ISSN 1648-3898

THE EFFECT OF THE "HYBRID MODEL" ON THE 7TH AND 8TH YEAR TURKISH STUDENTS' SUCCESS RELATED TO THE CHEMISTRY SUBJECTS

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Abstract. *Web-Based Learning Model provides various opportunities for students to study individually without time and space limitations and makes positive effects on students' learning and success. However, totally on-line courses have some limitations. To overcome these limitations, educational experts offer a mixture of traditional and on-line education together, called the hybrid model which can be superior to both traditional classes and totally on-line courses in terms of students' success. In this study, the effects of the "Hybrid Model" on the students' success related to chemistry subjects in the primary school 7th, 8th year science teaching program, in Turkey, by mixing two hours traditional teaching followed by a one hour on-line application by using a web page specifically designed for this study. As a result of this study it was found out that the hybrid model, when compared to the traditional learning method, has created positive effects on students' knowledge gain and success.*
Key words: *web-based learning, hybrid model, chemistry, knowledge scale, success.*

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Introduction

The learning via web is called "Web-Based Learning Model" (WBL) (McManus, 1996). WBL is an effective way to support the learning environment (Kumar, 1998). From the subject content and methodology points of view, WBL, which has a more dynamic structure than the traditional systems, has taken its place in teaching programs. A web-based teaching and learning environment includes audio, video, graphics, two or three dimensional (2D or 3D) animations and learning materials which presents instant feedback that can provide to students an enjoyable study opportunities and a long lasting learning.

In WBL, synchronized or unsynchronized communication can be set up between students and educators via internet services such as interactive web pages; e-mail, file transferring, discussion, chat rooms and news group services. Furthermore, during this process as a result of the students' confrontation with new information, coincidental learning can also happen (Davenport and Erarslan, 2001).

Resident areas far away from each other make it impossible for students to go to school and prevent them to communicate with one another. For this reason, web-based learning has become an alternative for schools and traditional environments in such areas (Yoshida, 2001). As Wyld (1997) stated, internet and web technologies serve to a variety of learning styles; supports student-centered environment and presents real-life experiences.

Moreover, in WBL, learning process may be turned out to be independent from the learning and teaching skills of teachers and students at certain levels, since learners can use the course material whenever and wherever they want. Students can revise the points that they have difficulties in understanding (Onay

and Yalabik, 2001). So the problems in the face to face teaching environments which assume all students with the same intelligence and motivation level can be solved and the teaching skills of an educator may not be so significant on students' learning(Kandirmaz, Cebeci and Derici, 1998).

In addition, courses with multi-media support active learning and make learning things easier (Schank, 1994). In a web-based environment students can interact with different people at the same time (Seng and Mohamad, 2002). That means that the web is an appropriate discussion environment. In traditional classroom atmospheres, the attendance to discussions is around 15%, but this rate is much higher in the web area (Hsiao, His, 1997). Therefore, students can learn things better in the web environment since they have the chance to discuss and exchange information with their peers rather than with their teachers. Students give similar examples and can ask questions to each other a lot more easily. All of these facilitate learning (Linn, 2000).

The Limitations of Web-Based Learning

Although WBL methods have advantages over traditional methods, they have also some limitations. For example, designing of an effective web page requires an advanced level of computer skills, necessary equipment and materials for the course, time needed for the preparation of the materials, higher level of proficiency in computer and internet use of students, up to date hardware and software. Supplying constant internet connection could be problem especially in rural areas. There are also some disadvantages of WBL. For example, it may lead attendance being passive viewers, in spite of the fact that it encourages active learning. The absence of face-to-face interaction environments which considered being important in learning environments. The difficulties faced during the learning period that cannot be overcome might arise afterwards. The difficulty in planning for the individuals who do not have the habit of studying on their own. The problems in covering the subjects which depend heavily on practice (e.g. Laboratory, workshop). The problems in communication due to the excessive number of students.

One of the most striking problems regarding the information resources in the web environment is to establish the validity and reliability of the information. Since both scientific documents and personal information can be easily changed in the web (Kurbanoglu, 1995).

A possible way to overcome such limitations and disadvantages of WBL, "Hybrid Model", which was developed to eradicate such problems by the combination of web-based learning and face-to-face learning, is offered.

The Hybrid Model

The hybrid model frequently entails 40-60 %, or half, of a course being taught in person and the reminder taught at a distance (Lago, 2000). Over the years, many technologies have been used to support distance learning. Soules (2000) writes about his early ventures into hybrid classes that matched the face-to-face format with one or more distance modalities such as videoconferencing, course newsgroups, e-mail, distribution lists, and the web (King, 2002).

Currently, in the USA, more and more colleges and universities are discovering hybrid courses and exploring how they may be best used within their curriculum (Young, 2002). Going further than supporting or supplementing traditional classes with technology, true hybrids built the distance technologies integrally into course delivery and reduce the number of face-to-face sessions substantially.

Some of the advantages of the hybrid model that are integrated into the web based learning could be stated as follows:

- Presents more opportunities to improve interactive and co-operative learning communities than the class getting education via the web only
- The technological disadvantages in the web-based learning are compensated with the clarity of face-to-face education
- The problem arises during the web-based learning, can be easily dealt with in a very short period of time, as the next face-to-face session is imminent As a result of the transferring students from the virtual world to face-to-face environments, the interactions among

students continue even after classes. This encourages students to study and spend more time together
- The abstract concepts difficult to comprehend and learning of logical problems requiring calculations have turned into troubles in the virtual environment. Such problems can be overcome with endorsing the face-to-face education
- The problems in teaching practice oriented subjects such as laboratory applications and workshops can be dealt with the face-to-face education.

Aim of the study is to investigate the effects of the "Hybrid Model" on the students' success related to chemistry subjects in the primary school 7th, 8th year science teaching program, in Turkey, by mixing two hours traditional teaching followed by a one hour on-line application by using a web page specifically designed for this study.

Methodology of Research

Data Collection Instruments

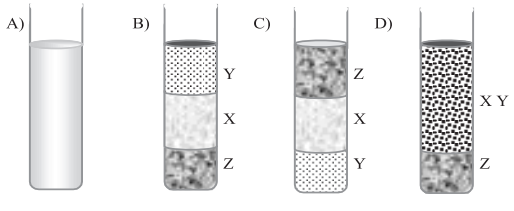
Two scales, Knowledge Scale-7 (KS7) and Knowledge Scale-8 (KS8), were developed and used to collect data and to measure the differences in the students' knowledge levels before and after the study depending on the methods used.

Knowledge Scale-7 (KS7): KS7 was prepared to identify the readiness of the 7th year students to the lesson and also to identify their success level after study. In the scale, a subject content table consisting of 7th year integrated science lesson subjects was prepared. With the help of the table, the targets to be achieved in students' learning as a result of this study were determined, and for each target a question was prepared.

A 25-item draft scale composed of all the targets to be achieved was prepared. The questions were prepared as a two tier type. In other words, the first multiple-choice question was followed by another multiple choice explanation part to eliminate the possibility of guessing the correct answer and to identify whether the students really understand the topic asked in the question. To accept an answer as the correct one, both the answer choice and the explanation part must have been responded correctly (Figure 1).

Draft form of the test was applied to 144 students, and factor loads of them were calculated. As a result, 14 questions were selected as KS7. Related to 14 questions, a new subject content table upon which the targets to be achieved as a result of this study, was prepared.

X, Y and Z are liquids which do not mix each other. Their density orders are $d_z > d_x > d_y$. What will be the situation, if all three liquids are put in a same tube and shaken, and then left for a while?



Because

1. All the liquids mix each other when the tube is shaken quite hard.
2. The liquid with the greatest density gets higher position in the tube, after mixing.
3. The liquid with the greatest density dives in the bottom of the tube, whereas the liquid with smaller density goes up, after the liquids are left for a while.
4. Since the liquids do not mix each other, the light liquid goes up.

KS7: Question-1

Figure 1. A sample two tier question used in this study.

The Cronbach į- reliability coefficient was found 0.82 for KS7. In the KS7, the minimum point a student would have got was 0 and the maximum was 14. As the point increase so does the success.

Knowledge Scale-8 (KS8): KS8 was prepared to identify the readiness of the 8th year students to the lesson and also to identify their success level after study. In the development of the KS8, the same method used in developing the KS7 was used exactly. The cronbach į- reliability coefficient was found 0.88 for KS8.

Application of the Scales

This experimental research design was partially taken from Campbell and Stanley's (1963) pre and post-test control group model. Before the test, the students were divided into two groups; control group (CG) and Experiment group (EG). First, the Knowledge Scales (KS7 and KS8), were performed as pre-tests. In the next step, the chemistry lessons of the primary school 7th and 8th year students were taught to the control group (CG) by using the traditional method and to the experiment group (EG) by using the Hybrid Model. In the Hybrid Model, the 2 hours of the 3-hour- science lessons in a week were taught out in the classroom and the last 1-hour was carried out practically in the computer cluster on a web based environment. The materials prepared for this purpose are published at http://www.sanalfen.com. These materials were used during the research.

Participants

This study was performed among 381 primary school students in the first term of the 2004-2005-education year. The distribution of the students according to their classes and groups is presented in Table 1.

Table 1. **Distribution of participants according to their classes and groups.**

	7th year	8th year
CG	103	83
EG	97	98
Total	200	181

Data Analysis

The data collected in this study were analyzed by using SPSS/PC version 10.0 statistical program, three different t-tests were performed: Paired Samples t-test was conducted to determine whether there was a significant difference between pre-test and post-test results in each group, in group analysis, as a result of the methods used in the study. Independent Samples t-test was performed to identify whether knowledge levels of all students in CGs and EGs in each year level were equal or at least similar before the study, and to find out whether a significant changes arise between groups as result of the methods used. One-way ANOVA was used to elicit whether there was a significant difference among schools in terms of students' success based on their socio-economic background. Significance level was decided by taking p values into consideration $p>0.05$, meant there was not a meaningful difference, $p<0.05$ meant there was a meaningful difference.

Results of Research

The results of the analysis of pre-test applications of KS7 and KS8 performed to find out the

students' readiness to chemistry subjects, before they were taught in this study, in the integrated science lesson, and to compare the students' pre and post performances and to find out whether there was a significant difference between students' success related to methods used, in groups, between groups and among schools are presented in Table-2 and 3, Table 4 and 5, and Tables 6 and 7, respectively.

Results of in Groups Analysis

Pre and post test results taken from CG and EG in each school were analyzed separately. Differences in students' knowledge levels between pre and post-test results in each CG and EG, in each school for KS7 and KS8 were presented in Table 2 and 3, respectively.

Table 2. Pre and Post Tests Results of KS7.

School	Group		N	X	SD	δ	t	P
HUSEYIN AVNI P.S.	CG	Pre-test	48	1.02	1.08	0.15	-4.994	0.000*
		Post-test	48	2.66	1.81	0.26		
	EG	Pre-test	35	1.80	1.43	0.24	-10.108	0.000*
		Post-test	35	5.37	2.21	0.37		
BUCA P.S.	CG	Pre-test	40	2.00	2.16	0.34	-0.878	0.385
		Post-test	40	2.45	2.45	0.38		
	EG	Pre-test	46	2.10	2.18	0.32	-5.733	0.000*
		Post-test	46	5.23	3.15	0.46		
DEVAK P.S.	CG	Pre-test	15	1.26	1.53	0.39	-5.901	0.000*
		Post-test	15	5.86	3.37	0.87		
	EG	Pre-test	16	1.06	1.38	0.34	-12.117	0.000*
		Post-test	16	7.68	1.62	0.40		

Table 3. Pre and Post Tests Results of KS8.

School	Group		N	X	SD	δ	t	P
HUSEYIN AVNI P.S.	CG	Pre-test	38	1.13	1.21	0.19	-0.168	0.867
		Post-test	38	1.18	1.46	0.23		
	EG	Pre-test	48	0.59	0.074	0.10	-4.062	0.000*
		Post-test	48	2.68	3.45	0.50		
BUCA P.S.	CG	Pre-test	45	0.40	0.65	0.09	-6.286	0.000*
		Post-test	45	1.68	1.32	0.19		
	EG	Pre-test	50	0.68	1.16	0.16	-8.771	0.000*
		Post-test	50	4.26	2.67	0.37		
DEVAK P.S.	CG	Pre-test	24	0.54	0.93	0.19	-7.861	0.000*
		Post-test	24	5.66	3.08	0.63		

As can be seen from Table 2, there were statistically significant differences between pre and post test results in all CGs and EGs in each school for KS7, except CG in Buca Primary School (BPS),. That means that there were significant differences between students' readiness before they were

taught in schools and their knowledge gain after they were taught the topics, either by a traditional method or by the hybrid model. When we look at mean values in all CGs and EGs, it seen from the table that the differences between pre and post test mean values of EGs are higher than those of CGs. In other words, achievement levels of students in EGs who received the topic through the hybrid model used in EGs were higher than students taught the topics through traditional method used in CGs.

In Table 3, it is understood that apart from CG in Huseyin Avni Atesoglu Primary School (HAAPS), for KS8, pre and post test results in all CGs and EGs in each school were statistically significantly different from each other. That means that 8th year students participated in this study in such groups gained significant level of knowledge as a result of either traditional teaching methods or by the hybrid model. On the other hand, like 7th year students, achievement levels of 8th year students who received the topic through hybrid model in EGs were higher than those students who received the topic through traditional method in CGs.

Results of Between Groups Analysis

Pre-tests of all CGs and EGs, and post-tests of all CGs and EGs were compared separately in each year level to see whether methods used in this study were affected students' success levels. The results of between groups analysis are presented in Table 4.

Table 4. Results of Between Groups Analysis for KS7 and KS8.

Year	Test	F	P
7th year	Pre-test	2.410	0.122
	Post-test	48.577	0.000*
8th year	Pre-test	0.670	0.414
	Post-test	42.323	0.000*

As it is understood from the table that there was no significant difference between 7th and 8th year students' pre-test results (for 7th year p=0.122 and for 8th year p= 0.4147). In other words, both control and experimental groups were selected from students with similar knowledge level before the study. On the other hand, as a result of the study it is seen from the table that post-test results in both year levels were significantly different (for 7th and 8th year p= 0.001<0.05) depending on the methods used. To understand the in favor of which group the difference was, mean values of each group in both 7th and 8th year students, Table 5 was prepared.

Table 5. Mean Values of 7th and 8th Year Students' Pre and Post-Test Results.

Year	Gr oup	Mean Values	
		Pre-test	*Post-test*
7th year	CG	1.437	3.049
	EG	1.825	5.691
8th year	CG	0.735	1.458
	EG	0.620	3.926

As can be seen from the table, the mean value of 7th year students who received the topic by traditional method in CGs raised by 212% (from 1.437 before the study to 3.049 after the study). However, the same value increased by 312% in EG (from 1.825 to 5.691). The similar situation is

also seen in 8th year students, too. The increase between mean values before and after the study was 198% (from 0.735 to 1.458) in CG, but 633% (0.620 to 3.926) in EG.

These results implicates that both 7th and 8th year students who taught the topic through the hybrid model used in this study in EGs were more successful than those students who received the topics through traditional method in CGs.

Results of Among Schools Analysis

Results of among schools analysis conducted to clarify whether there was a significant difference between the success of 7th and 8th year students from different schools, whose students have a similar socio-economical background in a school, but different among schools were presented in Table 6.

Table 6. Results of Among Schools Analysis.

	Groups	Test	F	P
7th year	CG	Pre-test	3.969	0.072
		Post-test	1.956	0.147
	EG	Pre-test	12.762	0.000*
		Post-test	5.515	0.005*
8th year	CG	Pre-test	12.211	0.001*
		Post-test	2.701	0.104
	EG	Pre-test	0.187	0.830
		Post-test	7.983	0.001*

The results of among schools analysis conducted to see whether socio-economic background of students make an impact on students success, seen in Table 6, showed that there were significant differences between pre-tests of both CG and EG, post-tests of EG in 7th year; and in 8th year CG pre-tests and EG post-tests. Table 7 was prepared to understand which school students the difference was in favor of.

Table 7. Mean Values of 7th and 8th Year Students among schools.

Year	Group	Test	Mean Values		
			H. Avni	*Buca*	*Devak*
7th year	CG	Pre-test	1.02	2.00	1.26
		Post-test	2.66	2.45	5.86
	EG	Pre-test	1.80	2.10	1.06
		Post-test	5.37	5.23	7.68
8th year	CG	Pre-test	1.13	0.40	-
		Post-test	1.18	1.68	-
	EG	Pre-test	0.59	0.68	0.54
		Post-test	2.68	4.26	5.66

Although there were no significant differences between pre-test results among schools depend on soico-economic background, when we look at the post test results it is seen from the table that in private primary school of DEVAK, in both CG and EG mean values were higher than those students in other schools participated in this study. That implicates that students of DEVAK were more successful. Students' success of other two public schools were almost similar, since in some groups students from HAAPS were more successful, while in some other groups students from Buca Primary School (BPS) were more successful, but the difference between success rate were not significant between each other.

Discussion

Throughout this study we tried to investigate the effects of the "Hybrid Model" on the students' success related to chemistry subjects in the primary school 7th and 8th year science teaching programs, in Turkey by mixing two hours traditional teaching followed by one hour on-line application by using a web page specifically designed for this study. Results of this study implicates that students in EG who were taught the topic by hybrid model either in groups or between groups and among schools have a significantly higher success rates over students in CG who received the course through traditional methods. Our results were supported by many studies:

Most of the studies investigating the effects of hybrid models on students' success were conducted in university level or over. Among them, Woodsa et all (2004) reported in their study that hybrid courses may enhance information skills acquisition and students' achievement. Similarly, some educators believe as a result of their studies on university students that student success rates in hybrid courses equivalent or slightly superior to face-to-face courses, and that the hybrid courses have lower dropout rates than do totally online courses (Young, 2002). Young (2002) interpreted this result as "hybrid model clearly improves students' achievement".

Some other studies support our results in a different way, by mentioning students' learning rather than the success. For example, Leh (2001) reported, as a result of her study, that students learned much through hybrid model and preferred the model over traditional methods. In another study, titled "Action Research on Hybrid Courses and Their Online Communities" carried out with master degree students, Leh (2002) reported that the students felt that they learned as much as or more in such course than in traditional courses and that they were more motivated. Similarly, in a recent study Lehman (2004) finds out that some students, who normally might not have done well in the regular class, have more fun and learn more through online. Cashion and Palmieri (2002) reported that 71 % of their respondents, in their hybrid study carried out in Southern Australia; believe that they gained higher learning ability.

When we review the related literature about WBL and hybrid courses, we saw that almost all studies support the views, we reached as a result of our study, that totally on-line and hybrid courses make a positive impact on students' success with a positive attitude and motivation towards the topic taught in the educational institution.

Among the studies some of them focused on educators views about WBL. For example, Victoria (2003) reported in analyzing the results of the fourth in a series of landmark studies, in the USA, presented by McGraw-Hill Ryerson that web-based technology is helping instructors to achieve teaching objectives and has a positive impact on students' attitudes and achievement. While Hayes and Billy (2003) reported in their study about a series of surveys over 2000 North American educators on the use of Web-based materials in teaching that majority of the respondents consider Web-based teaching materials as important as traditional teaching aids. According to the authors, the reports indicate that students' success is enhanced by Web-based learning activities; students perceive Web-based materials to be more effective learning aids than traditional sources. Similar feelings were also expressed by our students.

In another study, Serban and Fleming (2002) reported in their study carried out to investigate the demographic make up and academic success of online students compared to peer on campus classes and the campus average that students who take online classes carry a higher cumulative

GPA at the end of the term than their counterparts in on-campus peer classes. However, within online courses, students in totally online classes consistently have a higher GPA than those in hybrid classes, and the difference was consistent across all three terms of their study. This result seems a little bit contrast to our results, but we did not compare the effect of totally online courses on students' success with hybrid model. Therefore, to reach a conclusion on this issue, there is a need to study about it.

Related to this, Prof. Dede, of Harvard, says that "A strong case is beginning to be made on the basis of research evidence that many students learn better online than face-to-face, and therefore a mixture is the best way," "What proportion that mixture should be would vary from course to course" (Young, 2002, p.34).

Conclusion and Implications

Although most of the studies conducted on hybrid models for improving students' success and learning were carried out in university level or higher, results of our study suggest that hybrid model may also be valuable for improving younger students' learning, understanding, success, willing, attitude and motivation towards the chemistry topics taught in the 7th and 8th years in primary school level. This is an important implication for educators and administrators who recognize that hybrid model, in which traditional face to face teaching and learning environment is mixed with an on-line one, will be solution to the problem of students with lower level of achievement, attitude and motivation towards science lessons. Related to this issue Lorenzetti (2004) says:

"My dream [is to be able to say] we run hybrids because our students learn better" (Lorenzetti, 2004, Page 7).

We agree with Lorenzetti. Since a hybrid course maximizes the potential of success and learning by offering two very different environments, the traditional physical classroom and online space of the internet, for course members to interact with one another and the course material thus creating expanded opportunities for uniquely reaching students with different learning styles, backgrounds and educational goals. And instructors who employ a variety of strategies to build up and nurture an online community may achieve the most success with hybrid courses. This method provides students with options of choosing their best learning conditions and with opportunities to enhance their learning and improve their success by using resources beyond boundaries of time and space.

However, while there are many benefits of hybrid courses, the success of these classes depend on the suitability of such courses to year levels of students and course contents, and are complicated by the degree to which educators can effectively help students to become active members of both the online and face-to-face learning environments, overcoming online inequity issues and even the interference of technology itself (Smelser, 2002; Reasons, 2004).

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Резюме

ВЛИЯНИЕ "ГИБРИДНОЙ МОДЕЛИ" НА УСПЕВАЕМОСТЬ ТУРЕЦКИХ ШКОЛЬНИКОВ ПО ХИМИЧЕСКИМ ДИСЦИПЛИНАМ

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В работе исследовано влияние "гибридной модели" на знания и умения учащихся. Гибридная модель - сочетание традиционного и онлайнового обучения - может превзойти как традиционные занятия, так и исключительно онлайновые курсы в повышении успеваемости учащихся. Она предлагается специалистами как с целью использования широких возможностей Интернета в индивидуальном обучении (отсутствие пространственно-временных ограничений), так и с целью преодоления некоторых недостатков. Изучалась успеваемость 381 школьника 7-8 классов основных школ Турции в первой четверти 2004-2005 учебного года по химии в рамках программы преподавания основ наук. После двух уроков по методике традиционного обучения следовал один урок онлайн-обучения с использованием веб-страницы, специально разработанной для этого исследования. Для сбора данных и измерения различий в уровнях знаний школьников до и после эксперимента в зависимости от применяемого метода были разработаны шкалы Knowledge Scale-7 (KS7) и Knowledge Scale-8 (KS8). В дополнение к проведённым ранее исследованиям гибридной модели на университетском уровне, результаты данного исследования позволяют предположить её полезность и для повышения успеваемости учащихся по естественнонаучным предметам, в частности, химии, в 7-8 классах основных школ.

С гибридным курсом учитель, реализующий множество стратегий и строящий онлайн-сообщество своих учащихся, способен достичь максимального успех за счёт того, что курс предоставляет две совершенно различные среды - физически традиционное классное помещение и киберпространство Интернета - для взаимодействия учащихся между собой и с учебным материалом. В зависимости от конкретного курса доля этих сред может изменяться. Это создаёт уникальную возможность для обогащения студентов разными стилями обучения, разными багажами знаний, разными образовательными целями., может достичь максимума успеха с гибридными курсами. Такой метод даёт учащемуся возможность выбирать наилучшие условия для своего обучения и улучшить свою успеваемость путём привлечения ресурсов из-за границ времени и пространства.

Однако при ряде преимуществ гибридных курсов, успех их применения в классе будет зависеть от их адекватности уровню конкретных учащихся и содержанию курса. Дело усложняется тем, насколько эффективно учитель может помочь учащемуся стать активным в указанных учебных средах, преодолевая проблемы возможного несоответствия и влияние технологии как таковой.

Ключевые слова: "гибридная модель", онлайн-обучение, естественнонаучные предметы, обучение химии.

Received 21 May 2005; accepted 27 August 2005

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