

EFFECTS OF CARTOONS ON STUDENTS' ACHIEVEMENT AND ATTITUDES IN BIOLOGY TEACHING (ENDOCRINE SYSTEM)

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Abstract

The purpose of this study is to determine effect of cartoons as a teaching tool towards student's achievement and attitudes about endocrine system and biology. This study was applied to students that include 28 students in control group and 28 students in experimental group in secondary school in Erzurum. In the research, mixed research design which consists of interview form with open ended questions and quasi-experimental non-equivalent pretest- posttest control group was used. An achievement test, attitude test and interviews were used to investigate the impact of using cartoons as a teaching tool on student learning in teaching of endocrine system. The findings of this study show that students' knowledge and understanding and attitude of biology was positively changed on the unit of endocrine system with the use of cartoons.

Key Words: *Cartoon-based teaching, Conventional teaching, Achievement, Attitude, Endocrine system*

KARİKATÜRLERİN BİYOLOJİ ÖĞRETİMİNDE ÖĞRENCİ BAŞARILARINA VE TUTUMLARINA ETKİLERİ (ENDOKRİN SİSTEM)

Özet

Bu çalışmanın amacı, endokrin sistem hakkında öğrencilerin başarıları ve biyolojiye karşı tutumlarına bir öğretim aracı olarak karikatürlerin etkisini araştırmaktır. Araştırma Erzurum il merkezinde bulunan bir lisede 28 deney 28 kontrol gurubunu oluşturan öğrencilere uygulanmıştır. Araştırmada, öntest-sontest kontrol gruplu yarı deneysel ve açık uçlu sorulu içeren görüşme formunu içeren birleştirilmiş araştırma modeli kullanılmıştır. Karikatürün etkisini ölçmek için endokrin sistem ile ilgili bir başarı testi, biyolojiye karşı tutum ölçeği ve nitel görüşmeler kullanılmıştır. Çalışmanın sonuçları göstermiştir ki; karikatürlerin kullanılmasının endokrin sistemle ilgili öğretim başarısının ve biyolojiye karşı tutumun artırılmasında etkili olduğu sonucuna varılmıştır.

Anahtar Kelimeler: *Karikatür destekli öğretim, Geleneksel öğretim, Öğrencinin akademik başarısı, Tutum, Endokrin sistemi.*

1. Introduction

Excellent and effective teaching demands a host of devices, techniques and strategies not only to achieve cross critical outcomes, but because variety. It has long been accepted that using a variety of teaching styles and training media, is more likely to aid learning than reliance on one style or a limited range of media. It has long been recognized that keeping it light, simple and using humor are powerful tools to be included in any learning methodology (Fleischer, 2010). One teaching instrument which perhaps is seldom used is the cartoon.

Cartoons are readily processed by children and adults – they are “easy on the eye and easy on the brain”. It is generally accepted that most people take in approximately 75-80% of information visually. It seems logical that the visual nature of cartoons would therefore make information processing easier. Learning can be enhanced by the use of cartoons over other visual media as it is usual in this media for visual distractions around the focal point of the image to be reduced, allowing people to concentrate on the issue at hand (Fleischer, 2010). As a teaching strategy, alleged benefits include the promotion of understanding, increased attention and interest, motivation towards learning, improved attitudes, productivity, creativity and divergent thinking (Parrott 1994). Other benefits include decreased academic stress and anxiety, boredom and disruptive behavior (Povell and Andrasea 1985).

The presentation of ideas in visual form has been proven to be particularly important as it helps the educational process in a critical way (Dalacosta et al.,2009). Many writers have already pointed out the importance of visual communication in the instructive practice (Arnheim, 1969; Barlex & Carré, 1985; Fisher, 1990). Graphical representations have advantages, given that words only have context in the culture of the speakers. Scientists are lost in their own sub-culture based vocabulary. In contrary, the concept that “a picture speaks a thousand words” has been used in numerous settings to communicate educational messages of importance (Srikwan and Jacobsson, 2007). Because a cartoon is a pictorial representation its effectiveness as an educational device is increased. More learning occurs visually than orally. Experienced teachers have seen so-called slow learners or non-academic students gaze intently at pictures, filmstrips, moving pictures, and cartoons. To be used effectively, cartoons must be seen by all. For this purpose the overhead projector, opaque projector or handouts will be found useful (Eulie, 1969).

Previous experience (Doring, 1998) demonstrated that often it is difficult to encourage students, particularly first years experiencing the transition to higher education, to openly think and discuss new concepts especially in large classes. Cartoons stimulate and encourage thinking processes, encourage discussion and the development of communication skills. They have been found to appeal to students of all ages (Fleischer, 2010). If we want our students to become creative and innovative, we need teaching, learning and assessment strategies which are equally creative and

thoughtful. Creating cartoons achieves two goals: it stimulates creativity and makes students locate the organisms they are studying in a medium that they value in their everyday lives (Ross, 2012).

A great way to reach students in the classroom is by using comics. Using comics can teach a wide variety of standards. At the most basic level, you can use them to look for comprehension skills as well as check their knowledge on main ideas. Cartoons are a great way to differentiate learning abilities as well as vary from the normal kill-and-drill worksheets (Stetson, 2011).

There are very defines about cartoon:

Cartoons are lightweight enough to permit integration of new material at a low cost, and can be designed to avoid the intimidation factor that lists of abstract do-and-don'ts typically seem to suffer (Srikwan and Jacobsson, 2007).

In the words of Brocka (1982), "Cartoons are a dynamic combination of visual image and written word, of narrative and dialogue. They have just the cohesive and choreographed imagery we need to reach our students".

The cartoon is a very special form of humor in which a few squiggles create in the mind of the beholder an image of incongruity that evokes a smile or laugh (Matthew, 1991).

A simple cartoon is a form of amplification through simplification (McCloud, 1993).

According to Horn (1980) "cartoons have the ability to make a point without the semantic ambiguities inherent in the written words".

There are a number of benefits to using cartoons in teaching according to literature (Perales and Vilchez, 2005; Vilchez and Perales, 2006; Dalacosta et al., 2009; Fleischer, 2010):

- Identified the likely progression in conceptual understanding
- Provided a means by which the teacher could both differentiate and assess learning
- Demonstrated that a constructivist approach is possible within the tight constraints of a curriculum program.
- The cartoons involve an everyday situation underpinned by a specific aspect of science
- Practical investigations stemming from the cartoons allow the students to explore their own ideas but within the context of specific curriculum objectives

- Cartoons can represent a resource in the classroom for identifying the pupils' previous ideas, as well as for making an assessment on their learning.

- Cartoons can be used in learning to great effect by simplifying difficult concepts and making them entertaining. In this way, the subject matter at hand can be demystified and it can bring concepts closer to the everyday person. In addition, they are intended primarily as an aid to teaching and learning

There are other benefits. Modern educational theory highlights the importance of interactivity, involvement of the audience who should be stimulated to think and to learn and whose reactions should affect the conduct of the teaching (Ramsden 1992; Biggs 1999).

They were used by many researchers in the classroom in order to promote learning, both in children and adolescents (e.g. Ball, 1982; De Fren, 1988; Demetrulias, 1982; Eulie, 1969; Madden, Chung, & Dawson, 2008; Peacock, 1995; Tsou, Wang, & Tzeng, 2006).

While their benefits have been demonstrated in nurse education (Pease 1991) and language teaching (Mollica 1976), in the foundation sociology units taught by the writer, the use of cartoons has been found to offer an effective means to develop particular skills.

1.1. Related researches

It has been demonstrated that some cartoons of suitable type (e.g. visual 'puns') can be used with the intention of serving a direct teaching function such as facilitating the learning of definitions and symbols and promoting insights into difficult concepts. This approach might also provide an instance of the deliberate cultivation and use of 'in-jokes' which come to be shared within a particular class or subject (Poveell and Andreseas, 1985). Other benefits include decreased academic stress and anxiety, boredom and disruptive behaviour (Poveell and Andreseas 1985).

Wright (1979) argued that cartoons could be successful in integrating cognitive processes with the psychomotor domain because of the integration of visual, auditory, and kinesthetic learning modalities. Philippe (1980) indicated that using cartoons is effective because they are familiar, can exaggerate events, and can reveal many facts at a glance.

Michigan State University writes on their website that humor reduces stress, increases student interest and attentiveness and does much to improve the classroom environment. They offer a list of articles on one of their resource pages that offer guidelines and examples of how to use humor in the classroom and in online courses (<http://oir.fod.msu.edu/oir/TeachingMethods/humor.asp>).

Countries, such as Japan, comics actually are considered to have great literary

value. Comics and graphic novels are used in their schools from first year all the way through university courses. There is a movement in America to educate teachers on the effectiveness of using comics to teach children to read and learn basic grammar. There are many positive effects of using comics in the classroom (Stetson, 2011).

Students' misconception is one of the most important problems in biology instruction (Çepni et al., 2006; Köse, 2007; Öztaş & Özay, 2004; Dikmenli & Çardak 2004). In Zöhre (1999) and Zöhre et al. (2002) and Çimer (2011)' study; it is defined that students have misconceptions on endocrine system since secondary level. The students stated that endocrine system and hormones were the most difficult to learn. Tekkaya et al. (2001), for instance, revealed that endocrine system and hormones, cell division and genes and chromosomes were the most difficult parts of the high school biology curriculum because students perceived these concepts as abstract and complex.

1.2. The Purpose of the Study

The purpose of this study is to determine effect of cartoons as a teaching tool towards student's achievement and attitudes about endocrine system. For this purpose, achievement and attitudes of students who have followed cartoon-based courses and who have followed more conventional courses were compared.

1.3. Research hypothesizes

The study was designed to address the questions:

1- H_1 : there is a significant difference between the experimental group and the control group in the students' achievements.

2- H_1 : there is a significant difference between the experimental group and the control group in the students' attitudes.

3- H_1 : In experimental group, students' detail perceptions about cartoon based learning are positive.

2. Method

2.1. Sample

This study was applied to students that include 28 students in control group and 28 students in experimental group in secondary school at the first semester of 2011-2012 education years. Groups chose one of them experimental and the other control group.

2.2. Design

In the research, mixed research design which consists of interview form with open ended questions and quasi-experimental non-equivalent pretest- posttest control group was used. This design is very prevalent and useful in education, since it is often

impossible to randomly assign subjects (McMillan & Schumacher, 2001).

2.3. Procedure

The data were collected from the subjects in the following manner:

-Two weeks ago from the treatment, the achievement test developed by the researchers and attitude test towards endocrine system were applied to experimental and control groups as pre-test for learn equality between groups.

-While traditional teacher centered instruction used the in the control group, cartoon-based learning was used in the experimental group. The traditional instruction was based on lecturing in class. It was not designed explicitly to facilitate conceptual understanding or conceptual change.

- In experimental group; daily newspaper and internet websites for science cartoons reviewed. Funny or relevant cartoons selected to illustrate a scientific concept found (appendix). There are a large number of professional cartoon sites available online that provide cartoons for educational purposes.

1. <http://www.benitaepstein.com/index.html>
2. <http://www.sciencecartoonsplus.com/pages/gallery.php>
3. <http://www.cagle.com/teacher/>
4. http://www.cartoonstock.com/directory/h/higher_education.asp

Table 1. Examples of some cartoon used during lessons

<i>Title of Cartoons</i>	<i>Scientific Concepts</i>
Jet lag	Melatonin hormone
7 dwarves	Growth hormone
Candy buy with “insulin money”	Insulin
Milk factory	Prolactine
Orchestra conductor	hypothalamus
In blood, transport of hormones in boat	Hormones
Peoples escape from snake with adrenalin (urgent help)	Adrenalin
Parathormone wake up Ca in bones	Parathyroid hormone
Hormones that measure osmotic pressure of blood with balance	ADH,aldosterone
Hypothalamus message to hypophysis with telephone	Communication

-The activities began with cartoons in experimental group. After, questions and problems connected with cartoons were offered students.

- The cartoons were given to the students. They read silently to themselves, and teacher read it aloud in the class. Students worked on the questions. When they finished, gone over the questions aloud so that students can see the right answers. The students were encouraged to discuss, and in some cases argue about, appropriate responses to the scientific questions and problems presented through the cartoons. They discussed the answers so that students can see why they missed questions.

-All treatment was completed by the same teacher in 2 weeks (two lecture hours per week and a lecture hours is 50 minute).

-One week later from treatment, the achievement test and attitude test was applied to both control and experimental group as post-test.

-Interview form which includes open ended questions was asked only experimental group after cartoon based learning in order to investigate students' detail perceptions about cartoon based learning. These questions aimed to explore the phenomena which could not addressed through the instruments.

2.4. Data collection tools

An achievement test, attitude test and interviews were used to investigate the impact of using cartoons as a teaching tool on student learning in teaching of endocrine system.

1- Achievement test

Students' achievement on endocrine system was measured by using the 20 multiple choice test developed by researchers. The tests were piloted with a group of students in a secondary school education in Erzurum. Then modifications were made in terms of language and design of the test. The test has 0,762 α -reliability coefficients. This level of reliability coefficient obtained for the achievement test indicated that the test could be considered satisfactorily reliable (McMillan & Schumacher 2001). The validity of multiple choice achievement tests were supplied by two professors of science education and three science teachers. Each question of test is one point.

2- Attitude test towards biology

The scale of attitude towards biology was developed by Pekel (2005) consisting of 15 items with reliability of 0.83. The five possible responses to each statement were 1 (strongly agree), 2 (agree), 3 (neither), 4 (disagree), and 5 (strongly disagree). This inventory was used to measure students' attitudes toward biology. Scores were based on the student responses on the Likert scale. A student obtained a single attitude score that fell between a minimum score of 1-2 and a maximum score of 4-5. A neutral score is in the mid-range of 3.

3- Interview form

A qualitative questionnaire was conducted in order to understand students' perceptions about the cartoon based learning. There were 3 open ended questions in the questionnaire. These questions' answers were coded and these coded were converted into scores in results section. Four of codes the most repeated by different students are selected. Interview questions:

- 1) How did the cartoons affect your learning? Explain your response.
- 2) How did the cartoons affect your attitude towards endocrine system? Explain your response.
- 3) Do you believe that you learn biology by analyzing cartoons?

2.5. Data Analysis

Attitude and knowledge changes were evaluated by using the Statistical Package for the Social Sciences (SPSS) Release 16.0 for Windows. *t* test were chosen as statistical analysis techniques.

3. Results

3.1. Students' achievements

The mean and standard deviations of data for each dependent variable according to groups and tests are presented in Table.2.

Table 2. Achievement Test Scores of Between Experimental and Control Groups Students

<i>Test</i>	<i>Group</i>	<i>N</i>	<i>X</i>	<i>Df</i>	<i>t</i>	<i>P</i>
Pretest	Experimental Group	28	7,67	3,27	0,52	0,60
	Control Group	28	7,25	2,83		
Post test	Experimental Group	28	14,17	3,20	4,99	0,00
	Control Group	28	10,07	2,94		

t-test showed that there aren't statistical significant differences between control and experimental groups with respect pre-test to achievement ($p=0,60$). Groups are equal each other. But there are statistical significant differences between control and experimental groups with respect post-test to achievement ($p=0,00$). A scientific achievement of experimental group is higher than scientific achievement of control group.

3.2. Students' attitudes toward biology

To explore whether there is a statistical significant difference between experimental and control groups with respect to attitudes toward endocrine system, t test was performed. The findings are given in Table 3.

Table 3. Attitude Test Scores of Between Experimental and Control Groups Students

<i>Group</i>	<i>Test</i>	<i>N</i>	<i>X</i>	<i>Df</i>	<i>t</i>	<i>P</i>
Experimental Group	Pretest	28	3,10	0,62	2,80	0,00
	Post test	28	3,53	0,50		
Control Group	Pretest	28	3,03	0,96	1,42	0,16
	Posttest	28	3,42	1,10		

t-test showed that there aren't statistical significant differences between pretest and posttest in control groups with respect to attitudes. But there are statistical significant differences between pretest and posttest in experimental groups with respect to attitudes. Attitude' increase of experimental group is higher than control group.

3.3. Interview form

Open ended questions, answers and students' numbers are in below:

1) How did the cartoons implemented in your biology lesson affect your learning? Explain your response.

- to provide retention of knowledge through a visual and memorable stimulus (24 student)

- to make learning and understanding easy (25 student)

- to encourage of students (12 students)

- to make the biology fun (28 students)

- to motivate student (20 students)

- to arouse interest (24 students)

- to maintain attention (28 students)

- to make students laugh (28 students)

2) How did the cartoons affect your attitude towards biology and endocrine system? Explain your response.

- it affected positively (28students)

- it developed my interest toward the biology (20 students)

- to supplied sensitive toward hormonal sickness (21 students)

3) Do you believe that you learn biology by analyzing cartoons?

- Yes (28 students)
- No (0 students)

4. Discussion and Conclusion

Cartoons represent an attempt to ask some of the questions that students might like to ask, if they would think in terms of everyday life situations/ideas, and actually get some answers. Through these cartoon situations science concepts can be given a breath of life and realism. And more important is that cartoons attempt to provide learning opportunities such as to facilitate the differentiation of scientific concepts, to recall effectively the prior knowledge and therefore, promote the process of conceptual development (Dalacosta et al., 2009).

The purpose of this study is to determine effect of cartoons as a teaching tool towards student's achievement and attitudes about endocrine system. For this purpose, achievement and attitudes of students who have followed cartoon-based courses and who have followed more conventional courses were compared. In this paper, we intended to set out the results of the experiments that we carried out with secondary school students regarding the use of cartoons in the teaching of biology.

The present study gives an insight into how students can better understand scientific concepts with the help of cartoons. The findings of this study show that students' knowledge and understanding was upgraded of the concepts of endocrine system with the use of cartoons.

In all cases, changes significant at the 0.05 level occurred in students' achievement and attitudes towards biology. Interviews confirmed these results. In accordance with the first research hypothesis, there are statistical significant differences between experimental and control group students regarding their academic achievement.

Our research showed that the presentation of cartoons gave it an obvious advantage as a learning aid, based upon the presentation of specific scientific knowledge in a popular form that is enjoyed by most students.

Results obtained from interview question supported it. This study' qualitative test shows that cartoons-based approaches help students easily understanding, learning and retention. Cartoons-based approach creates opportunities in the classroom for connections between biology concepts and the real world.

“I think that this method significantly affected retention of what I learned. I can bear in my mind them easily and imagine powerfully”.

“I think that it enabled us to learn more easily the biology”.

“The cartoons that are presented at the beginning of the lesson had a positive effect on my learning”.

“It **helped me engage** actively with the situations and the cartoons chosen from **real-life incidents** Therefore, I think it affected positively my learning”

These results support the findings of others (Keogh and Naylor, 1999; Ugurel and Morali, 2006; Kabapınar, 2005; Balım et al.,2008; Ekici et al.,2007) who claim that cartoons helps students concentrate on the lecture and the visual aspects of the cartoons makes the lecture entertaining and exciting.

They have been found to be a very useful training tool because they are more readily processed by the brain: after all, a picture tells a thousand words. Cartoons can also be more easily processed by people who may lack language skills and can help avoid cultural bias that may occur in other forms of media or in materials that are more reliant on text. Appealing to both children and adults, cartoons appear to be increasingly utilised in educational contexts including (Fleischer, 2010). Humor is often identified as a teaching technique for developing a positive learning environment (Ferguson & Campinha-Bacote, 1989; Hill, 1988; Schwarz, 1989; Warnock, 1989; Walter, 1990).

The results obtained allowed us to put forward some considerations, such as:

- Teaching biology by showing cartoons constituted a clear incentive in the students' attitude towards the subject.
- This type of strategy can bring biology teaching closer to the communication media that most interest the students, and therefore reduce the barrier between school science and everyday knowledge.
- This type of strategy can supply positive experiences and increase motivation for participation
- This type of strategy can supply improved social and collaborative competencies
- Teaching biology by showing cartoons constituted a clear incentive in the students' academic achievement towards the subject.
- This type of strategy can supply improve transfer of learning and peer interaction support
- Teaching biology by showing cartoons accommodate student learning styles

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