

The Impact of E-Learning on Creativity and Learning in Physiology Course in Nursing Students of Shahrekord University of Medical Sciences

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Background: Rapid advancement of information and communication technologies has transformed the methods of education. It has created methods which help students achieve deep and effective learning as well as develop a desirable level of creativity. Implementation of e-learning in education is one of such methods. The purpose of the present research is to study the impact of self-learning (self-paced learning) on learning progress and creativity in students of Physiology course of Shahrkoord Medical University in school year 2014-15.

Methods: The present study employs a quasi-experimental design which incorporates pretest-posttest and a control group. The statistical population consisted all nursing students of Shahrkoord University of Medical Sciences studying at the first semester of 2014-15 among whom 40 individuals studying at two separate classes have been selected as sample members using convenient sampling method. The instruments of data collection are the realized learning test (with 0.84 pretest reliability and 0.81 posttest reliability, and face validity confirmed by university professors) and Abedi creativity questionnaire. In order to analyze the data the independent T-test has been carried out using SPSS software Ver.18.

Results: The results of the study indicated that the use of E-learning in physiology teaching-learning process both improves nursing students' learning (by 4.32 points) and increases their creativity (fluency 4.67, originality 8.87, flexibility 4.73, and elaboration 4.32 points).

Conclusions: Based on the results yielded by the present study, implementation of e-learning improves creativity and learning in university students in physiology course. Therefore, executives of education system should consider incorporation of e-learning in teaching-learning processes.

Keywords: E-learning; Creativity; Physiology Course

بررسی تأثیر یادگیری الکترونیکی بر میزان یادگیری و خلاقیت دانشجویان در درس فیزیولوژی

زمینه: پیشرفت‌های سریع در حوزه فناوری اطلاعات و ارتباطات موجب تحول در روش‌های آموزشی شده و توجه را به سوی روش‌هایی جلب کرده‌اند که علاوه بر دستیابی یادگیرندگان به یادگیری عمیق و اثربخش، به سطح خلاقیت مطلوبی نیز دست یابند. یکی از این روش‌ها، بکارگیری یادگیری الکترونیکی در آموزش است. هدف از پژوهش حاضر بررسی تأثیر یادگیری الکترونیکی از نوع خودآموز بر میزان یادگیری و خلاقیت دانشجویان دانشگاه علوم پزشکی شهرکرد در درس فیزیولوژی در سال تحصیلی ۹۴-۹۳ بود.

روش: طرح پژوهش حاضر نیمه‌آزمایشی با طرح پیش‌آزمون-پس‌آزمون با گروه کنترل بود. جامعه آماری پژوهش را کلیه دانشجویان دانشگاه پیام‌نور شهر همدان که در نیمسال اول سال تحصیلی ۹۴-۹۳ مشغول به تحصیل بودند، تشکیل دادند. نمونه از طریق نمونه گیری در دسترس به تعداد ۴۰ نفر که در دو کلاس قرار داشتند، انتخاب شد. ابزار پژوهش شامل آزمون محقق ساخته یادگیری (شامل پیش‌آزمون با پایایی ۰/۸۴ و پس‌آزمون با پایایی ۰/۸۱) و تأیید روایی صوری توسط اساتید درس مربوط و پرسشنامه خلاقیت عابدی بود. برای بررسی داده‌ها از آزمون تی مستقل به کمک نرم‌افزار SPSS نسخه ۱۸ استفاده شد.

یافته‌ها: نتایج حاصل از پژوهش حاکی از افزایش میزان یادگیری (۴/۳۲) و خلاقیت (سیالی ۴/۶۷، ابتکار ۸/۸۷، انعطاف‌پذیری ۴/۷۳ و بسط ۴/۲۳) در گروه آزمایش بود (p=۰/۰۱).

نتیجه‌گیری: بر اساس نتایج پژوهش حاضر، کاربست یادگیری الکترونیکی موجب افزایش میزان خلاقیت و یادگیری دانشجویان در درس فیزیولوژی می‌شود، بنابراین بکارگیری آن در فرآیند یاددهی-یادگیری باید مورد توجه مجریان آموزش باشد.

کلیدواژه(ها): یادگیری الکترونیکی، یادگیری، خلاقیت، درس فیزیولوژی

دراسة تأثیر التعلّم الیكترونی علی مستوى النبوغ عند الطلاب فی دراهة ماده الفیزیولوجیا

التمهید: إن التطور التمسارعی فی تكنولوجیا المعلوماتیه و خاصه فی مجال التواصل ووجد تحول فی الأسالیب التعلیمیة. بحیث إضافة الی الحصول علی تعلم عمیق و مؤثر یرفع مستوى النبوغ عند الطلاب . واهدی هذه النماذج هوالتعلیم الیكترونی . إن الیرف من هذه الدراهة هو متابعه تأثیر اسلوب التعلّم الیكترونی علی التعلّم و النبوغ عند طلاب جامعه شهرکرد للعلوم الطبیة فی درس الفیزیولوجیا فی العام الدراسي ۹۳-۹۴.

الأسلوب: أسلوب هذه الدراهة النصف اختیاریة علی اساس الاختبار السابق و الالاح مع مجموعه المتابعه . تمت هذه الدراهة علی جمیع طلاب جامعه بیام نور فی مدینه همدان الی کانو یتابعون دراستهم فی الفصل الاول من العام الدراسي ۹۳-۹۴ هـ.ش. اعتمدنا فی البحت علی اختبار مرقوم (یشمل اختبار سابیو بثبات ۰.۸۴ و اختبار لاهو بثبات ۰.۸۱ . و تأیید بواسطه اساتذہ مختصین و ایضا استماره نبوغ (عابدی). تم استخدام اختبار (T) الإحصایی و برنامج spss18 فی تحلیل المعطیات.

النتائج: نتیجتاً هذه الدراهة الی ارتفاع فی مستوى التعلّم (۴.۳۲) و النبوغ (السیالی ۴.۶۷ ، الابتکاری ۸.۸۷ ، النماظفی ۴.۷۳ و البسطی ۴.۲۳) عند فزیوم الاختبار (p=0.001).

الاستنتاج: اشارت نتیجه هذا البحت الی أن استخدام اسلوب التعلیم الیكترونی سبب فی رفع مستوى النبوغ و التعلّم عند الطلاب فی الفیزیولوجیا. لذا نوصی منسقی التعلیم فی استخدام هذا الأسلوب فی مجال التعلّم و التعلیم.

كلمات المفتاح: التعلّم الیكترونی، التعلّم، النبوغ، درس الفیزیولوجیا.

فیزیولوجی طلباء کے سبق یاد رکھنے اور تخلیقی صلاحیتوں پر الیکٹرانیک ذریعے سے تعلیم کے مفید اثرات

ہیک گراؤنڈ: انفارمیشن اور مواصلاتی ٹکنالوجی میں تیز ترقی سے تعلیمی روشوں میں بھی ترقی آتی ہے اور نئی تعلیمی روشیں سامنے آ رہی ہیں۔ ان روشوں کے استعمال سے طلباء نہ صرف اپنے سابق یاد رکھنے میں بلکہ ان کی تخلیقی صلاحیتوں میں بھی نکھار آتا ہے۔ ان میں سے ایک روش الیکٹرانیک طرز تعلیم ہے۔ اس تحقیق کا هدف خود سے الیکٹرانیک ذریعے سے تعلیم حاصل کرنا اور طلباء کی تخلیقی صلاحیتوں پر اسکے مفید اثرات ہیں۔ یہ تحقیق دوہزار چودہ اور پندرہ میں انجام دی گئی تھی۔

روش: اس تحقیق میں بھی پری ٹسٹ اور پوسٹ ٹسٹ کی روش سے کام لیا گیا ہے۔ اس تحقیق میں شہر ہمدان کی پیام نور یونیورسٹی کے طلباء نے شرکت کی اور دو کلاسوں میں پڑھنے والے چالیس طلباء کا انتخاب کیا گیا۔ تحقیق کے لئے سوالنامہ دیا گیا تھا۔ ڈیٹا کا تجزیہ ایس پی ایس ایس سافٹ ویئر ورژن اٹھارہ اور ٹی ٹسٹ سے کیا گیا۔

نتیجے: اس تحقیق سے واضح ہوتا ہے کہ طلباء کے سابق یاد رکھنے کی صلاحیتوں، تخلیقی صلاحیتوں، لچک، اور جدت عمل میں اضافہ ہوا ہے۔

سفارش: اس تحقیق سے معلوم ہوا ہے کہ الیکٹرانیک ذریعے سے تعلیم حاصل کرنے سے طلباء کی صلاحیتوں میں اضافہ ہوتا ہے لہذا اسے یونیورسٹیوں میں اپنانا چاہیے۔

کلیدی الفاظ: الیکٹرانیک ذریعے، یاد رکھنا، تخلیقی صلاحیت۔

INTRODUCTION

Higher education as a very important institution of education system can have a magnificent impact on university students' intellectual process, mental ability, learning methods, and creativity so that they can proceed with critical and progressive thinking and provide solutions to current problems.

Today, university students need to enhance their creative process in order to establish new ways of thought and move forward to a developed society (1). Emergence of creativity requires an appropriate background for development. In order to develop such a capability, the obstacles and barriers should be identified and studied so that the background for cultivation of creativity on all students is properly set (2).

Numerous studies have suggested that creativity can be cultivated; it is known to be more of an acquired characteristic rather than an inherited one. Torrance (1974) analyzes creativity as being consisted of four basic elements: fluency, originality, flexibility, and elaboration (3).

Bentley (2002) defines creativity as application of knowledge and skills in new ways in order to achieve valuable results (4). Saki (2001) defines creativity as a combination of personal or collective thoughts and solutions in a new method (5).

Modern education systems should train individuals who are able to understand today's complex world and can be creative and original in its management and leadership. Implementation of e-learning in teaching-learning process is a way to realize this goal. Horton & Horton believe that in a broad definition, e-learning or electronic education is the use of web-based and internet technologies by any possible means in order to create learning experiences.

E-learning requires providing equal, free, and searchable access to educational curriculum and development of a dynamic educational environment for all social classes everywhere. It is the optimization of methods of presenting lessons in order to initiate deeper and more serious learning. As opposed to traditional education, such an educational environment gives the individuals the opportunity to acquire knowledge and information to their personal full capacity (6). E-learning is defined as a system based on technology, organization, and management which bestows upon the students the ability to learn via internet and facilitates their learning (7). Also Wanting et al. define e-learning as acquisition of the disseminated knowledge using electronic devices (8).

All in all, it can be said that e-learning refers to the use of systems of electronic education such as computer, internet, multimedia disks, electronic magazines, virtual newscasts, and etc. whose purposes are to reduce time and expenses and achieve better, faster, and easier learning. Through fundamental transformation of concepts of traditional education, learning based on new information technologies has been able to overcome defects in education systems and create fundamental revolutions in education. With the use of virtual space in learning, new and efficient methods of learning can be achieved. The reason behind the use of information and communication technology in learning is

better and faster education. Employment of information and communication technologies in education has created a new mode of learning which does not require physical attendance; hence, learning has been made possible in environments other than classrooms (9).

Emergence of new theories of teaching and learning has made the education to shift from being teacher-oriented to being student-oriented. Moreover, growth and evolution of new communication devices has enabled modern man to fresh methods of teaching and learning and break free of time and space barriers and keep on learning in any time and place according to his needs and demands (10).

Negash & Wilcox (2008) suggest that there are six different types of e-learning. These six types are presented below:

1. E-learning with Physical Presence and without E-communication (face-to-face)
2. E-learning without Presence and without E-communication (self-learning)
3. E-learning without Presence and with E-communication (asynchronous)
4. E-learning with virtual Presence and with E-communication (synchronous)
5. E-learning with occasional Presence and with E-communication (blended/hybrid-asynchronous)
6. E-learning with Presence and with E-communication (blended/hybrid-synchronous) (11).

Of all different types of e-learning, the present study focuses on the second type i.e. self-learning method of e-learning. This type of e-learning is in fact the self-instruction of self-paced method of learning. In this method, the learners use the educational media and take responsibility of learning on their own. Some of the studies conducted in this area are presented below.

In a study titled "the impact of e-learning on educational progress of students of Isfahan University of Medical Science" Keshavarz et al. (2013) concluded that e-learning has a positive impact on educational progress (6).

Zarie, Zavaraki & Rezaei (2011) in their study titled "the impact of using electronic portfolio on attitude, motivation, and educational progress of students of Khaje Nasir Toosi University of Technology" concluded that educational progress, motivation and attitudes toward the exam in the experimental group is significantly higher from the control group (12).

In their study titled "The Role of Virtual Training on the Students Creative Learning at Universities of Bojnourd, Northeast Iran" Delavar & Ghorbani suggest that virtual training affects creative learning in university students (13).

Fallah, Hosseinzadeh, and Eslami (2012) in their study titled "the impact of electronic education on different aspects of personality growth in pre-university students" have concluded that in comparison with students who have been educated under traditional methods of education, cognitive, psychological, social, and ethical growth of students who have been educated under electronic methods of education demonstrate higher levels (14).

In their study titled "the effect of using information and communication technologies in cultivation of creative thinking" Zanganeh, Moosavi, & Badali (2013) have

suggested that use of information and communication technology generally improves the growth and develops creativity (15).

In a study of the effect of e-learning on students' creativity, Banihashem, Farokhi Tirandaz, Shahalizadeh, & Mashhadi (2014) have concluded that e-learning is considered to be a component which positively affects students' creativity (16). Badali, Dana Mazra'e, Herfeh-Doost (2013) have conducted a study titled "the impacts of using electronic portfolio in students' creativity". The results of this study indicate the effectiveness of using electronic portfolio on creativity and its dimensions (fluency, flexibility, originality, and elaboration) (17).

In a research titled "The Effects of Multimedia Education on learning and Retention in a Physiology Course" Zare et al. (2015) have concluded that compared to students who have been educated in traditional methods, students who are educated using multimedia method demonstrate higher levels of learning and retention (18). Some studies have suggested influence of e-learning in Medical Sciences (19, 20 and 21)

The present research aims to study the impact of e-learning on learning and creativity (fluency, originality, flexibility, and elaboration) of students of educational management in Hamadan Medical University. In accordance with this purpose, the research hypotheses are developed as follows: The first hypothesis: student in traditional methods of education and student who use electronic methods are significantly different in terms of learning levels.

The second hypothesis: student in traditional methods of education and student who use electronic methods are significantly different in terms of creativity (fluency, originality, flexibility, and elaboration).

METHODS

The present study employs a quasi-experimental design which includes pretest-posttest and control group. The statistical population is consisted of all nursing students of Shahrekord University of Medical Sciences studying at the first semester of 2014-15; with the use of convenient sampling method sample, members have been assigned to two separate classes each containing 20 individuals. In a random process, one of the two classes is considered as the control group while the other is used as the experimental group. The Criterion for participation in the research has been sheer willingness to participate.

The present research employs two instruments of data collection.

1. The learning test: it is consisted of a pretest (with 0.84 reliability obtained from Cronbach's Alpha and with face validity confirmed by three experts in Physiology course) and a posttest (with 0.81 reliability obtained from Cronbach's Alpha and with face validity confirmed by three experts in Physiology course). Each test is consisted of 20 multiple-choice physiology questions in the field of nursing. The minimum score is 0, while the maximum score is 20.

2. The multimedia physiology educational software: the content of this software program includes physiology lessons in the nursing field of study. The program is designed by educational technology experts and its validity has been confirmed. This software program which is based on personal and individual learning has been purposefully

designed for the experimental group. In fact, the control group learns the physiology educational materials through lecture method while the experimental group learns the same material via multimedia educational software program.

3. Abedi creativity questionnaire: this questionnaire has been designed by Abedi in 1993 and is consisted of 60 triple-choice items. This questionnaire is constructed based on Torrance theory about creativity; it measures creativity in four dimensions of fluency (the ability to produce numerous and abundant ideas; questions 1 to 22; the scores ranging from 22 to 66), originality (the ability to produce new and unusual ideas; questions 23 to 33; the scores ranging from 11 to 33), elaboration (the ability to pay attention to details; questions 50 to 60; the scores ranging from 11 to 33), and flexibility (the ability to produce ideas using various and diverse methods; questions 34 to 49; the scores ranging from 16 to 48). This questionnaire has been selected due to its credibility and widespread use. The questionnaire's reliability in measurement of the four dimensions of fluency, originality, flexibility, and elaboration equals 0.87, 0.81, 0.89, and 0.86, respectively (22). At the beginning, both control and experimental group have been pretested on physiology lessons using Abedi's Creativity test. Then, the control group learns the physiology lessons through lectures, while the experimental group learns the same material through five one-hour sessions of multi-media education. For the control group the traditional lecture method has been employed while the experimental group has been educated using multimedia methods designed based on personal learning. Then, both groups are post-tested on physiology lessons using Abedi's Creativity test. The obtained data is analyzed using independent T-test and SPSS software Ver.18. It should be noted that all the subjects have been completely aware and willing to participate in the research.

RESULTS

The descriptive statistics of the control and experimental groups are presented in table 1.

The first hypothesis: student in traditional methods of education and student who use electronic methods are significantly different in terms of learning levels.

As demonstrated in table 2, in the pre-test phase the mean scores of the students shows no significant difference ($\text{sig} = 0.678$). However, considering the mean scores obtained in post-test phase, mean scores obtained by the two groups are significantly different ($\text{sig} = 0.001$). This means that the use of electronic education affects the learning in the experimental group.

The second hypothesis: student in traditional methods of education and student who use electronic methods are significantly different in terms of creativity (fluency, originality, flexibility, and elaboration).

As demonstrated in table 3, mean and standard deviation of the

Table 1. Descriptive statistics of the subjects

Frequency	Number	Group
20	20	Control
20	20	Experimental

Table 2. Results of independent T-test of participants' mean scores in learning test

p-value	T	D.f	Std. deviation	Mean	Group	Test
0.678	0.168	38	1.42	8	Control	Pre-test
			1.52	9	Experimental	
0.001	4.32	38	1.30	7	Control	Post-test

Table 3. Mean and standard deviation of the participants' scores in pretest and posttest of creativity

Elaboration		Flexibility		Originality		Fluency		Dimensions		Test
Std. deviation	Mean	Number	Groups							
1.45	7	1.30	9	1.30	7	0.65	6	20	Control	Pre-test
1.30	8	0.73	10	1.60	8	0.78	7	20	Experimental	
1.11	7.80	1.30	10	1.42	9.20	0.73	6.80	20	Control	Post-test
1.39	12	1.48	14	1.20	12	0.71	12	20	Experimental	

Table 4. Results of the independent T-test of creativity in control and experimental group at pretest and posttest

P-Value	T	Std. deviation	Mean score	Group	Test	Dimensions
0.657	0.178	1.20	8	Control	Pre-test	Fluency
		1.35	7	Experimental		
0.001	4.67	1	8.20	Control	Post-test	
		1.78	13	Experimental		
0.568	0.345	0.81	6	Control	Pre-test	Originality
		0.81	6.13	Experimental		
0.001	8.87	0.78	7.80	Control	Post-test	
		0.69	11	Experimental		
0.354	0.679	1	9.50	Control	Pre-test	Flexibility
		0.90	10	Experimental		
0.001	4.73	1.45	10	Control	Post-test	
		1.65	14	Experimental		
0.430	0.654	1.30	7	Control	Pre-test	Elaboration
		1.23	8	Experimental		
0.001	4.23	1.30	8	Control	Post-test	
		1.45	12	Experimental		

control and experimental groups' scores on fluency, originality, flexibility, and elaboration in the pre-test phase are not much different from each other. However mean and standard deviation of the scores obtained by the two groups in the post-test phase are considerably different. The post-test scores of the experimental group have significantly increased. Therefore it can be said that the use of electronic education affects students' creativity (fluency, originality, flexibility, and elaboration).

As indicated in table 4, in pretest phase there is no significant difference between scores of fluency, flexibility, originality, and

elaboration. However, considering the mean scores in post-test phase, the scores of fluency, originality, flexibility, and elaboration are significantly different in control and experimental group. Therefore it can be said that the use of electronic education improves students' creativity (fluency, originality, flexibility, and elaboration) in the experimental group.

DISCUSSION

The purpose of the present research is to study the impact of electronic education on learning and creativity in physiology

course students of Shahrkoord Medical University in school year 2014-15. Concerning the first hypothesis (student in traditional methods of education and student who use electronic methods are significantly different in terms of learning levels) the findings reveal that the use of electronic education improves the learning of physiology students in experimental group. The result is in alignment with that of the studies by Keshavarz et al. (6), ZareiZavaraki et al. (12), Delavar et al. (13), Zanganeh et al. (15), Banihashem et al. (16), and Badali et al. (17).

As for the second hypothesis (students in traditional methods of education and students who use electronic methods are significantly different in terms of creativity), the findings indicate that the use of electronic education affects physiology course students' creativity (fluency, originality, flexibility, and elaboration). These findings also correspond to those of the studies by Keshavarz et al. (6) who conclude that the use of e-learning will lead to educational progress, Zarei Zavaraki et al. (12) whose research reveals that the use of electronic portfolio significantly increases educational progress, progress motivation, and the attitude among university students, Delavar et al. (13) whose study points out the impact of electronic education on creative learning among students, Zanganeh et al. (15) who conclude that the use of ICT leads to effectiveness of creative capabilities, Banihashem et al. (16) who suggest

that the use of e-learning increases creativity, and Badali et al. (17) whose study points out the effectiveness of electronic portfolio on components of creativity.

The results obtained in the present study also indicate that the use of electronic method improves nursing students' creativity in the dimensions of flexibility, elaboration, fluency, and originality. It seems that the positive impact of self-paced electronic education (self-learning) on learning and creativity (fluency, originality, flexibility, and elaboration) is due to the learner being kept active and interactive throughout the whole process of learning. The reason is that in the designed self-learning software the learner has the responsibility and the control over the process of learning; therefore, it leads to improvement of both learning and creativity (fluency, originality, flexibility, and elaboration).

Considering the impact of e-learning as an educational method on nursing students' creativity and learning in physiology course, it is suggested that the decision-makers of medical education and educational executives employ this method of education. The convenient method of sampling and the limited number of sample members are among the limitations of this study.

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