E-learning: Traditional and case-based presentations of respiratory disorders at the Medical University of Graz

Andreas Pfleger¹, Johannes Bernhardt-Melischnig², Gilbert Reibnegger³, Ernst Eber¹
¹Respiratory and Allergic Disease Division, Department of Paediatrics and Adolescent Medicine ² Institute for Medical Informatics, Statistics, and Documentation ³ Institute of Physiological Chemistry Medical University of Graz, Graz, Austria

E-learning is an important component of the medical curriculum at the Medical University of Graz. Comparisons between different learning environments under controlled conditions are the basis for continuous advancement of the Virtual Medical Campus Graz and the implementation of effective and efficient E-learning formats. The aim of this study was to compare two different learning environments, (1) traditional and (2) case-based presentations of respiratory disorders. Our hypothesis was that case-based presentations lead to better learning results than traditional presentations.

Two learning environments on two paediatric respiratory disorders (asthma, croup) were constructed. While the traditional environment consisted of the presentation of the disorders using text enriched with pictures and videos, the case-based environment had a problem-oriented structure. On day 1, medical students were randomly assigned to one of the two learning environments. Then, they sat a pre-test consisting of five multiple choice questions (MCQs) to test for previous knowledge (maximum score: 5 points). Subsequently, students worked with the assigned objects whereat their times on task were assessed via log files. Immediately thereafter, they sat a test consisting of 25 MCQs to objectively assess learning results (maximum score: 25 points). Students also had to answer questionnaires on intrinsic motivation, acceptance of the learning object, cognitive load, tolerance to ambiguity, and subjective learning success. After four weeks, they sat another test, again consisting of 25 MCQs, to assess sustained learning results (maximum score: 25 points). Power calculation, based on middle effects (difference of 0.5 standard deviations), one-sided testing, an alpha of 0.05, and a beta of 0.2, resulted in 51 students per group.

128 students (77 female) participated in the study; 68 (41 female; 10 ± 3 semester) were randomised to the traditional group, and 60 (36 female; 10 ± 4 semester) to the case-based group. In the pre-test, the traditional group scored median (range) 1.5 points (0-5), and the case-based group 1.5 (0-5). Time (median, range) spent with the learning object for croup was 582 (36-1924) sec for the traditional group, and 520 (14-4439) sec for the case-based group; for asthma, it was 829 (13-4647) sec vs. 877 (15-4382) sec. Objective assessment of the learning results showed 12.6 (0-20.5) points for the traditional, and 12.1 (0-20.9) points for the case-based group; assessment of sustained learning results yielded 13.0 (3.3-21.8) vs. 13.3 (6.3-21.3) points. There were no differences between the groups regarding intrinsic motivation, acceptance of the learning environments, cognitive load, tolerance to ambiguity, and subjective
learning success. While subjective learning results correlated with intrinsic motivation (p=0.001) and acceptance of the learning environments (p<0.001), objective learning results correlated with intrinsic motivation (p=0.015) and time spent in the learning environments (p=0.001).

While students may react differently to learning environments according to their intrinsic motivation, tolerance to ambiguity and learning styles, we found no major differences between the two groups with regard to objective learning results. Thus, none of the tested learning environments appears to be superior to the other.