Middle School Students' Attitudes Toward Online Homework In Science Education: A Case From A Private School

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Abstract

The present study aims to investigate private middle school students' attitudes toward online homework in science lessons. Furthermore, the relationship between these students' attitudes toward online homework and their academic performances in science lessons were examined. A total of 669 middle school students from a private middle school located in the capital of Turkey participated in the current study. These students had experienced online homework in science lesson for 15 months. The data were collected by the administration of 'Attitudes toward Online Homework in Science Lesson Scale' (ATOHS) covering 31 items in 5-point Likert type. The results revealed that the students had favorable attitudes toward completing online homework in science lesson. Students reported development in their understandings of scientific concepts through completing OHW.

Keywords: Online homework, Middle school science, Attitudes

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Internet has recently become a way of communication, education leading some shifts in our minds. As supported by Songer (2007), over two decades, internet has been viewed as a commonplace in various aspects in our daily lives. According to a survey study, majority of the children between 12 and 17 years of age were online on a regular basis. However, it was also reported that the usage of internet among these children for educational purposes, especially in schools was not as common as the usage of internet for other purposes (Levin and Arafeh, 2002). With the rapid integration of internet use into our daily lives, the usage of internet based homework (online homework) has accelerated all over the world. Online homework (OHW) is being utilized in the schools, from primary school to college as well as from public school to private schools (Malevich, 2011). In addition, these systems have been reported to be used actively by lots of teachers and students.

When compared with the traditional homework, it is required to consider various aspects of using online homework from the viewpoint of educators and students. Previous researchers (e.g Arasasingham, et al., 2011; Revell, 2013; Al-Jarf, 2011) have emphasized that online homework provides immediate feedback about wrong answers of questions, randomizes the order of the questions, and decreases the time spent for grading. However, some drawbacks of online homework attract the attention of practitioners. For instance, it has been pointed out that it may lead students provide some answers without reasoning. It was also stated that usage of online homework may not be suitable for entire subject areas. On the other hand, the number of online homework users is increasing day by day (Taraban, 2005). In order to stimulate efficient usage of online homework among schools, educators need to address how students feel about it, to what extend they can easily use it, etc. (Arasasingham, 2011).

In the context of science education, online homework has been regarded as a facilitator of academic performance and attitudes but it depends on the time spent on completing online homework. Supporting this claim, Beichner, et al. (2007) provided some evidences in "The Student Centered Activities for Large Enrollment Undergraduate Programs Project" (SCALE-UP Project). In this project, researchers developed rich teaching activities by integrating computer applications in the process. One part of this project covered using online homework for revealing that students tended to be more conscious about the lecture before coming to classes. It

was added that such a situation allowed the lecturer to focus on the teaching activities rather than spending valuable class time to unrelated situations. Furthermore, Okuno et al.'s study (2010) addressed some issues dealing with online homework application in a large sized laboratory classes. Their study showed that the students were well prepared for the next laboratory application before coming to class which made lectures much more effective. Also, another study which investigated the relationship between students' attitude toward OHW and their achievement indicated that students having more favorable attitudes toward completing OHW had higher exam grades in a chemistry course (El-Labban, 2003).

The literature review provided some empirical evidences on using OHW among university students attending science courses. However, the results of the research studies examining the effect of OHW on students' academic performance were inconsistent. For instance, some researchers (Hauk and Segalla, 2005; Palocsay and Stevens, 2008) reported insignificant difference between online and traditional homework takers in terms of academic performances. On the other hand, significant effect of OHW on academic performances was also found in a previous research (e.g. Taraban, et al., 2005; Babb, et al., 2011). Considering students' attitudes toward OHW, attitudinal studies reveal that OHW is as effective as THW, and students find OHW helpful and useful, especially the feature of the immediate feedback (Arasasingham, et al., 2011; Revell, 2013; Al-Jarf, 2011). In the light of the related literature, the main focus of the present study was to investigate the private middle school students' attitudes toward online homework in science lessons. More specifically, the following research questions guided this study;

1) What are the private middle school students' attitudes toward online homework in science lessons?

2) What is the relationship between private middle school students' attitudes toward online homework and their academic performances in science lessons?

Method

Research design and study context

This study employed descriptive quantitative research design. In this type of research, subjects are generally measured once in order to determine the relationship between one thing (an independent variable) and another (a dependent or outcome variable) in a specific sample of a population (Creswell, 1994). In the present study, private middle school students' attitudes toward online homework in science lessons were investigated by collecting data through a survey. Thus, the research design can be stated as appropriate for defining it as quantitative research.

In terms of study context, an online homework that was used by the private middle school students was formed by creating quiz on a website. The science teachers prepared the questions, feedback explanations and then embedded them through the online homework website. Each weekend, one online homework was assigned for each grade level about science concepts they were introduced in that week. In a year, the students of each grade level took 30 online homework in total. Additionally, in some days, one or more than one homework was assigned for each grade level. Considering the features of online homework used in study context, videos and figures could be embedded to the assignment. Various types of questions covering multiple choice, true-false, open-ended, matching, ordering, fill-in, and pop up was created. It provided immediate feedback to students when student completed the homework. A student could see her/his wrong and right answers. All homework could be taken again and again by the students that allow students make more practices. Teachers could see students' either first attempt, last attempt, or best attempt depending on which mode teachers chose during assigning the test.

Sample

A total of 669 middle school students at a private middle school located in the capital of Turkey participated in the current study. Of the participants, 20.9% were 8th grade students, 25.4% were 7th grade students, 24.6% were 6th grade students, and 29.1% were 5th grade students. These students had experienced online homework in science lesson for 15 months.

Instrument

In this study, the data were collected by the administration of 'Attitudes toward Online Homework in Science Lesson Scale' (ATOHS). The measuring tool was prepared by the researchers through adapting the related items that were previously developed by Pundak, et al. (2013) and Babb, et al. (2011). Initial version of this instrument consisted of 31 items in 5-point Likert type (1= strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree). The scales were carefully adapted and the wording of the statements was examined. In order to present content-related evidences, reactive comments were taken from the middle school science teachers who were employed in the school where the main study was conducted. Two experts in the field of science education and computer education provided their comments to clarify the ambiguities in the items. Utilizing the results of the pilot study, some items were revised in Turkish-adapted version of the scale. The items exemplified in Table 1 were selected since they loaded highly on the factor analysis of pilot data from private middle school students.

Data Analysis

In order to investigate middle school students' attitudes toward online homework in science lesson, means and standard deviations as well as the percentage of participant responses to the survey items were calculated through descriptive statistics. Also, Pearson product-moment correlation was considered to examine the relationship between students' attitudes toward OHW and academic performance. As an indicator of academic performance, students' self-reported grade point average in science lesson was used. The significance level was set to 0.01.

Procedure

The research was conducted ethically following the protocols approved by campus Institutional Review Board (i.e. Research Centre for Applied Ethics). The first author visited the schools after getting permission both from the Institutional Review Board and the Ministry of National Education. The students were informed about the purpose of the study and the procedure for completing the scales. They were also told that their identity would be kept secret and that the results of the study would not affect their school grades. Furthermore, the students were required to complete the questionnaire on their own. It took about one class hour for the students to finish it.

Results

The present study aims to explore private middle school students' attitudes toward online homework in science lessons. Descriptive statistics were utilized for this specified purpose. Table 1 presents the results of descriptive statistics regarding the students' attitudes toward online homework with respect to some example items. The mean score calculated on attitudinal items (M=3.43 out of 5, SD=.78) reflected that the students had favorable attitudes toward completing online homework in science lesson. To be more specific, the analysis showed that most of the students have positive experiences while using online homework in science lesson. Also these students found OHW moderately useful.

The frequency distribution on the attitudes toward the OHW reflected that these did not agree that they complete OHW because they are punished. These students appeared to support that the OHW made contribution on their conceptual understanding in science. However, a relatively high percentage of the students, more than 20.0% had some doubts about the difficulty of OHW. Regarding the experiences of the students during completion of the OHW, majority of the students stated that they solved the questions completely, and then they submit the final solution through the OHW. In the study context, submitting the OHW in this way was placed in the process of completing the OHW. These students were also provided another alternative, *"save for later"* option, however they did not delay completing OHW. Majority of these students pointed out that *"answering the questions within the OHW provides me a better understanding of the subject matter."* However, relatively high percentage of the students, about 25.0%, were not sure to support the following statement: *"I would have completed the OHW even if they were not to be graded."*

The relationship between private middle school students' attitudes toward online homework and their academic performance reflected by their self-reported grade point average in science lesson was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. The results reflected that there was a significant and positive correlation between their attitudes toward the OHW and academic performance ($r = .24$, $n = 669$, $p < .001$).

Table 1. *The results of frequency distribution on some example attitudinal items*

	St.D	Dis.	Und.	Ag.	St. A
Besides online homework, I did none of other homework given by my teacher. *(reversed)*	10.8	11.8	20.8	27.8	28.8
The online homework assignments did not further my understanding of science concepts. *(reversed)*	10.3	10.2	11.7	26.9	41.0
The online homework assignments were challenging. *(reversed)*	10.3	11.7	23.0	22.6	32.4
Overall, my experience with the online homework was negative. *(reversed)*	13.3	7.9	17.6	24.7	36.5
Because online homework saves the homework completion, I prefer traditional one. *(reversed)*	19.1	10.9	22.0	15.2	32.7
If I complete OHW, its main cause is its penalties. *(reversed)*	12.6	8.1	13.6	15.7	50.1
I solve the questions completely and then submit the final solution through the OHW.	2.8	1,3	5.5	13.9	76,4
For numerical questions, I worked out the answers with pencil and paper before submitting an answer within the OHW	18.4	8,8	17.3	23.9	31.5
I never tried to figure out my mistakes on questions I answered wrong within the online homework.(reversed)	7.9	8,2	13.2	24.4	46.3
The OHW is worth the effort.	9.0	7.3	19.4	26.2	38.1
I understand the questions within the OHW	4.2	3.6	11.1	29.0	52.2
Answering the questions within the OHW provides me a better understanding of the subject matter better.	7.5	7.9	19.0	24.8	40.8
I would have completed the OHW even if they were not to be graded.	18.1	8.8	25.1	21.1	26.9
I solve the questions completely and then submit the final solution through the OHW.	2.8	1.3	5.5	13.9	76.4

For numerical questions, I worked out the answers with pencil and paper before submitting an answer within the OHW	18.4	8.8	17.3	23.9	31.5
I never tried to figure out my mistakes on questions I answered wrong within the online homework.(reversed)	7.9	8.2	13.2	24.4	46.3
As a result of the OHW, I am more willing to learn topics associated with the course.	16.9	20.5	24.8	22.0	15.8
Due to OHW, my attitude toward science lesson has improved.	19.7	15.8	23.8	20.2	20.5
Since OHW lets my teacher to track my scores more often, I more frequently do my assignments at OHW.	16.3	9.4	19.3	28.0	27.1
The questions that appear in the OHW encourage higher order thinking at least questions given regular homework in other courses.	14.3	13.9	19.7	24.4	27.7
The OHW makes me think more about science concepts than I would have with traditional homework	15.5	14.9	29.1	20.9	19.4
My achievements in the course improve after I submitted the assignments through the OHW.	11.2	10.6	24.8	30.0	23.3
Feedback given by OHW is methodical and effective in comparison to feedback given in other courses.	10.9	8.1	17.6	22.3	41.1

**St.D = Strongly Disagree, Dis.=Disagree, Und.=Undecided, Ag.= Agree, St. A. = Strongly Agree*

Discussion and Implications

The results of the current study revealed that in science lessons, private middle school students had favorable attitudes toward completing online homework. To be more specific, these students stated that they did not use OHW, just because it saved their OHW completion information. In traditional homework, keeping students' homework completion is not as neat as in OHW, because OHW generates a gradebook; even students can go back to previously assigned tests, OHW gradebook keeps this information, which is sometimes not possible in traditional homework setting. Alternatively, in traditional homework for an incomplete one, teacher may not track the students' homework pattern in completion as in OHW. Such a result implies that middle school students did not take into account of the consequences of that incomplete homework caught by the teacher. This could be regarded as a favorable attitude about OHW. Similarly, the results of descriptive statistics showed that these students pointed out development of their understandings of scientific concepts through completing OHW. This finding could be associated with the qualities that OHW provided to the users. For instance, these qualities covered feedback section, colored-figure images, keeping scores, variety in question types, etc. The results of the present study were consistent with the findings of a previous research study conducted by Babb et al.'s study (2011). In their study, the students attending the chemistry course stated that they could recommend the online homework.

The results of the current study also revealed that the private middle school students felt comfortable while experiencing it. The difficulties and obstacles that the students came across with while experiencing OHW were also assessed in this study. Feelings of comfort related to computer setting and the internet should be considered as an important issue while the attitudes toward OHW were examined. Among the factors revealing the students' attitudes toward OHW, the highest mean score belongs to the factor on students' experiences in OHW. It could be inferred that these students' usage of internet and their experiences in completing OHW did not result with an obstacle during this process. The results of the present study were consistent with the findings of a previous research study conducted by Flori et al. (2002). These authors emphasized that the students' experience in OHW was found to be a significant factor in shaping their attitudes toward OHW.

In the current study, considering the findings of descriptive statistics, it could be concluded that in science lesson, private middle school students found completing OHW moderately useful. More specifically, majority of the students totally disagreed that they found the science lesson interesting because they practiced with the OHW. This result may imply that the students did not attribute their interest toward science lesson to the OHW. In fact, OHW was not the only activity that the students carried out in science lesson. The students may refer their interest in science lesson to the in-class activities. Parallel with these findings, it was found out that these students did not reach a consensus on the issue related to recommendation of the OHW to friends who do not take OHW. On the other hand, the students highly supported the idea in that feedback provided during the completion of the OHW was effective and presented their positive attitudes toward the feedback section of the OHW. These results were consistent with the findings of previous research studies emphasizing that students found OHW useful since it served hint and immediate feedback (e.g Revell K., 2013, Arasasingham R., et al., 2011, Babb M., et al., 2011).

The results of this study showed that the middle school students' academic performance and attitudes toward OHW was significantly and positively associated with each other. Although this finding does not imply a cause-effect relationship, considering the results of previous studies (El-Labban, 2003) favorable attitudes toward online homework may have a potential to make significant contributions on students' academic performance in science lessons. The literature also supports a further claim in that OHW improves students' academic performance at least as much as traditional homework (e.g Taraban, et al., 2005, Babb et al., 2011). Since the present study was not designed as an experimental research, academic performances of these students could not be compared with respect to the type of homework (online and traditional homework) completed. Further research studies should be conducted to depict the impact of OHW on middle school students' academic performances in science lessons.

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