Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.8, No.18, 2017

The Effect of Universal Design for Learning on the Academic Achievement and Self-Regulation Skills of High School Students in English Course[1]

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Abstract
The purpose of the present study is to examine the effect of Universal Design ror Learning (UDL) on high school students' learning a new grammar structure and self regulation skills in the English course. The study was carried out throughout 12 weeks with 64 students studying in two different 10th grade classes in Zonguldak province in the spring term of 2015-2016 academic year. In the study, two different groups were designated as the experimental group and the control group. During the courses, UDL was utilised as a teaching model in the experimental group, whereas traditional method was conducted in the control group. As one of the examples of quasi-experimental models, non-equivalent control group design was used in this study. Data was gathered with the help of an achievement test and self-regulation scale. These instruments were applied as a pre-test and a post-test in two groups. As a consequence, it was ascertained that UDL model is significantly and positively more effective on high school students' academic achievements and self regulation alike than traditional method.
Keywords: Universal design for learning, academic achievement, self regulation skills, high school students.

1. INTRODUCTION

UDL emerged from developments in architectural design, educational technology, and brain research. Architects designed buildings to meet needs of people with disabilities (Ralabate, 2011). Universal design for learning is described as a set of principles for curriculum development which give all the learners equal chances to learn (Udlcenter, 2015). UDL framework posits that inflexible curricular materials and methods are barriers to diverse learners. If curriculum designers notice these diverse learners, they can develop a curriculum for all learners (Hitchcock, Meyer, Rose & Jackson, 2002).

The essences of UDL are flexibility and to take into account alternatives to address learner needs, styles, preferences, abilities and disabilities. Flexibility has potential to maximize learning opportunities for all the students. Thus, the curriculum of UDL contains removing barriers in learning and providing flexible, customizable content, assignments, and activities (Edyburn, 2010; Rose, 2000; 2001). Accordingly, UDL offers options to students and teachers as to how information is presented, how to demonstrate their knowledge and skills, and how to take part in learning activities (Ralabate, 2011). Providing alternatives with respect to accessing, using, and engaging with learning materials enhances learning opportunities for every student (Rose, 2001). Additionally, universal design for learning is a framework to improve and optimize both teaching and learning by taking into consideration scientific insights into how human beings learn (CAST, 2015).

Furthermore, individuals' needs, interests and motivation for learning vary enormously. Neuroscience suggests that these differences are as varied as our fingerprints. In other words, we are all unique. In this regard, three brain networks outstand. Universal design for learning is reliant on neuroscience and focuses on three main brain networks. *Recognition networks* deal with "what" we learn as well as how we collect facts and classify what we hear, see and read. Besides, it identifies letters and words. In line with this network, teachers should present information and content in different ways (multiple means of represantation). This network is "what" of learning. *Strategic networks* are engaged in "how" we learn. This network plans and performs tasks. What's more, how we organize and express our ideas is a strategic task. Accordingly, teachers should differentiate the ways that the pupils can express what they know (multiple means of action and expression). *Affective networks* is about "why" we learn. How the students get engaged and stay motivated as well as how they are challenged, excited or interested are affective dimensions (multiple means of engagement) (Mayer, Rose and Gordon, 2014; Nelson, 2014).

These networks set a framework for thinking about students' strengths and weaknesses and how to eliminate barriers against learning with flexible materials and methods. And, three principles of UDL have a common recommendation for instruction, to provide students with wide range of options (Rose, 2001). So as to plan UDL application, three steps can be followed. These are defining learning goals, assessing diverse student needs and identifying learning barriers. It is important to define goals in a manner that allows students multiple

[1] This paper was reproduced from the first author's master thesis and it was supported by Bulent Ecevit University (Project Number: 2016-19959079-01).

ways to demonstrate the goals they have reached. Every student is different form each other in terms of his or her strength, weakness, interests, learning styles, readiness. So, these features may be taken in consideration to plan three learning network activities. Lastly, identifying barriers against learning provides an opportunity for removing these barriers (Ralabate, 2011).

Limited number of studies were conducted on UDL. The most of studies were performed in the USA, few of which were performed in other countries (Al-Azawei, Serenelli & Lundqvist, 2016; Mangiatordi & Serenelli, 2013). The studies showed that the students and teachers positively perceived the instruction based on UDL principles (Davies, Schelly and Spooner, 2012; McGuire-Schwartz and Arndt, 2007; Schelly, Davies and Spooner, 2011) and course (Hall, Cohen, Vue & Ganley (2015); He, 2014; King-Sears, et al. 2015; Kumar and Wideman, 2014; Staulters, 2006).

In our country, UDL has not been researched. Hence, herein lies the significance of the present study in that it has aimed to apply UDL in English course and explored effects of it on academic achievement and self-regulation skills of students.

2. METHODS

Design

The non-equivalent control group design which is one of the quasi-experimental designs was used to identify the effectiveness of the treatment (Gay and Airasian, 2000). Two groups were designated as the experimental and the control group. The instruction was conducted using UDL in the experimental group, while traditional method was applied in the control group. The achievement test and self-regulation skills scale were applied as a pre-test and a post-test in two groups.

Participants

The study was conducted on 64 students in the 10^{th} grade studying in the 2015-2016 spring term in Zonguldak Province. The experimental group and the control group consisted of 32 students. The age of participants is approximately 15 or 16 years old. The semestre grades, academic achievement test and self-regulation skill scale were used to identify whether groups are equal or not before treatment. Before the study, experimental group and control group were equal as regards semestre ($t_{(62)}$=-1,21; p>0,05), academic achievement test scores ($t_{(62)}$=0,55; p>0,05) and self regulation skill scores ($t_{(62)}$=-1,34; p>0,05).

Instruments

Achievement Test

The test was prepared by the researcher per se based on objectives in curriculum. Trial test consisted of 45 questions. Trial form was applied to 206 eleventh graders for the pilot study. The final form consisted of 30 questions. Mean of item difficulty index of test items was 0.61; mean of item distinguishing index was 0.80. Moreover, Cronbach Alpha internal constintency coefficient of test items was 0,98. It can be interpreted that this test measures reliably and validly English academic achievement level of pupils.

Scale of self regulation skill

The scale of self regulation skill which is a sub-scale of MSLQ developed by Pintrich ve De Groot (1990) and translated into high school in Turkey by İlker, Arslan and Demirhan (2014) was used to measure self regulation skill. The scale consisted of 9 items. Items were rated on a 7-point response scale ranging from 1 (not at all) to 7 (very much). The reliability coefficiencies of sub-scale were 0,75.

Analysis

The data obtained from the academic achievement test as well as the self regulation skill was analysed via SPSS 20. Thereby, mean, standard deviation, paired samples t test were conducted to analyse data. Furthermore, the effect size was calculated via Cohens'd. The interval of effect size 0,0 - 0,2 has no effect; 0,2 – 0,5 has small effect; 0,5 – 0,8 has medium effect; 0,8 and up has large effect (Green,Salkind and Akey, 2000). The data were interpreted in 95% confidence interval.

Besides, one way of analyses of covariance (ANCOVA) was utilised to compare differences between the two groups on the dependent variable (posttest scores) while statistically controlling the covariate (pretest scores). For both of the tests, eta square is included as a measure of effect size. Accordingly 0,01 is considered to have a small, 0,06 a moderate and 0,14 a large effect (Green, Salkind and Akey, 2000).

3.FINDINGS

Firstly, the experimental and control group students' pre-test and post-test means were compared with paired samples t test. The data obtained are shown in Table 1.

Table 1. The comparison of experimental and control group's academic achievement and self-regulation skills pre-tests and post-tests

		Experimental Group						Control Group					
Tests		**N**	**M**	**SD**	**t**	**p**	η^2	**N**	**M**	**SD**	**t**	**p**	*d*
Ac. Ach.	**Pretest**	32	11,87	5,30	11,42*	0,00	2,02	32	11,18	4,53	3,90*	0,00	0,69
	Posttest	32	20,18	4,89				32	13,87	4,93			
Self-reg.	**Pretest**	32	4,03	0,93	2,15*	0,039	0,48	32	4,34	0,92	1,65	0,107	-
	Posttest	32	4,43	0,74				32	4,01	1,03			

*p<0,05

The table 1 depicts that there were significant differences between the experimental group students' academic achievement pre-test scores (M=11,87; sd=5,30) and post-test scores (M=20,18; sd=4,89) in favor of post-test scores ($t_{(31)}$=11,42; p<0,05). Cohen's d value was calculated for effect size of this difference. Cohen's d value was calculated as 2,02 in experimental group. This value indicates a large effect. It can be interpreted that universal design for learning has a large effect on academic achievement in English course. Similarly, there were significant differences between the control group students' academic achievement pre-test scores (M=11,18; sd=4,53) and post-test scores (M=13,87; sd=4,93) in favor of post-test scores ($t_{(31)}$=3,90; p<0,05). Cohen's d value of this difference is 0,69. This value indicates a medium effect. It can be interpreted that traditional instruction has a medium effect on academic achievement in English course.

With regards to self-regulation skills scores, table 1 depicts that there were significant differences between the experimental group students' self-regulation skills pre-test scores (M=4,03; sd=0,93) and post-test scores (M=4,43; sd=0,74) in favor of post-test scores ($t_{(31)}$=2,15; p<0,05). Cohen's d value was calculated for effect size of this difference. Cohen's d value was calculated as 0,48 in the experimental group. This value indicates the medium effect. It can be interpreted that universal design for learning has a large effect on self-regulation skills. But, there were not significant differences between the control group students' self-regulation skills pre-test scores (M=4,34; sd=0,92) and post-test scores (M=4,01; sd=1,03; $t_{(31)}$=1,65; p>0,05). That is, traditional instruction didn't contribute to self-regulation skills of students.

At the same time, standart deviation has decreased both academic achievement scores and self-regulation skills scores at the post-tests in the experimental group. This change indicates that students scores became more homogenous in experimental group depending upon UDL.

The post test scores of both groups were compared with ANCOVA by controlling their pre-tests. The pre-tests were assigned as a covariate, post-test scores of experimental group students and control group students were compared. Results were presented in table 2.

Table 2. MANCOVA results.

Post-Tests	**Source**	**Sum of square**	df	F	**p**	η^2
Academic Achievement	Pre-test	672,056	1	*40,274**	*0,000*	*0,40*
	Group	*545,559*	*1*			
	Error	826,319	61			
	Cor. total	2135,937	63			
Self-regulation skills	Pre-test	3,639	1	*5,282**	*0,025*	*0,08*
	Group	*3,974*	*1*			
	Error	45,890	61			
	Cor.total	53,18	63			

p<0,05

Table 2 depicts that when pre-tests controlled, experimental group students' of academic achievement post-test scores were significantly higher than the control group ($F_{(1,61)}$=40,274; p<0,05). Eta square (η^2)of this difference was calculated as 0,40. This value both indicates a large effect and explains variance in post-test scores of experimental group students. That is, UDL has a large effect on experimental group students' academic achievement in English course and explains 40 % of variance in post test scores when pre-tests controlled. Similarly, when pre-tests controlled, experimental group students' of self-regulation skills post-test scores were significantly higher than those of the control group ($F_{(1,61)}$=5,282; p<0,05). Eta square (η^2)of this difference was calculated as 0,08. This value both indicates medium effect and explains variance in post-test scores of experimental group students. That is, UDL has a medium effect on experimental group students' self-regulation skills and explains 8 % of variance in post test scores when pre-tests controlled.

4. RESULTS and DISCUSSION

The purpose of this study was to examine the effects of universal design for learning on students' English lesson academic achievement and self regulation skills. Thus, the study focused on effects of UDL on standart deviation in addition to academic achievement and self-regulation skills.

The findings showed that students in experimental group outperformed the students in control group regarding English lesson academic achievement. Furthermore, it was found out that universal design for learning had a large effect on academic achievement in English course. Consequently, English language instruction based on UDL may enhance academic achievement in English course. The first principle of UDL's principles is recognition networks. This network requires to understand basic information and patterns among concepts. These properties overlap with the academic achievement in the present study. Instruction takes place by using multiple means of represantations. Therefore, presenting information in multiple ways may enhance academic achievement of students in the experimental group. Coyne, Pisha, Dalton, Zeph and Smith (2012), Hall et al. (2015), Kumar and Wideman (2014), Thorp (2008) conducted a study on effect of UDL on performance. The achievement of students in the experimental group increased more when compared to students in the control group. In contrast, these researches, King-Sears et al. (2015) did not find significant differences between academic achievement of experimental group and control group.

Universal design for learning leveraged self regulation skills of students in the experimental group in this study. That is to say, universal design for learning had medium effect on self regulation skills of students in the experimental group. Thus, it can be concluded that universal design for learning has a positive impact on improving self regulation skills. UDL aims to create self-regulated learners who can identify their own needs, monitor their own learning process, and regulate their behaviours and persist in learning task (Ralabate, 2011; 2016). To reach this purpose, it is provided by multiple means of engagement. Similarly, Hall et al. (2015), Katz (2013), Kortering, McClannon & Braziel (2008), McGuire-Schwartz, & Arndt (2007), Thorp (2008) researched the effect of UDL on student engagement. They have found that UDL enhanced active engagement of students in the lesson.

It can be concluded that UDL decreased standart deviation. That is, UDL decreased achievement and self-regulation differences among students. Experimental group becomes more homogenous at the end of treatment. Inasmuch as UDL environments encompass learning needs of all students and UDL plans are prepared by takin into consideration the individual differences (Ralabate, 2016). Such an instruction decreases differences between student marks and makes the group more homogenous. Similar to this result, Kennedy, Thomas, Meyer, Alves and Lloyd (2014) found that learning differences between students with and without disabilities diminished.

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