TRADITIONAL LECTURES, E-LEARNING AND BLENDED LEARNING IN ORTHODONTICS – ARE COMPUTERS THE BETTER INSTRUCTORS?

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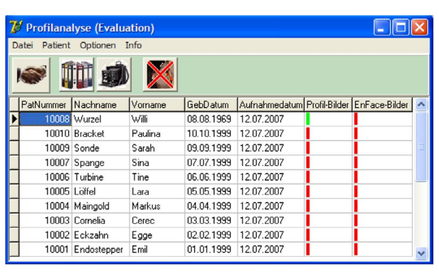
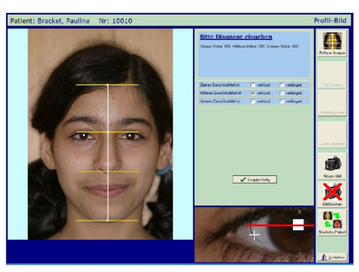
Introduction: After the hype of using computers in the 2000´s in pure e-learning environments, the results have been disappointing. Blended learning is suspected to combine the benefits of traditional courses with e-learning.

Aims: What are student's perceptions of their learning experience in traditional courses, e-learning and blended-learning groups? Is there an influence on the test results afterwards?

Materials and Methods: 75 students (52 female, 23 male) attending a orthodontic course in diagnostics (facial diagnostics) were divided into three groups, traditional lecture and seminar (A:N=26), e-learning (B:N=11) and blended-learning (C:N=38).
Group A: Introduction, lecture with PowerPoint slides followed by paper based exercises
Group B: Introduction, only computer based instruction and training with the software
Group C: Introduction, PowerPoint supported lecture combined with software based training
The students had no prior knowledge to the facial analysis used.
A special e-learning software (Fig. 1) for facial analysis was developed (Borland Delphi 7, including patient management, learning tool and facial analysis function). Each student was evaluated with a questionnaire (Tab. 1) with 20 items in four categories (motivation, didactics, response and effect) after completing the course.
In addition each student had to pass a test with 20 images to analyse afterwards. The software was distributed free of charge to all students after the test.





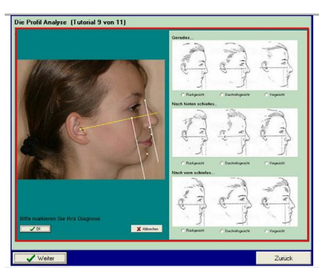
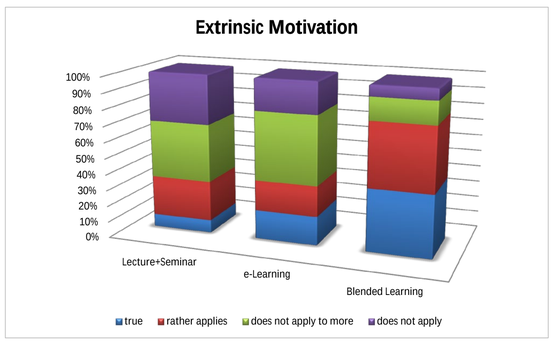


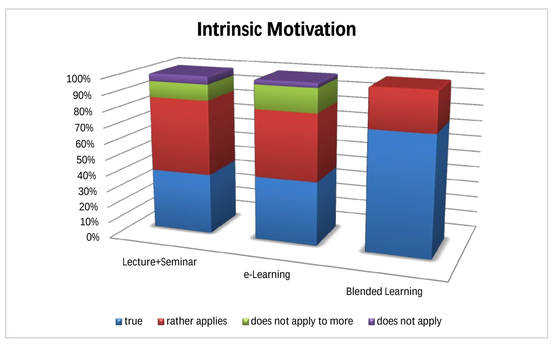
Fig 1: Screenshots of the developed software.
It consists of training module and a fully functional module for facial analysis in orthodontic practice. It is based on the Borland Database Engine BDE 5.11 and consists of nearly 2000 lines of source code.

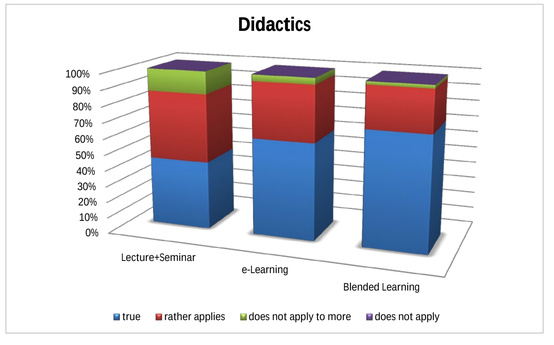
Tab. 1: Questionnaire

Item	Question	1 true	2 rather applies	3 does not apply to more	4 does not apply	5 no statement	Category
1	I felt encouraged to actively participate in this course.						intrinsic Motivation
2	The learning contents presented were easy to understand.						Didactics
3	In the lecture questions were answered satisfactorily.						Response
4	I felt well prepared for today's lecture / seminar.						extrinsic Motivation
5	A "red thread" was visible over the entire lecture / seminar.						Didactics
6	I obtained a significant increase of knowledge.						Effect
7	The mediated learning content is important for my exams.						Extrinsic Motivation
8	I am of the opinion that in 3 months I still mastering the knowledge imparted.						Effect
9	I could clearly understand the teacher / the instructions of the computer during the event.						Didactics
10	I am of the opinion that I can use the documents / transcripts in later questions on this area.						Response
11	My interest in this field is higher than before.						Response
12	I am of the opinion that the estimated time was exploited useful.						Didactics
13	I think the concept of today's lecture would be useful. Change of methodology and didactics are desirable at most a small extent.						Didactics
14	I felt the atmosphere during the event as pleasant.						intrinsic Motivation
15	For today's topics relevant test I feel well prepared.						Effect
16	Suppose this were a regular optional course: I'm going to visit the next event.						intrinsic Motivation
17	The pace of knowledge transfer was appropriate and sufficient.						Response
18	The materials were clear and helpful (lecture notes, computer programs, etc.).						Response
19	How much of the newly learned stuff you could repeat right now?	0%	25%	50%	75%	100%	Effect
20	Please give an overall score!	very good	good	medium	bad	very bad	Effect

Results: Group differences were tested using the Kruskal-Wallis test and showed significant differences between all the groups and all items together. For detailed testing, multiple pair comparisons according to Dunn were performed. Intrinsic and extrinsic motivation in the blended learning group were significantly higher (Tab. 2) than in the traditional learning and e-learning environments (which showed no difference). Questions dealing with didactic quality showed significant differences, with best rating in the blended-learning group (see pictures below). The question complex "response" was significantly better rated than the other groups; however ,in the suspected effect by the participants e-learning was rated inferior to the other groups. But exactly this group showed the best test results.

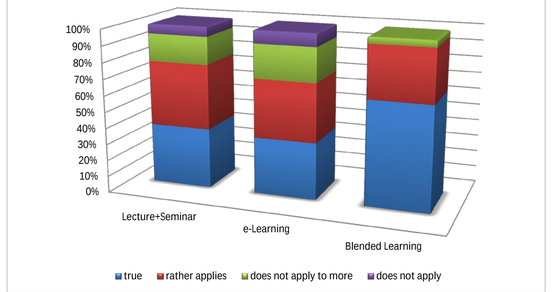


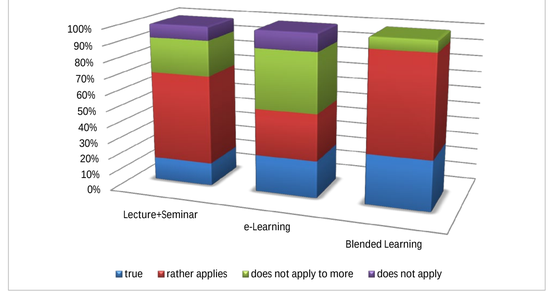


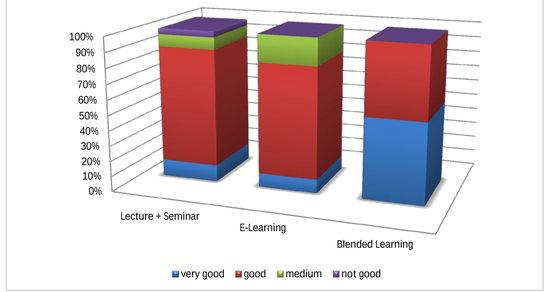


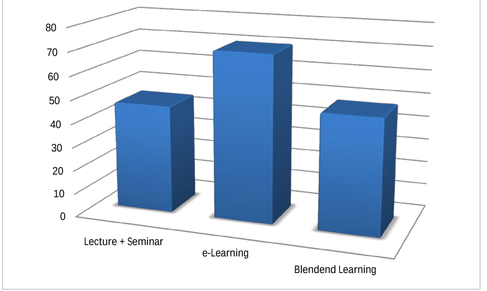
Tab. 2: Multiple paired Comparison according to Dunn (p-values, uncorrected).

	Lecture + Seminar vs Blended Learning	e-Learning vs Blended Learning	Lecture + Seminar vs e-Learning
Motivation (intrinsic and extrinsic)	0.0024 *	0.0008 *	0.3100
Didactics	0.0545 (*)	0.0159 *	0.0064 *
Response	0.0026 *	0.0150 *	0.8525
Effect	0.0369 *	0.0053 *	0.5540









Discussion: The motivation in the blended learning group was higher, but this may be an artefact of doing something completely different with easy-to-use software. All aspects recommend blended learning: the lectures were well prepared, the students feel better and expect a better knowledge gain, but better test results are not to be expected. That the best results were provided by the e-learners may be caused by the nature of the topic "facial analysis" – perhaps it meets the requirements learning for this topic, even if it's not so much fun to do so. On the other hand long, term effects were not investigated here.

Conclusions: As a result, e-learning only cannot be recommended as the one and only in teaching facial analysis in orthodontics. The networking of electronically generated content and personal contact leads to higher motivation, but no better test results can be expected. The didactic method should always be carefully selected to meet the requirements of the subject to be trained. Computers are not the better teachers, but can effectively help in the preparation for examinations.

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