
Analysis of the Effects of Smartification of the Schools on the Biology Learning of Students in the First Grade of High School

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Abstract: Since biology is one of the basic courses which requires deep conceptual understanding, teaching it in the usual way \ has been faced with challenges. On the other hand, smart schooling is recommended as the best pattern for the technology and information development in education. This research aims to analyze the effects of smartifying the schools on students' biology learning in the first grade of high school. The method applied is semi-trial with test and control groups. This research uses cluster random sampling among the high schools in Kermanshah. The first grade students of two classes with traditional education system and two classes with smart education system were selected. The sample size included 100 students divided by half into the test and control groups. The independent variable is the smart schools, and the dependent variable is learning. Chapter VIII content of the Biology Course was presented to both groups via traditional and smart methods. The applied tool was researcher-made learning examination, implemented in two phases (pre-test and post-test) on the groups. The results were analyzed via independent t-test in SPSS. The difference between the pre-test and post-test scores for both control and test groups reveals that there's a significant difference between the two groups; the mean score is higher in the test group.

Keywords: Smartification, Learning, Traditional Schools, Smart Schools, Biology

1. Introduction

The importance of biology both as a basic course and the basis for courses like physics and chemistry is obvious to everyone. What highly matters in biology is how to study it and understand the facts, concepts and the content of the textbook.

Living in the age of information and communication and with new technologies entering the field of education, the learners face more risks and need to learn newer and more comprehensive skills compared to the previous generations [1]. In this sense, smart schools could be considered as a sign of the presence of technology in the field of education.

Tully [2] believes smart schools are physical with a control and management based on computer technology and networks and the contents of most of courses are electronic and supervision and evaluation systems are smart. In the learning process, attention is paid to individual differences in

talents and abilities. In such a school, a smart student could develop and alter his sources and functionalities by spending time on subjects constantly which allows the school officials to prepare the students to obtain new information based on the changes occurred and the increase in their information level.

The purpose of smartification is to provide a condition in which easier learning and better outcome is met. The students' creative abilities are developed, and they are encouraged to take responsibility for their own learning. They're also encouraged to make a mutual connection with a larger society. The teachers are given the chance to update their scientific information and upgrade their teaching skills; they can use facilities available in the school to have a better and more accurate estimation of the students' conventional knowledge and to coordinate the educational courses and

lessons with it.

This research analyzes the effects of smartifying schools on the quality, the facilitation of and motivation for learning biology in the first grade of high school the results of which would be used for designing and producing proper and effective multimedia education.

Fazelian and Nazari [3] examined the effects of smart schooling on the teaching and learning processes of English language. The results reveal that smart schooling helps to improve these processes (in comprehension specifically) and is recommended to be used in learning processes of English language. Dalir Naser and Hosseini Nasab [4] conducted a comparative study on the educational progress and achievement motivation among students of elementary school in traditional and smart schools in Tabriz. As the results revealed, the students of the smart schools had higher educational progress and achievement motivation. Zaameni and Kardan [5] carried out research entitled the effect of ICT¹ usage in mathematics learning. The results suggest that ICT is effective in changing attitude, stabilizing and sustainability of the lessons, reasoning skills, creativity and finally active learning of mathematics. Turan [6] examined the usage of smart boards with cartoon characters on students' success. The results revealed that students in the test group were more successful than the control group.

Picouli [7] also proves that education aided by new technologies in smart schools causes the learners to achieve high self-regulation. Khaan and Masoud [8] studied interactive multimedia effectiveness with cooperative control approach on increasing thinking skills for cellular respiration learning. The results suggest that interactive multimedia creates a positive effect on cellular respiration learning by combining dominance and cooperative learning methods. In his research, Withing [9] analyzes the effect of computers on feeling included in the class. The results indicated that using computers in the class has positive effects on students and their education progress.

2. Methodology

The method used in this research is semi-trial, with pre- and post-test pattern and a follow-up group, applied in traditional and smart high schools in Kermanshah. The statistical population in the academic year 2015-16, includes 12123 students of first grade of high school according to Educational Statistics of Kermanshah. Cluster random sampling was used to select samples; among the high schools of Kermanshah two classes with traditional system and two with smart system were chosen. The sample size included 100 students divided by half into the test and control groups. At first, all groups were examined with the same pre-test (20 questions with the total score of 20) consisting of 4 true-false question, 4 multiple choice, 4 short-answer, 4 essay questions and 4 complete questions administered during 90 minutes. Then, the content of chapter VIII of the biology course was

presented in eight 90-minute sessions to the test group (in a smart school) and the control group (in a traditional school). Due to the non-interference of confounding variables both pre- and post-tests were taken in a completely similar condition.

The curriculum content in smart schools includes Chapter VIII of the Biology Course in which both teacher and the students present the production of electronic content in CD. Teaching is not limited to the teacher; teaching and learning are quite interactive and the students have a significant role in teaching scientific topics. Teachers can use the data banks, software applications, etc. to modify and improve the lessons. In traditional schools, the curriculum content also includes Chapter VIII of the Biological Sciences and Health Course which is presented by the teacher via chalk and board traditional method.

3. Measuring Tool

The research-made learning test: in this 20-item test designed for Chapter VIII of the Biology Course each question is allocated 1 score, and includes 4 true-false, 4 multiple choice, 4 short-answer, 4 essay and 4 complete questions. This test was administered as the pre- and post-test to both control and test groups. All questions had high face validity (higher than 1.5 for each question). Also, to determine the reliability, the correlation coefficient was measured among the graders; the final coefficient is called the Examiners Reliability Coefficient (Delavar, 1997). In this research, Spearman correlation coefficient was estimated by the judgment of two graders as 0.98. Thus, the questions are of good reliability.

4. Data Analysis

Kolmogorov-Smirnov Test is used to analyze data normality. The results are shown in Table 1.

Based on table 1, the results of Kolmogorov-Smirnov Test reveal that the statistical data has normal distribution ($p > 0.05$). So, parametric tests could be used to analyze learning.

Table 1. Kolmogorov-Smirnov Test to examine data normality.

		Learning
N		100
Normal Parameters	Mean	10.7575
	Std. Deviation	4.31881
	Absolute	.068
Most Extreme Differences	Positive	.048
	Negative	-.068
Test Statistic		.068
Asymp. Sig. (2-tailed)		.200

As the data is normally distributed, independent t-test is used via SPSS. The results are shown in Tables 2 and 3.

¹ Information and Communication Technology

Table 2. Average and standard deviation in the control and test groups.

	group	N	Mean	Std. Deviation	Std. Error Mean
Learning	control	50	8.7250	3.80428	.53801
	test	50	12.7900	3.84468	.54372

Table 3. The results of independent t-test on students' scores.

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
learning	Equal variances assumed	.015	.902	-5.314	98	.000
	Equal variances not assumed			-5.314	97.989	.000

Table 3. Continued.

		t-test for Equality of Means			
		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
				Lower	Upper
learning	Equal variances assumed	-4.06500	.76491	-5.58293	-2.54707
	Equal variances not assumed	-4.06500	.76491	-5.58293	-2.54707

Table 3 suggests that according to $F = .015$ and $p < 0.05$, there is a significant difference between the control and test groups via based on the difference between the pre- and post-tests.

5. Conclusion

The results indicate that smart schooling has a better effect on biology learning of students in first grade high school than traditional schooling. The results suggest that smartifying the schools helps the education of the students.

The results of this research are consistent with the findings of [3, 5-6, 11-14]. The consistency with previous studied indicates the significance of using smart methods. In general, various studies done about the effectiveness of smart methods indicate the desirability of them. The results mainly suggest that the quality of learning is higher when accompanied by students' higher activity. By getting the students involved in various activities and experiences, they must attempt to attain a set of knowledge, skills and attitudes in the forming and production of which they have contributed. The most important property of these methods is their aid in creating and developing thinking and learning skills in students, which seems to be the main problem in our country's education system. Yet this problem mainly can be solved by teaching via more active methods. The results of the conducted studies reveal that methods including more student activity result in creativity development. Computers and new multimedia devices have the ability to alter the learning environment, make it more appealing, attract students and learners to the learning process, reinforce the teaching-learning process in order to improve the quality of education and thus increase learners' motivation for learning the lessons. With the increase in motivation, students' efforts for learning will increase and thus they'll receive higher scores. As another reason to support these findings is that students' participation is low in traditional schools and there is not much encouragement for deep understanding and

learning. They do not have much motivation for learning and do not enjoy it much. In smart schools, on the other hand, learners have more participation and the use of technologies and smart boards make the subjects more interesting and their learning is more joyful. Students studying in smart schools have more independence and autonomy than those in traditional schools. Graphic pictures, diverse sounds, educational videos, etc. make a more attractive learning environment and cause the students to learn thoroughly and deeply, while in traditional schools learning is a boring process and the learners do learn the contents well. Involving and engaging the students in the process of learning in the smart schools results in more learning. Also, using the senses of hearing and sight and the cognitive ability excites the students. The learners have high autonomy in smart schools; thus they do their tasks and seek new information and resources actively.

Based on the results of this research, the following is recommended:

- According to the effects of smart schooling on students' learning, teachers are advised to use software application for generating content appropriate for that course for teaching other courses as well.
- The method discussed in this research is appropriate for courses with high rate of failure the learning of which requires deeper understanding.

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