Hands-on (micro)surgical skills training: Great expectations and learning outcomes

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Outline

The importance of simulation in the education (in particular surgical skills training)

Background (surgical education)

Special challenges
Pillars of surgical education in Hungary
Learning objectives and learning outcomes: surgical skills training, microsurgery

If gradual surgical hands-on (micro)surgical skills trainings becomes compulsory…

Modification in curriculum
Learning outcomes, feedbacks

Conclusions

The need of simulation in education (in general)

Background:

- Increasing number of students
- Increasing importance of hands-on training, more patients are needed
- Concerns regarding patient rights
- Lower willingness of patients to cooperate

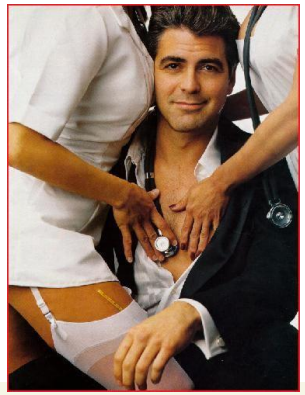
Disadvantages of the involvement in patients in education:

- Demanding and exhausting for the patients
- Interferes with inpatient care
- The difference between individual cases does not allow for objective evaluation

Simulated patients / simulators

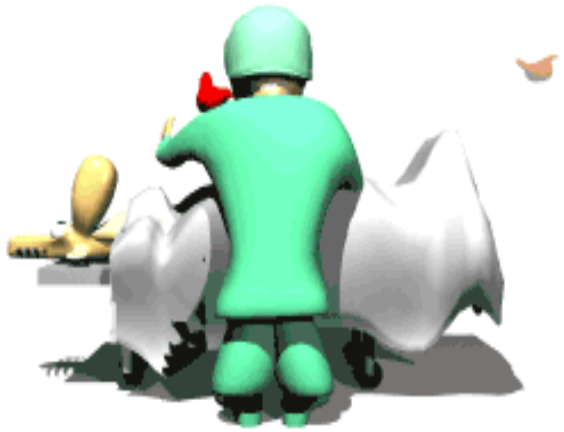
Simulation in surgery?

(kheirourgia = ***kheir + ergon*** = work that is done ***by the hands***)



- Communication skills

Clinical skills



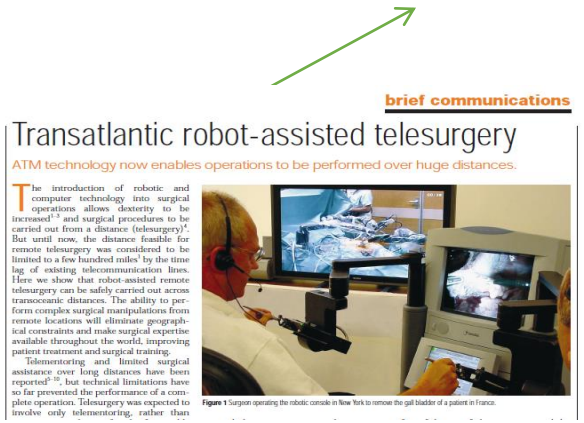
Technical skills

Special features of surgical education

Challenges of surgical education-I.

Theodor Billroth
(1829-1894)
Abdominal surgery

Erich Mühe
(1938-2005)
Laparoscopic surgery

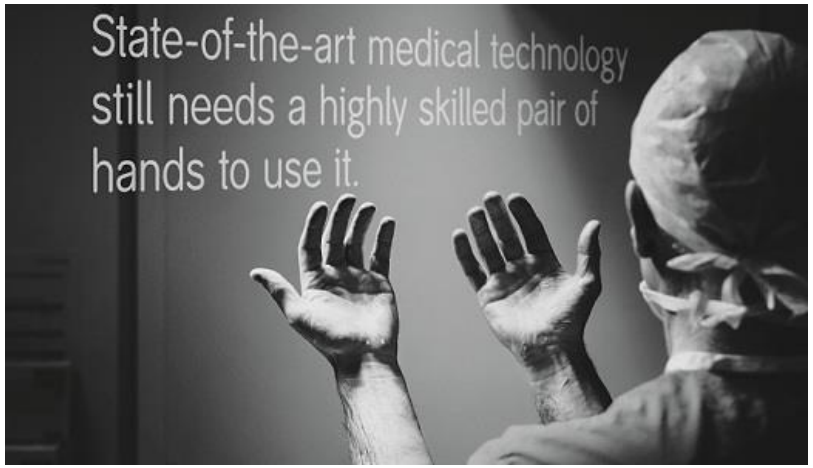


Jacques Marescaux
Telesurgery

XIX NINETEEN XX XXI ?

Challenge 1: Need to cover the rapidly changing technical aspects of surgery…

Challenges of surgical education-II-IV.



Challenge 2. Proficiency only comes from repetitive practice…

Challenge 3. Patient safety…

Challenge 4. Mass education…

What is the solution?


EDITORIAL

International Journal of Surgery 10 (2012) 393–398

Contents lists available at SciVerse ScienceDirect

International Journal of Surgery

journal homepage: www.theijs.com

ELSEVIER

Editorial

Introduction, availability and role of simulation in surgical education and training: Review of current evidence and recommendations from the Association of Surgeons in Training

International Journal of Surgery 2012 (Editorial)

„Structured simulation training can be integrated into surgical training programmes to reflect the requirements of any curriculum"

- Guarantees experience for every student
- Allows immediate feedback
- Allows many students to simultaneously access a given technique
- Allows updates
- Offers opportunity to practice critical events
- Reduces training variability and increases standardization
- Safe for patients

- Repetitive
- Mass education
- Technical improvements
- Standardization
- Safety

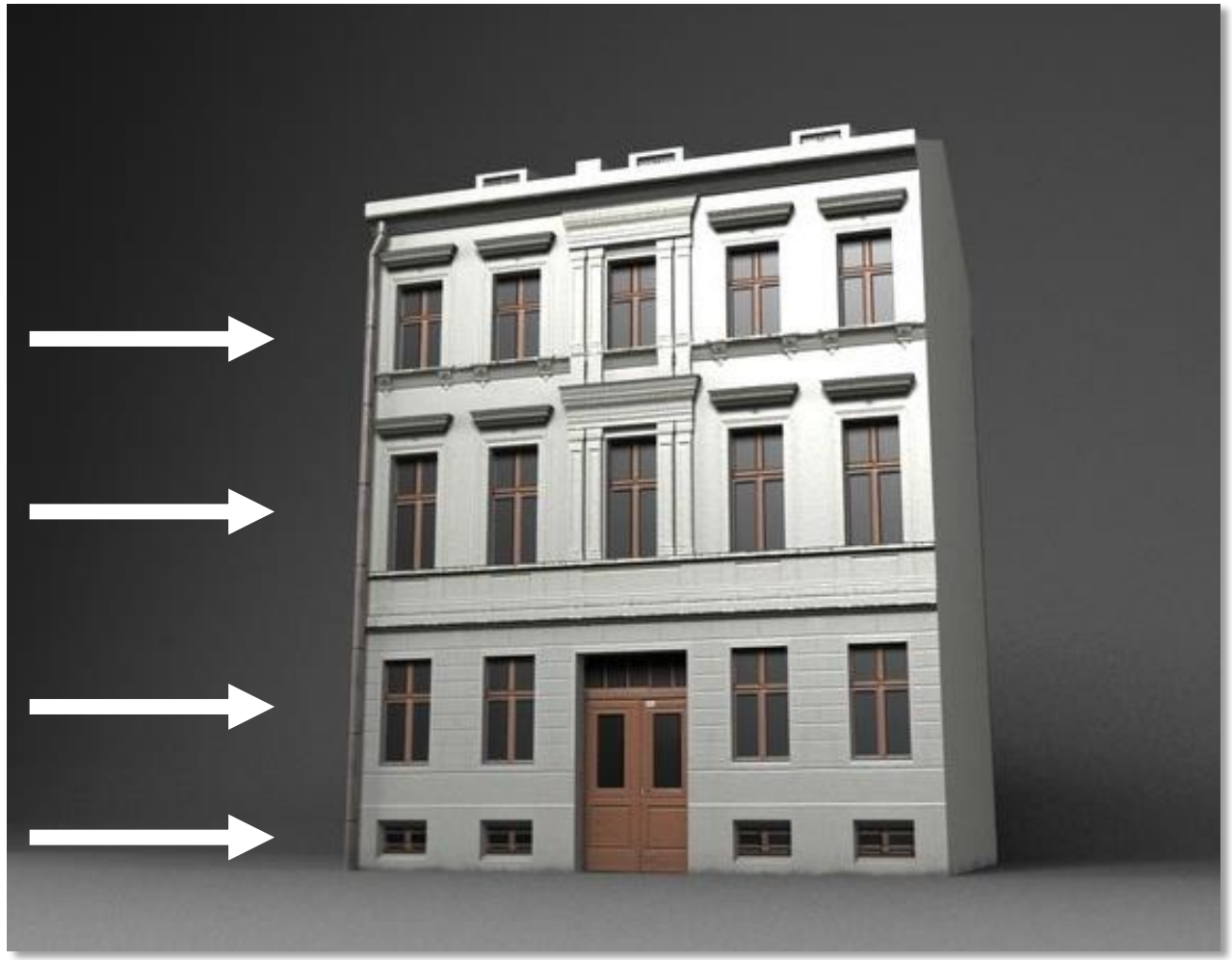
The place of simulation in surgical education

To acquire all-embracing practical skills

To expande the range of procedures that can be performed safely

To maintain performance

Basis: to develop core competencies



”Building blocks” of surgical training in Hungary

Institutes of Surgical Research & Techniques





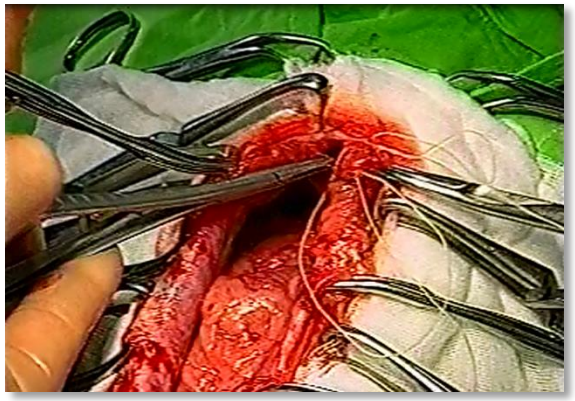



Level 1: 'Basic Surgical Skills' courses (University of Szeged, Institute of Surgical Research) 1951-1998

Elective course

For 3rd-year medical students

Lectures (7 x 2 hrs), Practical modules (6 x 2 hrs), Student's Op. Theatre (Skills Lab)
No. of students: approx. 200 / autumn semester
1951-1998
Scrubbing, knotting
Cleansing and isolation of the operative field
Incision *(in vivo)*
Tracheostomy *(in vivo)*
Laparatomy *(in vivo)*
Appendectomy *(in vivo)*



Level 1: 'Basic Surgical Skills' courses (University of Szeged, Institute of Surgical Research) 1998-2014

Simulation

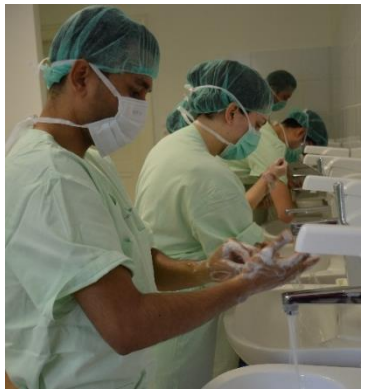
Elective course

For 2nd-year medical students and 3rd-year dentistry students

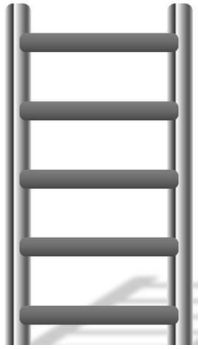
Lectures (7 x 2 hrs), Practical modules (12 x 2 hrs), Student's Op. Theatre (Skills Lab)
No. of students: approx. 400 (280 in Hungarian class, 120 English class) / autumn semester

A1-2. MODULES –	Asepsis skills
A3-4. MODULES –	Draping, instrumentation
A5-6. MODULES –	Knot tying skills (Suture Tutor Program)
A7-8. MODULES –	Suturing skills (Suture Tutor Program).
A9-10. MODULES –	Bleeding and wound management (bandaging) skills
A11-12. MODULES –	Minimally invasive surgery, the basics (Box trainers, 3D-MedTrainers)

Compulsory course (2015-)



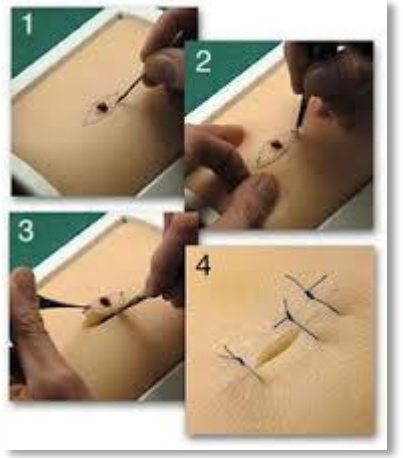
Level 2: ‘Advanced Surgical Skills’ courses



Elective course for 4th-5th-year medical- and 3rd-year dentistry students

Lectures (6 x 2 hrs); Practical modules (12 x 1 hrs)
No. of students: approx. 120 (80 in Hungarian class, 40 English class) / spring semester

C1. MODULE -	Asepsis, suturing (2 hrs)
C2. MODULE -	Advanced suturing skills (2 hrs)
C3. MODULE -	Minor Surgical Skills (Minor Skin Procedures Program) (2 hrs)
C4. MODULE -	Minimally invasive surgery (LapSym VR system) (2 hrs)
C5-6. MODULES -	Tracheostomy, hemostasis, suturing in vivo (pig) (4 hrs)



Level 3. Microsurgery (specialized undergraduate courses)(1999-2017)

for 3rd-5th-year medical students and 4th-year dentistry students

No. of students: approx. 50 (30 in Hungarian classes, 20 English class) / spring semester
D1. MODULES - Basic microsurgical skills (undergraduate level - 20 hrs of practice)
D2. MODULES - Microsurgery in dentistry (undergraduate level - 18 hrs of practice)

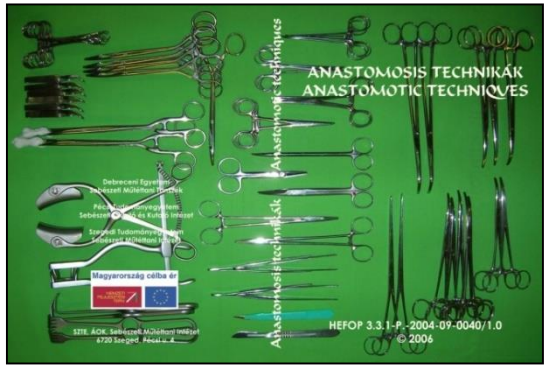
Elective course

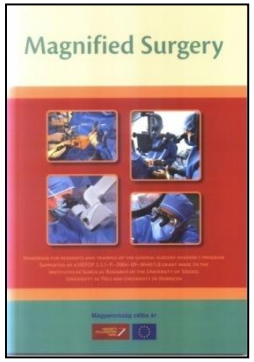
Compulsory course
(2016-)

Level 4. Postgraduate courses
‘Surgical Techniques’ for residents (*from 2004*)

3-weeks’ compulsory courses for 1st-year surgical residents*
„HEFOP 3.3.1. Programme” of Debrecen, Pécs and Szeged Universities

Indicators	2004-2007
Courses	45
Residents	409





* Budapest – Semmelweis University joined in 2010

Level 4. Postgraduate courses
'Skills Training courses' for residents (*from 2012*)

Simulation + conventional surgery (on pigs)

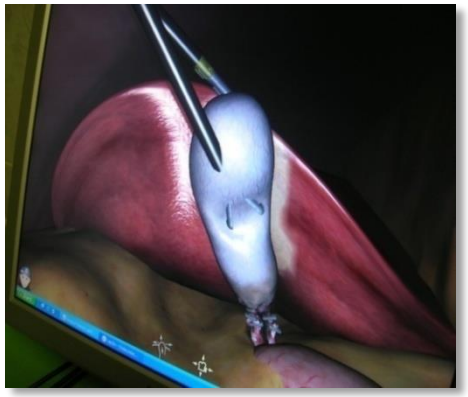
4-weeks' compulsory courses for 1st-year surgical residents

Number of participants max. 10 / course, 3 courses / year
E1. MODULE (5 days) 'Simulation-based crisis management training for operating room teams +
E2. MODULE (5 days) 'Traditional Surgical Skills' in pigs
E3. MODULE (5 days) 'Minimally Invasive Surgery' in pigs
E4. MODULE (5 days) 'Advanced Microsurgery' in rats

+ specialized 1-2 days programs – e.g. Advanced Trauma Life Support (ATLS) courses in pigs

GI –BRONCH Mentor

METI iStan®

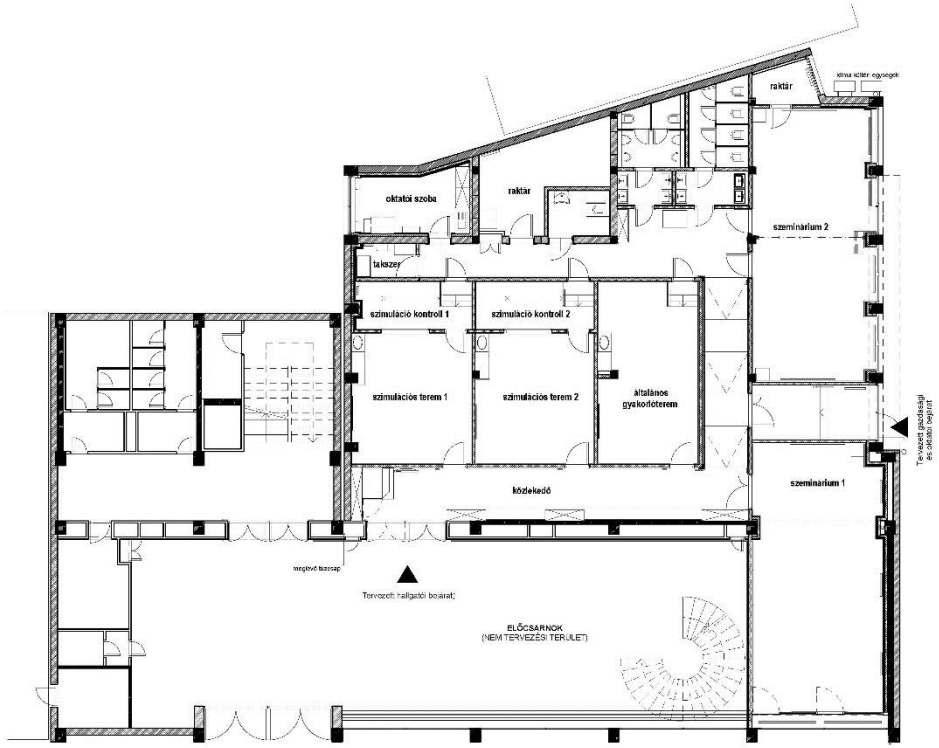


E1. Module - ‘Clinical Skills Training’ (5 days) for surgical residents (2012-)

CLINICAL SKILLS CENTER

- 450 square meters
- 3 practice rooms and 3 seminar rooms
- 2 technicians

Simulation



If elective courses become compulsory… Ad.1. Surgical Techniques

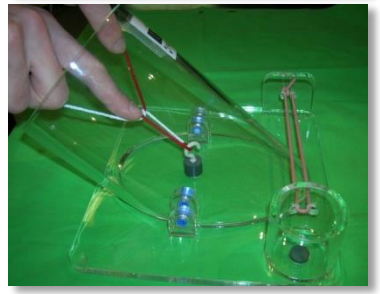
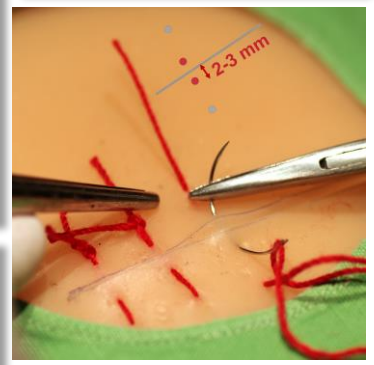
Elective course → Compulsory course (2015-)

For 2nd-year medical students and 3rd-year dentistry students
(with the same core knowledge as before)
No. of students: approx. 400 (280 in Hungarian class, 120 English class)

In the preparation period:

Qualitative and quantitative feedback forms
were obtained from the previous elective the courses



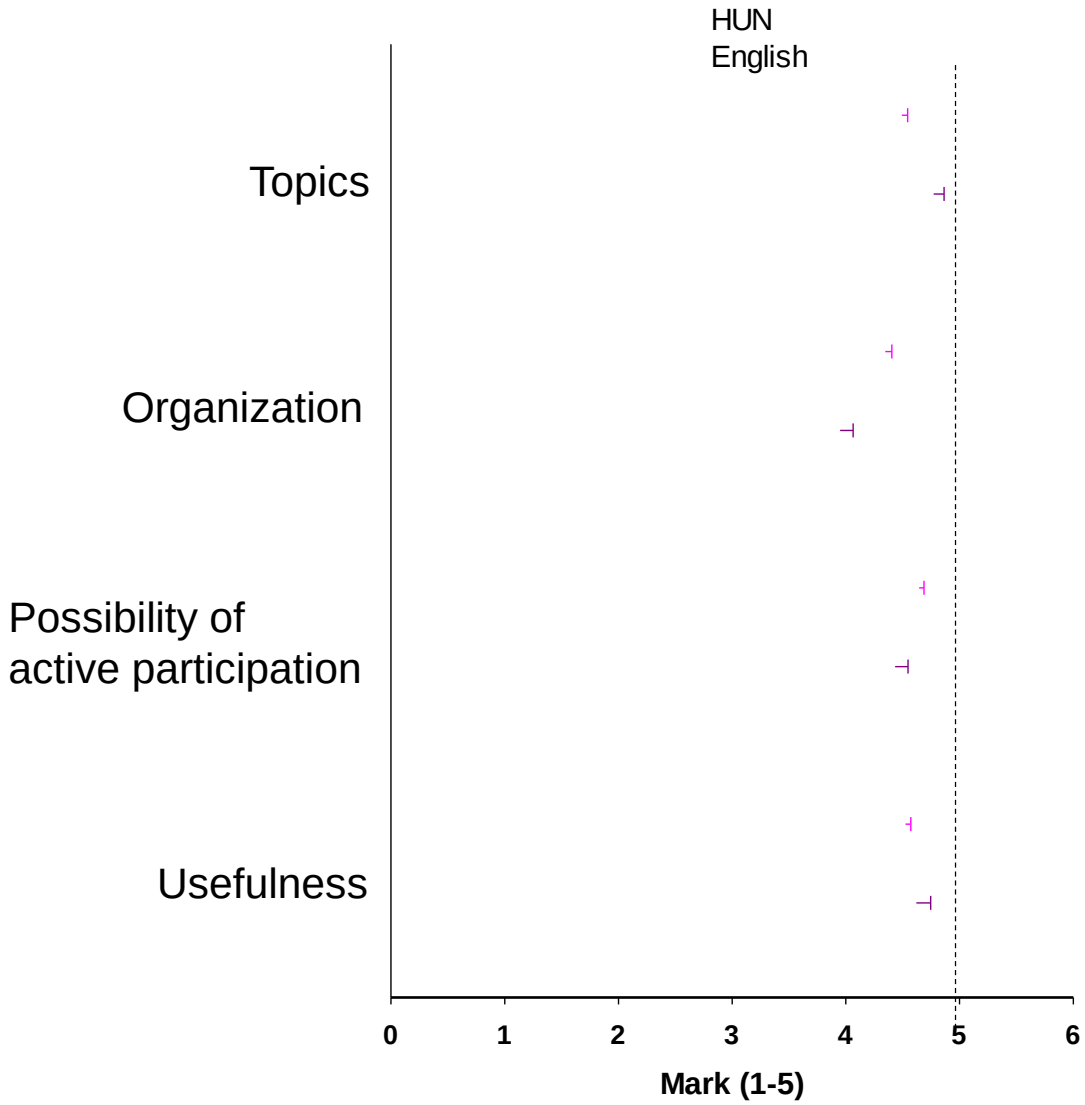




Results of feedback forms (from the elective course)

Elective course → Compulsory course (2015-)

Quantitative feedback:

High rate of satisfaction



Qualitative feedback:

The participants asked for more repetitions of the tasks

The modifications we made Ad.1. Surgical Techniques

Elective course → Compulsory course (2015-)

What we did not change: (1) topics), (2) 4 students/1 tutor

Modifications (based on qualitative feedback forms of elective courses):

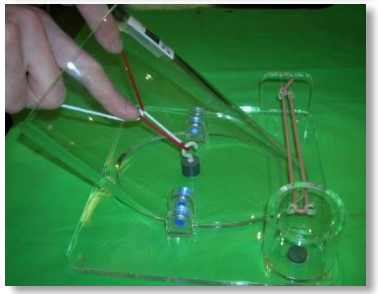
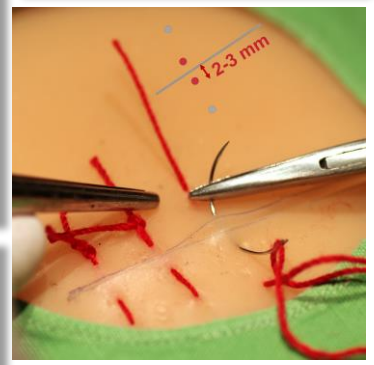
Changes in the organization of the course:

- small-group workshops to discuss any problematic issues
- basic tasks were presented by the teachers and then were repeated 3 times during the practices by the students
- (practical exams were organized with OSCEs with objective assessment and examination protocols)
- step-by step description of the assessment criteria for a successful completion of a practical exam task

Further changes:

(1) demonstration videos were made on-line accessible
(2) for dentistry students: dentistry-specific specialties (e.g. mucosal sutures)



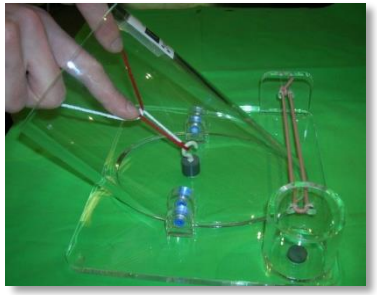




Assessment criteria for successful completion of a practical exam task

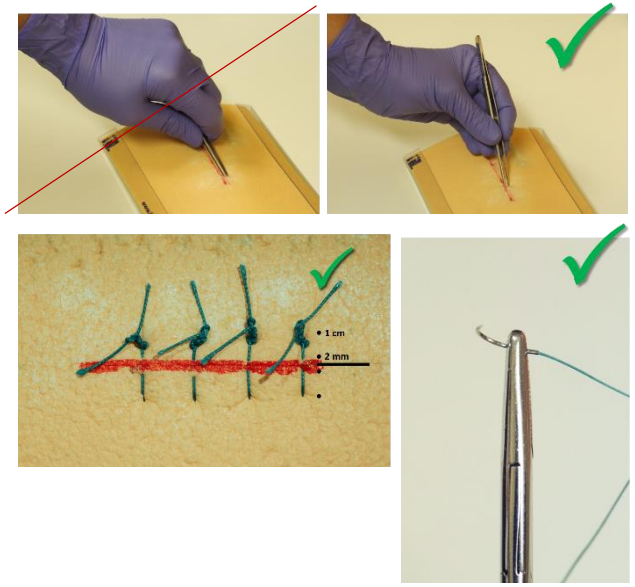
Task	Mistake (1 mark is deducted)
Putting on caps, mask, and shoe cover	**Missing** to put on any of them Incorrectly applied (uncovered hair, nose).
Preparation for mechanical scrub	**Wearing ring, wrist watch, bracelet, nail polish, or if the long sleeve of the cloth covers the elbow and the forearm.**
Hygienic hand wash	Missing or false (not rinsing)
Hand and forearm wash with soap	**Missing** or false: the extent, intensity or length of time of the scrub is not appropriate, wrong order
Rinsing	Inappropriate, the hand is held lower than the elbow, irregular rinsing; residual lather;
Water tap closing	The tap is closed by hand or forearm instead of the elbow (touch with washed hand surface).
Mechanical scrub	Breaching the rules of asepsis, e.g. touching non-sterile things
Drying hands	Missing or disinfectant is applied on a wet hand
Desinfection	Touching the feeder with hand or forearm instead of the elbow
Desinfection	**Missing,** fewer than 5 dosages; the time is decreased or not controlled.
Desinfection	Breaching the rules of disinfection (area, order)
Desinfection	**Rinsing the disinfectant**
Desinfection	Unintentional or unrecognized breaching the rules of asepsis; Hands kept irregularly, the feeder is operated not by the elbow
Donning sterile gown	Contamination of the gown while removing from the container
Putting on sterile gown	Breaching the rules of putting on a gown (hanging arms**, contamination)**
Assisted sterile gloving	**Contamination of gloves** (naked finger contact with sterile surface)
Removing gloves	Contamination with naked fingers

Assessment criteria for successful completion of a practical exam task

Evaluation of knotting



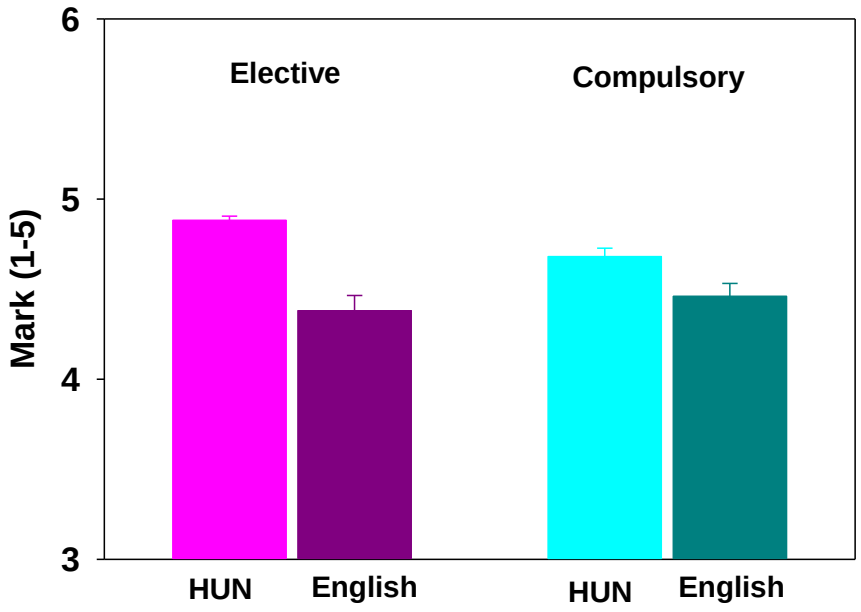
Evaluation of Donati-style stitching



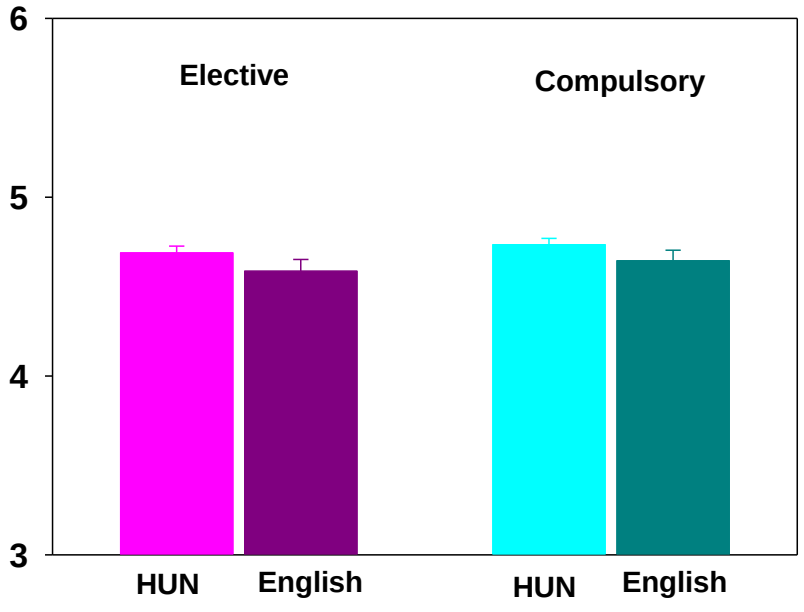
Task	Mistake (1 mark is deducted)
Knotting (the technique is optional (reef=sailors', surgeon's or Viennese knot)	The threads or hands are not crossed
	Knotting with the same hand (not with changed hands)
	Incorrect knotting technique
	The knot is loose, can be easily removed

Task	Mistake (1 mark is deducted)
Mounting a needle holder, closing an approx. 5 cm-long incision with vertical mattress (Donati) sutures (min. 4, max. 6 stitches), knotting with an instrument	Incorrect mounting of the needle holder with needle and thread
	Breaking the needle/ straightening the needle
	Holding and using the needle holder and/or the forceps incorrectly
	The distances between stitches are not identical
	The depth of the stitches and/or their distances from the incision site are not appropriate or not identical
	The position of stitches is not perpendicular to the incision
	The knots are not on the same side of the wound.
	Mistakes in the knotting technique
	The sutures are too tight or loose

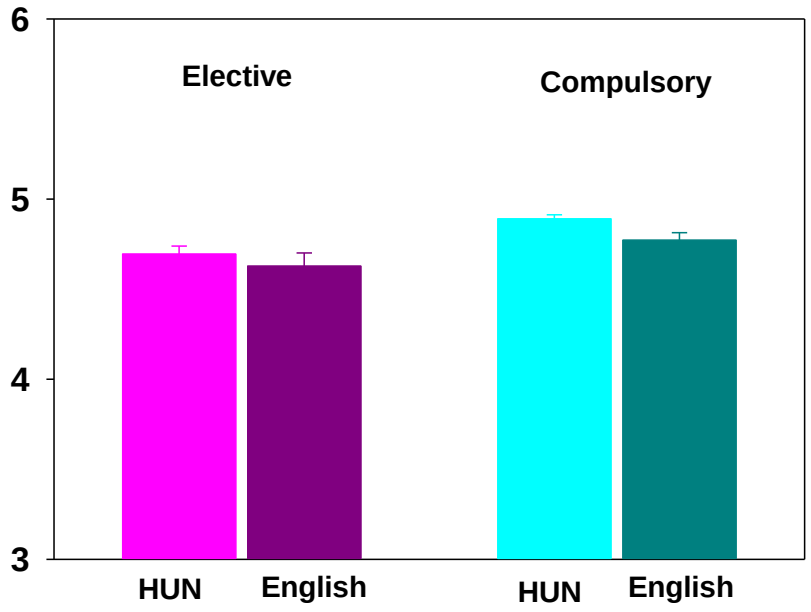
Learning outcomes (based on practical exam marks; 1-5)



Scrubbing&gowning&glowing



Suturing



Knotting

Qualitative (*and quantitative*) feedback from the students

Would not choose the course if it was not compulsory (%)	It do not find myself able to do surgery in the future (%)	I would like to be a surgeon, but I think I have to improve my dexterity. (%)	Based on my experience acquired during the course I would like to do surgery in the clinical practice. (%)	The course convinced me that **I would be a good surgeon.** (%)	Evaluation of the course (1-5)	Self-evaluation (1-5)	Motivation	

Qualitative (*and quantitative*) feedback from the students

Would not choose the course if it was not compulsory (%)	It do not find myself able to do surgery in the future (%)	I would like to be a surgeon,but I think I have to improve my dexterity. (%)	Based on my experience acquired during the course I would like to do surgery in the clinical practice. (%)	The course convinced me that **I would be a good surgeon.** (%)	*Evaluation of the course (1-5)*	*Self-evaluation (1-5)*	Motivation	
4.64					4.87	3.75	15.19	
	8.44				4.80	3.94		
2.11					4.50	3.00		
		20.25			4.89	4.23	**84.80**	
			10.97		4.80	4.58		
				11.39	4.89	4.77		**45.56**
		8.02			4.89	4.38		
			29.11		4.93	4.67		
		5.06			5.00	4.73		
Answered (85%)					4.85	4.34		
Not answered					4.94	4.42		
Total					4.86	4.33		

Hungarian students (%)(N=237)

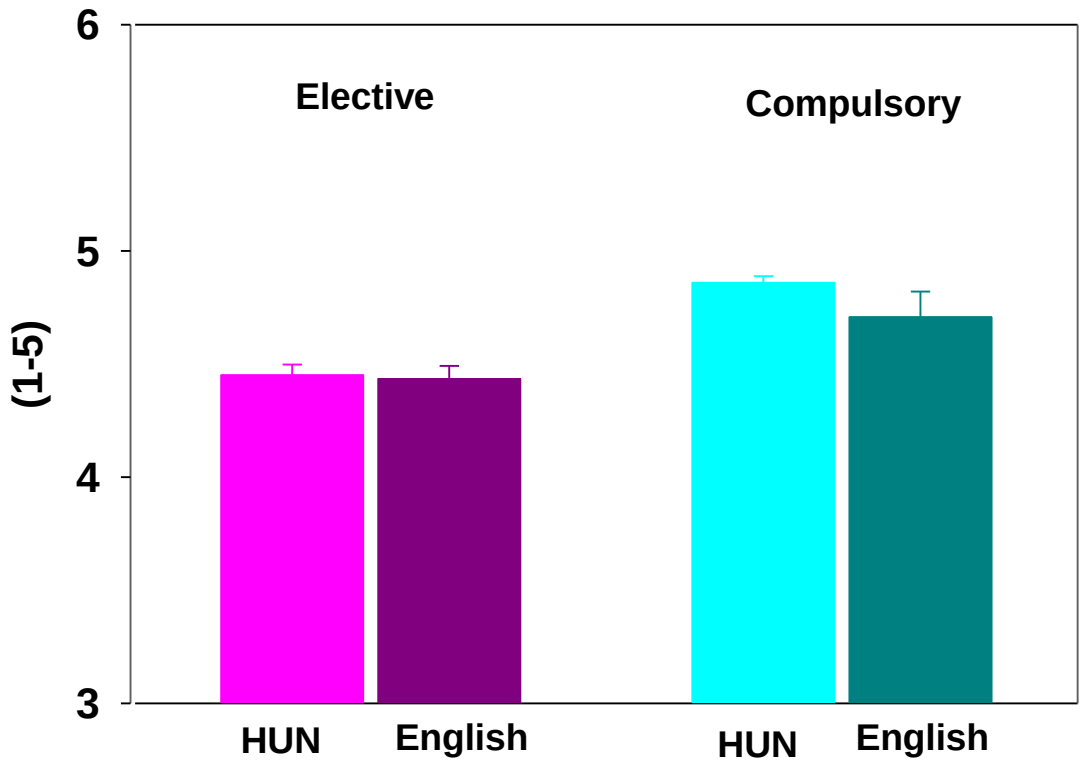
Qualitative (*and quantitative*) feedback from the students

Would not choose the course if it was not compulsory (%)	It do not find myself able to do surgery in the future (%)	I would like to be a surgeon,but I think I have to improve my dexterity. (%)	Based on my experience acquired during the course I would like to do surgery in the clinical practice. (%)	The course convinced me that **I would be a good surgeon.** (%)	Evaluation of the course (1-5)	Self-evaluation (1-5)	Motivation	Motivation
3.47					4.00	3.50	5.95	
	1.98				5.00	4.50		
0.5					4.00	4.00		
		16.34			4.50	4.15	94.06	
			29.21		4.79	4.64		
				10.89	5.00	4.78		**44.55**
		3.96			4.63	4.20		
			22.77		4.91	4.60		
		10.89			4.86	4.92		

Answered (86%)					4.78	4.55		
Not answered					4.69	4.52		
Total					4.77	4.55		

English program students (%)(N=202)

Quantative feedback (student satisfaction)



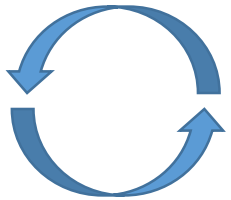
Conclusions about the undergraduate surgical skills course

Learning outcomes are not influenced by the fact that the course became compulsory

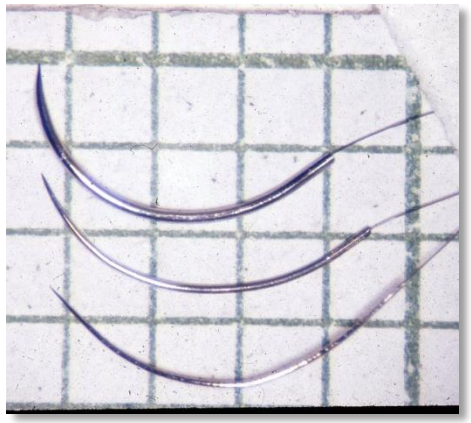
High level of **curiosity** and **motivation** can be aroused.

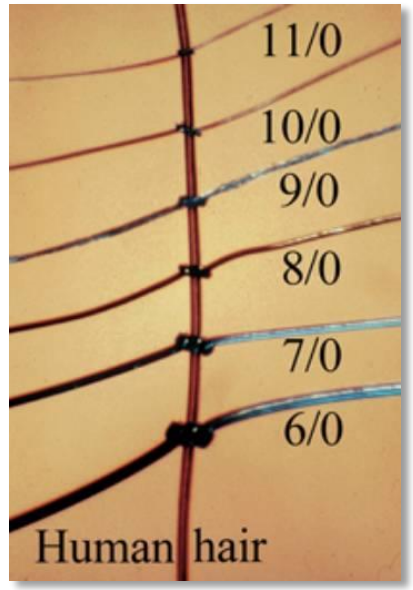
The **satisfaction rates** about the course of the compulsory courses did not significantly differ from those for the elective courses (even in case of the 3-5% of the students would not have chosen ‘surgical skills’ courses if it had not been made compulsory)

85% of the 2-year Hungarian students and **94%** of the English-program participants expressed their readiness to choose a manual **(“surgical”) profession** and this interest was mainly based on their experiences obtained during the course and the practical exam.

Higher number of students per groups  more peer tutors can be recruited (on a voluntary basis)

Special features of microsurgery





Curriculum for classical microvascular surgery (medical)

Post-graduate

	Topics	Hours	Total
Theory	Microsurgical instruments and materials, suturing techniques	2	5 hours
	Methodological aspects of vessel anastomoses	2	
	Nerve anastomoses	1	
Practice	Suturing and knotting on a rubber pad, end-to-end and end-to-side anastomoses on 2 and 1-mm sylastic tubes	4	16 hours
	A. carotis end-to-end anastomosis *in vivo* in rats	12	
	Nerve (n. schiatic) suturing *in vivo* in rats	2	

Simulation

1 week
(23 hours)
(6 students/2 tutors)

Under-graduate

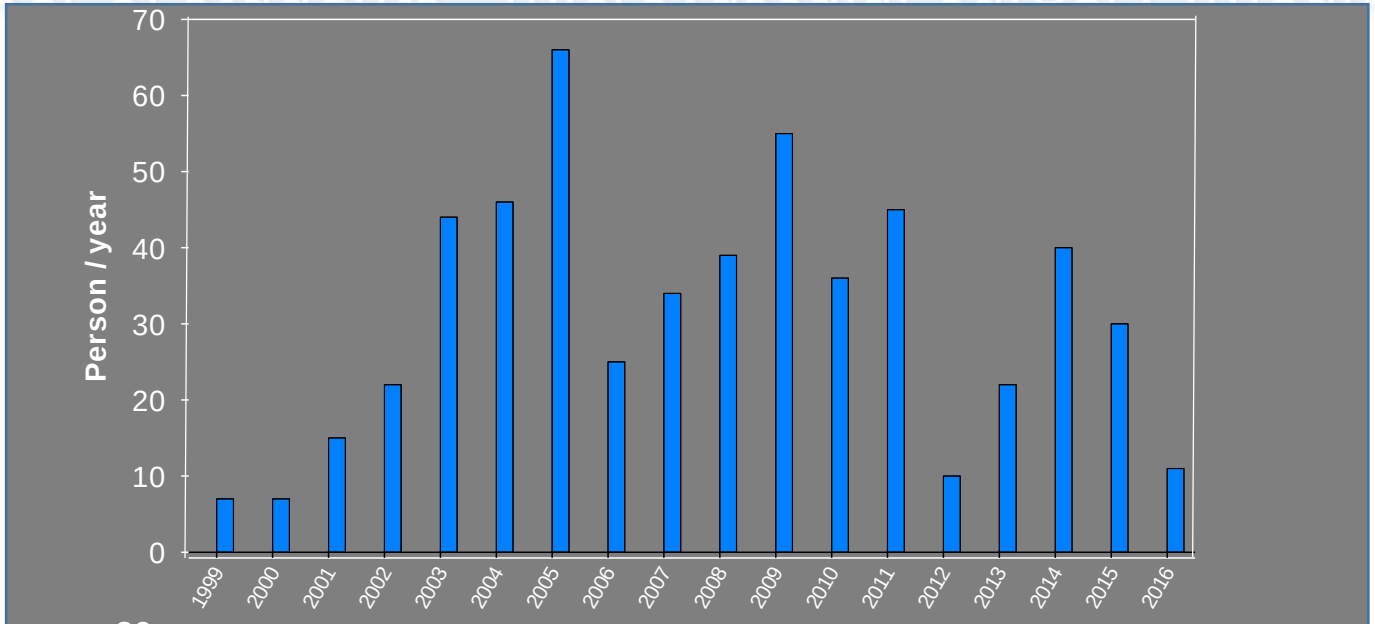
	Topics	Hours	Total
Theory	Clinical applications of microsurgery	4	10 hours
	Microsurgical instruments and materials, suturing techniques	4	
	Methodological aspects of vessel and nerve anastomoses	2	
Practice	Preliminary exercises, two-handed knotting (macroscopic)	10	18 hours
	Suturing and knotting on a rubber pad, end-to-end and end-to-side anastomoses on 1-mm sylastic tubes	5	
	A. carotis end-to-end anastomosis *ex vivo*	3	

Simulation

14 weeks
(28 hours)
(8 students/2 tutors)

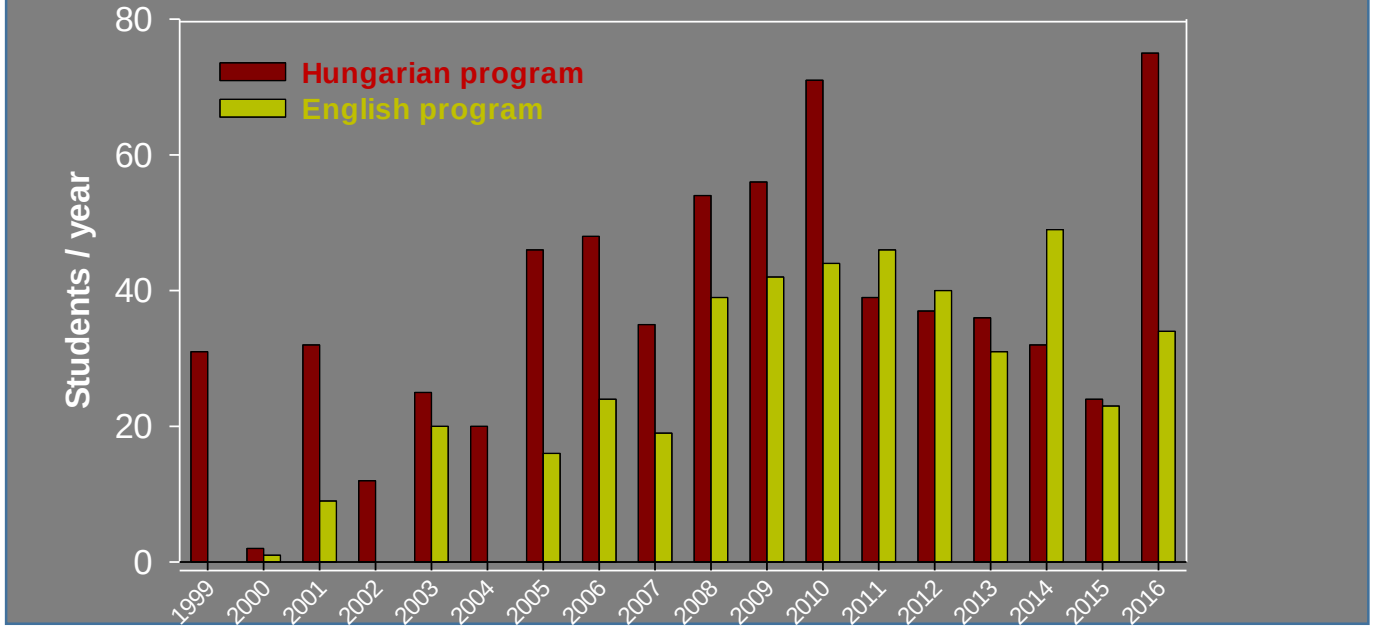
Number of students - microvascular surgery (medical)

Post-graduate



1 week
(23 hours)
(6 students/2 tutors)
Total: 554 students

Under-graduate



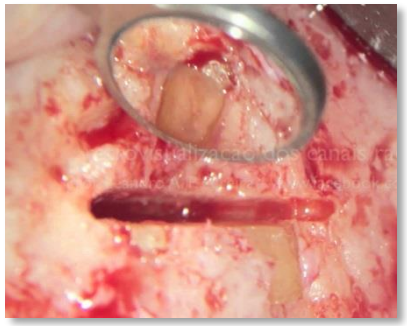
14 weeks
(28 hours)
(8 students/2 tutors)
Total: 1112 students

Microsurgery in dentistry

Endodontic microsurgery: root canal treatment

(Parodontology)

(Dental implantation)



http://www.indexmedica.com

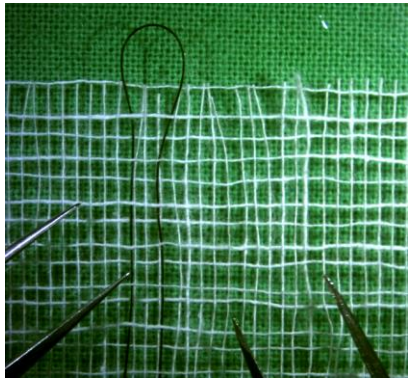
http://www.estetskastomatologija.rs/eng/parodontology

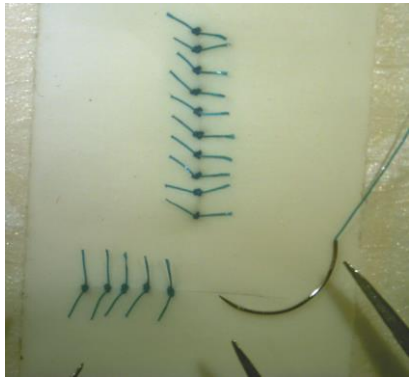
http://perioan.blogspot.hu

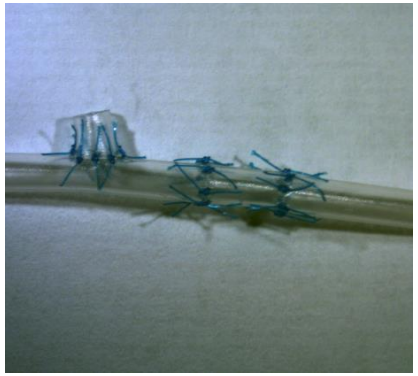
Simulation is needed for education

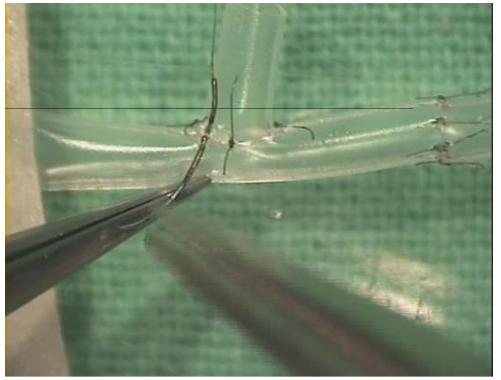
Methods of Microsurgery - Dentistry Faculty

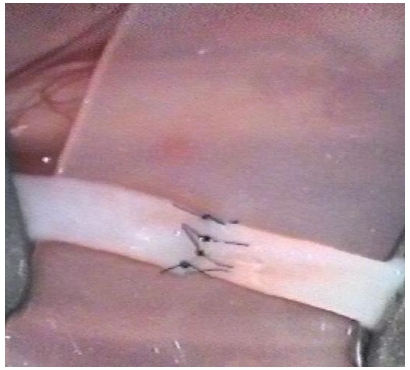
Simulation











Introduction of Microsurgery to the Dentistry Faculty – Qualitative feedback

A 2-semester trial period for 4th-year students (elective course for students of the dentistry faculty)

Curriculum:

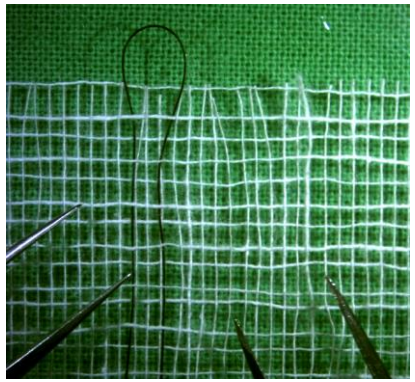
Lectures:

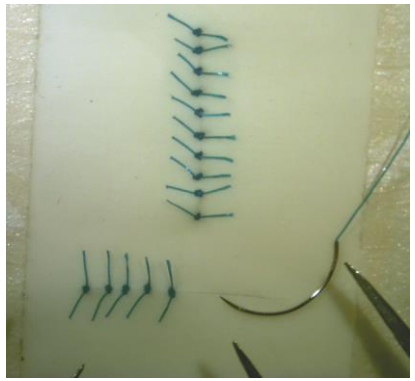
general microsurgery (microvascular surgery) + additional dentristry-specific topics (microsurgical aspects of periodontal surgery, endomicrosurgery)

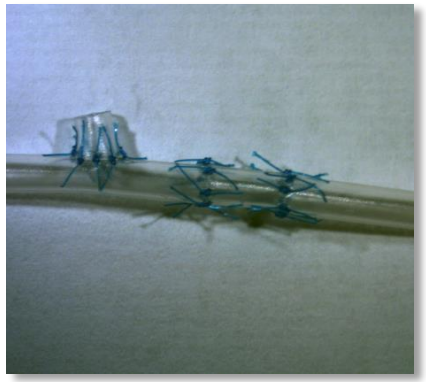
Practices:

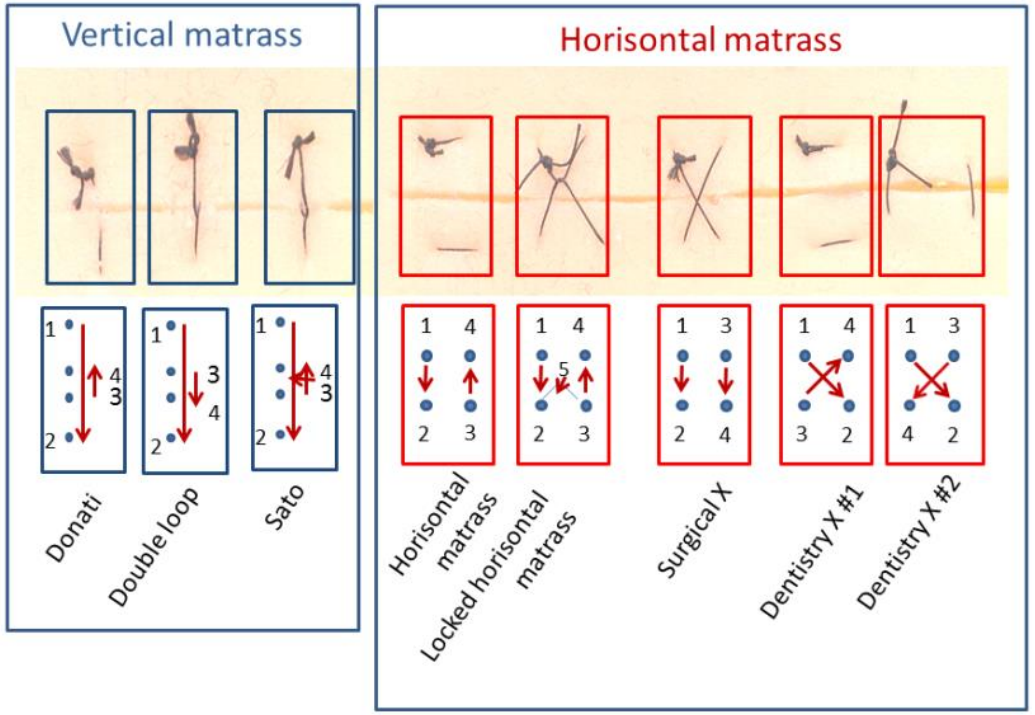
General microvascular surgery + special mucosal sutures

Simulation









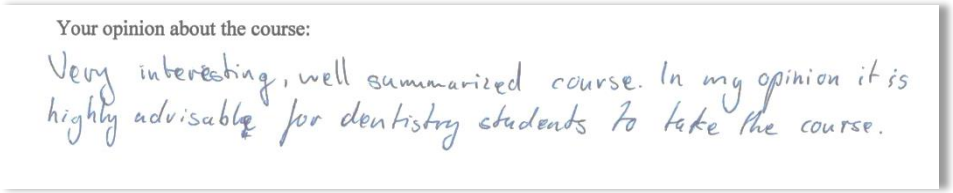
Quantitative scores and qualitative feedback forms

Qualitative feedback from dentistry students (elective course)

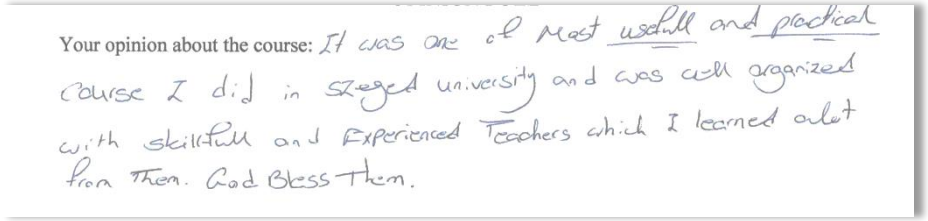
About the motivation:	Hun	Eng
1. I chose the course ONLY because I needed the credit	0%	0%
2. I was good at other courses of the institute and I wanted to test my skills at more challenging exercises	50%	44%
3. I want to perform surgical procedures in the future and I wanted to improve my dexterity	63%	67%

About the achievement: Based on my experience during the course…	Hun	Eng
1. … I would like to do microsurgical procedures in the clinical practice	12%	14%
2. … I do not find myself able to do microsurgery in the future	6%	11%
3. … I am convinced that I would be a good surgeon	16%	18%

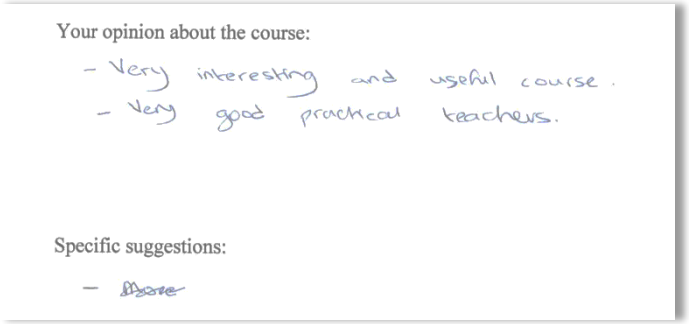
Qualitative feedback from dentistry students (elective course)


Your opinion about the course:
Very interesting, well summarized course. In my opinion it is highly advisable for dentistry students to take the course.

Very interesting, well-summarized course. In my opinion, its is highly advisable for dentistry students to take this course.

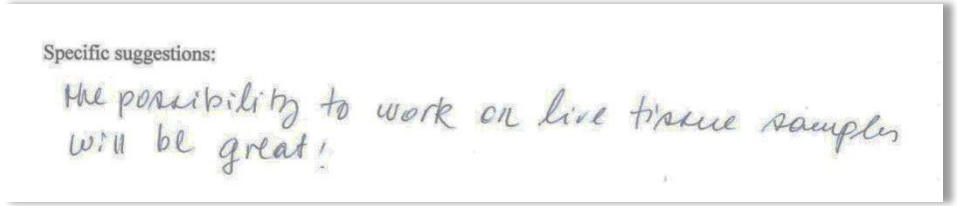

Your opinion about the course: It was one of most usefull and practical course I did in Szeged university and was well organized with skillfull and Experienced Teachers which I learned alot from them. God Bless Them.

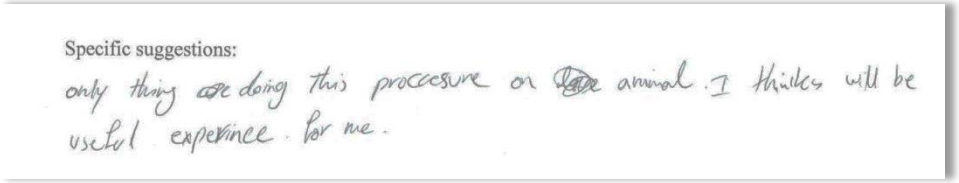
It was the most usefel and perfect course I did at Szeged University...


Your opinion about the course:
- Very interesting and useful course.
- Very good practical teachers.

Specific suggestions:
- None

Very interesting and useful course…

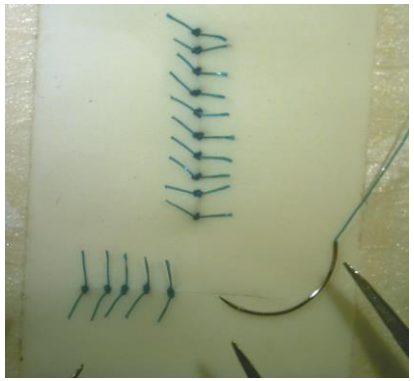

Specific suggestions:
the possibility to work on live tissue samples will be great!

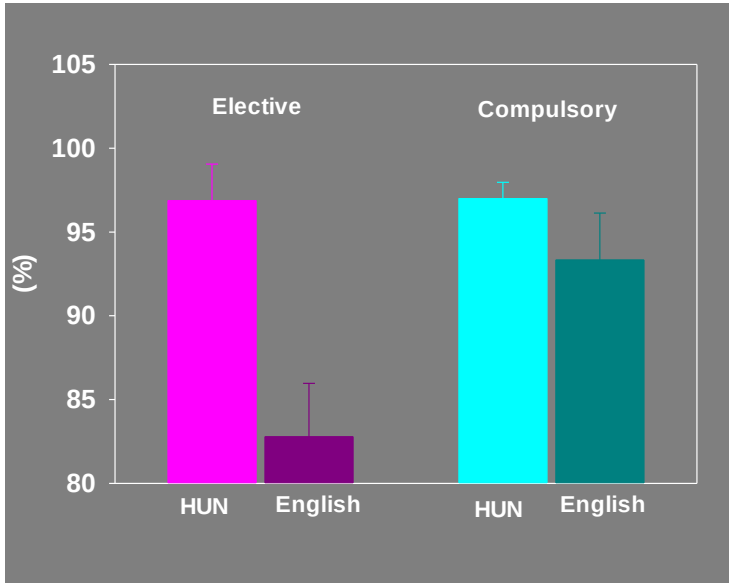

Specific suggestions:
only thing are doing this processure on ~~live~~ animal. I thinks will be useful experince for me.

Suggestions:
Work on live animals

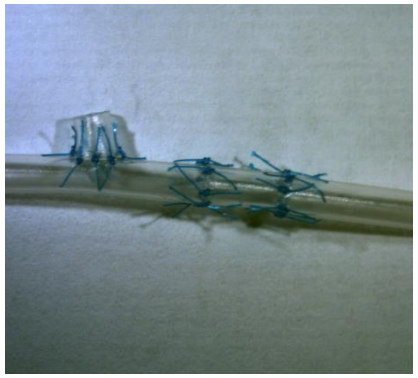
Learning outcomes (dentistry students)

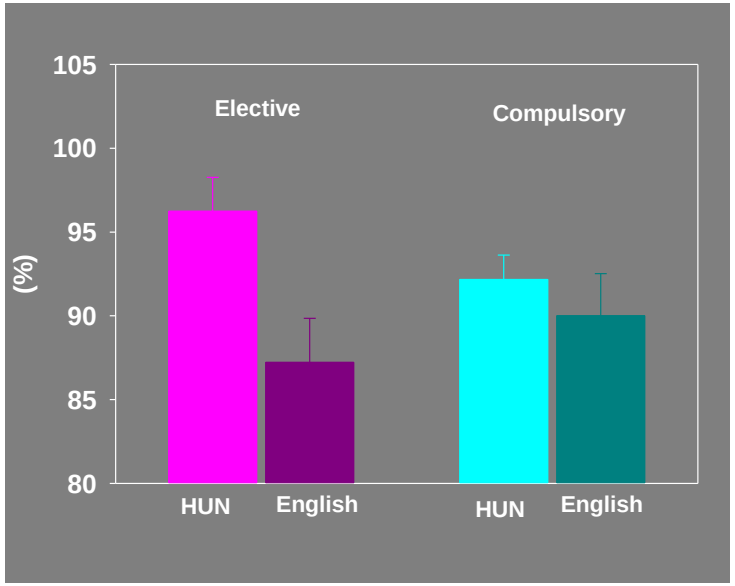
Task #1





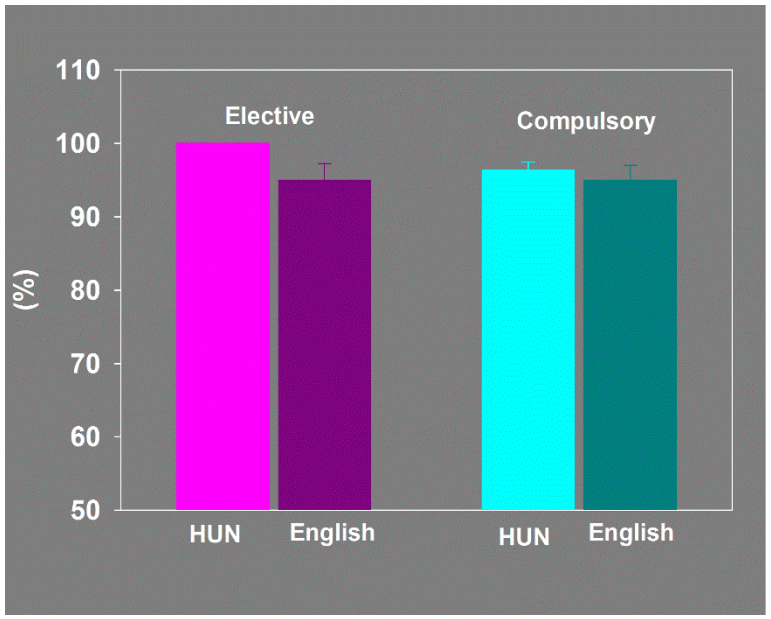
Task #2



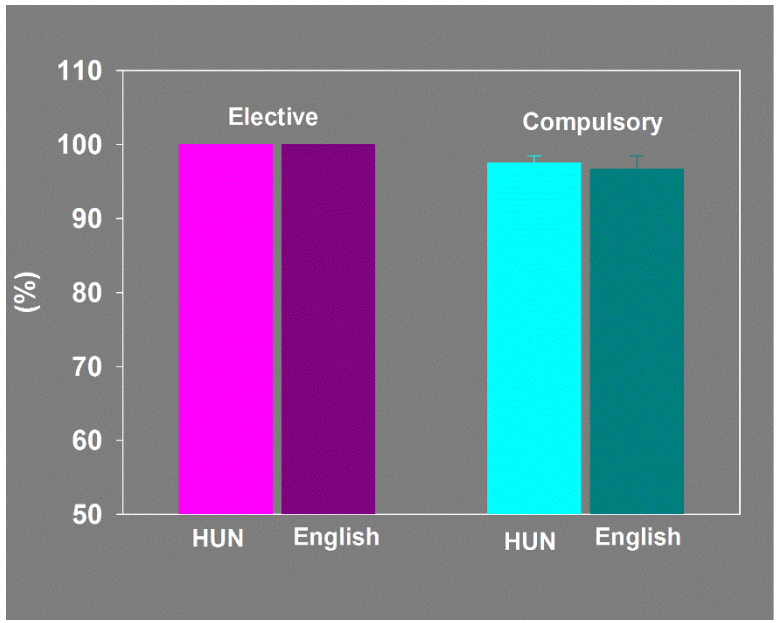


Evaluation of the course

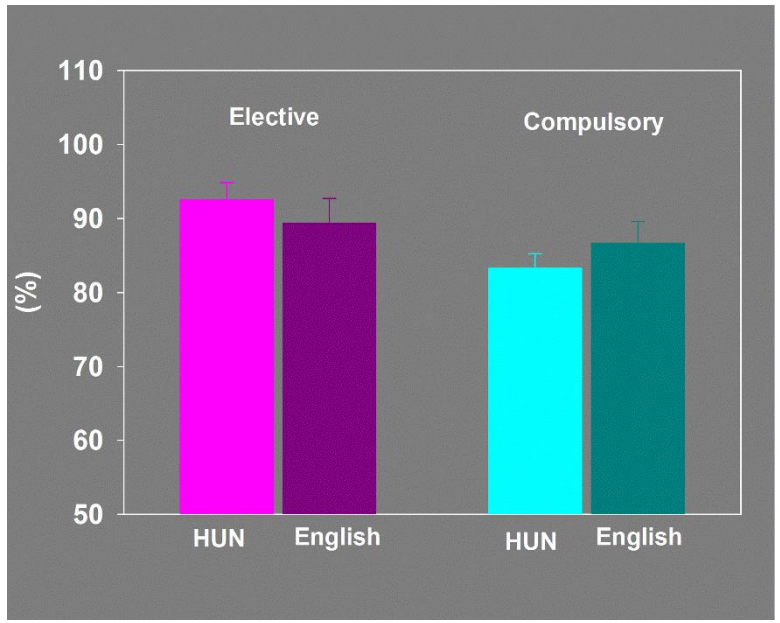
Course



Teachers



Self-evaluation



Qualitative feedback from dentistry students (elective course)

Question to the participants of the compulsory course:	Hun	Eng
Would you choose this course if it was not compulsory?	100%	94%

About the achievement: Based on my experience during the course…	Hun	Eng
1. … I would like to do microsurgical procedures in the clinical practice	12%	22%
2. … I do not find myself able to do microsurgery in the future	6%	11%
3. … I am convinced that I would be a good surgeon	6%	28%

Qualitative feedback from dentistry students (elective course)

Question to the participants of the compulsory course:	Hun	Eng
Would you choose this course if it was not compulsory?	100%	94%

vs medical students

About the achievement: Based on my experience during the course…	Hun	Eng		Hun	Eng
1. … I would like to do microsurgical procedures in the clinical practice	12%	22%		45%	56%
2. … I do not find myself able to do microsurgery in the future	6%	11%		15%	9%
3. … I am convinced that I would be a good surgeon.	6%	28%		21%	25%

Conclusions about the Microsurgery course for dentistry students

Nearly all of the students would have taken this course even if it was not compulsory

Learning outcomes are not influenced by the fact that the course became compulsory

High level of **curiosity** and **motivation** can be aroused

The **satisfaction rates** are remarkably high

10-20% of students are willing to perform **oral surgical interventions**

The place of simulation in (micro)surgical skills training

Preclinical training

Postgraduate training

Centralized and **standardized** skills training - **in Skills Centers**

Measures of success in surgical skills education

(objective assessment of the learning outcomes provides satisfactory results)

More indices:

- High satisfaction rates
- Students would take the course independently from its compulsory nature
- Students find the course: interesting, useful, well-organized…
- Students are interested in choosing a clinical profession related to surgery

(Requirements of success in surgical skills education)

Financial background

Motivated team (teachers, instructors, peer teachers)

Repetitious practice (continually practising at more challenging levels)

And in general:

Major aim:

Patients safety by means of well-trained surgeons (casting)

Tools:

….

e.g. competence-based learning with measurable learning outcomes.

Requirements:

High level of education necessitates optimal technical, financial and human resources (including teachers, instructors, peer teachers).