MEFANET

2021

14th international conference
of medical and healthcare academic
institutions in Czechia and Slovakia

23–24 November 2021, Brno, Czech Republic

Cooperation on the effective use of technology in medical and healthcare education reflecting on the challenges of today

editors

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WELCOME WORD

Dear colleagues and students,

we are pleased to welcome you at the 14th year of the MEFANET conference, which traditionally brings together education technologists, teachers and students from faculties of medicine and faculties of healthcare sciences across Czechia and Slovakia.

This year follows a one-year break forced by the Covid-19 pandemic. However, together with our colleagues associated with the MEFANET network, we have not been idle at all during those months… We have formulated a new vision and several basic missions of our educational network for the upcoming years. Now, we believe that the program of this year's conference is prepared in accordance with what the MEFANET strives for:

"Cooperation on the effective use of technology in medical and healthcare education reflecting on the challenges of today"

This year's event is supported by Erasmus+ funded medical education project entitled New Era in Medical Education (NEWMED). The conference programme encompasses two workshops, one keynote lecture, two sessions with short communications and a guided poster tour. Besides general concepts of medical and healthcare education, the conference program focuses on how medical educators and medical education technologists grasp the wide field of technology-enhanced learning.

The workshops will enable participants to explore existing approaches, use-cases and also new trends in collaborative learning, and in assessment. The invited lecture by Professor Zbyněk Tonar (Charles University in Prague - Faculty of Medicine in Pilsen) will uncover Ten Evidence-Based Recommendations for Higher Education.

We thank all participating speakers and authors of the conference proceedings contributions. Despite the ongoing pandemic, we sincerely hope that this year's conference will become another valuable asset for the MEFANET community.

On behalf of the programme committee and organization team
Daniel Schwarz, Martin Komenda & Jaroslav Majerník

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Faculty of Medicine, Masaryk University
Institute of Biostatistics and Analyses, Ltd., a spin-off company of the Masaryk University

GENERAL INFORMATION

Conference venue

TUESDAY – University Campus Bohunice - SIMU building

WEDNESDAY – Hotel Continental congress centre

Catering

Lunch is included in the registration fee and will be served in the foyer to all conference participants on 24 November 2021.

Registration of participants at the conference venue

23 November 2021 from 11.00 to 16.30 h
24 November 2021 from 8.00 to 15.00 h

Information for authors

- A data projector, PC connected to the internet, laser pointer and microphone are available for the lecture.
- All equipment is available for testing before the conference or during breaks.
- Technical support will be available for the whole time of the conference in the congress hall.
- Your presentation file will be uploaded to the PC at a registration desk.
- It will be also possible to upload your presentation directly to the PC in the congress hall; however, we do not recommend this due to time issues.
- Create your presentation; we recommend pptx format, eventually export to pdf.
- Duration of a standard lecture (including discussion) should not exceed 15 min.
- Authors of posters will receive information on poster presentation at a registration desk.
- Official languages of the conference are Czech, Slovak, and English.
- Poster dimensions: from A3 to A0 format.

We kindly ask lecturers to stay within the time limit for their presentations.

Tuesday
23 November

11.⁰⁰ ////// *Registration*

12.⁰⁰ ////// **Welcome word**

12.¹⁵ ////// **Workshop on collaborative learning**

13.⁵⁵ ////// *Coffee break*

14.¹⁵ ////// **Workshop on assessment**

16.⁰⁰ ////// **Simulation centre tour**

16.⁴⁵ ////// **MEFANET Coordination Committee: open meeting**

17.³⁰ ////// *Welcome reception*

Wednesday 24 November

08.⁰⁰ /////// *Registration*

09.⁰⁰ /////// **Poster session guided tour**

10.⁰⁰ /////// *Coffe break*

10.¹⁵ /////// **Invited lecture**

11.⁰⁰ /////// Lunch

12.³⁰ /////// **Short communications: Educators & pedagogy**

14.³⁰ /////// *Coffee break*

15.⁰⁰ /////// **Short communications: Education technologists**

16.⁴⁵ /////// *Conference closure*

ABSTRACTS

WORKSHOP I

COLLABORATIVE LEARNING: METHODS & PRACTICE

Daniel Schwarz, Tamara Skříšovská
Faculty of Medicine, Masaryk University

Keywords: collaborative learning, PBL, TBL, virtual scenarios, virtual patients

The workshop will deliver general information about how Collaboration Learning can be used effectively in order to develop clinical reasoning skills and decision-making competencies in students. This will be explained on the experience and data coming from the Evening Schools of TBL Sessions, which were organized by Masaryk University at its Simulation Centre during summer breaks in 2020 and 2021.

The participants will hear about the popular collaborative learning methods: PBL, TBL & Flipping classroom, and also about their subtle but important differences. The participants will also have an opportunity to work individually and in groups on Readiness Assessment Test, which form an integral part of TBL.

Another part of the workshop will consist of delivering information about new trends in Escape Room Pedagogy and surveying the participants with their thoughts about it.

The workshop is organized as an integral part of the multiplier event delivered by the NEWMED (New Era in Medical Education) project, which is supported by the Erasmus+ Programme of European Union.

Erasmus+ | NEW ERA IN MEDICAL EDUCATION

Co-funded by the Erasmus+ Programme of the European Union

WORKSHOP II

14.15–15.55 **TUESDAY**

ASSESSMENT: NEW TRENDS AND CHALLENGES FACING MEDICAL AND HEALTHCARE EDUCATION

Martin Komenda, Martin Vejražka, Čestmír Štuka, Daniel Barvík, Vojtěch Bulhart
Faculty of Medicine, Masaryk University, First Faculty of Medicine, Charles University

Keywords: medical and healthcare education, assessment, OSCE

The workshop will cover general concepts of modern new trends and challenges in the assessment of students in various medical and healthcare courses. Different methodological approaches will be explained together with examples from practice.

The main attention will be paid to the objective structured clinical examination (OSCE) as the gold standard how to assess the clinical competences of students. Both the theoretical and practical point of view will be presented.

A real usage of the OSCE concept in practice at the Faculty of Medicine at Masaryk University will be demonstrated using an integration platform called the SIMUportfolio. The entire process of OSCE examination planning, definition of stations, running of individual exams and final evaluation will be shown.

The participants will observe a real OSCE station, including work with checklists and a debriefing session, where all opinions will be discussed in detail.

INVITED LECTURE

TEN EVIDENCE-BASED RECOMMENDATIONS FOR HIGHER EDUCATION

Zbyněk Tonar, David Hurný, Anna Malečková, Čestmír Štuka, Martin Vejražka
Faculty of Medicine in Pilsen, Charles University; Faculty of Science, Charles University; First Faculty of Medicine, Charles University

Evidence-based education is a strategy promoting the use of techniques that have been identified to improve the outcome of learning and teaching in well-controlled studies as well as in daily practice. Our aim was to elaborate on points that can be recommended to University teachers and to share our experience with implementing tools for which the evidence is the strongest.

We searched both primary resources as well as textbooks dealing with higher education. The strongest evidence we found included using of specific learning outcomes, systematic and regular use of formative assessment, case-based discussion classes when students work together in teams to solve problems, asking conceptual questions representing higher level of the Bloom's taxonomy, collecting feedback from both students and teachers, and other techniques.

We elaborated a document summarizing evidence-based recommendations as well as examples of good teaching practice. The first part dealt with preparing the course, including (i) formulating learning objectives; (ii) establishing a learning schedule; (iii) preparing both obligatory as well as recommended study materials; and (iv) making the students familiar with course requirements and defining the form and scope of exams. The second part dealt with the teaching methods, including (v) motivating students and encouraging them to seek our advice; (vi) striving for a variety of teaching methods emphasizing the active involvement of students; and (vii) obtaining feedback from students and promoting self-evaluation of both students and teachers. The third part dealt with finalizing the course, including (viii) evaluating knowledge, skills, and competences, including the higher objectives of the Bloom's taxonomy; (ix) providing students with feedback and striving for an incentive effect during the course evaluation; and (x) not tolerating cheating or other undesirable practices.

The whole original document is being currently critically reviewed by representatives of other Universities in Czech Republic aiming for improving the pedagogical skills and teaching practices of their educators. Most of the concepts rely on learning outcomes that are supposed to be student-centered, measurable, achievable, realistic, concise, and timely. In our contribution, we would like to share and discuss the time and personnel costs necessary for implementing and revising the evidence-based education techniques. The usefulness of the techniques was tested during both the regular and the distance education period. We will share the benefits provided and the both positive and negative feedback received when trying to balance the pros and cons of evidence-based techniques at the Department level, at the Faculty level, as well as at the level of international cooperation. We cordially look forward for receiving feedback based on the experience of other educators to improve this ongoing work.

POSTER SESSION

A SIMPLE SIMULATOR FOR TEACHING THE PRINCIPLE OF COMPUTED TOMOGRAPHY

Petr Voda, Martin Kopeček
Faculty of Medicine in Hradec Králové, Charles University

Keywords: CT, simulation, imaging methods, education

The poster presents a simple simulator for teaching the principle of CT in exercises in the subject of biophysics in the 1st year of general medicine.

The device simulates the principle of CT by passing radiation (visible light) through cubes with a built-in filter with a defined attenuation simulating the patient's tissue. A student measures the intensity of radiation without material and then the attenuation of individual cubes, from which he or she calculates their CT numbers. In the second task, the student measures the attenuations of a matrix composed of four cubes from different directions and uses a system of equations to calculate their CT numbers.

The operation of a simple device is intuitive. It is complemented by a printed manual and instructional video, and an interactive protocol in which the student enters the results of measurements and calculations. This protocol checks the results of measurements and calculations and finally stores the results in a database of protocols.

The described simulator in combination with teaching materials – video, manual and interactive protocol – represents complex equipment for a modern laboratory task for students of the 1st year of general medicine in the subject of biophysics. Through this task, students consolidate their knowledge of the CT principles acquired in the lecture Imaging Methods by practicing measurements and calculations. At the same time, thanks to the use of visible radiation, it is possible to achieve an educational effect without the need to use ionizing radiation with all the difficulties that its use presents to students in the laboratory.

COMPUTER LITERACY OF STUDENTS OF NON-MEDICAL STUDY PROGRAMMES AT THE BEGINNING OF THEIR UNIVERSITY STUDIES

Hana Sochorová, Hana Materová
Faculty of Medicine, University of Ostrava in Ostrava

Keywords: blended learning, LMS Moodle, questionnaire, cybersecurity, computer skills

The Information systems in healthcare course is included into the study plan during the first year of study of all non-medical healthcare study programs. The basic concept of lectures has been set as a smaller block of theoretical lectures and a larger block of practical exercises. The teaching and learning process is supported and managed by LMS Moodle (since 2006). This form of blended learning offers a good combination of face-to-face teaching and e-learning.

The theoretical part of the course is focused on the management of medical documentation, both in general and in the electronic form, further the basic features of hospital information systems, training HIS, data security and cybersecurity not only in health care (this part was newly added since 2019). The practical part of the course is based on the finding that the computer literacy as an integral part of general information literacy is necessary for everyone who wants to succeed in the labour market today. Moreover, it is a necessary condition for fulfilling many study obligations for every student.

The field of information technology is generally a constantly and very rapidly evolving and changing domain. For this reason, the initial knowledge level of incoming students is always verified at the beginning of the course using the form of a questionnaire implemented in LMS Moodle. There were 13 knowledge questions rated 0 to 2 points. The domain of security was newly included in this introductory survey – here we used the freely available test of cybersecurity (https://kybertest.cz/) and its results were evaluated separately.

As mentioned in the introduction, the teaching is supported by LMS Moodle course. The current e-learning course covers 10 practical lessons. Individual lessons are aimed to practical computer skills (mandatory standards for writing text, MS Office, reference management software). Students have complete study materials at their disposal. The study materials included record lectures and practical exercises, various videos and instructions for practical problem solving, their own exercises and also final knowledge tests.

Based on the evaluation of the initial questionnaire, more attention was paid to certain topics. The questionnaire was responded by 202 new students (33 men and 169 women) in the age group 18-34. The results showed relatively large differences in knowledge, especially according to the type of high school graduated. Students of grammar school and vocational industry schools had better knowledge compared to the students of medical and other types of high schools. However, because the questions concerned just basic knowledge of the IT field, the overall average success rate was very low, just 64%. However, the cybersecurity test had an average score of 59% (women 58% and men 63%), which is a 16% better result compared to the same age group of the general population (www.kybertest.cz).

Our survey showed that students coming to study non-medical health professions have a good knowledge of mobile technology, mobile application use and multimedia in general. Unfortunately, students often lack very basic knowledge – and practical exercises have shown that even skills – in the field of IT (basic principle of storing digital information, amount of data, data storage, file name, data compression), that should be the standard in achieving a complete high school education in our opinion.

THE INNOVATIVE APPROACH TO THE EDUCATION OF GENERAL MEDICINE STUDENTS CONCERNING LEGISLATIVE CHANGES

Simona Saibertová, Dana Soldánová, Andrea Pokorná
Faculty of Medicine, Masaryk University

Keywords: general medicine, legislation, interactive curriculum, innovation, nursing education

The poster contribution presents the novel didactical and methodological approach to Nursing education in General Medicine students based on the legislation changes.

The subject Nursing has been currently modified with regard to the amendment of Act No.96/2004 Coll., which allows students of General Medicine to obtain the professional competence of Practical Nurse, among other things, after successful completion of 8 semesters of study, acquisition of the required practical skills, successful completion of selected subjects by examination and completion of summer nursing practice within the 4th and 6th semesters of study.

Nursing teaching has so far taken place in the professional classrooms of the Department of Health Sciences, where it will continue to be delivered to non-medical students. With the move of teaching to the SIMU teaching facilities, emphasis is now placed on increased student activity and the need for online preparation before completing the practical part of the course. In the newly created interactive curriculum in the IS MU, students have access to high-quality study materials, which they use in the framework of the so-called pre-class reading, in preparation for teaching at clinical workplaces (in hospitals), as well as in preparation for the exam.

The subject Nursing, both in Czech and also English language, consists of three main parts: online course (interactive curriculum – including pre-class reading before the clinical practice and as the preparation before the exam), seminar in skills lab and clinical placement in the nature environment of healthcare facilities. The follow-up of this subject is the summer practice (in July or August) as a part of the fourth and sixth semesters. The online course is a prerequisite for entering the clinical practice. It is necessary to study chapters 1-5 well in advance and pass a short test (pre-test). The test may be repeated; it consists of the 7 questions from chapters 1 to 5, and students can repeat it until reaching 100% success. Successful completion of the test is a mandatory prerequisite for passing the clinical practice. During the seminars (theoretically-practical oriented and communication), students are provided with information about the clinical practice, and they can practice the skills necessary to complete clinical placement under supervision. The clinical placement (clinical practice) take place in clinical workplaces under the guidance of mentors/tutors (mainly in Faculty Hospital Brno Bohunice and St. Anna faculty hospital). The presented online course supports students in mastering practical performance in the subject of Nursing and during summer internships (summer practice).

The new online course consists of 20 themes, including essential nursing interventions and, together with the learning at SIMU, changes the philosophy and educational strategy of quality professional training of future general practitioners while maintaining contact with the real practice and practising nursing activities. We hope that the new concept of the course taught in the new environment and the use of a new online course will be successful and effective. We look forward to receiving feedback from the teachers and especially the students, whom we wish the best of luck in Nursing education and further studies. We will continuously evaluate the outcomes and impact of the novel teaching approach on the student's knowledge and clinical skills.

INFORMATION AND EDUCATION IN CLINICAL PRACTICE GUIDELINES DEVELOPMENT

Tereza Vrbová, Andrea Gabrielová, Lucia Kantorová, Miloslav Klugar, Jitka Klugarová, Andrea Pokorná
Faculty of Medicine, Masaryk University

Keywords: clinical practice guidelines (CPGs), evidence-based healthcare, GRADE, methodology

National Clinical Practice Guidelines (CPGs) Project is a EU-funded project (2018–2022) whose principal investigator is the Czech Health Research Council and partners are Ministry of Health and Institute of Health Information and Statistics of the Czech Republic. The main aims of the project include creating a methodological framework for development and updating CPGs based on GRADE and evidence-based (EB) principles, draft system for developing, approving, publishing, and updating CPGs, development and issue of trustworthy CPG drafts and providing information and education for guideline-development-group (GDG) members, healthcare professionals and lay public in the field of CPG, GRADE and EB approach.

In order to raise awareness about CPGs in Czech healthcare professionals, development of the project website was appointed to the Institute of Health Information and Statistics. Development of an education and training approach, including e-learning was a task for project methodological committee.

Methodological seminars for GDG members focused on the CPG development process were planned in order to disseminate the national methodological approach among healthcare professionals. E-learning course for those interested in the basic principles of EB and GRADE was planned to be designed and made available for anyone after their registration.

Specialized courses on EB healthcare and GRADE were to be offered to the methodologists of the project who collaborate with clinicians in CPG development and GDG members in order to deepen their knowledge and skills in the fields.

International conferences – one at the beginning, another towards the end of the project should have disseminated the scope and purpose of the CPG project.

The website of the project has been developed and it is updated whenever a new methodological document or guideline is issued. All CPGs in progress or CPGs in their final version are also published on the website.

GDG members were at least introduced to the CPG development process and national methodology and its elementary principles were presented to them. E-learning (moodle) has been created for two methodological areas: 1) national methodology (various approaches to CPG development, tools for quality assessment and project procedures) and 2) expert evidence. Video presentations, additional reading materials and on-line tests were prepared in each module and made available for anyone after their previous registration. EBHC and GRADE courses were organized by the Czech National Centre for Evidence-Based Healthcare a Knowledge Translation; their participants recruited from various GDGs members – clinicians from different fields – involved in the project. An international conference JBI EB Healthcare Symposium, where presenters shared their experience in EB Healthcare and CPG methodology, took place in Brno in December 2018. Covid-19 situation intervened heavily into all other conference plans.

The CPGs project has greatly contributed to development of national methodological framework for development of trustworthy CPGs based on GRADE and EB principles, education of healthcare professionals and CPGs development. Healthcare professionals from various fields and methodologists have been educated and trained in CPG methodology and at least 40 CPGs will have been developed and/or updated. Information on CPGs, EB and GRADE approaches have been provided and disseminated to both healthcare and lay public.

MODEL OF COMBINED TEACHING WITH THE SUPPORT OF AVAILABLE ELECTRONIC INFORMATION AND COMMUNICATION TECHNOLOGIES

Michal Trnka, Eva Kráľová

Faculty of Medicine, Comenius University in Bratislava

The pandemic has hit higher education hard in the previous almost two academic years. The teaching of science subjects, for which contact teaching is necessary for the implementation of experiments in practical exercises, also had to deal with new challenges. At our workplace, we have been implementing theoretical and experimental teaching of medical biophysics for a long time, which in a concentrated form represents the necessary basis necessary for further study of medicine and medical practice.

The following platforms are used in our daily practice:

- Microsoft Teams - A unified communications and collaboration platform that takes ongoing workplace communication, video meetings, remote testing and trials, file storage (including file collaboration), and application integration. It is constantly used in distance teaching. Online meetings with Slovak and foreign students were held (online lectures, practical training and exams).
- The scientific and pedagogical team of the Institute of Medical Physics, Biophysics, Informatics and Telemedicine (IMPBPITM) in the years 2016-2021 prepared a bank of about 5,000 test questions in medical biophysics in Slovak and English. These are divided into 48 thematic blocks, which include questions from lectures and practical training. From academic year 2016/2017 We continue testing students' knowledge in the MS Moodle environment.
- On the MEFANET portal, the issue of biophysics is represented by 30 PowerPoint presentations in Slovak and English, which include the needs of teaching subjects and their medical applications.
- OpenShot Video Editor - An open source video editor, available on Linux, Mac and Windows. With OpenShot, videos, movies, and animations have been created with an easy-to-use interface and a rich feature set.

In the previous period, teaching, knowledge assessment and contact with students and teachers took place in MS Teams and MS Moodle.

A collection of video recordings (measurement procedures and their theoretical bases) was prepared for distance teaching and learning. The OpenShot application was used to modify and finalize the teaching videos. It allows additional editing, saving comments, adding images and texts.

All PowerPoint presentations explaining the theory of laboratory experiments were commented in Slovak and English and converted into video format and then uploaded into the video streaming service – Microsoft Stream.

The advantages of the above software packages have been shown in connection with the need to start a distance form of education. In these conditions, such teaching meets the attributes of modern education, is effective, interesting and provides students with a number of impulses to activate, motivate and increase the level of obtained knowledge. Many teachers are aware of the perspective of distance learning not only as a temporary solution to the current crisis situation, but also perceive this possibility as an alternative and a useful addition to full-time teaching. Compared to the previous academic year 2019/2020, it can be stated that the level of distance education has improved. Experiences with this type of teaching from recent academic years have been analysed and evaluated in relevant materials of Comenius University in Bratislava.

COMPARISON OF THREE WAYS OF TEACHING PRACTICAL SKILLS OF OSTEOSYNTHESIS FOR STUDENTS OF VETERINARY MEDICINE

Mária Kuricová, Filip Korim, Jakub Fuchs, Scarlett Marešová, Valent Ledecký, Tomáš Lipták
University of Veterinary Medicine and Pharmacy in Košice

Keywords: practical skills, fracture repair, veterinary

The COVID-19 pandemic made the practical teaching impossible for some period of time, which was reflected mainly in the ability of our students to perform certain clinical practical skills. Osteosynthetic surgeries require exceptional accuracy and excellent orientation and knowledge of the surgeon in bone modelling, the physiology and principles of bone healing. Therefore, we decided to evaluate the effect of fulfilling our goal to establish the station for practical training of fracture repair together with providing the step-by-step manual on how to perform an osteosynthesis in our training environment. The goal was to compare differently taught groups of students.

By evaluating the answers of students and tutors recorded in the questionnaire after completing the osteosynthetic workshop, we evaluated the effectiveness of the educational process during the difficult period of distance learning. Students were selected and divided into three groups according to whether they completed 1. the practical teaching of osteosynthesis on cadavers together with an online lesson, 2. the practical teaching of osteosynthesis on cadavers with the lesson and with the study of the prepared step-by-step manual, 3. only the online lecture during distance learning period. The students were invited to the Clinical Skills Centre (CSC) and they were allowed to perform osteosynthesis in the newly established station under the supervision of three teachers, surgeons.

The understanding and implementation of the methodology of bone fracture repair was clearly better for the group that has already performed this methodology in the past during practical hours within the present study, and the tutors recorded the best performance in the group that studied also the step-by-step manual. Based on the questionnaires, these students were calmer and more confident, in addition, all students evaluated the maximum positive opportunity to return to CSC and re-perform the various skills that CSC provides. The form of lectures used so far, which were usually tied to the relevant practical hours, seems to be insufficient at the time of the pandemic. It is therefore necessary to innovate the approach to teaching and training, especially practical skills. The online study is limiting, but we can manage it in an interactive way using new teaching aids such as aminations, self-prepared videos, as well as virtual scenarios.

The approach to ensuring the repetition of practical skills within the designated centres in the environment very similar to the real clinical environment will partially ensure that students will be capable to immediately manage also difficult cases in practice, but it will fully ensure sufficient self-confidence in the use of devices and instruments. As a part of e-learning, we pay attention to the case-based and problem-based scenarios, critical thinking and reasoning in terms of clinical scenarios/virtual patients, which we prepare on our platform with colleagues. Self-prepared videos and animations are very helpful for online learning.

PROJECT "THE USE OF INNOVATIVE EDUCATION TOOLS IN THE FIELDS OF NURSING AND EMERGENCY MEDICAL SERVICES"

Wioletta Mikuľáková, Aleksandra Kabus, Ľubomíra Lizaková, Danka Boguská, Lucia Demjanovič Kendrová, Stanislav Novák
Faculty of Health Care Professions, University of Prešov

The situation related to the COVID-19 pandemic and the university's transition to hybrid and e – learning has raised the issue of universities' readiness to education of health sciences student. The international project solved within the ERASMUS+ grant program is designed as a response to the situation. The aim of the paper is to present the goals and activities of the project "The use of innovative education tools in the fields of nursing and emergency medical services (E-NUREMS)", in the implementation of which three universities from Central Europe: The Higher School of Strategic Planning in Dąbrowa Górnicza, Presovska Univerzita v Presove and Jan Evangelista Purkyne University in Usti nad Labem. Its beneficiaries will be students and academic teachers of Nursing and Emergency Medical Services.

During the project implementation, it is expected to create an interactive, multilingual coursebook, e-learning platform consisting of a collection of videos recorded in the medical simulation center and practical vocational training laboratories. The project also includes the preparation international training program of practical subjects in the fields of Nursing and Emergency Medical Services. Project activities are focused on training academic teachers: "Practical training of Nursing and Emergency Medical Services students", as well as the implementation of courses for students: "Healthcare worker in a crisis situation" and "Work in international medical rescue teams".

The quality of education of health sciences students is measured mainly by the employment of graduates in the conditions of clinical practice. The aim of the project is therefore to adapt education in such fields as Nursing and Emergency Medical Services to modern learning in a remote system in order to achieve the highest level of education and create an international training program for practical subjects.

The expected benefit of the project is the improvement of the quality of education of health sciences students of with the use of e-learning in order to increase the readiness of students for performance in the conditions of clinical practice.

PRINCIPLES OF EDUCATION IN MEDICINE – A PART OF TEACHING AT THE FACULTY OF MEDICINE, COMENIUS UNIVERSITY

Silvia Hnilicová, Pavol Vitovič, Iveta Waczulíková, Tomáš Dalloš, Rudolf Drábek, Jana Plevková, Jana Tisoňová, Tomáš Hitka, František Šandor, Ľudmila Podracká, Pavol Hnilica, Daniela Ostatníková

Faculty of Medicine, Comenius University in Bratislava

The new elective Principles of Medical Education was included in the curriculum at the Faculty of Medicine of Comenius University in Bratislava with goal to prepare students for the role of physician - educator.

The new elective curriculum has been under development since 2013. Firstly, needs assessment was undertaken for the purpose of setting priorities and making decisions about the program. Following, focus group discussions with teachers and students interested in medical education were conducted. This research was used as the foundation for creating a curriculum with content, precisely defined measurable goals and outcomes. The Educational strategies were chosen, the blueprint of the included classes was developed. For each lesson, the resulting ILOs (intended learning outcomes) as well as teaching and learning methods were described and defined in more detail.

Since 2013, the course is offered for up to for 12 4th and 5th year students studying in the in Slovak and 12 students studying in English language. During the semester, they complete 24 hours of learning. In addition to the theory of learning and teaching, practical demonstrations of new methods of teaching are included. These are led by qualified teachers who have completed courses in the field of medical education. As part of the course, students take part in high- fidelity simulations, team-based learning, case-based learning, problem-based learning, the use of audio-visual learning and teaching techniques, surgical simulations, virtual patients, virtual reality, and OSCEs. Students also have the opportunity to apply these methods during practical work in groups, where they themselves, with the support of educators, create their own scenarios. Teaching also includes a greater range of preclinical and clinical courses taught at the Faculty of Medicine as a model for the application of new methods in practice. The course is concluded with an assessment consisting of an essay and academic debate. Student feedback from previous years rates the subject as excellent (95.8%), 4 for quality of teaching, and 100% said they would recommend the subject to their upcoming colleagues.

The elective course Principles of Education in Medicine features an innovated approach with high satisfaction of all students and teachers involved. It prepares our students for the role of educators not only for their future educational activities, but also for future education of their patients, fulfilling at the same the broader need for education and support for physicians in the field of Medical Education itself.

SHORT COMMUNICATIONS:
EDUCATORS & PEDAGOGY

12:30–14:30

CLINICAL INTRODUCTIONS AT SIMU

Martina Žižlavská, Martin Janků
Faculty of Medicine, Masaryk University

Keywords: propedeutics, basic skills, simulation, team-based learning, peer-to-peer

The Simulation Centre of the Faculty of Medicine of Masaryk University provides an ultimate opportunity to make a large-scale change in general medicine education. One of the key courses affected is a three semestral subject - Clinical introduction (Propedeutika), where students are supposed to learn basic clinical skills. Our team of doctors and students have prepared new and complex approach.

We have prepared and tried out a complex syllabus of the three semestral subject Clinical introduction using evidence-based medical education methods using various options provided by The Simulation Centre of the Faculty of Medicine of Masaryk University. All practical lectures are without frontal instruction teaching methods - those are replaced by complex online courses with videos, interactive tasks, instructive texts, images and mandatory pre-class tests. All our practical lectures use student-centred methods of teaching. All lessons are taught by trained student lectors under clinicians supervision. Dominantly we use team-based learning methods with various virtual scenarios in OpenLabyrinth, methods of low-fidelity simulation, peer-to-peer education principles and other evidence-based medical education methods.

During preparation of all lectures and training student lectors, more than 250 students attended to the new lectures. Their feedback shows a change in their attitude during clinical practise in hospital. They are getting rid of the fear of the unknown situations and it is becoming easier for them to become a real part of medical care, while feeling more motivation for further studies. We are still collecting data to confirm and evaluate this optimistic impression.

New possibilities are enrising with The Simulation Centre of the Faculty of Medicine of Masaryk University. We are prepared to use them to fulfil the vision of medical students who are better prepared for clinical practice in terms of basic clinical and soft-skills, which should build a solid foundation for further, more specialized education.

INVOLVEMENT OF STUDENT LECTORS IN PREGRADUAL TEACHING – THE TRAINING PROGRAM AND STUDENTS' POINT OF VIEW

Tereza Prokopová, Barbora Potocká
Faculty of Medicine, Masaryk University

There is an effort to make the general and dentistry medicine studies more practical at Masaryk University in Brno. We incorporated more simulations, skills training and made student groups smaller in First Aid. To be able to do it, we needed more teachers. We got inspired by the peer learning concepts and recruited students as teachers. To a guaranteed high level of education, we needed to train our lectors. Therefore, we created the First Aid course's Student as a Teacher training program.

This training program has two parts – theoretical and practical, together it takes ten months to finish. We asked the lectors what skills and knowledge they gained from it.

Students often state that they improved in understanding first aid theory and are more particular about their practical providing First Aid. Also, their soft skills improved.

The Student as a Teacher is a long and demanding training program. After completing this course, the students feel theoretically and practically prepared for First Aid. They also appreciated the feedback culture and debriefing training, which helped them develop feedback-seeking behaviour. They think of this program of a valuable experience.

STUDENTS' FEEDBACK OF DISTANCE EDUCATION AT THE BEGINNING OF A COMPLICATED EPIDEMIOLOGICAL SITUATION AT THE FACULTY OF MEDICINE, UNIVERSITY OF OSTRAVA

Hana Sochorová, Ivona Zavacká
Faculty of Medicine, University of Ostrava in Ostrava

In March 2020, all of us had to cope with unforeseen circumstances - the students may not enter the schools, which required modification of the teaching process, its organization, and, subsequently, the methods of verifying knowledge and skills. It was a challenge not only for students but also for teachers. Thanks to the fact that this was the first experience of this type, everyone coped with it in a different way based on their abilities and knowledge.

In July 2020, students of the University of Ostrava were asked to provide feedback in a form of electronic questionnaire survey. The goal of the study was to obtain data related to teaching and assessment methods that were used and to find out how students approved them, and especially whether there were positive aspects of the situation - and could even remain a suitable complementary element in standard teaching. In particular, we wanted to identify critical points, where worst complications occurred, or what we did not manage at all. This feedback provided outcomes and suggestions for the autumn second period of distance learning, as well as an impulse for innovations in the current educational process.

Students evaluated the methods of teaching in theoretical and practical subjects, except for clinical practice. We also focused on the methods used to assess knowledge and skills. In the questionnaire, students also answered questions about the technical solution of distance learning - environments used, their advantages and disadvantages, including suggestions on how they could be used to further improve teaching. The questionnaire also included a question concerning the use of online study materials within the Mefanet network and the "Wikiskripta" project.

166 students took part in the questionnaire survey, 90% of them in the full-time form of study, and almost half of them were first-year students. In the beginning, the most common way of teaching implementation was to send materials for self-study, published materials, and links to online resources. After about 3 weeks, teachers started offering online tools for teaching. At that moment, 14% of students had to deal with insufficient equipment, 23% with insufficient data connection, and 43% with an update or purchase of software.

The most frequently used tool for theory teaching was the Zoom environment (19%), MS Teams (13%), LMS Moodle - Big Blue Button (10%). The Mefanet learning portal was unknown to 90% of students, which can be explained by the fact that most of the respondents were first-year students. 96% of students stated that they knew the "Wikiskripta" portal, 92% of students had already used it, and 25% of students started using it more intensively.

In practical exercises, the lecturers used the form of sending materials and assignments by email (34%) and used e-learning courses (20%). At the end of the questionnaire, students could express their position in a short text. A quarter of students agreed that the theory should be taught completely online, three-quarters of students would welcome the inclusion of distance form in teaching, and only 3 students did not accept this form of education.

Student feedback was a very useful and important source of information for our future teaching process. As a consequence, an improvement of technical background for teachers happened, as well as the faster implementation of educational courses for teachers in the tools used and the creation of simple guidelines. In summer 2021, the University of Ostrava conducted a lengthy questionnaire survey, which focused on multiple learning methods. One part of this questionnaire was devoted to digital technologies in teaching and proved that the academic year 2020/2021 was a turning point in this area - and digital technologies became a regular part of the education process and were included in teaching and knowledge verification methods as a fundamental part of this process.

HOW TO ENGAGE WITH STUDENTS

Daniel Rajdl, Kristína Mizeráková, Lucie Pešanová, Monika Kubalová
Faculty of Medicine in Pilsen, Charles University

Student involvement in faculty activities is usually beneficial for both students and faculty. Collaboration can take many forms: from student representatives on the Academic Senate, to their participation in curriculum modifications, to students as tutors, classmates' guides, authors of creative outputs, or technical support for e-learning (e.g., in recording of presentations). The aim of this presentation is to share our experience in coordinating student activities at the Faculty of Medicine in Pilsen.

The basic organizational framework is the optional course Student Pedagogical and Publicity Activities (SPPČ). It is supported by approximately 2 FTE from the faculty and by our own students who are gradually able to pass on their experience to new colleagues.

The incentive system is based on three pillars:

- intrinsic motivation (personal development, gaining new experiences and skills), which we try to encourage regularly during coordination meetings and personal meetings.
- credits according to the European Credit System for Higher Education and bonus points to improve the position when selecting a sixth-year placement
- financial rewards based on student performance outcomes

The technical and implementation facilities of the course are provided by a room equipped with equipment for audio and video recording and processing, presentation, streaming and meeting in a comfortable environment (the so-called media studio). Software tools used by our students include MS Teams, ZOOM, MOODLE, Vimeo, Kapwing, Canva and Kontentino.

In 2020 and 2021, collaboration with students led to the creation of hundreds of electronic teaching materials (especially recordings of presentations), the creation of a new podcast of the Faculty of Medicine in Pilsen (Medicína srdcem), the translation of two textbooks into English, and the launch of bilingual (Czech and English) social media posts. In addition, we have started a large-scale provision of subtitles (Czech and English) for the produced videos and expanded the capacity for recording and streaming postgraduate teaching events (seminars, webinars and congresses). New creative forms of student-initiated publicity are gradually emerging (discussion programmes by international students with faculty personalities, psychological support and coaching of students online). Communication with other students (updates on teaching, collection of complaints ...) and with academics (quality and direct feedback) is an indispensable role of students.

The biggest challenge in working with students is to keep their intrinsic motivation high and to organise and manage the allocation of work to students in a very dynamic environment of changing needs during the covid-19 pandemic.

Cooperation with students at the Faculty of Medicine in Pilsen brings a number of benefits and has led to a significant improvement and increase in the capacity of the services provided by the e-learning team.

ANALYSIS OF SUICIDAL BEHAVIOUR BASED ON THE STUDY OF SUICIDE NOTES

Alena Lochmannová
Faculty of Health Care Studies, University of West Bohemia

Keywords: suicide, analysis of suicidal behaviour, teaching a highly sensitive topic

Suicidal behaviours are a serious problem that is the focus of many experts. This paper presents a research study conducted by the Faculty of Health Care Studies of the University of West Bohemia in Pilsen and the Institute of Forensic Medicine in Hradec Kralove, where the analysis of relationship variables within the topic of suicidal phenomenology is carried out on the basis of suicide notes.

The author will present partial results of the analysis of demographic variables of the selected cases as well as content and linguistic analysis of suicide notes of 164 cases of completed suicides. The suicide notes were monitored over the period 2015-2020 and were supplemented by studying the documentation of the Police Department and records of coroner's call, as well as by obtaining information from the concerned professionals - police, medical examiners, coroners - using the oral history method. Case studies, excerpts from letters, photographs from the places where the bodies were found and video recordings are used in the teaching and presentation of

the topic, which allow for the analysis of sub-variables in the behaviour of a person in crisis just before a suicidal act.

Based on the analysis, the basic clues supporting the suicidal act can be observed, while the basic motives and links between the variables in terms of the content of the letters in relation to the actions preceding the act itself are included. The topic is important for future physicians and non-medical professionals, as one of the specific sites for suicide with its own dynamics is the hospital environment. In terms of educating students, it is not only the form that is important here, but also the mutual consensus and appropriate techniques for a message that is sensitive and with which the spectrum of listeners/students may have their own or mediated experience.

The results of the study are valid for physicians, non-medical professionals and other professionals (police officers, coroners, medical examiners), both in terms of prevention, case investigation and intervention in relation to the persons concerned (witnesses of suicide, survivors, etc.).

NEWMED PROJECT: PILOT RESULTS OF TRANSITION TO ONLINE TEACHING ANALYSIS

Jaroslav Majerník, Monika Pávková Goldbergová, Andrea Kačmariková, Daniel Schwarz, Martin Komenda, Petr Štourač
Faculty of Medicine, Pavol Jozef Šafárik University; Faculty of Medicine, Masaryk University

The need to improve IT support at medical faculties resulted in preparation of international ERASMU+ grant NEWMED (New Era in Medical Education), in which three EU universities participate, including Masaryk University, University of Thessaloniki and Pavol Jozef Safarik University. The main goal of the project is to rationalize online teaching at the participating medical faculties thanks to the unified methodological guidance of academics in the preparation of syllabi and online study materials for students.

As an initial activity of our project we decided to analyse the recent situation in online education at partner institution. Doing so, we designed a questionnaire with 42 questions divided into three areas that related to educators' needs, experience and evaluation of the online way of education. The aim of this questionnaire was to increase the quality of online education and reduce the workload of teachers based on the real knowledge from educational practice.

We collected and translated to English 272 responses from teachers at two partner institutions (MU and UPJS). Answers from AUTH will be included into analysis after translation from Greek. The pilot analysis showed different preferences in approach and technologies used by educators. Both institutions converted from various platforms used at the beginning of COVID-19 pandemic to MS Teams. Despite of high potential of today's technologies, there are problems with equipment and internet connection reported by respondents. The high number of educators feel the online education cannot substitute clinical practice.

This pilot analysis of the survey showed us suggestions of educators regarding online education. Their comments and suggestions helped us identify gaps and better target online learning support. The analysis also included a description of the technical background (hardware and software), which can be used for online teaching. It will serve as a basis for preparation of Implementation guide. Based on the results of the final analysis, the recommendations for the creation of methodological manual will be determined.

SHORT COMMUNICATIONS: EDUCATION TECHNOLOGISTS

15.00–16.45 **WEDNESDAY**

CENTRE FOR SIMULATION AND VIRTUAL MEDICINE

Jakub Jánošík, Jaroslav Majerník
Faculty of Medicine, Pavol Jozef Šafárik University

Keywords: simulation, virtual reality, education

The modern approaches in medical education are increasingly based on various simulation tools combined with traditional teaching methods. As a result of our long-term efforts, we established a largest medical simulator centre in Slovakia: Centre of Simulator and Virtual Medicine at UPJŠ LF (hereinafter CSVM). In this contribution, we present the process of CSVM implementation, basic information about our simulators and their utilisation in daily teaching of medical students.

We have procured and use the latest technologies and simulators that are currently available on the market with the aim to modernise education in medical and healthcare disciplines. The individual simulators were included in the time schedules to plan their effective utilisation. Moreover, the afternoon hours were reserved for individual study. Virtual and augmented reality is also part of the teaching process.

Starting on September 2021, we opened our CSVM and integrated it into the education process at Faculty of medicine in Kosice, Slovakia. After the first months of its operation in academic year 2021/2022, we obtained a very positive feedback from both the students and the teachers, who benefit from the change that CSVM has brought. Continuously with the education process, we prepare a lot of workshops that are intended not only for undergraduate teaching, but also for doctors in specialized training. We have also initiated collaboration on various projects that are important for various branches of medicine.

We operate our Centre of Simulator and Virtual Medicine only a few months of current academic year, but it has already proven to be a huge step forward and increases the quality of medical education at a much higher level. We also argue that the connection between science and technology is an essential part of today's education.

METHODS OF OBJECTIVE STRUCTURED CLINICAL EVALUATION IN THE EDUCATIONAL PROCESS OF STUDENTS OF HEALTH CARE STUDY PROGRAMMES

Ivan Farský, Martina Lepiešová, Mária Zanovitová
Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava

In modern health education, the main goal of teaching is to acquire clinical competencies that represent the overall set of knowledge, skills, and attitudes needed to practice health care safely and effectively without direct supervision, and graduates are able to provide care independently. It is abandoned to strive for perfect instrumental mastery of performance techniques, and the emphasis is placed on the complexity of individual performances. The aim of the project is the implementation of the OSCE method (Objective Structured Clinical Examination) into the teaching process and evaluation of clinical competencies in students of health care study programs (nursing, general medicine, midwifery).

The project aims to implement the method of Objective Structured Clinical Evaluation/Examination (OSCE) into the professional preparation of the students of health care studies through developing the electronic database of OSCE protocols (checklists) and developing e-learning course (virtual patients, e-clinical case studies) for nursing techniques and skills. The students of these programs will be able to use the OSCE protocols as study material to prepare for training, application, or evaluation of selected clinical competencies, nursing techniques, and skills in the simulated and clinical learning environment. For teachers, the protocols can serve as a tool for structuring and objectifying clinical competencies needed to adequately deal with a particular clinical situation, and also as a tool for their assessment or evaluation. At the same time, they can also be used in the real clinical practice of healthcare facilities as a tool for evaluating the clinical competences of healthcare professionals, e.g., within the introductory practice, or in the process of unification of the different procedures of nursing techniques and skills used in various departments.

We implemented the OSCE method in a nursing techniques course for nursing students in this semester. They will be evaluated by this method and after that will be asked for feedback in the last week of course. We also created a database of 26 OSCE protocols in two versions. One of them is the "checklist form" and is designed for students without simulated scenarios and evaluation. The second one is intended for teachers/evaluators. There is a simulated task/scenario for students and an evaluation for particular parts of the OSCE protocol. These protocols cover basic nursing techniques such as venous and capillary blood collection, measuring vital signs, insertion of catheters, nasogastric tubes, and others. Both databases are parts of an e-learning class/course which is accessible in LMS Moodle. The E-learning course will also be available for general medicine students and offered to other health care programmes within our university in a summer semester.

We hope so OSCE method in education process will be useful for students and teachers. For students this form of evaluation allows them to identify the exact areas which they manage excellently, which, on the contrary, they do not manage at all, or manage only partially. Using the OSCE teaching and assessment method, educators can identify those areas of clinical competence that make students the biggest problem, which they can then review in the teaching process using the OSCE protocols e-database and e-learning course as study materials for students and can also be used for distance teaching. Supported by the grant KEGA 025UK-4/2021.

TEACHING AND CLINICAL EXAM IN THE TIME OF COVID – IMPLEMENTATION OF OBJECTIVE STRUCTURED CLINICAL EXAMINATION

Jan Pospíchal, Vít Blanař, Jindra Holeková
Faculty of Health Studies, University of Pardubice

The teaching of general nurses and paramedics in 2020 and 2021 was significantly affected by the COVID-19 pandemic. With the work duties and restrictions on face to face teaching, the clinical exam was also moved from the clinical environment of hospital wards to laboratory conditions and set with OSCE elements.

Aims: To describe the setting and implementation of the clinical exam during lockdown with OSCE elements.

Analysis of syllabus and implementation of courses related to hospital training with the implementation of the OSCE exam.

Due to the closure of the hospitals for students, the clinical exam was moved from the clinical environment to laboratory conditions with OSCE elements. Each student had to perform 6 clinical procedures on two patients in the created inpatient department in the laboratory, simulating a real patient room. An 8 patients (complete medical records) with 4 sets of daily medical documentation were created. It was 32 unique patients. 74 students passed the exam and 16 academic staff participated in the implementation.

The implementation of a clinical examination outside the clinical environment is very demanding on the organization, but allows the exact setting of the difficulty of the examination. It allows to set up the diversity covering the whole range of tested knowledge and skills.

USING FACULTY PORTAL AS A CENTRAL PLACE FOR CLINICAL CASE REPORTS AND VIRTUAL PATIENTS

Jaroslav Majerník, Andrea Kačmariková, Stanislav Balčák
Faculty of Medicine, Pavol Jozef Šafárik University

Universities and education institutions face the great challenges during the continuing waves of COVID-19 pandemic. The restrictions caused the traditional face to face teaching must be alternated with distance teaching methods for long time periods. However, the nature of medical education was not prepared for such scenario and almost no medical faculty, nor the faculty staff was able to switch to the new virtual environments with a variety of functions and features offered. Except of the change in technical thinking the high working load was put on educators, who were forced to improve quality of their teaching materials too.

To minimize the lack of clinical information, which cannot be substituted by online education, we continued in our efforts to create and extend a knowledge and technological information base of clinical education resources. The aim was to offer the alternative and modern study materials that support the increase of the critical thinking level in students of clinical and health care study programs. Combining the key clinical elements in the form of patient case reports and virtual patient scenarios, we provided an approach to share experiences of clinical professionals in one place of faculty portal.

As a request of educators and their students to be able to study clinical problems from their homes and to be prepared for discussions during online teaching, we guided authors of clinical case reports and virtual patient scenarios to share these education materials, or the links to them, at the faculty portal of multimedia support in education of medical and health care disciplines. Doing so we collected a database of over 100 clinical examples, topics and problems that can be reused not only during pandemic restrictions.

The pilot survey among students showed they appreciate it, are thankful for this activity and believe the activity will continue and they will have additional cases and scenarios for not covered topics and clinical areas. The majority of medical students felt that it is highly beneficial to use such multimedia materials and also declared the online accessibility is highly suitable for preparation on bedside teaching. On the other side, we feel the educators are overloaded and they argue that it is a time consuming to prepare reports or scenarios of high quality.

STANDARDISATION AND SIMPLIFICATION OF CREATING INTERACTIVE WEB SIMULATORS NOT ONLY FOR MEDICAL EDUCATION.

Tomáš Kulhánek *, Jiří Kofránek, Jitka Feberová
First Faculty of Medicine, Charles University

We do long-term research and development of simulators and related technologies in our laboratory of biocybernetics and computer aided design, Institute of Pathological Physiology, First Faculty of Medicine, Charles University in Prague. We develop simulators used in education. The time of proprietary plugins and technologies that replaced the lack of standards and system support is over. The support of plugins and technology of Adobe FLASH and MS Silverlight was ended and even the programs using these technologies are not possible to launch after some of the latest updates (June 2021) on Microsoft Windows 10 operating system. Therefore half of the simulators developed in our laboratory become obsolete and impossible to launch on modern computers.

Our recent effort focus on standard technologies and the development of web simulators use the following standards around HTML (HTML5 and Javascript language (Ecmascript 6):

1. Web components - it is a standard way to register and enhance the HTML language tag of custom elements, which can deliver smarter customized interactive functionality into web pages and make it an interactive web application.

2. Web Assembly - is standard assembly language able to be executed directly in a web browser allowing to execute demanding computation in a speed almost as fast as native application.

3. WebGL - is standard API allowing to render and manipulate 2D and mainly 3D graphics in a smooth fast way utilizing capabilities of multiple hardware devices but giving standard uniform API.

4. WebXR - is a new standard API, allowing the rendering of a 3D graphics environment in an immersive view in virtual or augmented reality.

We have developed a compiler from Modelica language into Web Assembly. We used Modelica to develop and validate mathematical models. The Web Assembly allows the user to execute models in the web browser. We have introduced web components - a set of custom elements to simplify creation of web simulators called bodylight-components and distributed as Javascript library. With the help of our graphical designers, we transformed a 3D model of simplified human anatomy and some medical devices into an interactive environment using WebGL technology. The WebXR technology allows us to show the environment in an immersive view while making it live - our human model breathes. The 3D visualisation is integrated with a mathematical model as a web application able to be launched not only on a desktop computer, but also on tables, mobile devices or devices for virtual reality or augmented reality (we have tested it on Oculus Quest 2 and Microsoft Hololens 2). https://bodylight.physiome.cz

It is costly to fabricate a scenario and coordinate work with many different experts who realize a scenario of an educational game. The scenario must make sense from a pedagogical point of view. I.e. It must strengthen knowledge and mainly skills. The scenario must make sense economically too. The costs must be balanced with incomes and benefits should be compared with other methods of education.

Currently we are actively searching for follow up funding (charity foundation, research grants, seed capital or venture capital). We also are searching for other collaborators - creators of scenarios - educational games.

The lack of cooperation and coordination among different expertise may lead to stagnation and underutilization. E.g. the project WIKISKRIPTA contains only the content in the area of medicine, even the domain and name seems to be broader. Valuable contributions of students and volunteers in the domain of medicine are not systematically enhanced by graphical design of students of appropriate domain. The potential of possible cooperation is underutilized here.

Our experience is that non-standard technology may bring fast results, but may not survive technology evolution like our Atlas of Physiology and Pathophysiology based on Adobe FLASH and MS Silverlight http://www.physiome.cz/atlas

Therefore we actively realize cooperation of different domain experts and we do prefer standard technologies over proprietary solutions to deliver long term sustainability of developed simulators. We hope that our simulators will survive longer technology evolution.

editors
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Graphic design: Martin Janíček