Electronic Learning in Undergraduate Medical Education

Mezuniyet Öncesi Tıp Eğitiminde Elektronik Öğrenme

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ABSTRACT

Objective: This study was designed to assess the impact of electronic education on students' learning levels and to compare the video-based electronic learning with text-based learning among medical faculty students.

Materials and Methods: This study was conducted as a single center, cross-sectional study. All of the volunteers were fourth year students of the medical faculty. All students were randomly divided into two groups. Each group had 100 students. In group 1, all students were educated by video-based electronic learning about wound healing, and in group 2, all students were educated by standard lectures from textbook. Both groups were evaluated according to their correct response rates.

Results: The video-based learning increased the correct response rates by 25 fold for more than five questions (OR: 25, p=0.0001) and increased the correct response rates by 10 fold for more than seven questions (OR: 10, p=0.0001).

Conclusion: In this study, video-based learning was found more successful than the text-based learning as a learning method.

Keywords: Video-based learning, text-based learning, success, medical education, correct response rate

ÖZ

Amaç: Bu çalışma, tıp fakültesi öğrencileri arasında elektronik eğitim öğrencilerinin öğrenme düzeylerini üzerindeki etkisini değerlendirerek ve video tabanlı elektronik öğrenmeye metin tabanlı öğrenmeye karşılaştırmak için tasarlanmıştır.

Gereç ve Yöntem: Bu çalışma tek merkezli, kesitsel bir çalışma olarak yapılmıştır. Gönüllülerin tamamı tıp fakültesinin dördüncü sınıf öğrencilere ve tüm öğrenciler rastgele iki gruba ayrıldı. Her gruba 100 öğrenci dahil edildi. Grup 1’den tüm öğrencilere yara iyileşmesi hakkında video tabanlı elektronik öğrenme ile eğitim verildi ve 2. gruptaki tüm öğrenciler ders kitabından standart derslerle eğitildi. Her iki grubunun başarı oranlarını göre değerlendirildi.

Bulgular: Video tabanlı öğrenme, bénéz fazla soru için doğru yanıt oranını 25 kat arttırdı (OR: 25, p=0.0001) ve vücut fazla soru için 10 kat arttırdı (OR: 10, p=0.0001).

Sonuç: Bu çalışmada video temelli öğrenme, bir öğrenme yöntemi olarak metin temelli öğrenmeye göre daha başarılı bulunmuştur.

Anahtar Kelimeler: Video temelli öğrenme, metin temelli öğrenme, başarı, eğitimi, doğru yanıt oranı

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INTRODUCTION

There are 2 main factors in students’ motivation to learn, which are described by Sobral (1) as intrinsic and extrinsic factors. Intrinsic factors, in other words autonomous factors, are basically the student’s learning motivation and learning styles while extrinsic factors are controllable factors, with teaching methods being one of these factors.

Learning styles have been a common concept in the literature for more than 30 years, and there are different definitions (2). Learning styles are categorized in different ways that address how individuals learn. Barbe and his colleagues classified them into 3 main categories: visual, auditory, and kinesthetic learning (3). Keefe et al. (4) described learning styles as combinations of physiological, cognitive, and emotional characteristics that influence a student’s learning. This perspective influences how a learner perceives the learning environment, how they respond to it, and how they react to it.

Dunn and Dunn have developed different teaching methods according to their learning styles. They redesigned their classes, started small group trainings, and used different teaching methods (5). In the perception of the lecturer’s emotional state, both visual and auditory cues play a role. The video-based learning contains both visual and auditory stimuli and appeals to both visual and auditory learning.

The purpose of this study was to assess the impact of electronic education on students’ learning levels and to compare the video-based electronic learning with text-based learning among medical faculty students.

MATERIAL AND METHODS

Study Design

In this single-center, cross-sectional study, there were 200 fourth-year medical students of Istanbul University, Istanbul Faculty of Medicine. All students were randomly divided into two groups with 100 students in each. Group 1 (n = 100) consisted of students who got video-assisted lectures, and Group 2 (n=100) consisted of students who got lectures from a textbook.

All students had their training about wound healing. The content of the theoretical training for the two groups was exactly the same. While the training was provided to the first group of students with video assistance, the second group was given this training as text reading. This study was blind for all of the students. All medical students only knew the scope, lessons, and exams and believed that this whole process was a part of a routine. Additionally, each group did not know that they were being compared with the other exam-lesson group. 7 days after the video-assisted and text-based lectures, all participants were examined. Groups were evaluated according to the correct response rates. Informed consent was taken from all students. Ethical approval for this study was given by the Istanbul School of Medicine Ethical Committee at Istanbul University.

Statistical Analysis

Continuous variables were analyzed in terms of normal distribution. Normally distributed variables were examined using Student’s t-test, and values with non-normal distribution were examined using the non-parametric Mann-Whitney U test. The proportions were compared using χ2 or Fisher’s exact tests. Pearson’s χ2 was performed for dichotomous variables, and Student’s t-test for continuous variables.

Binary logistic regression models were used to compare the impact of effectiveness of video-based learning and text-based learning. The significant variables which were detected after χ2 exact test were included in the binary models.

RESULTS

There were 200 students included in this study, 100 in each group. The mean age of students in group 1 was 24±4 years (20-28) and 23±3 years (20-26) in group 2. The female/male ratio were the same (3:2) for groups 1 and 2, respectively. There was no significantly detected difference between the groups in terms of gender and age (p>0.05) (Table 1).

The mean correct response rate among the students was analyzed, and in group 1, the correct response rate was significantly higher than group 2 (7.9±1.2, 5.3±1.4, respectively) (p<0.001) (Table 1). Therefore, the correct response rate was significant-

| Table 1. Demographic features and correct response rates of both groups. |
|-------------------------------------------------|-------------------------------------------------|----------|
| Video-based learning group n=100 | Text-based learning group n=100 | p       |
| Age (years) mean±SD (min-max) | 24±4 (20-28) | 23±3 (20-26) | >0.05   |
| Female/Male | 65/35 | 70/30 | >0.05   |
| Correct response rate mean±SD (min-max) | 7.9±1.2 (5-10) | 5.3±1.4 (3-9) | <0.001  |
| Correct response rate for >5 questions (%) | 97 | 41 | <0.001  |
| Correct response rate for >7 questions (%) | 60 | 7 | <0.001  |
ly and positively correlated with video-based learning group (r=0.661, p=0.001).

**The evaluation of correct response rates with more than five and seven questions:**
In the analysis of correct response rates with more than five questions, we have found that the students in group 1 had significantly higher rates than that of group 2 (97%, 41%, respectively) (p<0.001). The correct response rates with more than seven questions in group 1 was also associated with significantly higher rates than in group 2 (60%, 7%, respectively) (p<0.001) (Table 1).

According to logistic regression analysis, the video-based learning increased the correct response rates 25-fold with five questions (OR:25, p=0.0001) and increased the correct response rates 10-fold with seven questions (OR:10, p=0.0001).

**DISCUSSION**
This study was performed to compare the effectiveness of video-based and text-based learning methods. This comparison was particularly done for the similar homogeneous groups simultaneously in different classrooms. Videos are useful for showing spoken language and moving images, plus many effects like superimposed text, slow motion clips, or animations. All audiences can observe optimally by visualizations remains visible (6). Moreover, video can potentially overcome the shortcomings that simple printed illustrations have. Also, presenting videos to students before starting the course helps to encourage a kind of “blended learning” (7).

When teaching methods are adapted to audiences’ learning styles, motivation and performance increase (8-12). Similarly in our study, we found that correct response rates with more than five questions was significantly higher in group 1 (97%) than in group 2 (41%) (p<0.001). Additionally, we found that the rate with more than seven questions was also significantly higher in group 1 (60%) than in group 2 (7%) (p<0.001). We think that, particularly for surgical education, video-based learning is a crucial factor for students’ motivations. According to publications in the literature, active learning strategies end with better learning, and active learning reaches all kinds of students (13-15). Therefore, active learning strategies cause reasoning while thinking, develop problem-solving abilities, and can also be used in large classrooms with activities like collaborative learning exercises, simulations, role play, games, and discussion (13). These activities increase motivation and encourage group working.

Recent neuroscience studies have also shown that meaningful developments in learning can be achieved if the learning environments conform to dominant learning styles, a concept known as the “network hypothesis” (16). The most common unimodal selection is kinesthetic, after which visual, auditory, reading, and writing are listed (17). Students who learn kinetics prefer hands-on learning and enjoy learning that has a connection with reality (18,19). Kinesthetic learners should pay more attention to experience to be better informed. They more frequently select simulations of practical applications, examples, exhibitions, photographs, “real-life examples”, role play, and applications that facilitate their understanding of principles and advanced concepts (20).

According to research conducted by Kharb et al. at a medical university in India, 61% of the students preferred the multimodal VARK (Visual, auditory, read/write and kinesthetic). 39% of the participants preferred unimodal learning, 41% bimodal, 14% trimodal, and 6% quadrimodal learning (18). We believe that the bimodal learning system, video-based learning style, is more successful than other unimodal learning styles. In another study, Slater et al. (21) reported that Wayne State University’s first-year medical students, consisting of both male and female participants, preferred to utilize multiple sensory modalities over unimodal learning. Although visual preference was common for both genders, it was not statistically significant. We also didn’t find any significance between both genders (p>0.05). Age has been accepted as a factor in the learning method shifting from one to another (22). However, as age increased, there were significant differences in visual and reading/writing learning style preferences. In this study, it was found that as the subjects got older, their preferences for kinesthetic and auditory modalities increased and their visual and reading/writing presentation preferences decreased in the same model (10,23).

Although it is not known exactly whether the difference in learning styles is due to different levels of medical education or to increasing age, it required further research by taking both factors into account (24).

However, in this study, age was not found to be significant between both groups.

We attribute this to the close distribution of the age between the 2 groups.

In a study conducted by Samarakoon and et al.(25), while first year medical students preferred auditory and reading/writing learning strategies, multimodal learning styles were preferred by senior students. According to logistic regression analysis, video-based learning increased the correct response rates 25-fold with more than five questions (OR: 25, p=0.0001) and 10-fold with more than seven questions (OR: 10, p=0.0001).

While the video includes both visual and auditory perceptions, the text-reading just includes visual perception. Moreover, in terms of the text-reading, this visual perception cannot include any motion or depth perception.

**CONCLUSION**
Visual perception is crucial in surgical education. Additionally, auditory perception is another important cornerstone. As a result, training with videos may make a significant remarkable difference in learning surgical tissue plans. In the comparison of learning modalities between video-based (bimodal modal-
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5. Dunn, Rita Stafford; Dunn, Kenneth J. Teaching students through their individual learning styles: a practical approach. Reston, VA: Reston Pub. Co; 1978. p.431.

6. Schwerdtfeger K, Wand S, Schmid O, Roessler M, Quintel M, Leissner KB, et al. A prospective, blinded evaluation of a video-assisted ‘4-stage approach’ during undergraduate student practical skills training. BMC Medical Education 2014; 14: 104. [CrossRef]

7. Greenhalgh T. Computer assisted learning in undergraduate medical education. BMJ 2001; 322: 40-4. [CrossRef]

8. Alick BE. Case studies of the effect of learning styles, problem-solving strategies and instructional strategies on the achievement of African American college students in general chemistry (African-American). Diss Abstr Int 1993; 54/06: A2108.

9. Boydak AL. Learning Styles. Istanbul, Turkey: White; 2001.p.8-10.

10. Brown B. Myths and Realities No. 26: Teaching Style vs. Learning Style. Columbus, OH: Educational Resources Information Center 2003.

11. Murphy RJ, Gray SA, Straja SR, Bogert MC. Student learning preferences and teaching implications. J Dental Educ 2004; 68: 859-66. [CrossRef]

12. Zhang S. Students’ Perceptions of Multimedia Classrooms at East Tennessee State University. dissertation.Johnson City, TN: East Tennessee State Univ; 2002.p.721.

13. Fulton JF. History of medical education. Br Med J 1953; 2: 457-61. [CrossRef]

14. Bonwell CC, Eison JA. Active Learning: Creating Excitement in the Classroom. Washington, DC: George Washington Univ; 1991.p.121.

15. Lujan HL, DiCarlo SE. First-year medical students prefer multiple learning styles. Adv Physiol Educ 2006; 30: 13-6. [CrossRef]

16. Lujan HL, DiCarlo SE. Too much teaching, not enough learning: what is the solution? Adv Physiol Educ 2006; 30: 17-22. [CrossRef]

17. Fleming ND. Teaching and learning styles: VARK strategies. New Zealand; 2001.p.128.

18. Kharb P, Samanta PP, Jindal M, Singh V. The learning styles and the preferred teaching-learning strategies of first year medical students. J Clin Diagn Res 2013; 7: 1089-92. [CrossRef]

19. Fleming N, Baume D. Learning Styles Again: VARKing up the right tree! Educational Developments, SEDA Ltd; 2006; 7: 4-7. [CrossRef]

20. Baykan Z, Naçar M. Learning styles of first-year medical students attending Erciyes University in Kayseri, Turkey. Advances in Physiology Education Published 1 Vol. 2007; 31: 158-60. [CrossRef]

21. Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? Adv Physiol Educ 2007; 31: 336-42. [CrossRef]

22. Rezaienejad M, Azizifar A, Gowhary H. Procedia - Social and Behavioral Sciences 2015; 199: 218-24. [CrossRef]

23. Whillier S, Lystad RP, Abi-Arrage D, McPhie C, Johnston S, Williams C, et al. The learning style preferences of chiropractic students: A cross-sectional study. J Chiropractic Educ 2014; 28: 21-7. [CrossRef]

24. Laxman Khanal, Sandip Shah, Sarun Koirala. Exploration of preferred learning styles in medical education using VARK modal. Russian Open Medical Journal 2014; 3: 0305. [CrossRef]

25. Samarakoon L, Fernando T, Rodrigo C. Learning styles and approaches to learning among medical undergraduates and postgraduates. BMC Med Educ 2013; 25:13-42. [CrossRef]