



EVALUATION OF A NEW E-LEARNING METHOD OF TEACHING PRACTICAL HISTOLOGY AT THE DEPARTMENT OF HISTOLOGY AND EMBRYOLOGY IN OLOMOUC

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Abstract

We have developed our own database of histology practical in the format of MS Excel document. After logging into a welcome desktop screen, students are hyperlinked into the content page of the histology practical database. Each topic of practical session (24 in total) contains a set of virtual slides with slide properties, keywords, file size information and overview pictures of virtual slides. Additional supporting documents in pdf and ppsx format are also available for each of the histology topic. These are: a guide to the practical session, presentation for pre-lab session, presentation of selected electron micrographs, folder of movies and animations and embryology notes). During their own study of virtual slides, students can copy to clipboard selected areas of virtual slides viewed in the Olyvia viewer, and paste them directly into their own self-prepared pptx presentation for later revisions. Using the official university-recommended questionnaire and also our own specific set of evaluation questions, we have allowed students to evaluate this new method of practical sessions. Students evaluated positively the use of PC for examination of virtual slides, as they allowed them to study and also to discuss various details of cells and tissues clearly at various magnifications. Teachers benefited from a uniform quality of presented slides and also from a straightforward and personal communication with students in the class when personal guidance and explanation was needed at student's monitors.

Key words: histology, e-learning, virtual slides, practical

Structure of the database and supporting documents.

The database of histology practical, which is under development at our department [1], is based on the format of MS Excel document. It is available in two identical language versions, Czech and English. After logging into a welcome desktop screen, students are hyperlinked into the content page of the



histology practical database. Each topic of practical session (24 themes in total) systematically deals with General Histology and Microscopic Anatomy of various body systems including notes on development of various organs. Each practical session contains a set of virtual slides with slide properties, keywords, file size information and overview pictures of virtual slides. Additional supporting documents in pdf and ppsx format are also available for each of the histology topic. These documents are as follows:

A guide to the practical session includes description and labeled micrographic visualization of all virtual slides available in the session. This information is supplemented with didactic tools like control questions, schematic pictures with legends and references to external bibliographic and internet resources or quizzes. Teacher's presentation for pre-lab session contains micrographs and schematic drawings of slides that are introduced to students at the beginning of the practical session with teacher's explanation and diagnostic notes. A document, presentation of electron micrographs, briefs students with basic information about ultrastructure features of specific types of cells in the body system. It contains selected and labeled electron micrographs with explanatory legends. A folder of movies, animations and embryology notes guides students through the difficult visualization of 3D shapes of developing organs (ossification process, tooth eruption, muscle contraction etc.), containing movies and animations available from our previous FRVŠ projects or from internet resources.

During their own study of virtual slides, students can copy to clipboard selected areas of virtual slides viewed in the Olyvia, (OLYMPUS) viewer [2], and paste them directly into their own self-prepared pptx presentation for later revisions.

As an optional student's activity in the session, classical binocular light microscopes are available for each student in the class to revise and compare the virtual and optical microscopy images of histology structures.

Pros and cons of practical sessions with virtual slides.

Students of histology practical classes readily accepted the use of computers for observation of virtual slides. They represent a computer-trained generation of future medical professionals that is able to utilize fully the capability of modern PCs and can learn new software applications easily. They benefited from a high quality scans of histology slides available equally to all students in the class. The user-friendly interface of Olyvia viewer makes the orientation in the virtual slides at various magnifications easy and enables



students to quickly follow teacher's demonstration of the same slide on the central projection screen. This is a highly beneficial feature of this system when used in large practical labs of 50 and more students participating simultaneously. Practical histology with virtual slides makes also the departmental organization of the teaching process easier, since students can revise their practical experience home in their own time and pace, independently of office hours of professors and teaching assistants. It also makes an important environment for future distant learning courses.

Teachers benefited from a uniform quality of presented slides and also from a straightforward and easy personal communication with students in the class when personal guidance and explanation was needed at student's monitors. PC-based classes of practical histology also provide an easy environment for computerized testing of student's practical knowledge of structures displayed on their monitors during formative and summative examination quizzes or tests.

From the point of view of a traditional histology teacher, the drawback of this method could be seen in limited manual use of light microscopes during practical sessions with virtual slides. This can be contradicted with the fact that the experience in operating light microscopes is trained mainly in biology and microbiology practical. Our students also have the possibility to use light microscopes during or at the end of their regular histology sessions.

Student's evaluation of practicals with virtual slides.

Using the official university-recommended questionnaire and also our own specific set of evaluation questions, we have asked students to evaluate this new method of practical sessions. Majority of students in General Medicine and also in Dentistry specializations evaluated positively the use of virtual slides, as they allowed them to study and also to discuss various details of cells and tissues clearly at various magnifications (Figure 1). About half of students of both specializations claim, that they benefit from using the attached supporting documents during practical sessions (Figure 2) and almost all students download these supporting documents to their external media for later self-studies (Figure 3). The classical light microscopes and glass slides, that were available next to computers, were used by histology students occasionally, according to their reply in this questioner (Figure 4). In order to assess student's ability to operate classical light microscopes and to perform well in identification of histology tissues and organs, we have tested their practical



skills on a group of students attending two semesters of histology practical solely with virtual slides.

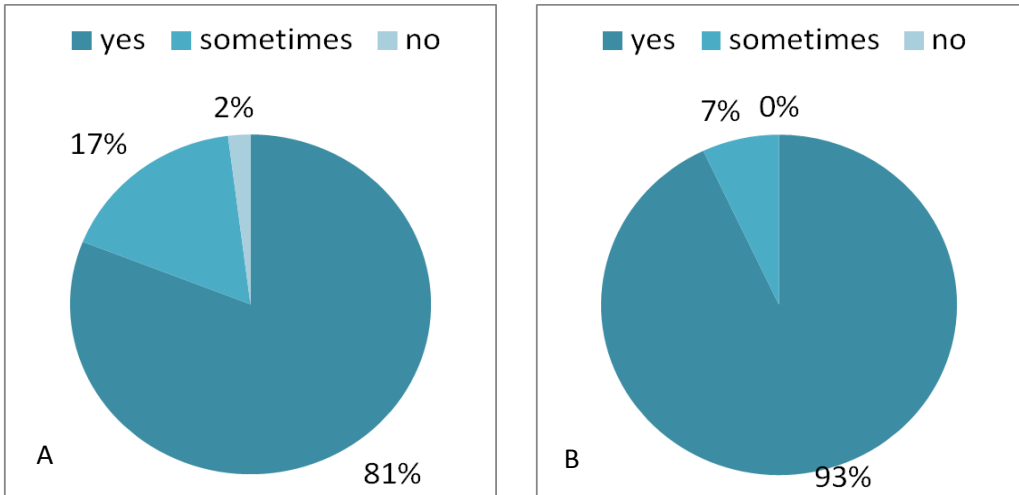


Figure 1: Virtual microscopy helps students with their orientation and understanding histology slides. A - General medicine students, B - Dentistry students.

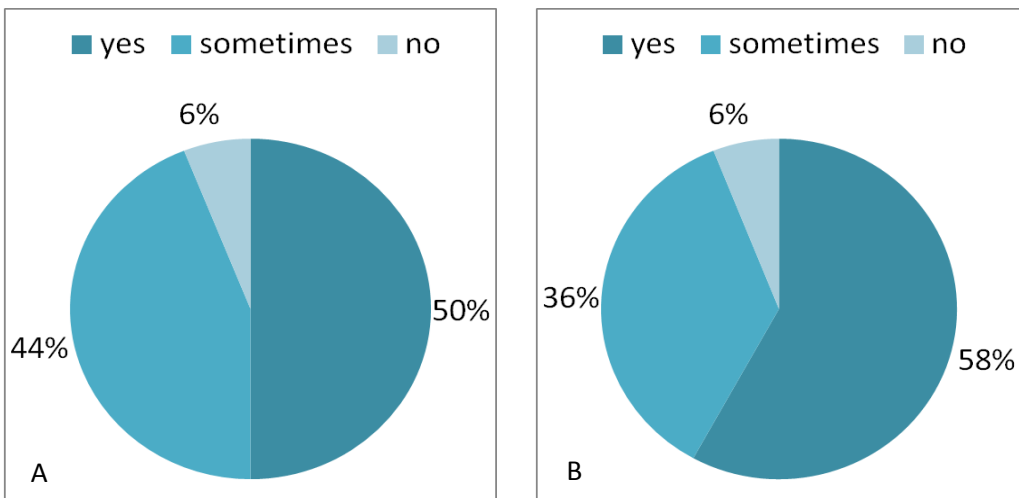


Figure 2: During practical sessions with virtual slides students use the attached supporting documents. A - General medicine students, B - Dentistry students.

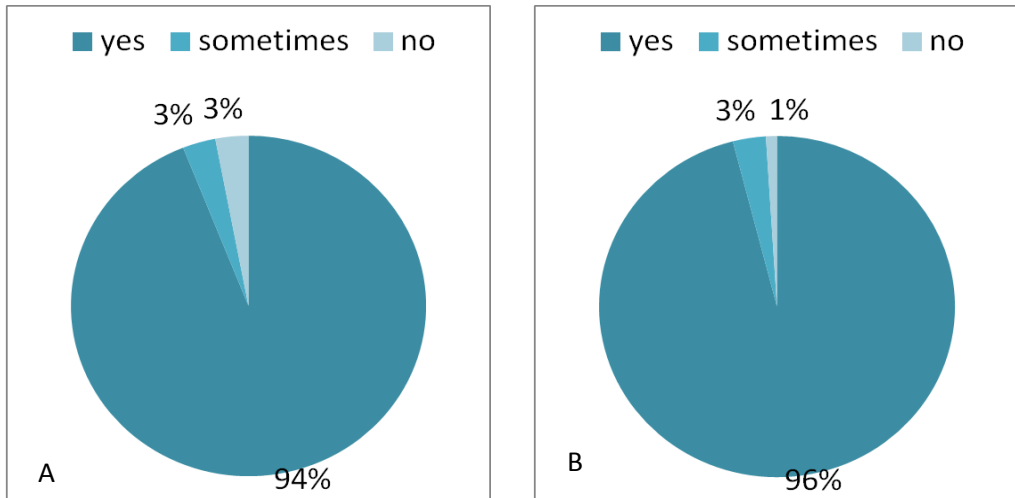


Figure 3: Students download the attached supporting documents to their external media for self-study. A - General medicine students, B - Dentistry students.

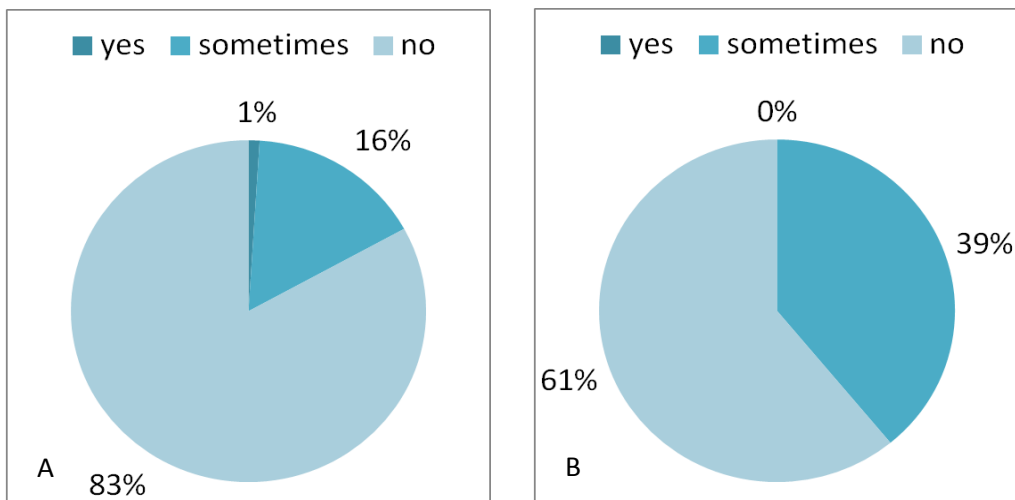


Figure 4: Students use light microscopes together with observation of virtual slides. A - General medicine students, B - Dentistry students.



After completing their practical and theory examinations, and without their prior knowledge, these students have been given standard glass slides for identification. As seen in Figure 5, most of these students operated the light microscope correctly and identified the slide of a given organ successfully. About 21% of students that failed this classical identification failed also in the final theory examination. This proves that the use of virtual slides in histology practical course does not affect student's practical abilities to use light microscopes for their own observations, if necessary.

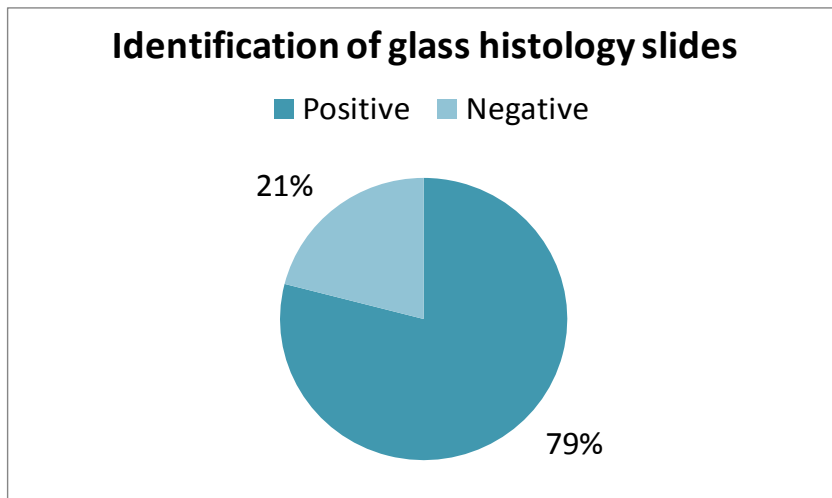


Figure 5: Identification of glass histology slides by students trained with virtual microscopy education system.

Conclusion

The e-learning format of histology practical based on virtual slides proves to be a modern and didactically efficient method of teaching histology to medical students. It standardizes the set of histology slides and gives all students in a large teaching group equal opportunity to see the same high quality slides in practical sessions. It also gives students a new experience with observation of histology structures on PC monitors, and enables them to take selected screen prints of virtual slides for their own study/research observations as if they would be using a complete research microscope with a digital camera. Teachers benefit from a uniform quality of presented slides and also from a straightforward and easy didactic communication with students in the class.



References

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