technology. This year's conference was also connected with the 20th anniversary of existence of the Association 'Computer and Matters of School'.

Mobility in the meaning of digital solutions is continuous learning, improvement and barrier overcoming by the people using them. The idea behind the conference was a look at mobility in education as at an enormous chance, simultaneously knowing and understanding the threats. The lecture of Professor Janusz Morbitzer entitled: 'Sztuka uczenia się w cyfrowym świecie' (The art of learning in the digital world) like always raised great interest since it included a lot of examples from the modern professional literature combined with extremely interesting comment and interpretation of the professor. School operates according to an old model and has to change since currently we have a situation, in which the teachers and the students have access to the same sources of information.

An ECDL representative from Dublin, Jakub Christoph, the Development Director of ECDL in Europe, presented a couple of interesting tools for online cooperation. In his lecture entitled: 'Narzędzia współpracy online i ich wykorzystanie w edukacji' (Online cooperation tools and their use in education), he discussed the ECDL Certificate: Online Cooperation, which may be the confirmation of skills and competences not only in the school environment.

Another lecture entitled: ‘Wielka nauka rozpoczyna się od pytania - mobilne systemy sprawdzania wiedzy’ (Great education starts with a question – mobile knowledge checking systems), presented by Maciej Pulnar, M.A., the physical education teacher, showed that a smartphone or a tablet may also be used in a lot of school situations without any special input of time and work. He conducted a quiz, in which the conference participants took active part winning minor prizes. The interactive lecture was an example of a specific method, in which everybody could participate and check his or her own impressions and emotions during the quiz.

The lecture of Jolanta Gałecka, the Education Expert of Young Digital Planet from Gdańsk – ‘Jak technologie mogą pomóc rozwiązać niektóre problemy w edukacji – ciekawe przypadki z Brazylii’ (How technologies may help to solve some problems in education – interesting examples from Brazil), raised enormous interest. Illustration of a couple of examples from Brazil and presentation of educational projects of students from the other side of the ocean was a real example of how changes should occur in the current school as well as how the teacher should change – ‘from a wise man on a stage into a guide at a side’. During the presentation, it was possible to see an educational project of the Brazilian students, in which the digital technologies were used by the students to show the negative changes in their environment and how this environment started to change thanks to this project.

An example of good practice from work in the grammar school was a lecture entitled: ‘Grając uczyć się - czy to możliwe? Jak motywować ucznia’ (Learning while playing – is it possible? How to motivate the student) of Elżbieta Buk from the Polish Office of ECDL, who organises an all-Polish competition connected with safety in the Internet every year. Can the method based on implementation of the elements and mechanisms of computer games in the teaching process change the attitude of the students to school? Can it activate them and improve progress in learning? The attempt to answer the questions based on a game created together with the students, ‘Smokowisko’, was an interesting presentation of teacher’s creativity.

'Cyberbaiting - problem agresji elektronicznej skierowanej wobec nauczycieli' (Cyberbaiting – the problem of electronic aggression directed at the teachers) was discussed by Anna Waligóra-Huk, Ph.D., from Uniwersytet Śląski (University of Silesia) in Katowice based on her scientific research. Presenting numerous examples of violation of the law by the young Internauts in relation to their teachers, she showed a new aspect of cyber-violence and the surprisingly growing scale of this problem. She emphasised the need of a specific school policy focused on assistance for the persons affected by such events and media education of the parents as well as social responsibility shaping.

What has happened to our morality? – with this question, Professor Mariusz Jędrzejko, Ph.D., from WSB started his lecture entitled: 'Czy komputer i Internet uzależniają? Jak modelować relacje dziecko – nowe technologie cyfrowe' (Do the computer and the Internet addict? How to model the relations: child – new digital technologies). Information found in the Internet is not categorised into real and less real and a young man does not have the orientation which to choose, so the model of the teacher as the master and not as the guide should function at school.

At the end of the panel, a representative of the Upper-Silesia Branch of Polskie Towarzystwo Informatyczne (PTI; Polish Information Processing Society) recalled the person of Janusz Trawka, Ph.D., and presented the decision of PTI on awarding him with the title of the Honorary Member of PTI *post mortem*.

During the workshops which were first of all aimed at improvement of the teachers who want to develop in the field of use of digital technologies in didactics, new tools, interesting applications, inspiring lessons and proven methods were shown in brief. The subject matter of the workshops of this year's conference was connected *inter alia* with online graphics, programming, e-handbook, gamification in interactive games or writing of a scenario for an e-learning lesson. They were conducted mainly by the members of the Association 'Computer and Matters of School' who possess great experience in conducting teacher trainings on modern methods for ICT implementation in education.

This year, a very popular seminar entitled: ‘Dlaczego i gdzie dzieci "uciekają" rodzicom. O wartości wychowania w granicach i normach’ (Why and where do the children ‘run away’ from their parents? About the value of bringing-up within the limits and norms), was conducted by Professor Mariusz Jędrzejko. Also a meeting for the persons interested in acquisition of European funds was held.

This is what was said about the conference by its participants:

Maciej Rostański, M.Sc., Eng. - university lecturer, IT consultant, certified Cisco Academy instructor, associate professor in Wyższa Szkoła Biznesu w Dąbrowie Górniczej (University of Dąbrowa Górnicza).

I was very pleased to host already the 10th Janusz Trawka, Ph.D., Scientific & Methodological Conference ‘Information technology in the knowledge society’ together with the President of the Association ‘Computer and Matters of School’, Ms. Elżbieta Bowdur. The motto of this year’s conference - ‘Mobile Education’ – shows how important mobile technologies become for the teachers and students and how many possibilities but also challenges and problems entailed by their use at school occur together with them. As it was emphasised by Ms. Elżbieta Bowdur, remote access to applications and remote access to the Internet become a key issue for the modern society and therefore also for the school environment. This year, from the scientific experts such as Anna Kwiatkowska, Ph.D., but also from the practitioners, such as Ms. Jolanta Gałecka, we heard, we saw and we even experienced (thanks to the excellent demonstration of Mr. Maciej Pulnar) how great motivation and interest may be activated by modern technologies as well as how they can develop and form the learning of young people. The conference did not also avoid the difficult and current questions, such as a question about impact of digital education on the youth or a question about the phenomena of use of mobile devices in a harmful manner – it proves how important and necessary a wide discussion on this subject matter not only in the national but also in the international environment is. I am happy that I was able to participate in the event which undoubtedly paves the way of the modern education, which allows the teachers and all other persons interested in the future of teaching for refreshment, expansion and opening of the new horizons of possibilities provided to us by the modern technology.

Also Marcin Stalmach, M.Sc. – vocational subjects’ teacher in Zespół Szkół (School Complex) in Czerwionka - Leszczyny.

Janusz Trawka, Ph.D., Scientific & Methodological Conference is an exceptional event which not only allows for exchange of experience in education with the use of IT tools but also provides the possibility to acquire new skills, not only in information technology teaching. It may very well be said that it allows for having a new look at the relations between the teacher and the student in the world of the omnipresent social media. The topic of the 10th jubilee conference was mobile education – inter alia the online tools and the use of mobile devices. Therefore, the conference related to the new perspectives which occur in activity of the Polish school. I think that great organisation both of the conference and of the workshops places the November’s meeting in the forefront of events of this type.

Full conference coverage may be watched on the website: http://konferencja2014.kiss.pl