# EFFECTIVENESS OF THE DIGITAL IMAGE LIBRARY CASES IN HUMAN ANATOMY STUDIES

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**Abstract.** *In several education technologies and options for teaching and studies one of the alternatives is the Anatomage 3D virtual dissection table with included Digital Image Library. The aim of this study was to observe the effectiveness of the Digital Image Library cases in Human Anatomy studies at Rīga Stradiņš University (RSU). In 2017 it was used every second week during the autumn`s practical classes on several occasions to show variety of interesting and many unique human anatomy cases, abnormalities, diseases and detailed sectional scans. As methods for collecting data were used discussions between students groups and survays. The sample included 100 students and 1 Human Anatomy tutor. The findings suggest that the Digital Image Library cases are very interactive and effective tools of the teaching and studies in Human Anatomy at RSU. This is a new form of the communication between students, tutor, virtual reality of the body systems and it provides a lot of digital materials that develop relationships between basic and clinical study subjects.*
*Keywords: Anatomage, Digital Image Library, effectiveness, Human Anatomy, study process.*

## Introduction

Today digital technologies are becoming an integral part of education and they quickly increase in number, variations and size. With increased numbers of students from undertaking University programs of study, part of students are better skilled to access and effectively utilise new technologies to support their study process and learning (Rizollo et al., 2010). The Universities are now tending to provide a broader range of different educational methods but at the same time students are expected to undertake more independent learning (Mutalik & Belsare, 2016).

Rīga Stradiņš University (RSU) offers its students the 3D Anatomage Virtual Dissection Table (Medical education, 2016) at the Department of Morphology.

Today it is the most technologically advanced anatomy visualization system. In Virtual Table are included a lot of options, possibilities and one of them is the Digital Image Library that comprises very well organized collections and different types of information. The Anatomage Digital Image Library contains different human anatomy cases, including detailed regional scans and interesting medical

pathology cases (Paech et al., 2017). It also contains an interesting animal anatomy cases, including detailed cross sectional scans and full body scans (Custer & Kimberly, 2015).

The aim of this study was to observe the effectiveness of the Digital Image Library cases in Human Anatomy studies at RSU.

## Material and Methods

The study took place at Department of Morphology of the RSU. In 2017 Digital Image Library was used every second week during the autumn`s practical classes on several occasions to show variety of interesting and many unique Human anatomy cases, abnormalities, diseases and detailed sectional scans. As methods for collecting data were used discussions between students groups and survays. The sample included 100 students and 1 Human Anatomy tutor.

Students from two faculties have been involved in the study. The age group ranged from 18 to 25 years. In all classes Digital Image Library was used and supported for students learning. Students were distributed in two groups A and B. The first group consisted of 66 students of the Faculty of Dentistry and 34 students of the Faculty of Medicine. Group A and group B learnt anatomy and stuctures of the head, neck, thorax and abdomen. Group A focused more on anatomy and stuctures of the head and neck. Group B studied all of the mentioned parts of the body but with more larger amount of the anatomical structures and details of the abdomen.



Fig. 1. **Screen and overview of the Anatomage**

At the end of each practical class the tutor performed a discussion session with the students about increasing of their knowledge and an effectiveness of the Digital Image Library in Human Anatomy studies.

The students were also asked if they had ever used the Anatomage (Fig. 1) and the Digital Image Library. Lastly, the comparison of the types of learning and satisfaction of the students were explored.

## Results

In our article we are presenting the results of a survey aimed to answer to the question: „Did the Digital Image Library has an impact on the students` learning?"

The viewpoints of students and tutor about the role and functions of Digital Image Library in all of cases were similar and positive (Table 1).

Table 1 **Students` views on effectiveness of the Digital Image Library cases in Human Anatomy studies**

| Type of view | Students (n=100) |
|---|---|
| | *Effective or very helpful,%* |
| supports the virtual dissection | 95.5 |
| determines 3D visualization of the structures | 74.1 |
| deepens understanding of Human Anatomy | 77.8 |
| helps to understand the relationships between structures | 90.0 |
| helps to understand different abnormalities | 84.8 |
| helps to understand the effects of diseases | 65.5 |
| prepares for analysis of clinical cases | 80.3 |
| makes learning and education more interesting | 100.0 |
| helps to use correct anatomical terminology | 55.5 |
| helps to review level of knowledge | 64.8 |

n - number

The majority of students agreed that training with Digital Image Library (Fig. 2) gave better results than a demonstration of dissected structures in the books, anatomy atlases and presentations.

Majority of the students mentioned that they received fast and economical access (saved materials and time) to the content of the Digital Image Library and easily performed communication between different facilities without loss of the information or speed somewhere. The students touched only screen with content of the Digital Image Library and the images were annotated, rotated 360 degrees, cutted in any plane, and layered to demonstrate structures layer by layer.

The Digital Image Library allowed to students to learn anatomy through a high-quality and interactive 3D tool, offered cases from many sources and in

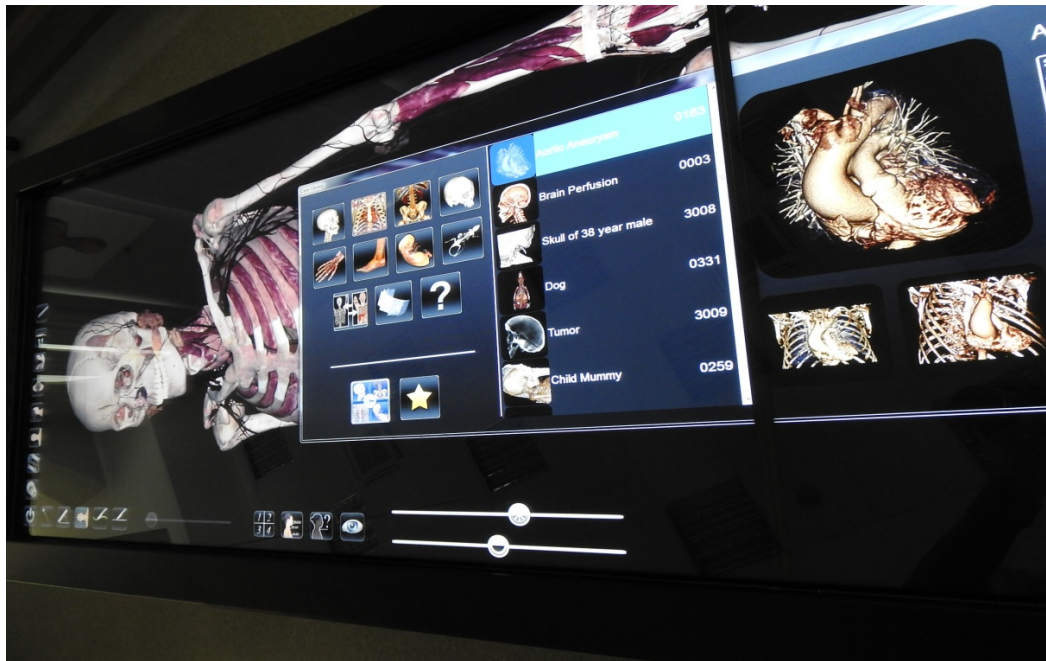different formats. Virtual anatomy served as a wonderful tool for dissected procedures.



Fig. 2. **Some virtual options of the Digital Image Library of the Anatomage**

The use of Digital Image Library made cases much more visible (Fig. 3). Many interactive functions allowed the students and tutor to rotate or tip the visible models, removed or added layers of anatomy from skin to bone and label any structure (Fig. 4). Simple edit functions allowed animation to use the pictures in the educational presentations.
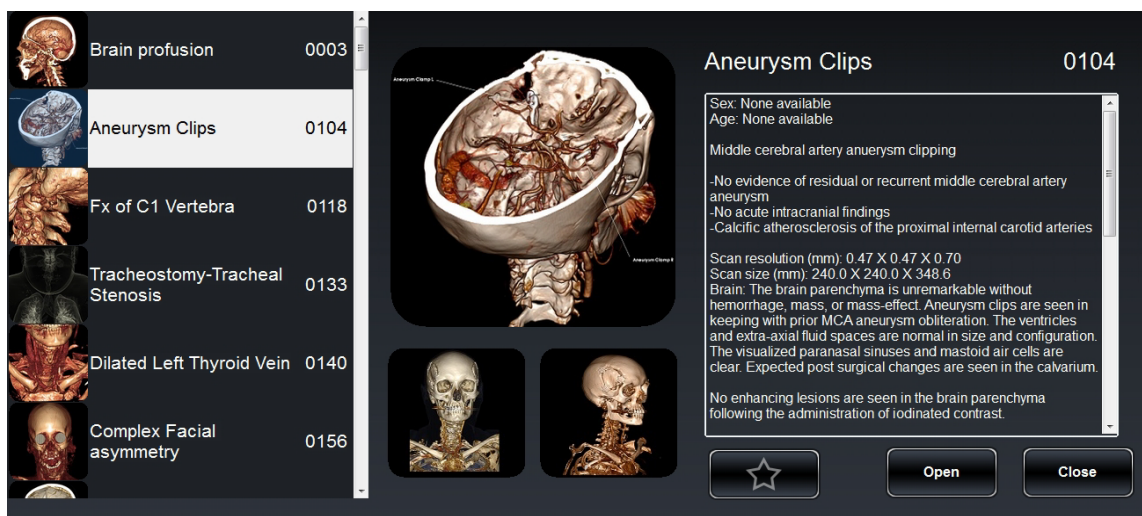


Fig. 3. **Part of the content of the Digital Image Library**

The Digital Image Library included a lot of pathological examples. There were several descriptions together with skull, head and neck cases, thorax, abdomen and pelvic cases, upper and lowere limbs cases, veterinary, mummy and Embryology cases.



Fig. 4. **Some interactive functions using and analysis of cases by students and tutor in practical class**

It offered comparative study cases with synchronized dissections of multiple cases and opened three related cases at a time. The user interface made it easy to search fo scans by regions of the body and included notes on each case. Many scans were included in the Digital Anatomy Library. The 3D and 4D scans were rotated in any direction to truly show medical devices in a new and intuitive way.

Tutor demonstrated to students of all ranges the location and functions of different virtual instruments. The users explained fractures of the bones and different unique case examples.

Our study underlined the positive impact of the integration of innovative solutions in learning anatomy. The virtual Digital Image Library environment was useful to help students and tutors identify different normal and pathological anatomy structures and topographical relationships between them.

Most of the students rated positively the content of the Digital Image Library and they concentrated their focus on structures of organs and relations among organs. The students were positive about integrating of the Digital Image Library into anatomy teaching. They evaluated their own learning goals and underlined the importance of Human Anatomy learning in clinical practice in future.

## Discussion

The major changes are happening across the educational system and they affecting all aspects of teaching and learning at the moment. These changes allow and offer new digital learning environment and several opportunities to Universities (Tanasi et al., 2014). The use of medical imaging in teaching anatomy is widely increased (Brazina et al., 2014; Grignon et al., 2016; Lufler et al., 2010). Nowadays, the different educational sources are available on the internet and students can easily access them (Hopkins et al., 2011; Khot et al., 2013). There is a lot of information in the literature in regard to how the use of different technologies are impacting students' learning (Kerby et al., 2011; Kurt et al., 2013; Sugand et al., 2010).

The course of Human anatomy at RSU is organized in three semesters for students of the Faculty of Medicine or two semesters for students of the Faculty of Dentistry. The first part of the course focuses on gross anatomy of the bones, joints, muscles and organs. The second part focuses on circulatory system, nervous system and Topographical anatomy. Anatomy studies shouldn`t be completed in the 1st or 2nd year of University. The process of understanding and studies of the Human Anatomy should continue in the 3rd, 4th, 5th and 6th year by means of optional and elective courses such as Topographical anatomy or Clinical anatomy.

There are many definitions of a Digital Library (Zarghani et al., 2015). Users are of varying backgrounds and cover a wide range of expertise in Human Anatomy and computer skills. Digital Library functions today are different from what we have experienced in the past and we can expect in the future. What is common to all definitions, is the use of new technologies, of digital collections and the access to services and resources. Different users can perform different interpretations of the digital information. It combines the structure and gathering of information. Many authors have underlined that the integration of images with anatomical structures improves the development of professional competences (Azer & Azer, 2016; Hoyek et al., 2014).

This article describes the effectiveness of Digital Image Library for students learning and the importance of design to enable different types of learning. The Digital Image Library of the Anatomage stores, preserves, distributes and protects contents in different formats and, at the same time, it allows activities between the users and the contents. Part of the content of the Digital Image Library can be easily embedded into anatomy lectures, plans of the practical lessons or handouts. The role of knowledge construction of the students in learning is really significant (Anand & Singel, 2014). Our teaching practice made clear how important is the active participation of the students in the teaching – learning process.

Students evaluated the importance given during study to Morphology, relations and variations of organs, the usefulness and an effectiveness of Digital Image Library in preparing different anatomical tasks. The characteristics that makes active study process attractive for teaching purposes and reference tools are also what help to make the Digital Image Library accessible and easy to use by a variety of users.

## Conclusions

The findings suggest that the Digital Image Library cases are very interactive and effective tools of the teaching and studies in Human Anatomy at RSU. This is a new form of the communication between students, tutor, virtual reality of the body systems and it provides a lot of digital materials that develop relationships between basic and clinical study subjects.

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