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Development opportunities  
of emotional intelligence  
with reflective strategies  
using video-based training

Our experience with e-learning  
method of teaching practical  
histology

GaMeTix – new software for  
management of MCQ databases

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Virtual patient AKUTNĚ.CZ  
on the route

New teaching methods for practical  
training in nursing within the  
project Tempus IV – CCNURCA

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# CONTENTS

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PREFACE	42
DEVELOPMENT OPPORTUNITIES OF EMOTIONAL INTELLIGENCE WITH REFLECTIVE STRATEGIES USING VIDEO-BASED TRAINING <i>Andrea Pokorná, Anneyce Knight</i>	43
OUR EXPERIENCE WITH E-LEARNING METHOD OF TEACHING PRACTICAL HISTOLOGY <i>Radka Lichnovská, Drahomíra Krajčí, Běla Erdšová, Dimitrolos Krajčí</i>	48
GAMETIX – NEW SOFTWARE FOR MANAGEMENT OF MCQ DATABASES <i>Dimitrolos Krajčí, Pavel Kylar</i>	54
VIRTUAL PATIENT AKUTNĚ.CZ ON THE ROUTE <i>Petr Štourač, Hana Harazim, Daniel Schwarz, Martina Kosinová, Olga Smékalová</i>	61
NEW TEACHING METHODS FOR PRACTICAL TRAINING IN NURSING WITHIN THE PROJECT TEMPUS IV – CCNURCA <i>Gabriela Kuriplachová, Dagmar Magurová, Anna Hudáková, Štefánia Andraščíková, Lubica Rybárová</i>	64

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## PREFACE

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With a great pleasure we present the 2nd 2015 issue of the MEFANET Journal (MJ). MJ is dedicated to provide readers around the world with high quality peer-reviewed articles on a wide variety of topics related to applications of computer science and technology-enhanced learning in medical education. Its mission is to become the premier vehicle for disseminating information about MEDical FACulties NETwork ([www.mefanet.cz](http://www.mefanet.cz)), which covers all Czech and Slovak medical faculties as well as schools or faculties of health care sciences.

The five papers presented here run the gamut of e-learning and other innovative methods in medical and nursing education. The original paper by Pokorná & Knight brings information about the use of selected parts from well-known contemporary movies for facilitating the development of emotional intelligence – one of the essential ability of a nursing professional. The authors not only describe their approach to the video-based training, but also show very interesting results gathered from reflective assignments completed by students. Krajčí & Kylar focus on e-assessment with the use of their own original software developed for management of test items as well as for generating written tests. Lichnovská et al. share their experience with the practical teaching using high-quality histology virtual slides including some interesting figures from long-term students' evaluation of their computer-assisted histology and embryology courses. The editorial material by Štourač et al. recalls the long and successful journey of AKUTNE.CZ interactive algorithms for management of acute patients across several recent conferences and congresses. The final editorial material by Kuriplachová et al. report on improving the quality of the nursing education at the universities of Western Balkan countries involved in the TEMUS IV project entitled CCNURCA.

I am sure that the readers will benefit from the information in the presented papers and it is my hope that this issue will stimulate further discussion and additional research. I would like to extend my sincere appreciation to the editorial members and reviewers, without whom this issue would not have been possible. I would like to see the whole third volume of the MEFANET Journal as another valuable resource for the MEFANET community and a stimulus for further research into the vibrant area of medical education science. The wide range of topics presented in this issue emphasizes the complexity of the use of information and communication technologies in medical education. Readers are encouraged to submit both comments on these articles as well as their own relevant manuscripts.



December 2015  
Daniel Schwarz  
*Editor-in-chief*

# DEVELOPMENT OPPORTUNITIES OF EMOTIONAL INTELLIGENCE WITH REFLECTIVE STRATEGIES USING VIDEO-BASED TRAINING

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**ABSTRACT — Background:** Within nursing, Emotional intelligence (EI) means the ability of nurses or nursing students to understand not only their own feelings and reactions, but also, and more importantly, the feelings and reactions of the patients in their care. EI plays an important part in forming successful human relationships as a part of emotional labour. Emotional labour is important in establishing therapeutic nurse–patient relationships but carries the risk of ‘burn-out’ if prolonged or intense.

**Objective/Purpose:** The assessment of students’ views and perceptions of video-based training as an opportunity to develop emotional intelligence.

**Material and methods:** Data about the video-based training in relation to EI were collected, after the completion of the reflection assignments, using semi-structured interviews and reflective sheets (ALACT model /acronym of the basic phases and steps/ - Action, Looking back on the action, Awareness of essential aspects, Creating alternative methods of action, Trial). The study included 46 students in total (post-graduate student Intensive care nurses) in two sequential academic years (2012/13 n = 15 and 2013/14 n = 31).

**Results:** The results showed that students in both cohorts considered video as an effective tool for carrying out self-evaluations and development of EI. The usefulness of video and peer-feedback for other reflection processes differed in students’ view. Most students (80%) appreciated the opportunity of viewing some unusual situations from clinical practice and appropriate ways of communicating. Some students (17%) stated that they needed more time for similar teaching activities.

**Conclusion:** 80% of all the students considered video-based training generally useful for all the reflection processes and improvement of EI; however they also indicated some limitations (i.e. time consuming teaching method). The study demonstrated that student-centric pedagogies and reflective activities on student learning showed more advanced development of self-evaluated EI.

## INTRODUCTION

In the practical part of health care education, students are instructed to apply their theoretical knowledge to their practice. It can be divided into education obtained both in the clinical laboratory and clinical practice. Traditionally, clinical practice education has been defined as practical experience occurring in a real-world environment [1]. Generally, any practical education taking place on a clinical site will, however, hardly ever meet the learning goals planned by curriculum designers, or educators. This is especially true when speaking about the teaching of communication skills and employing students’ emotional

intelligence (EI). The perceived factors contributing to this imbalance include unpredictable working environments, the need to consider patients’ comfort, dignity and safety, increased attention to patients’ rights and self-determination, and the shortage of training staff (both mentors and qualified staff who help them during the clinical practice) when compared to the number of students. There has to be emphasized the fact, that real patients cannot be “standardized”, so in real-life situations the tutor is never able to predict, whether a given patient would be suitable for such a demonstration and what kind of reaction is the best solution for both (patients and caregivers). The situation within intensive care units is even more

problematical, as the lack of time is a daily reality and the majority of patients may be unconscious and need highly specialized care.

There is a strong evidence in the literature [2], that nursing students want real-world training rather than theoretical lectures – not only for training related to their communication skills. However, the limited time spent in clinical practice, and the acknowledged theory/practice gap suggest the need for specific classroom based session on communication skills.

EI is connected with communication skills [3], and a high EI demonstrates that empathy and social/interpersonal skills are being improved especially in the students' ability to express their own feelings or recognize inappropriate behavior, which is evidenced by their response to the video clips. An improvement in communication skills is related to a satisfactory (improved) level of EI, which means that the student in her role as a nurse is able not only able to understand her own feelings and reactions, but also, more importantly the feelings and reactions of patients under her care.

The importance of the EI concept in the context of nursing is increasingly emphasized [4, 5, 6]. Thus, recently nursing educators have been trying to find new ways and approaches to the training and development of EI. Traditional role-playing during communication lessons in lecture rooms receives positive evaluations overall, but there are several disadvantages including limited involvement by all the students, disconnection with real situations and the shyness of some students. One possible way to solve these issues is the use of video-based training. A video clip allows students to observe communicative and interactive techniques [7]. Using video clips in this kind of education assists students to improve their own nonverbal behavior, such as laughing, eye contact as well as various verbal techniques, such as paraphrasing and interpretation of the observed actor's behavior [8]. After watching the video clips, students – with the facilitation of their tutor – usually reflect on the effect of the movie on their communications skills and their ability to become an empathetic healthcare professional. Students stated that they are able to understand some nonverbal and verbal expressions as well as being able to identify appropriate reactions and that it was possible to be professional whilst, for example, laughing with patients.

## METHODS

Data about a video-based training lesson focusing on EI development was collected through reflective assignments, semi-structured interviews and reflective questionnaires according the Kortaghen's ALACT model [9]. A short sequence from the 'Spacesuit and a butterfly' (the original French title: *Le Scaphandre et le papillon*) was shown for 15 minutes and the students discussed sections of the video during their facilitated

sessions and reflective assignment as a part of the communication sessions (subject: Didactics in intensive care nursing). There were 46 students involved from the "Intensive care nursing" master degree programme in two sequential academic years (2012/13  $n = 15$  and 2013/14  $n = 31$ ). Analysis of the reflective questionnaires was performed with the use of the Heideggerian phenomenological approach involving open and axial coding of the text.

## Participants

In the academic year 2012/2013, there were 23 students who participated, and the reflective questionnaire was completed by 15 students – 13 female students and 2 male students. Their average age was 22 and most of them were without previous clinical practice as nurses (6 students had had limited professional experience in nursing as part-time employees). In the academic year 2013/2014, 36 students participated with 31 students filled out the reflective questionnaire – 30 female students and 1 male student. Their average age was 24 and most of them were without any previous clinical practice (9 students had had limited professional experience in nursing as part-time employees, and 2 students had professional experience in nursing of over 10 years).

## RESULTS

The overall students' attitudes (80%) to video-based training were extremely positive. Students appreciated the comprehensive approach and the opportunity to react immediately in response to the behavior of the actors who played health professionals in stressful situations (for example when communicating the diagnosis and prognosis to the patient, when bathing, during rehabilitation). All students (100%) also appreciated the opportunity to discuss selected scenes in smaller groups and reflect on them in written form afterwards – either during their lectures or later outside of formal teaching.

### Positive evaluation of the video-based training

Most of the students ( $n = 40$ ; 97% in total in both academic years) stated that it was their first experience with video-based training in such comprehensive way and most of them (80%) of them evaluated it as positive experience. The most common words in their descriptions of the video-based training were: "helpful"  $n = 16$ ; 35%, "illustrative"  $n = 34$ ; 74%, "very colorful"  $n = 10$ ; 22%, "fun – despite very sad sometimes"  $n = 43$ ; 93% (in relation to the main character of the movie, who was ill seriously), "interactive"  $n = 45$ ; 98%, and "mediating"  $n = 41$ ; 89%. Analysis of the transcripts revealed three main themes, all with



associated subthemes. The first theme identified was CHALLENGE for students with subthemes: inspirational and motivational, demonstrations with immediate explanation and awareness of errors and deficiencies in student's own behavior in comparison with actor's role playing. The second theme was MOTIVATION for searching new information with subthemes: ability for consultations, discussions of their own ideas and personal/different view on the issue. The third theme was higher EFFICIENCY OF LEARNING with subthemes: "experiencing" a situation that enriches personal experience, the ability to find the "effective" solution to the problem and understanding the "impact" of equity in one's action.

### Negative evaluation of the video-based training

A minority of the students ( $n = 3$ ; 20% in the 2013/2014 academic year and  $n = 6$ ; 19% in the 2013/2014 academic year) reported negative attitudes to the video-based training. The common denominator was the time demands. Some students from both study groups ( $n = 8$ ; 17%) wanted to see the whole film and not just sequences. There are risks associated with seeing the whole film; for example, loss of students' attention or missing out on some of the important learning details. Another problematical issue identified by students from both groups ( $n = 4$ ; 9%) was their unwillingness to express themselves and participate in the classroom discussion. Students also recommended some ideas for increasing their compliance of the video-based training. They suggested: (i) to extend the time devoted for video-based training; (ii) more frequent use of films in other subjects; (iii) to reflect on the entire film rather than on several selected sequences. They also suggested having some kind of motivational video at the beginning of each video-based training session – focused on the main topic of the session. They also requested viewing some films with comments and tasks within their e-learning courses and this has been established. One of the most interesting findings was that the students ( $n = 35$ ; 76%) felt that more educators needed to have a wider overview of similar sources of popular information which could be used within a professional context. The students highlighted that they recognized that they do not have to obtain new knowledge and skills purely from academic textbooks and journals, but could acquire knowledge and skills, especially related to communication, from other sources.

### Ability to reflect previous experience from video-based training

The ALACT model describes a structured reflective process, where the person reflecting should firstly describe a particular situation and then use their

previous experience for future improvements in their values, attitudes and behaviors. In our study, students were able to describe problematic situations they had experienced in relation to communication and recognized how some film sequences related to the problem. They were not necessarily able to suggest better solutions or to come up with ideas which might have been helpful in improving and enhancing negative relationships and communication between the patient and healthcare providers. However, we cannot say that this is a negative finding as when reflection activities are used students should feel free to respond honestly and openly.

### Ethical consideration

The purpose and procedure of this study, voluntary participation, guaranteed anonymity, and the possibility to withdraw at any time were explained to the subjects and written consent was obtained. Ethical permission for the study from the university was obtained.

## DISCUSSION

The efforts of the stakeholders, curriculum designers and educators need to look at reorganizing the clinical curriculum and education of nurses so that there are more opportunities to be innovative in developing communication skills within a controlled educational context. Generally, it is thought that communication competence is only effective when communication training is done in the clinical environment [10]. However, we believe that when educators use simulated situations such as videos clips and discussion about them, that this is as effective in developing communication skills and EI.

These students expressed that through the improvement in their communication skills by the group discussions they were able to recognize problematical situations and also understand the opinions and views of others. We cannot say that in our experience this occurs within a more traditional teaching pedagogy which may seemingly constrain communication skills and EI where teaching is didactic.

The purpose of developing communication skills within a classroom environment is to improve empathy and to educate students to understand others. For nurses to be safe in practice and provide quality care in clinical practice, there is need for EI as well as communication and intellectual skills (decision-making based on logic, knowledge and skills). Fernandaz et al. [11] claimed that emotional intelligence training should be included in the nursing curriculum and video-based training is an appropriate way. However, the use of video-based training and teaching must respect some basic rules. There should be a rationale for using them and not just to "kill" time. When using film/video clips,

the teacher/educator needs to have an effective teaching plan and a facilitation strategy to elicit information by students. Furthermore, teachers/educators have to utilize an appropriate teaching strategy in relation to the students' motivation, ability to concentrate and individual learning style. As in the reflections questionnaires, students reported the risk of loss concentration ( $n = 15$ ; 32%).

The technical support is very important as teachers/educators and students should not be wasting time due to some technical obstacle. Finally, there is the need for evaluation and verification of the learning that has taken place as a result of video-based training and reflection, in this case discussion and reflective assignment seems to be the most appropriate tool.

For future usage of video-based training it would be helpful to involve students in role-playing in similar situations as those they saw in the film to further help them to understanding situations and emotions, develop EI and create future positive behaviors [12].

In our study we did not use an emotional intelligence scale for objective evaluation as the students did not want to complete another questionnaire. We are aware this is a limitation and it would be useful to use one in future research. We believe it will be beneficial to use a specific EI questionnaire to measure in more detail communication skills such as empathy and social skills. Students with high EI are more able to recognize not only the reaction of others, but also their own reactions and can modify their behavior accordingly.

According to Salbot et al. [13], EI includes qualities such as awareness of one's own feelings, empathy for the feelings of the other person and regulation of emotions with the aim of improving their quality of life. For effective video-based teaching, EI and communication needs to be contextualized. There needs to be preparation in the form of content analysis of the sources (films/video clips) by the teacher/educator, as well as an opportunity for analysis by the students together with the opportunity for reflection of the benefits and possible risks of this teaching method – reflection with video clips/films. Students in our study appreciated the opportunity to reflect on situations in their own time after the lectures, but on the other hand they wanted to explore situations involving conflict in group discussions. Some groups that experienced extreme conflict in finding a solution often solved it through group discussion with the educator.

We concluded that the highest contributory factor to developing communication skills and EI can be attributed to participation. Indeed, it has been found that effective student participation in working groups

is a strong predictor of satisfaction within a profession. As Salbot et al. [13], stated and it was mentioned already, for both regular and specific personality functioning, we need both rational abilities (decision-making based on logic) and abilities that fall within the domain of EI to increase also our professional satisfaction.

Through these activities and experiences, this study identified the fact that EI could have an influence on efficient communication competence (e.g. the ability to react in hard to solve situations) [14]. The gap between the theoretical expectations and the practical reality of the clinical learning environment for nursing students has been noted in many studies and is an international issue which needs to be addressed [15]. New technologies are seen as a way forward. Given the constant development of new technologies in the health care arena, discernment should be used regarding the implementation of all new developments in modern preclinical/pre-registration training in order to prevent negative impacts on students' emotional status which limit the development of EI. Using video-based training or simulation training in the classroom environment situation (i.e. peer group discussion, simulated patients/ mannequins) and the follow-up group and individual reflection is one way to include technologies in order to have a positive impact and influence and link theory and practice.

## CONCLUSION

Although this was a pilot, this study has produced a wealth of data that demonstrates the impact of video-based training on students' ability to reflect on their feelings and their ability to understand the feelings of others. We suggest that students were able to improve their communication skills and EI as they were able to reflect not only their actual emotional status but also use the scenarios from the film for reflection. It is a rewarding experience to get into touch with one's inner potential, and to use this as a basis for future positive action. We anticipate that through the model/simulated situations which students experienced using this video-based training their leaning is enhanced within a safe arena in the educational setting rather than in a clinical one, resulting in transferable skills. According to the findings of our study we would like to suggest that a variety of scenarios can be developed for use in simulation video-based education and training in the area of intensive care nursing.

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Andrea Pokorná

## LIMITATION

In this study, the number of participants was quite small, so it is difficult to generalize the results because of this and it is limited to these two cohorts. It was conducted with the participation of students from only one university and our students were motivated to use the new teaching and learning methods. The students completed a self-report reflective questionnaire, which can lead them to answer questions in a confidential way where they could potentially be more open. As mentioned



previously, this study did not use an EI questionnaire which would have enabled triangulation of the data. The study did not evaluate the dynamics and potential impact arising from one-to-one interviews and feedback with teachers and mentors outside of the regular communication class. We recommend that a future study should be designed to include activities taking place outside of the regular class time and also possibly including role playing by students and their own video clips (students as actors), as well as using an EI questionnaire.

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## CONFLICT OF INTEREST

The authors stated that there is no conflict of interest.

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# OUR EXPERIENCE WITH E-LEARNING METHOD OF TEACHING PRACTICAL HISTOLOGY

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**ABSTRACT** — Five years ago, the system of practical teaching at our Department of Histology and Embryology in Olomouc underwent major innovation by using e-learning format in the delivery of high-quality histology virtual slides (VS) and subject-related supporting documents observed on a PC. We have developed our own system of application of virtual slides in a classroom equipped with PC technology. In this communication, we are evaluating the impact of this method on our pedagogic effort from a teacher's and students' points of view.

## INTRODUCTION

Histology is one of the basic morphological courses at medical faculties. Observation of images is a crucial method for understanding how tissues, as well as organs, are organized and function. A traditional light microscopy and glass histology slides were essential study tools of practical histology in the past. In the last decade, advances in computer technologies allowed a “quiet revolution” in learning and teaching, as well as diagnostic assessment in morphological disciplines such as histology and pathology [1]. Implementation of virtual microscopy (VM) constitutes an effective tool in new approaches and efficient ways in innovative teaching sessions at morphological departments. Curriculum using the virtual microscopy has been developed at several universities and the application of virtual technology has expanding tendency in education systems throughout the world [2–13].

## METHODS

The virtual microscopy system allows conversion of classical glass histology slides into digital images characterized by high resolution. Glass histology sections were scanned by means of the Olympus dotSlide

system [14] to create thousands of overlapping images saved in a multi-resolution file format (vsi).

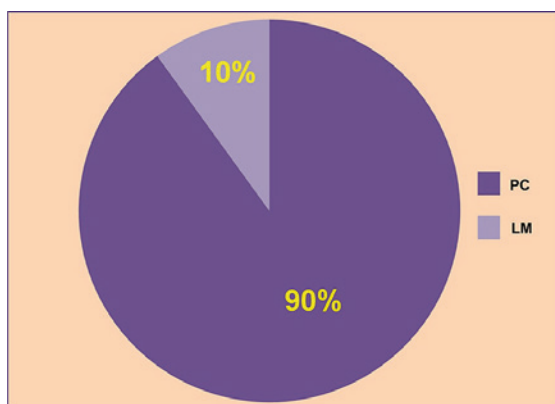
Files of VS can be quite large (up to gigabytes). Nevertheless, VS are easy to open and quick to reload when changing the field of observation or magnification. The delay in loading and magnifying virtual slides on the client PC is negligible and multiple supporting files open quickly and can be used continually during the study. The resulting images can be colour-, contrast-, and brightness-corrected to further improve the quality of faded stains in sections.

The scanning of glass slides was done with a standard 40× objective lens. Using Olyvia viewer (Olympus) the images can be viewed on local PC or in the web browser as a single image map with variable magnifications [15].

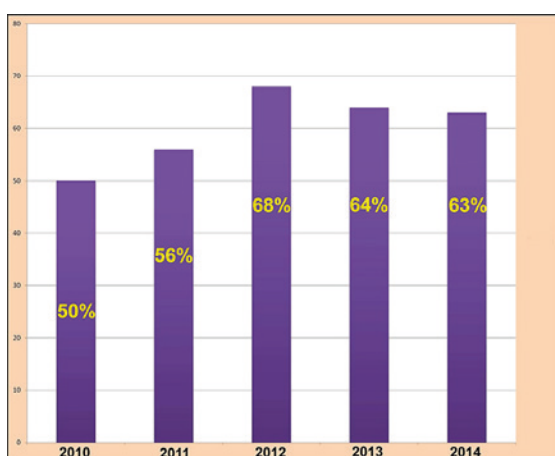
Our classroom dedicated to histology practical sessions is equipped with 1 server PC (teacher) and 30 students' PCs (clients) (Figure 1). This system is locally networked with limited, password protected connection to the faculty intranet. The server is a standard Microtower PC (Processor Intel® Core™ 2 Duo E8400, 3.00 GHz, 2×2 GB RAM, L2 6 MB cache) running on MS Server 2003 Standard Edition. The student's PC (client) is an ultra-slim unit (Processor Intel® DualCore™ E6500, 2.90 GHz, 2×2 GB RAM) running on windows



**FIGURE 1.** Histology practical session with virtual slides. Students follow demonstration of laryngeal structures projected on the screen in this classroom and observe the identical slide on the monitor of their client PC stations



**FIGURE 2.** Majority of medical students prefers PC technology delivering virtual slides over the conventional use of light microscopes (LM)



**FIGURE 3.** Increasing positive tendency was mentioned in the students' use of supporting documents during the long-term application of e-learning format of histology practicals

XP, SP3 operating system. The core of our virtual slide learning system is our own Database of Histology Practical designated in MS Excel format. Our database is available in two language versions, Czech and English. VS are arranged into 24 sessions that systematically follow the syllabus of histology topics focused on general and special histology. The student's PC have Administrator, Lector, Student and Exam accounts set up. Students can assess only the last two accounts without any login password. The last two accounts have limited users' rights preventing any modification or delete any of the study documents. Further technical data on the setup of our practical room network are available in Krajčí et al. 2011 [16].

For electronic testing of student's practical knowledge, we have prepared quizzes using Articulate Quiz-maker 13 software [17] which is simple and easy to use by teachers having no programming skills. This software has a selective option to shuffle sequences of questions and also to shuffle all distracters in the quiz randomly on monitors of student's PCs so that only one version of the quiz is enough to prepare for one practical class. The time limit for display of each question and a total time allowed for a complete test were also settable.

"Histology and Embryology" is a theoretical subject taught in two semesters in both General Medicine and Dentistry programmes. During long-term application (years 2010–2014) of our new digital format of practical teaching histology we have questioned students from both General Medicine (794 respondents) and Dentistry (405 respondents) study programmes to evaluate the impact of this new didactic format as seen from students' points of view. We have also evaluated teacher's attitude to this innovative teaching process.

## RESULTS

After logging into a welcome desktop screen, students are hyperlinked into the content page of the histology practical database. In each session, a set of the virtual slides is completed with information on slide properties, keywords, file size, and also overview images of virtual slides. Additional supporting documents in .pdf and .ppsx formats are also available for each of the histology topics.

When we introduced our own e-learning system based on virtual slides (in 2010), we asked second-year students of General Medicine and Dentistry, who passed this new model of practical histology for the first time, to evaluate the digital format of practical sessions by means of anonymous questionnaires (the setup of the questionnaire and results are discussed in [18]). The majority of students in both specializations evaluated the use of virtual slides positively and appreciated the benefits of the new digital form of practical histology sessions (the study of histology structures in VS, the work with supplementary documents).

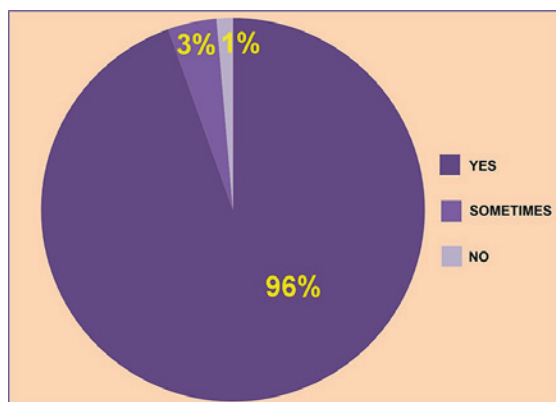


FIGURE 4. Almost all students (96%) download supporting text and figure materials for later self-revisions

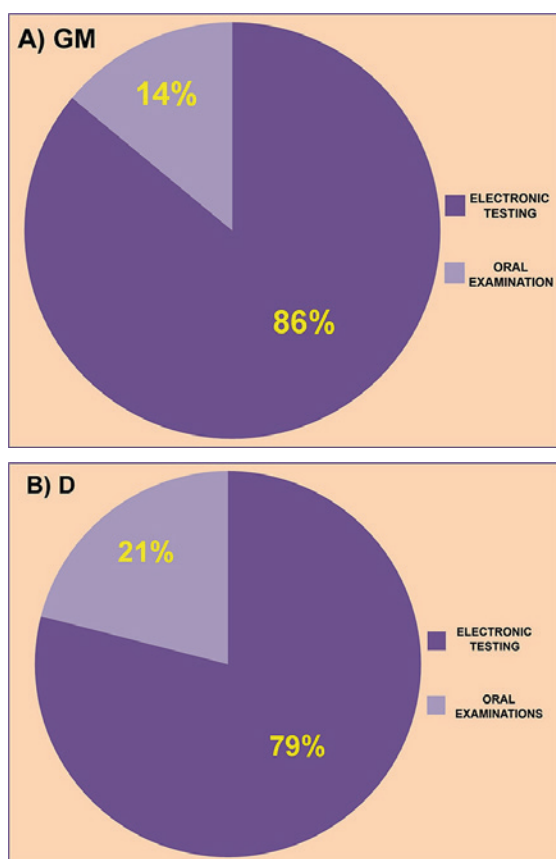


FIGURE 5. The majority of students from both study programmes, General Medicine (GM) and Dentistry (D) preferred electronic forms of examinations over oral ones

Preliminary results of the evaluation are available in Pospisilova et al. [19]. The positive trend in acceptance of VM by students was evident also in following year evaluations. Based on students' responses, our digital-learning format brought several benefits to our teaching practice. During last five years majority of students (90%) in General Medicine and in Dentistry study programs (Figure 2) readily accepted the use of

computers for observation of VS. The young population of students represents a computer-trained generation that is in compliance with new modern PC technologies.

The increasingly positive tendency was also found in the students' use of supporting documents attached to the e-learning system (from 50% to more than 60% during the years 2012–2014, Figure 3). More than half of students claimed that they benefited from using the supporting documents (slide guides, .ppt presentations, and electron microscopy images) during each practical session and almost all students (96%) download these didactic materials to their external media for later self-revisions (Figure 4). The new digital format using virtual slides and supporting materials was well accepted by teachers as well. Teachers benefited from a uniform high quality of presented virtual slides and also from more flexible personal communication with students in the class when individual guidance and explanation were needed at the student's monitor. This feature improves communication between students and teachers and improves their mutual understanding.

Students from both study programmes, General Medicine (GM) (Figure 5A) and Dentistry (D) (Figure 5B) also admitted that they benefited from the in-course electronic testing that motivated students to more systematic individual study. They unequivocally preferred electronic forms of examinations over oral ones.

There were also some drawbacks recognized during the hours of histology practicals, like a tendency of some students to passively follow the demonstration of digital slides. This should be minimized by the proper interactive engagement of students in the practical histology session. Using the screen printing function of the Olyvia viewer, students create their own presentations. They are able to screen-copy to a clipboard selected areas of virtual slides and paste them directly into their own-created .pptx presentation that are useful for later revisions.

Simultaneously, students watch projected virtual slides by means of the overhead projector on a wide screen accompanied by a teacher's explanation. (Figure 1).

Access to virtual slides at any time, not only during scheduled practical sessions, is provided through the external login (intranet, internet, multiple browsers) to the database of virtual slides (Olympus, NIS-SQL) which correspond to those in practical sessions (Figure 6) [20]. The open-access database contains short annotations of typical histology structures that are essential for identification of slides. Unlimited access to the database allows students to revise histology structures themselves.

In traditionally-oriented histology teacher's opinion, the drawback of virtual microscopy could be the limited experience with practical handling of light



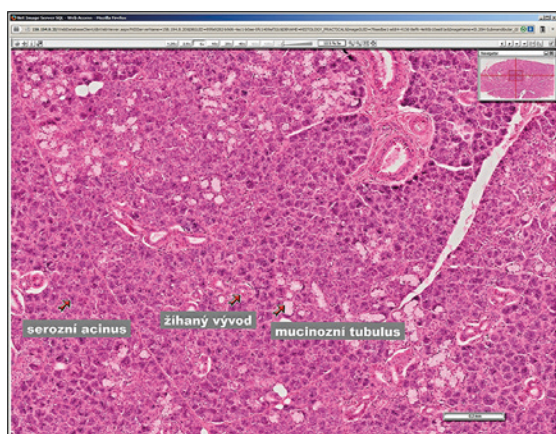


FIGURE 6. Virtual slides are freely available in an open access database Olympus NIS SQL. In this website VS are accompanied by short annotations locating and describing the main histology structures (arrows)

microscopes in practical sessions. From our point of view, the inclusion of classical histology observing methods using light microscopes depends on the organization of teaching lessons. We do not underestimate the importance of classical microscopy in the didactic procedure. Our students also have the possibility to use light microscopes during or at the end of their regular histology sessions. Classical binocular light microscopes are available for each student in the class to revise and compare both image qualities of histology structures.

In order to follow up the student's performance in other preclinical subjects and to receive their comparative evaluation of the digital learning method, we questioned students of 3rd year of the General Medicine Programme (136 respondents) who already had passed the Histology course with PC-based practices and at that time were currently attending histopathology practical sessions conducted in the classical format of a glass slide presentation. Although 46% of responding students experienced some discomfort when they switched to a fully manual examination of glass slides in pathology, most of them (90%) still preferred observing the virtual slides on PC monitors over the observation of glass slides. In the same attending group, 51% of students preferred virtual microscopy, 45% supported a mixed observation of virtual and glass slides, and only 4% of respondents preferred the conventional microscope observation method (Figure 7).

## DISCUSSION

Digital-learning format enabled us to introduce new models of practical teaching histology. At the Faculty of Medicine and Dentistry in Olomouc, the new digital format using virtual slides and supporting study materials represents a fundamental innovation in didactic principles of classical morphology sciences. From

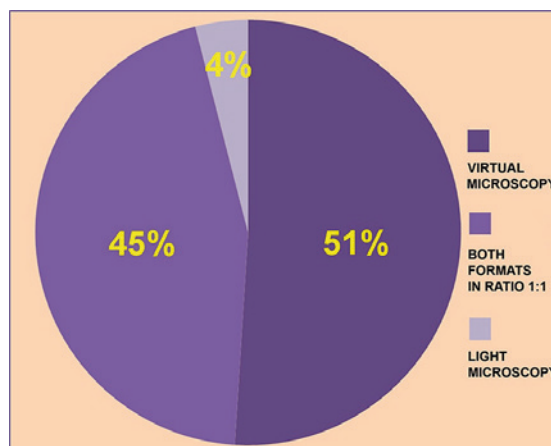


FIGURE 7. From the student's point of view, virtual microscopy was preferred to conventional optical observation. Half of students favoured virtual slide observation only, less than half supported the use of both formats, virtual and classical microscopies

our point of view, the main preconditions that enabled the switch from classical light microscopes to virtual microscopy include a technical and software support, extensive collection of classical glass slides, "PC help care" performed by IT specialists available during practical sessions and enthusiasm of teachers who are open to new didactic strategies.

Recent findings based on the long-term evaluation of computer-assisted teaching histology follow and extend our previous already published data presented in MEFANET reports 04 a 05 [16,21].

According to the long-term experience, our system runs faultlessly and it is easy to be used by students and teaching staff.

Students considered virtual microscopy system comfortable and more efficient tool for study. Students also appreciated the better resolution and better image quality of virtual slides compared with conventional microscopes. This is the main statement highlighted also in other studies dealing with the application of VM [3,7,8,10,12,22,23]. The uniform set of virtual slides of the same quality was used for all students and they benefited from high-quality scans of histology slides available equally to all students in the class. They allowed them to study and discuss various details of cellular and tissue arrangements clearly at various magnifications.

When using the virtual slides, the classical glass slides no longer need to be stored in hundreds of sections, and also some rare samples or slides prepared with special staining and expensive methods can now be safely presented to students. Digital slides prevent loss or breakage of this valuable teaching material.

Student's self-created .pptx presentations with details of already observed VS and text legends fully substituted the hand-drawn and written notes used in earlier years during practical sessions. The active participation in creation of own presentations increases

student's interest and attention during sessions and, on the other hand, this didactic method provides a good tool for teachers for their concurrent control of a student's activity in large groups.

Despite the engagement of teachers during practical sessions, implementation of E-learning format based on digital technology requires supplementary documentation such as precise description and annotations of VS that is essential for later self-study and revision. Students greatly appreciate the unlimited access to the online NIS-SQL database of annotated virtual slides [20], which correspond to those in practical sessions, at any time and place with external login (intranet, internet, multiple browsers). The external practice with VS allows students to study slides that have otherwise been restricted to the classroom equipped with conventional optical tools and sets of glass slides. These findings are also supported by the study of Tian Y et al [10].

The new teaching format also fulfils students' expectations to use innovative technologies (PC, laptops, and tablets) during their study. The previously mentioned benefits are also reported in other studies concerning virtual teaching programmes [1,22]. E-learning format, delivering virtual slides is an efficient didactic tool which supports active student's approach and their engagement in group activities on virtual slides. The observation with Olyvia viewer is highly interactive and user-friendly, making the orientation in the VS at various magnifications easy. It enables students to quickly follow teacher's demonstration of the same slide simultaneously projected on the central projection screen and to better concentrate on the comments given by the teacher. This is a highly beneficial feature of this system that helps to manage ever-increasing numbers of students at our faculty. The number of students attending the 1st year of the Faculty of Medicine and Dentistry at the University in Olomouc is more than three hundred in the General Medicine programme and about one hundred in Dentistry study programme. The current trend at other universities is to organize histology sessions in large practical labs of 50 and more students at once [1,10].

PC-networked classroom also provides an easy environment for computerized testing of student's

practical knowledge. Our digital learning system seems to be an efficient tool for computer-based assessment of student's practical knowledge of histology structures displayed on monitors. Students found the use of the electronic testing easy and friendly. Sequences of questions, as well as all distracters, were shuffled in the quiz randomly on monitors of student's PCs. Despite the fact that all students answered the same set of questions; lateral communication between students was limited to the minimum. The results were automatically evaluated and displayed at the end of the test. The properties of the electronic application of tests considerably contributed to the objective and quick evaluation of student's practical knowledge. In view of the fact that teacher's PC serves as a server, it is very important to secure the access to teacher's PC as well as students' PCs and prevent them from hacking and illegal downloading data when the teacher's PC is logged on.

The e-learning format of delivering virtual slides brings the substantial changes in the methodology of teaching morphological subjects like histology to students of medicine.

Because of the use of modern technology, this system attracts the attention of students and makes this subject more interesting to study. It stimulates the engagement of students during practical sessions and their independent work. Muñoz and López [11] highlighted another prospective benefit of VM in believing that students may play a central role in the interactive, group-based histology practical, whereas teachers may serve as guides on students' learning sessions. Most of the discussed drawbacks of the VM can be prevented by a proper organization of practical sessions.

## CONFLICTS OF INTEREST

Authors of this paper claim no conflicts of interests with this research. Contents of this paper have been poster-presented at the MEFANET 2014 Conference in Brno, Czech Republic [24].

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# GAMETIX - NEW SOFTWARE FOR MANAGEMENT OF MCQ DATABASES

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**ABSTRACT** — We have developed new software named GaMeTix for management of large collections of examination questions written in a variety of MCQ (Multiple Choice Question) formats. This application provides a wide scale of functionality modes like collecting and editing sets of questions, generating electronic versions of examination tests, printing examination paper sheets and exporting sets of questions in a plain text document for hard copy archiving or transfer to specific electronic testing applications. The content of the database is searchable according to several criteria using sets of filters that characterize each question. Collections of MC questions can be divided or merged together according to results of the filtering function. Examination questions can be complemented with pictures or diagrams in .jpg format. GaMeTix is a portable, freeware application that runs on MS Windows operating systems.



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## INTRODUCTION

Examination of student's knowledge by application of written or electronic tests is widely used in modern pedagogy [1]. Large collections of examination questions must be managed systematically and securely using dedicated software that allows the user to add new questions progressively and to edit these questions written in various MCQ formats. There is a couple of commercially available software [2–6] for the creation and administration of question banks available to purchase. These applications are costly, proprietary licensed, and must be permanently installed on a computer. Creation of question sheets and their publication for both, printed or electronic delivery is another required feature of such software.

On the other hand, the Learning Management Systems (Moodle [7], Black Board [8], just to name a few) are open source web-based systems designed to run on a university or corporate servers. They provide a wide scale of functionalities, like the construction and

delivery of educational courses, development and administration of examination questions and evaluation of individual students and courses. They are inherently bound to internet facilities, complex and rather difficult for a lay person to learn and set up and may require the assistance of IT-trained personnel.

The major requirement of our educators was to have a simple to use, the Czech language localized, secure and portable freeware application to be able to create and manage several databases of MCQs. We have coded and in seven versions practically tested a stand-alone portable application called GaMeTix. It accepts questions in the MCQ (Multiple Choice Single Best Answer Question), MRQ (Multiple Choice Multiple Response Question) and TF (Multiple True/False Question) formats [9,10] and allows for their administration in a fully searchable environment, running either on the PC's system hard drive or on any standard external storage media or flash drives. Examination papers can be exported to .txt, .xls and .pdf files for in-paper examinations or they can be imported

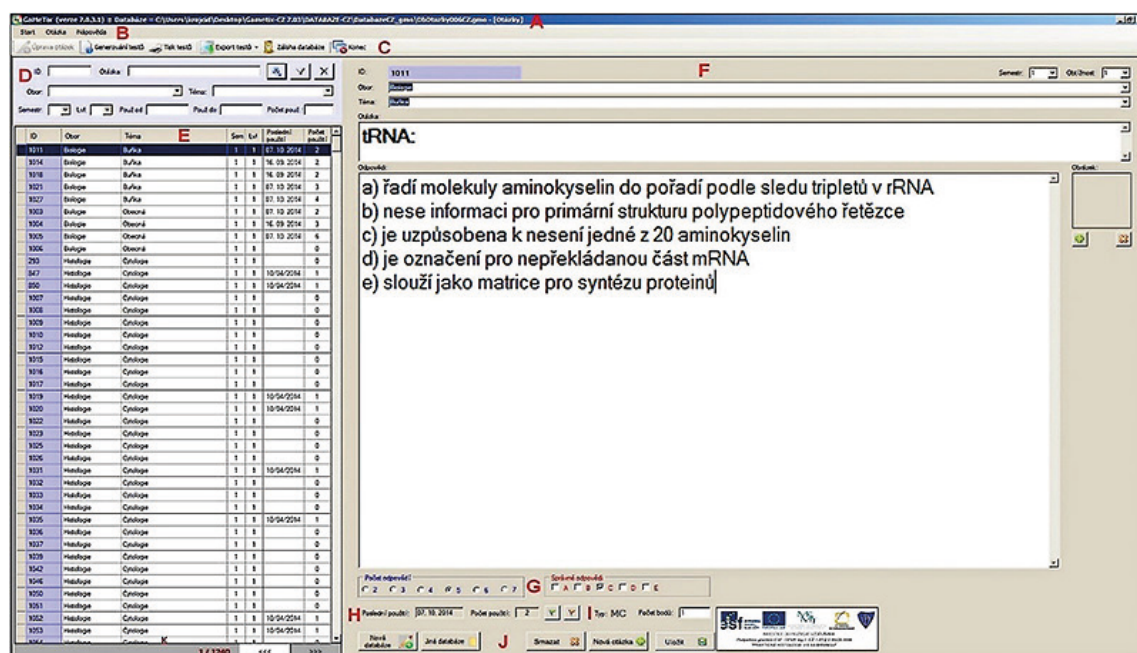


FIGURE 1. An overview of the graphical user interface. A – title bar, B – menu bar, C – toolbar, D – search filter bar, E – list of questions window, F – question editing panel, G – number of distractors and correct answers indicators, H – date of the last use of a question and frequency of question usages, I – format of a question and its point value, J – Buttons for selection of a new/another database and questions, K – total number of questions in an open database

into the Articulate Quizmaker 13 software [11] for computer-based (CB) application of assessments. In this report, we analyse specific features of this application and evaluate its functionality in practical testing of Histology for medical students.

## METHODS

The program has been created under the .NET framework in the C# language. Database of the test questions is stored in a file encrypted using the symmetric cryptography. Questions and generated tests are stored in UTF-8 format and can be imported or exported from/into various formats of documents. The root folder Gametix-CZ 7.4 contains two main folders: The Program folder with all application components in it and the Database-CZ folder with subfolders for databases and exported files. A shortcut to GaMeTix.exe for case-sensitive login into the application is also provided. The folder “Database-CZ” contains subfolders for the main database saved in an internal .gmo file format, secondary databases and all backups. It also contains subfolders for files with exported questions in a plain text format, and a subfolder for generated (not yet printed) tests saved in an internal .gmt file format. Both internal files are .xml files that are encrypted for enhanced security of question databases and created examination tests. Special folders are provided for printable tests in pdf and .xls file formats, for complementary pictures and diagrams, and for saving setups of filters used in previously generated

tests. Successful printing of hard copies of examination papers requires the free Microsoft Report Viewer Redistributable Package [12] to be installed on a PC in use. In order to generate tests, one or more databases can be used simultaneously. Access to the program is protected by a username and password. Several user accounts can be created.

## RESULTS

The program is composed of five functional units that cover Database Management, Generation of Tests, Test Printing, Test Export and Database Backup. It operates in two graphical user interfaces (GUI). The first GUI is dedicated to the creation and management of databases of questions (Figure 1). The second GUI is used with all other functions. Both interfaces share identical title bar, menu bar and a toolbar.

### Database management function

The Database Management window provides the key functions of this software to add new questions to the database and to categorize them by different criteria (ID number, subject, topic, semester, difficulty level, date of the last usage, frequency of use). A new ID number displayed in the first column of the list of questions is added to every new question (Figure 2). A row with the currently selected question is indicated in deep blue colour, incomplete questions are in red colour and questions containing supplementary

ID	Obor	Téma	Sem	Lvl	Poslední použití	Počet použití
1011	Biologie	Buňka	1	1	11/03/2015	5
1014	Biologie	Buňka	1	1	11/03/2015	3
1018	Biologie	Buňka	1	1	11/03/2015	3
1021	Biologie	Buňka	1	1	11/03/2015	5
1027	Biologie	Buňka	1	1	11/03/2015	3
1003	Biologie	Obecná	1	1	11/03/2015	5
1004	Biologie	Obecná	1	1	11/03/2015	6
1005	Biologie	Obecná	1	1	11/03/2015	9
1006	Biologie	Obecná	1	1		0
293	Histologie	Cytologie	1	1		0
1051	Histologie	Cytologie	1	1		0
1052	Histologie	Cytologie	1	1	10/04/2014	1
1053	Histologie	Cytologie	1	1	10/04/2014	1
1054	Histologie	Cytologie	1	1		0
1055	Histologie	Cytologie	1	1		0
1057	Histologie	Cytologie	1	1		0
1059	Histologie	Cytologie	1	1		0
1060	Histologie	Cytologie	1	1		0

FIGURE 2. List of questions. A row with the currently selected question is highlighted in blue, incomplete questions in red and questions containing the supplementary picture in green colours

pictures are labelled in green colour. The serial number of the currently selected question in this list and the total number of questions in the open database is indicated by red numbers at the bottom part of this list (Figure 2).

A collapsible search filter bar is available in this pane to sort and display sets of questions selected according to various criteria (Figure 3).

The entire content of the database or its selected part can be displayed and exported into .txt file (plain text format) or .gmo file (new GaMeTix database) by right clicking on one of the selected questions (Figure 4). Questions can also be imported into the main database from .txt file with proper formatting of questions, or .gmo file (another GaMeTix database). This function enables the administrator to combine and merge various content-specific databases together.

Question editing panel (Figure 5) is available as a part of the first GUI to administer all necessary information about questions (subject, topic, etc.) which are selectable from the roll down menus. The stem of the question automatically formats in a bold font and the correct answer with a maximum of six distractors are automatically marked by letters from a) to g). The correct answer is also indicated there. With each use of a question for generation of a new examination paper the date of its last use and the total number of its usage is recorded and displayed by this application. These values are resettable.

The accepted question formats are MCQ, MRQ, and TF. The question formats and their point values (weight) are also shown in this panel. All questions can be supplemented with pictures in .bmp, .jpg and .gif file formats. The thumbnail of the added picture displays in the rectangle located on the right-hand side of

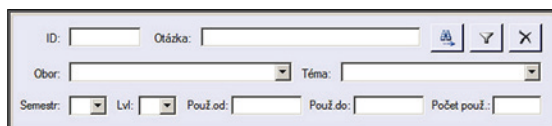


FIGURE 3. Search filter bar with selection criteria

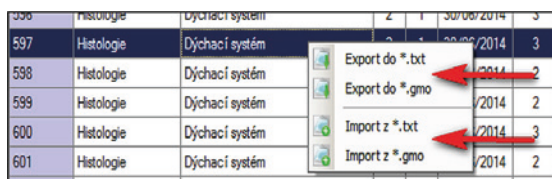


FIGURE 4. Exporting/Importing dialogue window appears when right clicking on a question in the list an open database

the panel of distractors. On pushing buttons located at the bottom of this panel a new database can be started, or another already existing database can be opened, or the currently selected question can be deleted, or a new blank question can be added to the database.

## Test generating function

The second GUI is used with the Test Generator. For creation of subject-specific tests several filters can be set up to specify the range and the number of questions that should appear in the test. The generator checks whether the selected databases contain a sufficient number of questions for the specified filters and then, using a random number generator, it generates the tests. Tests of the same topic can be generated in several versions, with each version containing different, randomly selected and variably sorted questions of the same weight, to prevent possible cheating. The header of the examination paper containing short description of the examination topic, the title of the examination and the term of the session should be filed up prior to the generation of the test. The test sheet and the corresponding question key sheets are generated and saved in an internal .gmt file in the pre-selected destination subfolder in a Database-CZ folder.

## Test printing and exporting functions

For classical paper-delivered examination the generated tests must be exported into the text file or directly printed (Figure 7). Before printing, the header of the test can be edited. Printing of test pages for a printer or into a PDF file is followed by printing of the key to the correct answers for easy evaluation of test results.



ID: 1011

Obor: Biologie

Téma: Buňka

Otázka:

tRNA:

Odpovědi:

a) řadí molekuly aminokyselin do pořadí podle sledu tripletů v rRNA  
b) nese informaci pro primární strukturu polypeptidového řetězce  
c) je uzpůsobena k nesení jedné z 20 aminokyselin  
d) je označení pro nepřekládanou část mRNA  
e) slouží jako matrice pro syntézu proteinů

Počet odpovědí: 2 3 4 5 6 7

Správné odpovědi: A B C D E

H Poslední použit: 11/03/2015 Počet použit: 5 Typ: MC Počet bodů: 1

Nová databáze J Smazat Nová otázka Uložit

FIGURE 5. Question editing panel (F) displays question n. 1011. Subject: Biology, topic: Cell, question stem: tRNA, number of distractors: 5, correct answer: C, last used: 11/03/2015, number of usages: 5, format of the question: MC, value of the question: 1 point

Start Generátor

Úprava otázek Generování testů Tisk testů Export testů Záloha databáze Konec

1) Počet variant: 1 Popis testu: Stručný popis testu

2) Hlavníka testu (také se v záhlaví): Hlavníka testu

3) Seznam databází: + -

4) Seznam filtrů a otázek: + -

Celkem otázek: 0

1 2

Uložit nastavení Načíst nastavení

Filtr

Výmout otázky použité od: 15.5.2015 Semestr: 1

Obtížnost: 1 Počet odpovědí: 5

Obor: Histologie Typ otázky: MC

Téma: Epitelová tkáň

Vymazat filtr STORNO OK

FIGURE 6. Test generator interface GUI contains two panels - list of databases and list of used filters. The databases and filters can be selected with + buttons (red arrows). The filter selection dialogue window shows all selectable criteria (green arrow)

Varianta č.: 1		1 / 1
Hlavička testu <b>Ústav histologie a embryologie</b> <b>Lékařská fakulta Univerzity Palackého v Olomouci</b> <b>ZKOUŠKA Z HISTOLOGIE A EMBRYOLOGIE</b> Řádný termín		
Jméno a příjmení studenta .....		
Výsledek testu .....%	Klasifikace .....	
Datum .....	Hodnotil/a .....	

- 1 Žíhané vývody jsou přítomny ve žlázách/žlázách:
  - a) příušní
  - b) Brunnerových
  - c) palatinálních
  - d) Weberových
  - e) jícnových

a
  
- 2 Podkladem jazyka je:
  - a) svalovina příčně pruhovaná
  - b) svalovina hladká
  - c) v apikální části svalovina hladká, při kořeni svalovina příčně pruhovaná
  - d) neobsahuje svalovinu, jen vazivovou ploténku

a
  
- 3 Mléčná lišta je:
  - a) proužek zesílené epidermis jen v rozsahu hrudníku
  - b) proužek zesílené epidermis od základů horní končetiny po základ dolní končetiny na obou stranách těla
  - c) zesílená epidermis ze které se vyvíjejí pouze vývody
  - d) u člověka se nezakládá

d
  
- 4 Gianuzziho lunuly se vyskytují v:
  - a) velkých slinných smíšených žlázách
  - b) glandula parotis a glandula sublingualis
  - c) Weberových a Brunnerových žlázách
  - d) glandula submandibularis a gll. palatinae

b
  
- 5 V žaludeční sliznici vznikají tyto hormony:
  - a) somatostatin, serotonin a gastrin
  - b) gastrin a cholecystokinin
  - c) histamin, serotonin a VIP
  - d) pouze gastrin

c

Vytvořeno programem Gametix v. S. Vývoj tohoto softwaru byl podpořen z projektu ESF-OPVK, "Histologie v E-learningu". Reg.č. CZ.1.07./2.2.22/28.0089

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

FIGURE 7. An example of the first page of the printed examination paper. The letter of the alphabet, indicating selection for the correct answer, is to be written into the rectangle located at the right-hand side of each question



The saved tests can be also exported into .txt and .xls files for on-paper editing or for importing sets of questions into electronic test creators like Articulate Quiz-maker '13 [11].

The function of the backup of any database stored in the application accessible is also from the GaMeTix toolbar. Statistical information about the current database is available from the menu bar. It gives information about the total number of questions in a database and details the amounts of questions per subjects and topics. These data can be copied to the clipboard and saved as a document.

## DISCUSSION

GaMeTix is a dedicated stand-alone application to manage several databases of MCQs in a secure and portable manner. Advanced database management functions are available to edit properties of questions with regard to the dates and frequency of their usage. It provides educators with a simple tool to create sets of examination question sheets with a random selection of questions on predefined topics in various MCQ formats. Specific export/import functions allow users to split or merge databases of questions and to export examination tests for paper- and computer-based examinations. In an examination of morphology sciences the question stems can be enhanced with images, schematic drawings or graphs. This improves student's recognition of the question contents and provides teachers with the possibility to assess the practical application of the theoretical information.

Using the test generating function, this application can export several versions of tests dealing with the same topics. Standardisation of the test format and difficulty in all exported versions of the same examination paper is ensured by proper selection of question difficulty and question format features in the test generator filter menu. Should the anchor-test be included

in all varieties of examination papers, the anchor questions would be added to the examination sheet from a separate "anchor questions database.gmo".

GaMeTix application is a simple to use software developed by educators. Its outstanding feature, which makes it different from all existing question databases, is its portability. The portable usage of this application increases the security environment by handling the examination questions on external memory devices with controlled access to internet connections. This prevents any hacking attempts to hack the database of examination questions. In the case of an accidental loss of the external memory media, the access to the database is protected by password settings and encryption of the .gmo and .gmt files.

Another added value is the compatibility of exported .txt files with import files of Articulate Quiz-maker '13 software [11]. In this way, the examination papers generated with GaMeTix can be easily converted into electronic HTML-based files for computer-based assessments that are LMS (SCORM) compatible [14].

The development of this application already advanced to version 7.4 and still continues according to comments and requests of academic users. It has been successfully used in last three years of Histology final examinations. In its current version, this application has been written in Czech language only. As such, it can be provided to teaching institutions as a freeware for further testing.

## CONFLICTS OF INTEREST

The authors of this paper claim no conflicts of interests with this research. Content of this paper has been orally presented at the MEFANET 2014 Conference in Brno, Czech Republic [13].

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Dimitrolos Krajčí

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## VIRTUAL PATIENT AKUTNĚ.CZ ON THE ROUTE

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**ABSTRACT** — Concept of the virtual patient AKUTNĚ.CZ is known since 2007 when Educational portal of acute medicine AKUTNĚ.CZ was established ([www.akutne.eu](http://www.akutne.eu)). Since that time it was presented many times as conference abstracts, posters, oral presentations and full papers at national or international congresses and journals. Let's have a close look at last four international journeys of our virtual patients covering three continents.



### AMEE 2014, MILANO, ITALY

More than 3,300 participants (of which almost 300 deans of medical schools) from 93 countries around the world gathered in Milano Congressi Convention Center in early September, to think about the ideal way of teaching health professionals in the 21st century, all within the 41st conference organized by the Association of AMEE (International Association for Medical Education). The Medical Faculty of Masaryk University was actively represented in the programme of the AMEE conference in 2014 through the presentation of interactive learning algorithms AKUTNĚ.CZ® and their integration into the curriculum.

Many outstanding personalities in field of medical education appeared during lectures in front of education-eager teachers and students. Undoubtedly one of the most interesting plenary lectures was a performance duo Jonas Nordquist and Andrew Laing "Directions for change in the design of learning spaces for health professions: global insights," which gave the concept of concentration learning environment with modern teaching a new dimension. Subsequent workshop showed how to design or modify teaching space for the needs of modern teaching forms.

### IASP 2014, BUENOS AIRES, ARGENTINA

After Montreal and Milano, Buenos Aires became the next host city of the World Congress on Pain of IASP association, situated on the banks of the majestic rivers Rio La Plata and Parana in sight of the Atlantic Ocean. What was this Congress most outstanding feature, besides the fact that it brought together more than 4,000 algoslogists from all over the world? Yes, in 2014 it was just 40 years since the founding of the IASP organization by John J. Bonica and at the same time it was the annual 15th Congress of IASP.

What happened to us, therefore, on the South America continent? Favourable mild climate, excellent steaks and a huge agglomeration including more than 10 million inhabitants. Surprisingly, contrasts between poverty and wealth, so typical of this continent, were not so significant in Argentina as you might expect. Convention center was located in the Plaza Italia in sight of botanical and zoological gardens. Not only plenary session with excellent speakers were crowded, but this center offered especially exclusive spaces for the poster session, which became twice a day the most important area around the convention events. What a difference compared to some



FIGURE 1. AMEE 2014, Milano



FIGURE 2. IASP 2014, Buenos Aires



FIGURE 3. San Diego Conventional Center



other professional events. Thousands of works focusing on different areas of research and clinical applications of pain treatment would be enough for a separate monograph. We have introduced algorithms AKUTNĚ.CZ on the field of pain management education.

## ANESTHESIOLOGY 2015, SAN DIEGO, USA

Interactive algorithms AKUTNĚ.CZ also had the opportunity to be introduced to the world of anaesthesiology this October at the annual congress of the American Society of Anesthesiologists in San Diego. California's sunny climate and huge Convention Centre on Pacific Ocean coast created pleasant ambience for the largest gathering of anaesthesiologists from all around the world. There were five days packed with

lectures, workshops, poster presentations, an extensive business exhibition and not missing Scientific and Educational Exhibition.

Within more than 20 stalls introduced here, there was one of portal AKUTNĚ.CZ, aimed to present the current 53 interactive algorithms – virtual patients and their implementation in undergraduate teaching of medical students and in young doctors training. They not only aroused interest among physicians involved in teaching at medical schools, but also in the students themselves or in biomedical engineers. The greatest amazement was evoked by a unique process of creation new interactive algorithms: in teams of students and physicians it is several-stage process and involvement of students helps them to gain really deep understanding of the treated topic. Also they appreciated the opportunity of widespread use of these teaching aids, also suitable for other health care students, refreshing lectures with “case from clinical practice” and in particular the availability of these smart tools – online without any registration or fees.

## AMEE 2015, GLASGOW, GREAT BRITAIN

Our desire for acquiring latest knowledge in the field of new trends in the medical education brought us again after one year from Milano to Scotland. This time it was not the historic St. Andrews, hosting 2013 IAMSE conference, but at first glance much more industrial city Glasgow at the confluence of the rivers Clyde and Kelvin.

Team of authors from Medical Faculty of Masaryk University presented in poster section “Retention of Extra-motivated Students Who Underwent Learning By Doing Concept In Anaesthesia And Intensive Care Medicine”, which was accompanied by an interesting discussion. It was focused on the point that students who underwent during their studies the concept of “learning by doing” with creating the tools for PBL/TBL on AKUTNĚ.CZ portal are in more than 50% of cases prone to remain in the field of Anaesthesiology and Intensive Care Medicine. The use of this concept has been identified as one of the motivating elements keeping graduates in this field.



FIGURE 4. AKUTNĚ.CZ booth at ANESTHESIOLOGY 2015



FIGURE 5. Glasgow Conventional Center

.... Let's meet on AKUTNĚ.CZ...

# NEW TEACHING METHODS FOR PRACTICAL TRAINING IN NURSING WITHIN THE PROJECT TEMPUS IV – CCNURCA

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**ABSTRACT** — The aim of this article is to present new teaching methods for practical training in nursing within the project Tempus IV – CCNURCA (Competency based Curriculum Reform in Nursing and Healthcare in Western Balkan Universities) No. 544169-TEMPUS-1-2013-1-BE-TEMPUS-JPCR. Implementation of new practical teaching methods, such as learning with simulator mannequins, practical workshop, nursing process, mind mapping, case studies and problem-based learning (PBL) in practical training could help to improve the quality of the educational process in nursing at Universities of Western Balkan countries that have been involved in this project. The realistic conditions in simulation laboratories are reflecting real hospital and patient's care, communication with patient and hospital staff, discussion and analysis of all student's activities. The methods of next nursing generation in practical training that can help nurses to get used to the recognition and management of patients by using of simulated real life situations.

## INTRODUCTION

Project TEMPUS IV is the European Union's program which supports the modernization of higher education in countries of European Union. Project promotes institutional cooperation that involves European Union and partner countries and focuses on the reform and modernization of higher educational system including countries of Eastern Europe, Central Asia, Western Balkans and the Mediterranean countries [1].

Within this framework a consortium of universities, university colleges and governmental authorities engaged themselves in a project called "Competency based Curriculum Reform in Nursing and Healthcare in Western Balkan Universities" (CCNURCA). The project CCNURCA No. 544169-TEMPUS-1-2013-1-BE-TEMPUS-JPCR searched for interconnectivity in university educational system with European standards arising from Bologna process and the Lisbon strategy [2].

European Federation of Nurses (EFN) in collaboration with the International Council of Nurses (ICN) and with the World Health Organization (WHO) for European region established several basic principles in relation to nursing education in Europe, particularly

condition of initial assessment for universities and 1st degree of university education as mandatory grade to carry out nursing practice in European countries [3].

Higher education in nursing has become a model for education in the Western Balkans, which supported the creation of project CCNURCA. In Slovakia, nursing is a study program administered by the Ministry of Education, Science, Research and Sports through which the graduate of the study program gains the professional ability/qualification to practice the profession or is prepared to continue in following university studies. The profile of studies is harmonized with the criteria of the European directives, enhanced by the adoption of the Declaration of Munich and implemented into the curriculum of educational institutions that provide this training [3].

Project CCNURCA started in 2013 and its plan is designed for 3 years. The main partner is educational institution HUB-KAHO in Belgium and co-operative institutions are Department of Nursing at the Faculty of Health Care University of Presov in Presov (Slovak Republic) and other 15 participating partners from Albania, Bosnia and Herzegovina, Switzerland, Netherlands, Serbia and Montenegro [2].



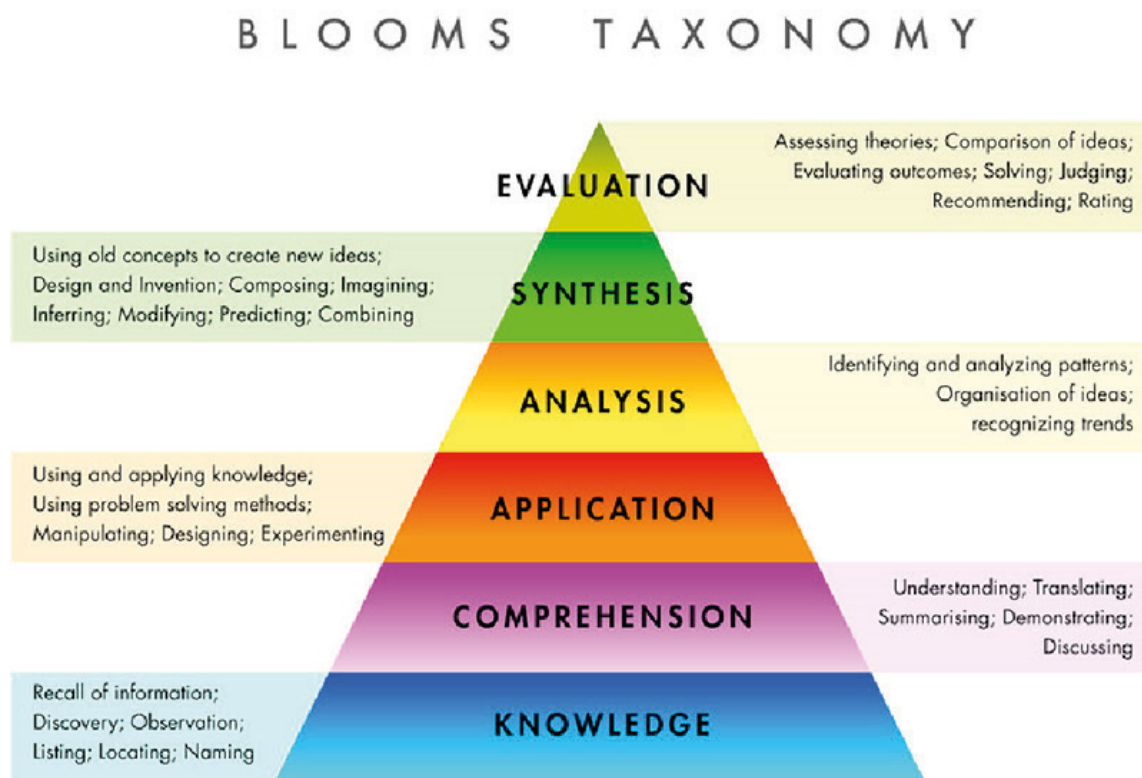


FIGURE 1. Bloom's taxonomy [10]

## THE 1ST DEGREE OF UNIVERSITY NURSING EDUCATION IN SLOVAKIA

Act of the National Council of Slovak Republic No. 131/2002 Coll. on Higher Education states that professionally orientated bachelor programs of the 1st degree of university nursing study focusing on acquisition of theoretical and practical knowledge whilst practicing, based on the present state of science and art with possibility to progress into 2nd degree and 3rd degree of university education [4].

Pursuant to Decree of Ministry of Health of Slovak Republic No. 364/2005 Coll. stipulates the extent of nursing practice provided by a nurse independently and in cooperation with a doctor and the extent of midwifery provided by a midwife independently and in cooperation with a doctor the competences of nurses were introduced into nursing practice [5].

University study of the 1st degree of nursing in Slovakia is compiled in accordance with the competencies of Directives 36/2005/EC and 2013/55/EU and the annex of Decree of the Government of Slovak Republic No. 296/2010 Coll. which govern professional qualification for performance of nursing occupation at universities in Slovakia [3,6,7].

Pursuant to Act of the Ministry of Health of Slovak Republic No. 455/2012 Coll. which amends and supplements Act No. 131/2002 Coll., the nursing study program in the 1st degree of university education consists of a set of courses which include education activities such as lectures, seminars, practicals, practical training, continuous clinical practice, summer clinical practice, project work, internship, field trip, final thesis, and state exam. The entire extent of study is minimum of 4 600 contact and non-contact hours, where half of it is practical education and a minimum of one third is theoretical education [8].

A condition to be met for student's advancement to the next year is acquirement of prescribed number of credits in the individual years = 60 ECTS credits (European Credit Transfer System).

Each course of study program in nursing is evaluated by certain number of credits expressing student's workload:

- Theoretical subjects (lectures, seminars and practicals) are converted to credits based on student workload: 1 ECTS = 25 hours student's workload.
- Practical training (clinical training, clinical practice, continuous clinical practice, and summer clinical practice) is converted based on student workload: 1 ECTS = 30 hours student's workload [7].



FIGURE 2. Pediatric simulator in laboratory (Brusel)

When creating educational objectives in teaching practice, it is necessary relate to applied findings of revised Bloom's Taxonomy (2001), which focuses on cognitive knowledge and cognitive process [9].

Taxonomy identifies three "domains" of learning (cognitive domain, affective domain and psychomotor domain), each of which is organized as a series of levels or pre-requisites. In the Cognitive domain, training for technicians may cover knowledge, comprehension and application, but not concern itself with analysis and above, whereas full professional training may be expected to include this and synthesis and evaluation as well (Figure 1). Bloom's taxonomy is classification of learning objectives, forms and levels of student learning [10].

### NEW TRAINING METHODS IN NURSING WITHIN PROJECT CCNURCA

Objective of this article is to present the new teaching methods for practical training in nursing within project CCNURCA, because these methods should be beneficial to the professional nursing training. Testing of new teaching methods is next phase of this project



FIGURE 3. Adult simulator in laboratory (Brusel)

during 4–6 months of years 2015–2016. Methods for the planned testing are set in the following text.

### Practical workshop

The practical workshop is a form of educational activity in which the lecturer/assistant prepares topic, objective and program. Students go through a variety of techniques brainstorming, feedback and use their own knowledge and experience to acquire skills that will be used in practice. Lecturer/assistant during the workshop organizes, supervises and assists students with their course. The practical workshop is meant to deepen the already acquired knowledge and skills. The output of the workshop is to fulfill the conditions specified topic and target. The workshop does not have a theoretical component, it is assumed that the student has a theoretical basis and is able to transfer theoretical knowledge into practical skills and it is necessary to activate cooperation among the participants of the workshop. The workshop can be prepared on the basis of various scientific and professional topics. It is recommended to prepare for approximately 60 minimum (one theme/topic) with an optimal number of 25 participants [11].

### Case studies

The case studies a description of emergency/interesting clinical case/disease. It is used as a form of presentation, particularly in some biomedical and social sciences. In the event of case studies it is a deliberate choice. It may be oriented on the typical but also the specific, unique, individual and small-occurring cases. The role of case studies is the description of the case and it is based on its deep, intensive analysis and detailed interpretation. Case studies have potentials for measuring application of knowledge, analysis, problem-solving and evaluative skills. This method allows students to apply theory to practical situations. Marking criteria helps re-grading and feedback. Case study and its scope is individual and depends on the particular case. It is recommended to prepare for approximately 30–45 minutes (one clinical case/disease) with an optimal number of 3–4 participants [12].

### Learning with simulator mannequins

Education with simulator mannequins in nursing is the use of interactive simulations of real-life clinical scenarios for the purpose of nursing training, education and assessment. This method uses mannequin simulations. Students use simulation models for training nursing procedures and skills at the first in the simulation laboratory (Figures 2 and 3). They then can work in hospitals with patients. They were originally used to support active learning strategies in self-directed learning and problem-based learning.

### Nursing process

Nursing process is a systematic and rational method, which plans nursing intervention and provides nursing care. The aim of this method is to evaluate the patient's medical condition, actual and potential health problems, the level of health care, make a plan to assess the patient's needs and to provide specific nursing interventions to meet those needs. Nursing process has five phases. This process consists of the following phases: assessing the health problems of the patient, diagnosis, intervention planning, implementation and evaluation of interventions provided by the nursing care [13,14].

### Mind mapping

Mapping makes the use of graphics and designs to understand complex relationships and possible outcomes of these relationships. In a nursing environment, it can help students to connect conditions with treatments and potential side effects. Mind mapping joins the critical thinking and case-based learning and presses onto a student to make a visual scheme of how to solve the patient problem. Concept and problem mapping can develop the ability to see problems in their mind's eye and improve creative thinking ability of students. Nursing practice often calls for innovative thinking from practitioners and concept mapping can train students to meet this requirement. Mapping can be applied with equal effectiveness to both – individuals and groups. Concept maps are graphical tools for organizing and representing knowledge in networks of concepts and linking statements about a problem or subject [15].

Concept maps include concepts, usually enclosed in circles or boxes of some type and relationships between concepts or propositions, indicated by a connecting line and linking words between the concepts.

### Problem-based learning

Principles of problem-based learning (PBL) are based on the fact that students are actively participating in helping plan, organizing and evaluating the problem solving process. It requires students to solve authentic, real-life open-ended problems with as many correct answers as possible. Objectives of the problem-based learning process are: Knowledges (theoretical and clinical), Skills (scientific reasoning, critical appraisal, information literacy, self-directed, lifelong learning) and Attitudes (value of teamwork, interpersonal skills, the importance of psycho-social issues) [2].



## CONTROL OF PRACTICAL TRAINING AND EVALUATION OF ACADEMIC RESULTS

Assessment methods chosen at project program CCNURCA should enable students to demonstrate their achievement of learning outcomes, and enable them to be judged against relevant assessment criteria. These links should also be made clear to students. Evaluation of academic results of the student within the academic subject is carried out: through continuous controlling of academic results during the period of study (presentation of nursing process, evaluation of practical workshop...) and by practical exam for the given period of study. The teacher gives a grade for the completion of the subject. The grade expresses the quality of acquired knowledge and practical skills in accordance with the results of learning on the subject information sheet. The different approaches to learning have all been included in the history of curriculum design and implementation, for example cognitive, behavioral, constructivist and postmodern approaches to nursing and nurse education.

Credits are allocated to entire qualifications or study programs, as well as their educational components (such as modules, courses, placements, dissertation

work, practice and laboratory work). Number of credits are to be credited for individual components, based on their weight in relation to the workload, which students must complete in a formal context to achieve the learning outcomes.

## CONCLUSION

Good teaching methods, which are in accordance with proclaimed goals of study programs and final competencies which should be reached by graduates, are necessary for final reform and for creation of good educated doctors and nurses full of appropriate knowledge and skills.

New teaching methods for practical training within project CCNURCA could prove to be beneficial in the professional nursing training, for example realistic conditions in simulation laboratories are reflecting real hospital and patient's care, communication with patient and hospital staff, discussion and analysis of all student's activities.

This article includes teaching methods and principles applicable not only in teaching nurses, but can also be beneficial to teachers in other fields of study.

Gabriela Kuriplachová

## CONFLICT OF INTEREST STATEMENT

Neither author has any financial or personal relationship with people or organizations that could inappropriately influence (bias) their work.

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## MEFANET JOURNAL PROFILE

### Aims and Scope

The journal is intended to present within a single forum all of the developments in the field of medical informatics, medical education, e-learning and thereby promote the synergism among these disciplines. The journal is the premier vehicle for disseminating information about MEDical FACulties NETwork, which covers all Czech and Slovak medical faculties.

The journal enables medical teachers and scientists to share and disseminate evidence demonstrating the actual practice in on-line education in medicine and healthcare sciences by focusing on:

- research in medical educational informatics and learning analytics
- applications of medical informatics into education
- design, usage and results of novel e-learning tools and innovative pedagogical methods in medical teaching and learning
- other interdisciplinary topics related to information and communication technology in medical education

In 2009–2012, MEFANET report was published as one volume per year and was printed in 1000 copies. Since 2013, MEFANET journal has been published biyearly.

### Subjects of interest

- E-health and telemedicine
- E-learning
- Information science
- Innovative teaching methods
- Medical educational informatics and learning analytics
- Modeling and simulation
- Multimedia
- Social media pedagogy
- Evidence-based medicine in education

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## KEYWORDS INDEX

### B

Bloom's taxonomy | 64

### C

communication | 43  
computer-assisted learning | 48  
conference presentation | 61

### D

database | 54

### E

e-learning format; assessment | 48  
electronic | 54  
emotional intelligence | 43

### H

higher education | 64  
histology | 48

### I

interactive algorithms | 61

### L

learning by doing concept | 61

### M

management | 54  
MCQ | 54

### N

nursing | 64  
nursing education | 43

### P

practical training | 64  
project CCNURCA | 64

### Q

questions | 54

### R

reflective strategies | 43

### S

Software | 54

### T

teaching methods | 64  
testing | 54

### V

video-based training | 43  
virtual microscopy | 48

### W

written | 54

## AUTHORS INDEX

### A

Andraščíková Štefánia | 64

### E

Erdősová Běla | 48

### H

Harazim Hana | 61  
Hudáková Anna | 64

### K

Knight Anneyce | 43  
Kosinová Martina | 61  
Krajčí Dimitrolos | 48, 54  
Krajčí Drahomíra | 48  
Kuriplachová Gabriela | 64  
Kylar Pavel | 54

### L

Lichnovská Radka | 48

### M

Magurová Dagmar | 64

### P

Pokorná Andrea | 43

### R

Rybárová Lubica | 64

### S

Schwarz Daniel | 61  
Smékalová Olga | 61  
Štourač Petr | 61

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