



## **Do Our Medical Students Even Want E-Learning? A User Rated Evaluation of Case Based E-Learning in Undergraduate Medical Education at the Medical University of Vienna.**

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### **Abstract**

**Online platforms and other e-learning methods have shown a multitude of advantages compared to traditional classroom and lecture hall teaching. These include lower total cost, an increased temporal and spatial flexibility as well as taking individual interests and learning style preferences into account. In this paper we evaluated a newly implemented e-learning program at the Vienna Medical University for medical students by assessing user acceptance and satisfaction of the novel program in the fields of psychiatry (PS), microbiology and laboratory medicine (ML) and orthopedic surgery (OS). We showed a high participation of the voluntary courses, whereby more than half of the students felt more prepared for the end of year exam and 70% stated having felt that the entire project was a profitable learning experience. In future, we aim to use these data in improving current didactic frameworks by extrapolating an optimal e-learning case template in length, difficulty and user interface.**

### **INTRODUCTION**

Online platforms and other e-learning methods showed a rapid increase in utilization over the last decade [1]. These modi provide a host of advantages compared to traditional classroom and lecture hall teaching including lower total costs and an increased temporal and spatial flexibility for both student and teacher [2,3]. Additionally, e-learning, especially when integrated into state of the art blended-learning frameworks support a transfer of knowledge with increased flexibility, adapting more towards individual interests and learning style preferences [4,5,6,7].

A recent article depicted a high user satisfaction with e-learning methods in higher medical education [7]. Other studies show that a majority of training participants believe their skills and knowledge have improved due to the use of e-learning programs [2,7,9].

Learning efficiency derived from these methods are highly dependent on course design [10]. Participants have stated their wish for a clear structure and user-friendliness [1,11,12] in such programs and have stressed the need for flexibility [1,11,12], easily understandable learning material networked with further learning resources [1] and a final review of acquired knowledge in form of a test [1,11].

At the Vienna Medical University the implementation of a blended-learning program commenced in 2013. In this paper we aim to evaluate the user-satisfaction and -acceptance of the program which has seen implementation in the fields of psychiatry (PS), microbiology & laboratory (ML) medicine and orthopaedic surgery (OS). Additionally participant feedback

may help us in improving current and future programs. Each of these programs consist of several patient cases derived from real-time actual patient data, transported and transformed into didactic content using a newly implemented framework [13]. These blended-learning cases consist of an online patient scenario with interactive questions, integrated learning resources linked both to text book and classroom seminars as well as simulated patient contact exercises. This didactic model of learning experience addresses the affect-cognitive interface essential for learning processes.

## METHOD

In the fourth year of university, the curriculum of the Medical University of Vienna for medical students entails PS, ML and OS courses. The skills and knowledge learnt are tested and graded in the skills oriented OSCE (Objective Structured Clinical Examination) [14] at the end of the year. The blended learning psychiatry program is an obligatory element in the curriculum for all students. ML and OS e-learning programs are currently voluntary and serve as preparation for the OSCE examination.

After completion of one of the three e-learning programs, an e-mail was sent to the participants with asking to fill out an online evaluation questionnaire.

The questionnaire consists of 19 questions using a Likert- 5-point-scale [15] ranging from “I absolutely disagree” (-2) to “I absolutely agree” (+2). Using this scale, we evaluated five main areas: user acceptance of the program, subjective learning effect, individual flexibility, design and user-friendliness and how realistic the case is perceived. User age and sex data was also collected.

## RESULTS

### Course participation

Our results show a high participation rate for the two voluntary courses at 65,9% (388 of 589) for ML and 58% (342 von 589) for OS, mean course completion rate of participants was 68.7% for ML and 52,7% for OS. The number of females to males was approximately balanced with preponderantly males (46,7% to 53,3%) and the average age of the participants was between 25 and 26 years. The most important results are compiled in table 1.

Evaluation Questionnaire for E-learning courses					
Acceptance	Participant agreement in percent				
	-2 Absolutely disagree	-1 Rather disagree	0 Partly agree	+1 Rather agree	+2 Absolutely agree
I am satisfied with the E-Learning-program.	7,5	11,8	15,2	33,9	31,2
psychic functions & psychiatry (PS)	5,6	13	25,9	24,1	31,5
microbiology & laboratory medicine (ML)	2,9	8,6	5,7	35,7	45,7
OS	14	14	14	41,9	16,3
The E-Learning should be used in the future at university.	3	3,9	8,7	21,7	62,9
psychic functions & psychiatry (PS)	3,7	5,6	9,3	24,1	57,4
microbiology & laboratory medicine (ML)	2,9	1,4	2,9	22,9	68,6
OS	2,3	4,7	14	16,3	62,8
Learning effect					

<b>Overall dealing with the cases of the E-Learning was a profitable Learning experience.</b>	<b>8,2</b>	<b>3,8</b>	<b>11,4</b>	<b>26,1</b>	<b>42,8</b>
psychic functions & psychiatry (PS)	5,6	20,4	7,4	29,6	37
microbiology & laboratory medicine (ML)	2,9	4,3	5,7	18,6	65,7
OS	16,3	4,7	20,9	30,2	25,6
<b>The questions which have been asked me during working on one of the cases, were helpful for me participate actively in the case and further my knowledge.</b>	<b>3,3</b>	<b>9,8</b>	<b>16,0</b>	<b>24,3</b>	<b>44,7</b>
psychic functions & psychiatry (PS)	7,4	11,1	20,4	24,1	37
microbiology & laboratory medicine (ML)	0	4,3	4,3	18,6	71,4
orthopedic surgery (OS)	2,3	14	23,3	30,2	25,6
<b>After working through the cases of the E-Learning I feel better Prepared for the OSCE.</b>	<b>16,6</b>	<b>16,2</b>	<b>15,0</b>	<b>25,1</b>	<b>26,1</b>
psychic functions & psychiatry (PS)	24,1	20,4	16,7	13	24,1
microbiology & laboratory medicine (ML)	7,1	7,1	14	34,3	35,7
orthopedic surgery (OS)	18,6	20,9	14	27,9	18,6
<b>Flexibility</b>					
<b>I appreciate the flexibility, which is combined with the concept of E-Learning.</b>	<b>3,4</b>	<b>15,3</b>	<b>11,6</b>	<b>19,7</b>	<b>58,5</b>
psychic functions & psychiatry (PS)	5,6	9,3	14,8	18,5	51,9
microbiology & laboratory medicine (ML)	0	1,4	12,9	24,3	58,6
orthopedic surgery (OS)	4,7	4,7	7	16,3	65,1
<b>Design and user friendliness</b>					
	<b>-2</b> much too difficult	<b>-1</b> rather too difficult	<b>0</b> accurate	<b>+1</b> rather too easy	<b>+2</b> much too easy
<b>The cases are according to my current level of knowledge.</b>	<b>1,4</b>	<b>11,2</b>	<b>54,2</b>	<b>20,6</b>	<b>11,0</b>
psychic functions & psychiatry (PS)	1,9	14,8	53,7	20,4	9,3
microbiology & laboratory medicine (ML)	0	7,1	60	15,7	14,3
orthopedic surgery (OS)	2,3	11,6	48,8	25,6	9,3
	<b>-2</b> much too long	<b>-1</b> rather too long	<b>0</b> accurate	<b>+1</b> rather too short	<b>+2</b> much too short
<b>The length of the cases is accurate.</b>	<b>3,3</b>	<b>16,1</b>	<b>46,5</b>	<b>15,1</b>	<b>17,3</b>
psychic functions & psychiatry (PS)	5,6	25,9	40,7	14,8	13
microbiology & laboratory medicine (ML)	4,3	20	50	7,1	15,7
orthopedic surgery (OS)	0	2,3	48,8	23,3	23,3
<b>Closeness to reality</b>					
	<b>-2</b> I absolutely	<b>-1</b> I rather disagree	<b>0</b> partly	<b>+1</b> I rather	<b>+2</b> I absolutely
<b>After working through the cases of the E-Learning I feel better Prepared to confirm a diagnosis at a real patient with these symptoms and to exclude important</b>	<b>25,2</b>	<b>20,0</b>	<b>18,6</b>	<b>30,5</b>	<b>19,3</b>
psychic functions & psychiatry (PS)	9,3	29,6	22,2	20,4	18,5
microbiology & laboratory medicine (ML)	4,2	8,6	17,1	38,6	30
orthopedic surgery (OS)	11,6	27,9	16,3	32,6	9,3

Table 1: Table 1 shows results of the Online Evaluation Questionnaire with values as a percentage of a mean of three subjects: psychic functions & psychiatry (PS), microbiology & laboratory medicine (ML) and orthopedic surgery (OS). Dark blue colored fields indicate highest values, grey the second highest.

### DISCUSSION

One of our goals in establishing a novel non-compulsory educational resource was to determine the level of interest of the target group. Our results showed a high level of participation for both voluntary courses. The difference of 66% to 58% between ML to OS may be explained by students expectation of being required to perform a more hands-on approach during the practical examination for the latter.

While participant satisfaction at 65% may be indicative of a successful pilot project, the high percentage (80%) of students willing to see other similar e-learning programs in their curriculum underlines the demand in expanding and establishing these methods. Especially satisfactory is that the ML course, as a less well represented field amongst students was shown a very high level of satisfaction (85%). As expected, user flexibility with e-learning was also highly appreciated.

In addition to general satisfaction, user-interest and -flexibility, the parameters of curiosity and interest may prove to be one of the primary affects [16], which have been shown to arouse intrinsic motivation. This is crucial to maintaining the endeavour of lifelong learning, as essential aspect for every physician.

Cases for orthopaedic surgery should be increased in difficult and length as one third of the users found the tests to be too easy and too short. Didactically, the ML course gave 70% of the users the confidence, that they would be able to confirm a diagnosis after completion as opposed to 40% in PS and OS. Further analysis of the differences in case architecture as well as an adaptation towards the ML course may ameliorate these differences. This may be accomplished by specifying test-question generation algorithms within the didactic framework.

Overall more than half of the students felt more prepared for the end of year exam and 70% stated that the entire project was a profitable learning experience.

Future studies have yet to show a quantitative difference in exam grades and an improvement in knowledge or skills versus traditional textbook methods for our students. This matter of contention is bombarded by a multitude of results and hypothesis. Some authors claim that using e-learning leads to an increase of knowledge amongst users [7,17,18,19] and a significant improvement of skills [20,21] versus traditional textbook and classroom learning, while others suggest that there is no difference regarding the knowledge [22-30] or the skills gained [31-33].

One surrogate parameter to quantitatively approach this endeavour is in comparing the exam results from this year of the users of the ML and OS e-learning users with the non-users. Additionally the compulsory PS seminar results might be compared to exam results from previous years.

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