

Efficiency of Computer Assisted Cooperative Learning Method On Students' Performance In Using Colors

Bilgisayar Destekli İşbirlikli Öğrenmenini Öğrencilerin Renk Kullanma Performanslarına Etkisi

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ABSTRACT

In this study, the effects of computer assisted cooperative learning method on students' performance of using colours in art education were examined. 15 students at the ages between 12 and 15 who owned a personal computer and had access to the internet were selected to form the experimental group. 35 students at the same time age and education levels were randomly selected to form the control group. In order to determine the students' performance in using colours a performance instruction was developed. The program took place for six weeks and at the end of the program posttest drawings were collected. In this study the results were in favour of the experimental group

Key words: Cooperative learning, computer assisted, using colors, art education, students' performance.

ÖZ

Bu çalışmada, bilgisayar destekli işbirlikli öğrenme yönteminin, sanat eğitiminde öğrencilerin renk kullanma performanslarına etkisi araştırılmıştır. Kendine ait bilgisayar ve İnternet bağlantısı olan 12-15 yaş arası çocuklardan 15 tane öğrenci deney grubuna seçilmiştir. Aynı yaş ve eğitim düzeyine sahip 35 öğrenci de random örnekleme yoluyla kontrol grubuna seçilmiştir. Öğrencilerin renk kullanma performanslarını belirlemek amacıyla bir performans yönergesi geliştirilmiştir. Programın uygulanması altı hafta sürmüş ve programın sonunda son test amaçlı resimler toplanmıştır. Bu çalışmada, renk kullanma performanslarının deney grubu lehinde sonuçlandığı görülmüştür. Bu çalışmanın sonuçları deney grubunun lehinde olmuştur

Anahtar Sözcükler: İşbirlikli öğrenme, bilgisayar destekli, renk kullanma, sanat eğitimi.

INTRODUCTION

Students' skills, learning and thinking styles, academic motivation levels and interest are different from each other. The modern educational environment puts the teacher in a position in which s/he has the necessity and responsibility to select and apply the teaching method, which would maximize the learning. Lazarowitz, Lazarowitz and Baird (1994) criticizes the teaching method which is based on teachers explanation for encouraging learning through individual work and competition, not contributing enough to the academically and social development of all the students in the classroom and for only applying to hard-working children and suggests that teachers should use other methods than these. According to Lazarowitz and friends since the

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explanation method is not suitable enough for the students' expressing and discussing their thoughts and asking the thing they don't understand it is disadvantageous especially for students who have understanding problems.

Computer supports learning in different ways. In situations which are difficult to implement and expensive in cost, computers assist to develop the learning environments. Computers can also be considered as one-to-one learning tool. In this case, there are two research activities. One of them is "computer assisted teaching" in which assisting and helping the activities students developed or reinforcing the activities take place. The other one is using the computer for cooperative learning as an environment and source. In direction computers support the students cooperation and communication by assisting the coordination process in shared activities. Barker and Yeates (1985: 27) indicate that computer assisted education has improved the efficiency of traditional teaching techniques, accelerated the learning process and provided compensatory education.

As it has become easy to share information through the computer network, this started to effect the individual competence. McConnell (1994) indicates that Computer Assisted Cooperative Learning (CACL) is different from traditional teaching and that it eliminates the time concept and each member contributes to the group work. Since it provides an opportunity for students to look from their own perspectives and from others' perspectives it provides a rich experience environment.

In CACL group communication is a technology developed to facilitate group work. Group work can be classified in two aspects: Synchronized and Asynchronized group work. Asynchronized communication is a communication system independent from time and place. They are provided by services such as interactional web pages, e-mail, file transfer, discussion and news groups. Synchronized communication, on the other hand, is a communication process which is usually dependent to time and place and occur on face-to-face basis. However, by using different computer hardware tools (microphone, web camera, etc.) and softwares (messenger, net meeting, ICQ, etc.) synchronized communication can be established.

Johnson, Maruyama, Nelson and Skon in a study in which they reviewed 122 researches about the relationship cooperative learning and academic success in 1981 pointed out that for academic success in all age groups and in all subject masters cooperative learning method had more positive results than the "competitive learning" and "individualistic learning" methods (Johnson and Johnson 1999). Slavin (1983) in a study in which 16 researches were examined determined that in 63% of the researches cooperative learning, when compared to competitive and individualistic learning methods, showed significantly positive results for academic success.

In art education also CACL has an important effect. Art Education gives people freedom and develops creativity. All the researches and studies conducted by Jeffus(1999) about education, led him to believe that art education is the most important catalyzer for problem solving and creative thinking. One of the objectives of visual art education as follows: The student comprehends the techniques, processes and media applications about visual art (Walling, 2001: 628; Davis, 1999: 30).

The 12 and 15 years old children are between the logical and puberty period of the developmental phase in art education. The child, in this period, tries to reflect the ratio, dimension, and depth of the objects, s/he observes in the environment, to drawings. S/he has the skill to solve problems with her/his intelligence and logic but still is a child. In the human drawings of this period the joints are observed and transferred to drawings. They witness the changes in the nature and feel it. The puberty period is a period in which the child or the young tries to reflect the environment in a realistic way. They should be taught how to look to a reality concept by introducing them the art

works of different periods and civilizations. Lowenfeld and Brittain (1970) designed the developmental phases of art by assuming that individuals will develop from being “universal to partial”. Lowenfeld and Brittain indicate that the first period in which colors are important for children is between 4 and 7 years old. For 7 to 9 years, from pre-schematic period until the schematic period children use colors for representative specific objects. At the age of 9 they begin to conceive the differences between colors. At the age of 14 they become capable to respond to different feelings with different colors. According to them the children in this period are between the expressionist color perception and realistic color perception. O’Hare and Cook (1983:268) classified the artistic works of the children under five categories. In this classification we cannot observe any property related to colors.

Milne and Greenway (1999) conducted a research in order to indicate that there is a difference between girls and boys in using colors in their drawings. Their research included 33 boys and 28 girls, a total of 61 subjects, between the ages of 4 to 14. It was observed that elder boys tended to use fewer colors than the younger boys while girls had a tendency to use colors and that this did not show any difference according to ages. Richards and Ross (1967) examined 1200 of the cat and kitten pictures that the children between the ages of 5 to 14 had drawn. They counted the number of the colors used in the picture, and examined the unrealistic colors, the peacefulness in the sky and ground lines, the situation of the background and the usage of drafts. The results of the research showed that all the measurements differed according to age and gender, girls showed an early development in using colors when compared to boys, the highest measurement peak was around the age of 12 and that this showed decrease later.

The rapid development and science and technology and the rapid increase in knowledge on one hand enlarges the scope of education while on the other hand form new requirements for education. The researches conducted determined that the students in the puberty period defined by Lowenfeld and Brittain, suffered from using colors in their drawing and for this reason quitted to use colors and began to charcoal drawings. Most of the researches about students’ using colors were conducted to point out the differences between gender and age groups. In literature, there are no studies about improving the performances of students who have low performance of using colors. It is considered that children will actively involve in using colors in cooperative learning environments supported with computers.

The aim of this study is to find out the effects of CACL on students’ performance of using colors in art education; to determine whether there are any differences in the students’ performance of using colors when taught through CACL method and the traditional method; and, to examine the effects of CACL method on the performance of using colors between girls and boys.

METHOD

Participations

In this study an experimental and a control group was established by using the pre-test–post-test model of Campbell and Julion (1966). The population of the research consisted of the adolescents between the ages of 12 to 15 and who were in puberty phase. For the sample of the research 15 students who owned a personal computer and had access to the internet were chosen to form the experimental group. 35 students at the same time age and education levels were randomly selected to form the control group.

Data Gathering Method

In the research as a data gathering method an evaluation rubric developed in order to evaluate the portfolio materials prepared by the students (Dikici, 2003). Paulson, Paulson and Meyer (1991:60) defined as portfolio as an aimed total of the student works which reflect individual development and success. In portfolio evaluation approach it is important for the criteria to be integrated, because these kinds of rubrics facilitates the evaluator and provides a broader perspective for success (Aschbacher, Koency and Schacter, 1995).

The basic components of the desired student performance were determined and they were transformed into measurable evaluation items. The score determination was established by specified principles and values increasing two by two were given in equal intervals from 0 to 8 (Herman, Gearhart and Baker, 1994; Custer, 1996; Moscal, 2000).

The scoring criteria are as follows:

Task not done or no evidence of success.....	0 point
There is some evidence of success.....	2 point
Improving.....	4 point
Good.....	6 point
Perfect.....	8 point

In order to prove the reliability of the rubric, evaluators were determined. The reliability of the evaluators was by the probability of similar scoring by different evaluators (Moscal, 2000). Including the researcher three art teachers did the scoring. In order to eliminate the inconsistency between the evaluators, they were informed about the rubric (Koretz, Stecher, Klein, McCafery and Deibert, 1993).

In the pre-application drawings of 35 students were studied. The reliability analysis of the evaluators' scoring in pre-application showed that there was a high correlation of .76 between the first and third evaluator .71 and the correlation between the second and third evaluator was .72. The Cronbach Alpha value was .87.

Experiment

The CACL program was established to be applied to the experimental group. Before the beginning of the program drawings were collected from both the experimental and control groups as a pre-test. The program took place for six weeks and at the end of the program post-test drawings were collected.

During the implementation of the program web pages containing information about colors and e-mail were used. The program was implemented on asynchronized basis.

In order to provide cooperative learning the experimental group students were divided into groups of their and five, three expertise groups were determined.

- 1.The first expertise group worked on information about color perspectives and examples.
- 2.The second expertise group worked on color harmonies.
- 3.The third expertise group worked on the psychological effects of colors.

For the first two weeks the students in the expertise groups worked on their subject and starting from the third week returned to their groups and shared the information and discussed the examples. Group discussion took place in the classroom and on internet network. Traditional teaching method based on teacher explanation was

applied to the control group. At the end of the six weeks drawings were gathered both from experimental and control group students as a post-test.

Analysis of Data

The results were processed by using the SPSS for windows package program. Arithmetical average, standard deviation and t-test were used as the analysis techniques. In comparison between groups independent groups t-test was used and with the Levene's Test the homogeneity of variance was tested. In the pre-test and post-test comparisons within the group paired groups t-test was used and homogeneity of variance was determined by Kolmogorov-Smirnov Z Test. In cases in which the variance showed a homogenous distribution ($P > .05$) parametric tests (t-test) were used.

RESULTS and DISCUSSION

In the section the findings were analyzed in the directions of related hypothesis.

Hypothesis 1: No significant differences are observed between the pre-test and post-test scores of the experimental group in which CACL was implemented:

According to the t-test result between the pre-test and post-test scores of the experimental group in which CACL was used [$t(14) = -9.60 p < .05$] a significant difference was observed and hypothesis 1 was rejected. This can be interpreted as the CACL method applied improved the students' performance in using colors (Table 1).

Table 1. Table of Analysis Related To the Pre-Test and Post-Test Scores of the Experimental Group in Which CACL Was Used

Exp. group	n	\bar{x}	sd	Kolmogorov		r	df	t	p
				z	Sig.				
Pre-test	15	3,02	,91	,969	,305	,69	14	-9,60*	,000
Post-test	15	4,64	,60	,889	,408				

* $P < .05$ Significant

Hypothesis 2: No significant differences are found between the pre-test and post-test scores of the control group in which traditional teaching method was applied.

According to t-test results of the between the pre-test and posttest scores of the control group in which traditional teaching method was used [$t(34) = -13.50 p < .05$] a significant difference was found and hypothesis 2 was rejected. It can be indicated that the performance of using colors of the students in the control group has also increased (Table 2). In this situation, it will be more appropriate to compare the experimental and control group.

Table 2. Results of the Analysis Related To the Pre-Test Scores Between The Experimental Group and Control Group

Control group	n	\bar{x}	sd	Kolmogorov		r	df	t	p
				z	Sig.				
Pre-test	35	2,78	,93	1,375	,871	,91	34	-13,50*	,000
Post-test	35	3,70	,73	,046	,434				

* $P < .05$ Significant

Hypothesis 3: No significant differences are found between the pre-test scores of the experimental group in which CACL method was used and the control group in which traditional method was used.

Before implementing the CACL method the results of the t-test between the scores of the experimental and control group [$t(48) = .841 p > .05$] did not show any significant differences (Table 3). In this case, hypothesis 3 was accepted. After applying the CACL method the analysis between the experimental group and control group were examined.

Table 3. Result of the Analysis Related To the Pre-Test Scores
Between The Experimental Group and Control Group

Groups	n	\bar{x}	sd	Levene's Test		df	t	p
				F	Sig.			
Expe. Pre-test	15	3,02	,91					
Control Pre-test	35	2,78	,93	,003	,955	48	,841	,405

Hypothesis 4: No significant differences are found between the post-test scores of the experimental group in which CACL method was used and the control group in which traditional method was used.

According to the t-test results between the post-test scores of the experimental group and control group [$t(48) = 4.31 p < .05$] a significant difference was found (Table 4). For this reason hypothesis 4 was rejected. The arithmetical average of the experimental group was 3.02 on the pre-test while it was 4.64 on the post-test. There was an increase of 1.62 in the arithmetical average of the experimental group. The arithmetical average of the control group was 2.78 on the pre-test while it was 3.70 on the post-test. There was an increase of 0.92 in the arithmetical average of the control group. This indicates that when compared with the traditional method CACL method improves the performance of using colors more.

Table 4. Result of the Analysis Related To the Post-Test Scores
Between The Experimental Group and Control Group

Groups	n	\bar{x}	sd	Levene's Test		df	t	p
				F	Sig.			
Expe. Post-test	15	4,64	,60					
Control Post-test	35	3,70	,73	,151	,699	48	4,31*	,000

*P<.05 Significant

Hypothesis 5: No significant differences are found between the pre-test and post-test scores of the girls and boys in the experimental in which CACL was used.

According to the pre-test data of the experimental group [$t(13) = -2.575 p < .05$] hypothesis 5 was rejected while according to the post-test data of the experimental group [$t(13) = -.680 p > .05$] it was accepted (Table 5). The results of the analysis showed that before the implementation of CACL method the girls had better performance in using colors than the boys. However, after the implementation of CACL, this difference was not observed anymore.

Table 5. Result of the Analysis Related To the Pre-Test and Post-Test Scores
Between The Girls and Boys in Experimental Group

Experimental Group	n	\bar{x}	sd	Levene's Test		df	t	p
				F	Sig.			
Pre-test Boy	8	2,54	,64					
Pre-test Girl	7	3,57	,89	2,268	,156	13	-2,575*	,023
Post-test Boy	8	4,54	,58					
Post-test Girl	7	4,76	,65	,829	,379	13	-,680	,509

*P<.05 Significant

Hypothesis 6: No significant differences are found between the pre-test and post-test scores of the girls and boys in the control group in which traditional method was used.

According to the data of pre-test [$t(33) = -2.077 p < .05$] and post-test [$t(33) = -2.238 p < .05$] of the control group, hypothesis 6 was rejected (Table 6). It was observed that the traditional teaching method did not make any difference in the performances of using colors in girls and boys. However Table 5 showed that the boys who had a low performance in using colors improved their performance after the implementation of the CACL method. The data given in Tables 5 and 6 supports the findings of Milne and Greenway (1999).

Table 6. *Result of the Analysis Related To the Pre-Test and Post-Test Scores Between The Girls and Boys in Control Group*

Control Group	n	\bar{x}	sd	Levene's Test		df	t	p
				F	Sig.			
Pre-test	Boy	16	2,43	,84	,874	33	-2,077*	,046
	Girl	19	3,06	,93				
Post-test	Boy	16	3,41	,61	,691	33	-2,238*	,032
	Girl	19	3,94	,76				

*P<.05 Significant

In contrast to the individualistic and competitive learning methods, the cooperative learning method is based on students' working together to solve the problems. Seeking for a solution to a problem cooperatively means having more options for solution. The individuals while trying to convince the others about his/her thoughts in the same time learns how to analyze, synthesize and criticize the thoughts of the others and this contributes highly to the development of critical thinking. Cooperative learning contributes to the critical thinking of the students during the art works.

Art education can be considered as a kind of education which is provided to teach art, make students love art and to make art live and to develop the creativity of the individuals. In previous studies on art education it was found that students had difficulties in using the colors. However, in literature there are no studies about solving this problem. It is known that the idea of cooperation is not new and that cooperation increases the efficiency of people. In this study, it was aimed to develop a learning environment based on CACL method among students by the assistance of new technologies.

CONCLUSION

The data of this research showed that CACL increased the performance of students in using colors. It can be indicated that the web pages used in the CACL method had an effect on the students' performance in using colors. In addition, while e-mailing their studies to the other group members and receiving the criticism of their friends in the expertise group helped the students to acquire different perspectives about colors. It was also observed that this study conducted in a cooperative environment improved the friendship attitudes of the students and had a positive effect on their socialization. This research supports the researches conducted by Johnson and Johnson (1999) and Slavin (1983) about the superiority of cooperative learning method on the other methods. In addition, this study also supports the research conducted by Milne and Greenway (1999) which indicates that girls have more

tendencies to use colors. However, by applying the CACL method the differences between the girls and boys were eliminated and the both groups' performance in using colors was improved. Data gathered from the control group also was in favor of girls.

Depending on the results of this study art teachers should be informed to use the CACL method. The art workshops of schools should be reorganized by adding the new technology systems and tools. In addition, the effects of CACL on developing students' compositioning performances in their drawings can also be studied.

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ÖZET

Öğrencilerin yetenekleri, öğrenme ve düşünme biçimleri, akademik motivasyon düzeyleri ve ilgileri birbirinden farklıdır. Çağdaş eğitim anlayışı öğretmeni, öğren-meyi maksimum düzeyde gerçekleştirecek öğretim metodunu seçme ve uygulama sorumluluğu ile karşı karşıya bırakmaktadır. (Barker ve Yeates (1985: 27) bilgisayar destekli eğitimin, geleneksel öğretim yöntemlerini daha etkili hale getirdiğini, öğrenme sürecini hızlandırdığını ve telafi edici eğitimi sağladığını belirtmektedirler. McConnell (1994), Bilgisayar Destekli İşbirlikli Öğrenmenin (BDİÖ) geleneksel öğretimden farklı olduğunu, zaman kavramını ortadan kaldırdığını ve grup çalışmalarına herkesin katkıda bulunduğunu belirtir. Öğrencilerin kendi ve diğer öğrencilerin perspektifinden bakabilme imkanı sağladığından dolayı zengin bir yaşantı ortamı sağlamaktadır. Sanat eğitiminde de BDİÖ'nün önemi büyüktür. Sanat eğitimi insanı özgürleştirilen ve yaratıcılığı geliştiren bir eğitim biçimidir. Jeffus'un (1999), eğitim alanında yaptığı bütün araştırma ve çalışmalar, onu sanat eğitiminin problem çözme ve yaratıcı düşünme için en önemli katalizör görevi gördüğüne inandırmıştır. Yapılan araştırmalar, Lowenfeld ve Brittain'in belirlediği ergenlik dönemi öğrencilerinin, resimlerinde renk kullanma sıkıntısı çektiklerini, bu nedenle de öğrencilerin renk kullanmayı terk edip resimlerini karakalem ile yapmaya eğilimli olduklarını ortaya koymaktadır. Öğrencilerin renk kullanmaları konusunda yapılan araştırmaların çoğu, öğrencilerin cinsiyetleri ve yaş düzeyleri arasındaki farklılıkları ortaya koymaya yöneliktir. Literatürde, renk kullanma performansları düşük öğrencilerin bu performanslarını geliştirmeye yönelik bir araştırmaya rastlanamamaktadır. Bilgisayarın bir araç olarak kullanıldığı işbirlikli öğrenme ortamında çocukların renk kullanmaya daha aktif olarak katılacakları düşünülmektedir. Bu araştırmanın amacı; BDİÖ'nün sanat eğitiminde öğrencilerin renk kullanma performanslarına etkisini araştırmak ve BDİÖ yöntemi ile geleneksel öğretim uygulaması sonucu öğrencilerin renk kullanma performansları arasında fark olup olmadığını belirlemektir. Ayrıca, BDİÖ yönteminin kız ve erkek öğrenciler arasında renk kullanma performanslarına etkisini araştırmaktır. Bu çalışmada, Champbell ve Julion'un (1966) ön-test - son-test modelinden yararlanılarak bir deney ve bir de kontrol grubu oluşturulmuştur. Araştırmanın evrenini; yaşları 12 ile 15 arasında değişen ve ergenlik gelişim evresinde yer alan er-genler oluşturmaktadır. Araştırmanın örnekleme için, kişisel bilgisayara sahip olan ve istediği anda internete girebilen 15 öğrenci deney grubuna seçilmiştir. Aynı yaş düzeyine ve aynı eğitim düzeyine sahip 35 öğrenci de random örnekleme ile kontrol grubuna seçilmiştir. Araştırmada veri toplama aracı olarak; öğrencilerin hazırladıkları portfolio materyallerin değerlendirilmesi için değerlendirme yönergesi geliştirilmiştir (Dikici, 2003). Geliştirilen yönergenin geçerlik ve güvenilirlik çalışması için 35 öğrenci resmi üzerinde çalışılmıştır. Yönerge üç puanlayıcıya ayrı ayrı puanlatılmış ve puanlayıcılar arasında yüksek düzeyde korelasyon bulunmuştur. Güvenirlik değeri ise .87'dir. Araştırmada deney grubuna uygulanmak üzere BDİÖ programı oluşturulmuştur. Programa başlamadan önce deney ve kontrol gruplarından ön-test amaçlı resim çalışmaları alınmıştır. Program altı hafta sürmüş ve program sonunda öğrencilerden son-test çalışmaları alınmıştır. Araştırma sonucu elde edilen veriler analiz edilmiştir. Araştırmanın sonuçları sırasıyla şöyledir: 1) BDİÖ yönteminin kullanıldığı deney grubunun ön-test ve son-test puanları arasında anlamlı fark olduğu görülmüştür. 2) Geleneksel öğretim yönteminin kullanıldığı kontrol grubunun ön-test ve son-test puanları arasında anlamlı fark bulunmuştur. Kontrol grubu öğrencilerinin de renk kullanma performanslarının geliştiği görülmüştür. 3) BDİÖ yönteminin uygulanmasından önce deney ve kontrol grubu arasında anlamlı fark olmadığı görülmüştür. 4) Deney grubu ile kontrol grubu son-test puanları arasında anlamlı fark olduğu görülmüştür. Deney grubunun aritmetik ortalaması ön-testte 3,02 iken son-testte 4,64 olmuştur. Deney grubunun aritmetik ortalamasında 1,62' lik bir artış gözlenmektedir. Kontrol grubunun aritmetik ortalaması ön-testte 2,78 iken son-testte 3,70 olmuştur. Kontrol grubunun aritmetik ortalamasında 0,92'lik bir artış

meydana gelmiştir. Elde edilen veriler, BDİÖ yönteminin öğrencilerin resimlerinde renk kullanma performanslarını geleneksel öğretim yöntemine oranla daha fazla geliştirdiğini ortaya koymuştur. 5) BDİÖ yönteminin kullanıldığı deney grubundaki kız ve erkek öğrencilerin ön-test ve son-test puanları arasında yapılan analizlerde BDİÖ yöntemi uygulanmadan önce kız öğrencilerin erkek öğrencilere oranla renk kullanma performanslarının daha iyi olduğu görülmüştür. Ancak BDİÖ yönteminin uygulanmasından sonra kız ve erkek öğrenciler arasındaki bu fark kapanmıştır. 6) Kontrol grubunun ön-test ve son-test verilerine göre geleneksel öğretim yönteminin, kız ve erkek öğrenciler arasındaki renk kullanma performansları açısından farkı kapatmadığını ortaya koymuştur. Bu araştırmanın verileri, BDİÖ'nün renk kullanmada öğrencilerin performanslarını daha fazla geliştirdiğini ortaya koymaktadır. BDİÖ yönteminde kullanılan web sayfalarının öğrencilerin renk kullanma performanslarını etkilediği düşünülebilir. Ayrıca, öğrencilerin kendi çalışmalarını internet aracılığı ile grubundaki diğer arkadaşlarına göndermeleri ve gruptaki konunun uzmanı olan arkadaşlarının eleştirilerini almaları öğrencilere renk konusunda farklı bakış açıları kazandırmıştır. İşbirlikli ortamda yürütülen bu çalışmanın öğrencilerin arkadaşlık tutumlarını ve sosyalleşmelerini de olumlu yönde geliştirdiği gözlenmiştir. Bu araştırma; Johnson ve Johnson'un (1999) 1981'de, Slavin'in 1983 yaptığı araştırmalardaki işbirlikli öğrenmenin diğer öğrenme türlerine olan üstünlüklerini destekler niteliktedir. Ayrıca; bu araştırmanın ön-test sonuçları Milne ve Greenway'in 1999'da yaptığı araştırmaları-ndaki kız öğrencilerin renk kullanmaya daha fazla eğilimli oldukları sonucunu desteklemektedir. Ancak BDİÖ yönteminin uygulanması ile kız ve erkek öğrenciler arasındaki anlamlı fark ortadan kalkmış ve her iki öğrenci grubunun da renk kullanma performansları gelişmiştir. Kontrol grubundan elde edilen veriler ise yine kız öğrencilerin lehine sonuçlar ortaya koymuştur. Bu araştırmadan elde edilen sonuçlara dayalı olarak, BDİÖ yönteminin etkili kullanımı için sanat öğretmenleri bilgilendirilmelidir. Okulların sanat atölyeleri yeni teknolojiler ile donatılmalıdır. Öğrenciler işbirlikli çalışmaya yönlendirilmelidir.

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