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Turkish Vocational School Students' Perception of 5E Teaching Model

Ibrahim Yasar KAZU (Corresponding author)
Department of Education Science, Faculty of Education
Firat University, Elazığ, 23119 TURKEY
iykazu@firat.edu.tr

Emine BOZU
Fashion Design Program, *Tunceli Vocational School*
Tunceli University, Tunceli, 62000 TURKEY
eminebozu@windowslive.com

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Abstract
The purpose of this study is to determine the perception *of students about implementation of 5E teaching model, one of the applications of constructivist approach in classroom environment, in vocational schools. For this purpose a 32-question survey was administered. 631 students were surveyed, including 227 male, 404 female students of 13 different programs in Tunceli Vocational School of Tunceli University during the 2011-2012 academic year. Average, t-test, standard deviation, frequency and percentage distribution were used for the analysis of the research data. According to the results of the study, significant variations by gender were detected in 6 items, including "Supporting learning by revealing pre-knowledge", "Defining the wrong points in the developed hypotheses ", "Considering as unnecessary the instructor's encouragement to learn", "Listening to the explanations of my friends", "Giving opportunity for peer-review among students" and "Giving answers to questions with admissible evidences". Affirming with their replies, the students revealed the applicability of the model. However further studies are necessary to see the implementation of the phases of the 5E model respectively, and it is considered that different researches should be performed with the purpose of observing that necessary pre-learning for each phase has been carried out.*

Keywords: *Constructivist Approach, 5E Teaching Method, Teacher, Student, Learning,* Perception *of Students*

1. Introduction

The knowledge we acquired during our educational life is to be adapted in line with the developments in the world. New approaches should be developed in education in order to acquire new knowledge, obtain scientific information on technology and contribute to the improvement of the existing knowledge with a new one. This is only possible in innovative educational institutions. Educational institutions should change and innovate themselves more rapidly compared to any institutions in the society. The reason is that educational institutions give the opportunity to learn the ways to become aware of innovations and to obtain

information. Unlike the traditional approach in which information is just transferred and students are only passive learners; the recently-developed approaches embrace new attitudes. As a consequence, with the new approaches replacing traditional ones, some changes have occurred in the objectives of education. The new objective of education is to raise individuals who know how and where to use acquired knowledge, find his/her own learning methods and use them effectively, taking advantage of his/her existing knowledge in the production of new information (Nuhoğlu, 2004). Efficiency of information can be increased by combining and varying previous and new information. Thus, individuals are forced to learn continuously in order to complete their personal development by adapting themselves to the changes and developments in life (Keser, 2003). They should search and learn ways to get information to become a continuous learner. What is important in education is not the information itself but the way to get information, since the method can change more slowly than the information itself (Sönmez, 2010). The pace of technological developments offers opportunities for accessing information in various ways. Teachers, one of the most important actors in the education process, are responsible for teaching-learning activities in classrooms. Therefore, to increase the quality of education, it is of great importance for teachers to use modern teaching methods and technology (Reis, 2004). By means of technology, information can be easily accessed at the other end of the world, nowadays learning the ways to access information, to acquire information, and to propound new information based on the acquired knowledge instead of memorizing it has gained importance. Individuals should be provided with the necessary environment that will enable them to learn ways to access information and thus, they will find ways to solve the problems they encountered during life (Sönmez, 2010). The constructivist approach ensures that students find solutions to upcoming problems by using the knowledge they acquired. Constructivism emerged as a concept related to the nature of information. At the beginning it developed as a theory concerning how learners learn information, then evolved into an approach on how learners construct the information (Bransford, Brown & Cocking, 1999; Demirel, 2009). This approach advocates that students construct learning process actively. In constructivism, information is not obtained in a passive way from the environment, but interpreted and constructed effectively by the individual who perceives it. Constructivism is not only a concept related to education but also a theory on information and learning and therefore re-interpretation of information is of great importance.

Several studies have shown that the 5E teaching method was successfully applied to a variety of grade levels (e.g., Barman, 1992; Barman, Cohen, & Shedd, 1993; Purser & Renner, 1983; Saunders & Shepardson, 1987; Stepans, Dyche, & Beiswenger, 1988; Liu, et al., 2009). For example, in their study of an eighth-grade genetics class, Balci, Cakiroglu, and Tekkaya (2006) compare the effectiveness of the 5E Learning Cycle with the effectiveness of expository instruction. According to the authors' conclusions, the activities for students in the 5E teaching method helped them to activate their prior knowledge and to overcome their misconceptions. In addition to the acquisition of knowledge, these students had the opportunity to explain, to argue, and to debate their ideas, practices that helped them to further extend their conceptual understanding.

A program was launched as a pilot scheme based on constructivist approach in Turkey in the 2004-2005 School Year and it was applied nation-wide in the 2005-2006 school year (Çınar, Teyfur & Teyfur, 2006). It is estimated this new education program will help raising individuals equipped with capabilities as nowadays required. In this new program the aim is to raise individuals who have the abilities of self-expression, problem-solving, scientific thinking, and who are able to communicate, cooperate, comprehend, research, criticize,

investigate and interpret, who are capable of using IT technologies, producing information, shaping their own future, i.e. who implement, analyze, synthesize and evaluate (MoNE, 2005).

With this program, the duties of a teacher have also changed. Since teacher's role of transferring and teaching information has been replaced with the roles to guide and help students interpret the information using their pre-knowledge and experiences and produce new information. A teacher should put the student in the center and give direction to learning-teaching process as a participant observant by taking into consideration their pre-knowledge, interest and needs (Şentürk, 2010).

2. Literature Review

5E model is an instructional strategy, which first assesses students' misconceptions and then promotes conceptual change. 5E model promotes scientific understanding and thinking abilities among students. With the infusion of multimedia into the education, multimedia lessons provide the teacher with a more effective way to transfer knowledge and information to students. Multimedia lessons also enable the students to learn in a more productive way.

The 5E Learning Cycle, first created by Robert Karplus in the late 1950s and early 1960s, has been regarded as a general philosophy of teaching and learning with strong constructivist foundations. It is a teaching-and-learning procedure consistent with the privileged status of inquiry and with the ways in which students naturally learn (Musheno & Lawson, 1999; Eisenkraft, 2003). The following paragraphs include explanations of both the 5E Learning Cycle phases and the major tasks for the teacher and students in each phase (Bybee & Landes, 1988; Bybee et al., 2006; Stamp & O'Brien, 2005).

5E teaching model, developed by Bybee, consists of activities that enhance curiosity of students for research, meet the expectations of students on the subject, and require students to use their knowledge and skills actively. This theory is an educational model combining constructivism and science education. It has five stages. These are: Engage, Explore, Explain, Elaborate and Evaluate (Carin & Bass, 2005). Each "E" stands for a different stage in this teaching model (Turgut et. al. 1997; Semerdan & Burkam 1999; Çepni et al. 2000; Eisenkraft 2003; Balci, Cakiroglu., & Tekkaya, 2006; Süzen, 2009).

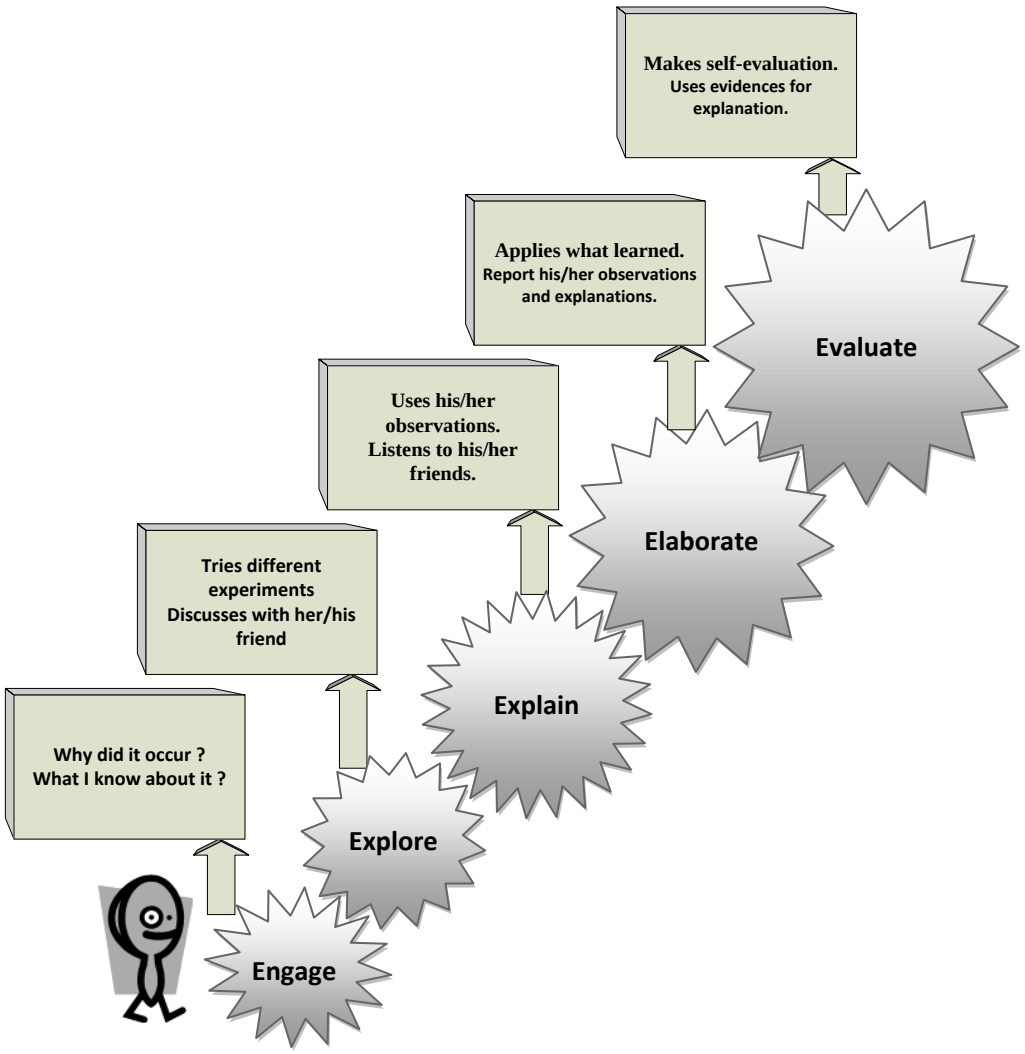

Figure 1. *Stages of 5E Teaching Model*

According to Figure 1 demonstrating the stages of the model, each stage ensures realization of pre-knowledge necessary for the subsequent stage and thus, the transition to the next stage. As a consequence, the order of the stages should not be changed for the sake of fundamental understanding of learning approaches. Stages of 5E model are as follows respectively (Bybee & Landes, 1988; Bybee et al., 2006; Eisenkraft, 2003; Stamp & O'Brien, 2005; Peşman & Özdemir, 2012):

Engagement phase (E1): The teacher assesses students' prior knowledge and engages students in learning a new concept. The teacher also helps students to make connections between prior and present knowledge, and helps to organize students' thoughts about the learning outcomes of present activities.

Exploration phase (E2): The teacher provides students with a common base of activities reflective of present concepts processes, and skills. Students complete activities by using prior knowledge to generate new ideas, to explore questions and possibilities, and to execute a preliminary investigation.

Explanation phase (E3): The teacher focuses the students' attention on a specific aspect of their "engagement" and "exploration" experiences and provides opportunities for students to

demonstrate their understanding or skills. The teacher can also use direct instruction and guide the students toward a deeper understanding of a concept.

Elaboration phase (E4): The teacher challenges and extends students' conceptual understanding and skills. Students learn to develop broader and deeper understanding as well as skills, through the above three phases.

Evaluation phase (E5): The teacher evaluates students' progress toward achieving the instructional goals. Students learn to assess their understanding and abilities.

Each phase has a specific function and contributes to the teacher's coherent instruction and the students' formulating a better understanding of scientific and technological knowledge, attitudes, and skills. The model has been used to help frame the sequence and organization of programs, units, and lessons. Once internalized, it also can inform the many instantaneous decisions science teachers must make in classroom situations.

This survey is prepared for the purpose of determining students' views regarding the implementation of 5E model, one of the implementation types of constructivist approach in classroom setting, in vocational high schools. In line with the arguments provided so far, the research questions of this study were formulated as follows:

- To reveal whether there is a difference among students' views with regard to the gender variable concerning the Engage or in other words attention getting phase,
- Whether there is a difference among students' views with regard to the gender variable concerning the Explore phase,
- Whether there is a difference among students' views with regard to the gender variable concerning the Explain phase,
- Whether there is a difference among students' views with regard to the gender variable concerning the Elaborate phase,
- Whether there is a difference among students' views with regard to the gender variable concerning the Evaluate phase.

The criteria for the selection of experiment and control groups are sufficiently objective. The multi choice test used in the study is reliable.

3. Methodology

3.1 Participants

The population of the survey was constituted by Tunceli University students. As for the sample, it was formed by 631 freshmen and sophomores, 227 of whom are men and 404 are women in total studying at Tunceli University, Tunceli Vocational High School in 2011-2012 Academic year.

Table 1. *Men-Women Distribution According to the Departments in the Study Group*

Departments	Gender	f		%
Fashion Design Program	Male	13	72	1.4
	Female	59		
Child Development Program	Male	0	162	25.7
	Female	162		
Electrical and Energy Program	Male	52	56	8.9
	Female	4		
Accounting and Tax Applications Program	Male	17	81	12.8
	Female	64		
Construction Program	Male	31	38	6.0
	Female	7		
Furniture and Decoration Program	Male	14	14	2.2
	Female	0		
Food Technology Program	Male	24	60	9.5
	Female	36		
Aquaculture Program	Male	8	13	2.1
	Female	5		
Apparel Manufacturing Technology Program	Male	1	10	1.6
	Female	9		
Hair Care and Beauty Services Program	Male	12	14	2.2
	Female	2		
Chemistry Technology Program	Male	2	10	1.6
	Female	8		
Computer Programming	Male	54	85	13.5
	Female	31		
Organic Agriculture Program	Male	9	16	2.5
	Female	7		
	Male	**227**		**36.0**
Total		**404**	**631**	**64.0**
	Female			**100.0**

3.2 The data collection and analysis

As a data collection tool, a questionnaire developed by the researcher including things to do in each phase of the 5E model was used in the survey. In the questionnaire, a five point likert type scale was used with the points including *"Strongly Agree"* (4.21–5.00 points), *"Moderately Agree"* (3.41–4.20 points), *"Neutral"* (2.61–3.40 points), *"Moderately Disagree"* (1.81–2.60 points) and *"Strongly Disagree"* (1.01–1.80 points). Gender and the department of students constitute the demographical features and a **5E Learning Model Implementation Scale** (5ELMIS) consisting of 32 items and including the phases of 5E model takes place in the questionnaire. From these items, numbers (1, 2, 3, 4, 5 and 6) belong to Engage – Attention getting phase, (7, 8, 9, 10, 11 and 32) to Explore phase, (12, 13, 14, 16, 19 and 31) to Explain phase, (15, 17, 18, 20, 21 and 22) to Elaborate phase and finally (23, 24, 25, 26, 27, 28, 29 and 30) to Evaluate phase.

As a pilot scheme, 72 volunteering students have participated to the survey. As a result of reliability and validity calculations, Kaiser-Meyer-Olkin (KMO) value was found to be 0.769. According to Field (2000), as the KMO value got close to 1, it can be said that the relationship between the variables are clear and the factor analysis gave reliable results. As for the Bartlett test, it was determined to be 1327.637. According to that, the Bartlett test result is meaningful at the level of 0.05 (p=0.000). According to Büyüköztürk (2007), obtaining a coefficient value above 0.60 and a meaningful Bartlett Test result would show that the data are appropriate for the factor analysis. With respect to this result, it can be said that the data is appropriate for the factor analysis. When the results of the factor analysis are examined regarding 5ELMIS, it is observed that the eigenvalue of 32 item are gathered under 9 factors with an eigenvalue that is higher than 1. The variance that these factors show concerning 5ELMIS is % 72.623. On the other hand, as a result of the line chart analysis determined according to the eigenvalues, a high

accelerated fall is observed after the first factor and this condition shows that 5ELMIS can have a general factor. These findings support the idea that 5ELMIS is single factoral. Therefore, 5ELMIS is decided to be used as a single factor model. Consequently, the 5ELMIS items used in the survey are handled under a general factor. The reliability of the points obtained by the implementation of 5ELMIS is calculated by using Cronbach Alpha reliability formula. The Cronbach Alpha reliability coefficient was found to be 0.903. With this ratio, the reliability of 5ELMIS is proven and it is applied to the sample group. In the analysis and interpretation of the data, a significance level of 0.05 is accepted.

3.2 The Statistical Data Analysis

The literature part of this study, which holds the qualification of a descriptive field study, was constituted by making use of studies conducted both within the country as well as abroad on the 5E learning model. The data were put forward according to the responses that students gave to the questionnaires. The data analysis was carried out by SPSS 15.0 for Windows Evaluation Version. In order to analyze the instructors' implementation of 5E learning model according to the student views and the relationship of gender factor; mean, t-test, standard deviation, frequency and percentage calculations were used.

4. Results

The results, regarding each sub-problem of the study, are presented in separate table headings. As each phase of 5E serves for a different purpose, there are certain activities that must be realized in each of the phases. When these activities are completely performed, the opportunity to apply the model in classroom setting shall be available. In the light of these data, the interpretations are realized according to the gender variable. Results are summarized in the tables below.

***Table 2**. The Average of Agreement Levels Regarding Items in the Phases of 5E Model*

5 E Model	STATEMENTS		M	SD
	Item No	Item		
ENGAGE	1	Arousing interest regarding the topic introduction	3.44	1.25
	2	Arousing curiosity by using materials related to the subject	3.54	1.23
	3	Increasing attention by asking questions	3.80	1.13
	4	Helping learning by revealing previous learning	2.89	1.31
	5	Self-questioning (what do I know about the subject?)	3.90	0.99
	6	Showing interest while introducing the new subject	3.93	0.98
The overall average			**3.58**	**1.14**
EXPLORE	7	Exchanging opinions by working together with friends	3.68	1.22
	8	Learning when adequate time is given for learning	3.85	1.06
	9	Taking different trials and sharing with friends when the subject is learnt	3.50	1.14
	10	Making new hypotheses after the subject is learnt	3.29	1.13
	11	Guiding so as to make them gain different point of views by asking questions about researches	3.56	1.20
	32	Indicating wrong points of the hypotheses made	2.69	1.30
The overall average			**3.42**	**1.17**
EXPLAIN	12	Finding teacher encouragement unnecessary in learning	3.44	1.28
	13	Involvement of student experiences in explanations	3.81	1.03
	14	Describing concepts with their own sentences and self-expression	3.84	1.03
	16	Listening to their friends' explanations	2.34	1.28
	19	Making explanations and definitions after interaction takes place	3.65	1.03
	31	Using different materials to ease understanding	3.16	1.32
The overall average			**3.37**	**1.16**
ELABORATE	15	Reminding alternative explanations	3.44	1.19
	17	Integration of concepts and definitions with the previous learning	3.51	1.12
	18	Encouraging students to apply their acquired skills in new conditions	3.41	1.19
	20	Applying acquired knowledge and experiences to real life	3.82	1.11
	21	Making logical inferences based on proofs after the subject is learnt	3.86	1.01
	22	Paying attention that observations and explanations are understood by friends	3.89	1.02
The overall average			**3.48**	**1.10**
EVALUATE	23	Assessing knowledge and skills	3.62	1.16
	24	Analyzing behavior and idea differences after the subject is learnt	3.37	1.21
	25	Giving students the chance of self-assessment	3.33	1.22
	26	Giving students the chance of assessing their friends	3.42	1.25
	27	Giving students the chance of assessing their group work skills	3.39	1.21
	28	Giving clear answers to the questions by well accepted evidences	3.29	1.22
	29	Showing that the subject is understood	3.83	1.03
	30	Posing questions for the later phases of the subjects	3.76	1.05
The overall average			**3.50**	**1.16**

When looked at the general averages of participants regarding the items of "*Engage-Attention Getting*" phase, it was seen that the average rate of all items (M=3.58) was on the level of "*Moderately Agree*". As for the analysis of point averages on item level, it was observed that the item "*Helping learning by revealing previous learning*" was in the "*Neutral*" segment whereas other items took place in "*Moderately Agree*" segment.

When general averages of agreement-level (M =3.42) for the items prepared for the "*Explore*" phase were analyzed, it was seen to be at a level of "*Moderately Agree*". On the other hand, when point averages were analyzed on item level, the items "*Exchanging opinions by working together with friends*", "*Learning when adequate time is given for learning*", "*Taking different trials and sharing with friends when the subject is learnt*" and "*Guiding so as to make them gain different point of views by asking questions about researches*" were found within the range of "Moderately Agree" whereas "*Making new hypotheses after the subject is learnt*" and "*Indicating errors in the hypotheses made*" at "*Neutral*".

As students gave answers such as "Moderately Agree", stating that they exchanged opinions, shared what they know by taking different trials after they have learnt the subject, gained different point of views by being asked questions about researches and are given adequate time for the learning to take place indicate that the conditions required for this phase are partly satisfied. However, besides generally agreeing on the items regarding the explore phase, it was also observed that they exhibited neutral attitudes towards some of them. Due to this result, it can be said that students could not completely acquire the skills regarding this phase.

Looking at the average of general agreement levels on the items prepared for the "Explain" phase, it was determined to be at the level of (M =3.37) "*Neutral*". Agreement levels on the basis of items were analyzed and the results were as following; Their views about the items "*Using different materials to ease understanding*" were "*Neutral*", "*Listening to their friends' explanations*" were "*Moderately Disagree*" and responded other items as "*Moderately Agree*". On the other hand, the average of students' views was determined within the range of "*Neutral*". As a consequence, it is thought that skills and activities regarding this phase couldn't fully be realized or the required physical structure was not available.

When general averages of participants' responses for the items prepared for the "Elaborate" phase were analyzed, it was determined to be at the level of (M =3.48) "*Moderately Agree*". As for the agreement levels on the basis of items, students gave answers as "*Moderately Agree"* to the items that belong to the Explore phase.

Participants' views on the basis of items were determined to be as "*Moderately Agree*" for all of the items. From these data, it can be said that skills regarding the Elaborate phase were generally acquired since students gave answers at Moderately Agree level.

When the averages of general agreement levels for the items prepared for the "*Evaluate*" phase were analyzed, it was determined to be at (M =3.50) "*Moderately Agree*" level. When agreement levels were analyzed on the basis of items, it was observed that students gave answers to the items "*Evaluating knowledge and skills*", "*Giving students the chance of evaluating their friends*", "*Showing that the subject is understood*" and "*Posing questions for later phases of the subjects*" as "*Moderately Agree*" and replied others as "*Neutral*".

Showing attitudes like "*Moderately Agree*" indicate that the Evaluate phase was generally actualized and the evaluation carried out for the student was appropriate for the 5E model. Yet, when the items were evaluated separately, a definite result confirming that this phase is fully implemented could not be obtained since students were neutral about half of the items.

T-test results of students' agreement levels according to gender variable regarding "Engage-Attention Getting" phase of 5E Model take place in Table 3.

Table 3. *T-test Results of Agreement Levels According to Gender Variable Regarding Engage-Attention Getting phase*

Item No	Items	Gender	M	SD	p	t
1	Arousing interest regarding the topic introduction	Male	3.52	1.30	.251	1.15
		Female	3.40	1.22		
2	Arousing curiosity by using materials related to the subject	Male	3.48	1.31	.408	-.83
		Female	3.57	1.19		
3	Increasing attention by asking questions	Male	3.92	1.10	.056	1.91
		Female	3.74	1.14		
4	Helping learning by revealing previous learning	Male	**2.67**	**1.30**	**.002***	**-3.11**
		Female	**3.01**	**1.30**		
5	Self-questioning (what do I know about the subject?)	Male	3.87	1.03	.619	-.50
		Female	3.91	0.97		
6	Showing interest while introducing the new subject	Male	3.88	1.04	.313	-1.01
		Female	3.96	0.94		

*p < 0.05

When students' views regarding Engage-Attention Getting phase were evaluated, it was determined that out of six items belonging to this phase, there was only one significant difference. Looking at the answers to the item "*Helping learning by revealing previous learning*", it was determined that there was a significant difference. When gender averages of the same item are considered, it is observed that female participants constitute a rate of (M=3.01), whereas male participants constitute (M =2.67). Although their answers took place in the neutral segment, male participants stated that they are more neutral than female ones. From this result, it can be claimed that male participants care less for previous learning or that they have less previous learning than females. A significant difference did not exist in the participant data of other items belonging to this phase.

T-test results of students' agreement levels according to gender variable regarding "*Explore*" phase of 5E Model are presented in Table 4.

Table 4. *T-test Results of Agreement Levels According to Gender Variable Regarding Explore Phase*

Item No	Items	Gender	M	SD	p	t
7	Exchanging opinions by working together with friends	Male	3.67	1.25	.870	-.16
		Female	3.69	1.20		
8	Learning when adequate time is given for learning	Male	3.79	1.07	.318	-1.00
		Female	3.88	1.06		
9	Taking different trials and sharing with friends when the subject is learnt	Male	3.54	1.13	.582	.55
		Female	3.49	1.16		
10	Making new hypotheses after the subject is learnt	Male	3.37	1.13	.198	1.29
		Female	3.25	1.13		
11	Guiding so as to make them gain different point of views by asking questions about researches	Male	3.51	1.22	.394	-.85
		Female	3.59	1.19		
32	Indicating wrong points of the hypotheses made	Male	**2.88**	**1.40**	**.005***	**2.79**
		Female	**2.58**	**1.23**		

*p < 0.05

According to the analysis results of students' views regarding the Explore phase; of the six items that belong to this phase, there was a significant difference in one, while there was none among others. The item in which a significant difference was observed has been "*Indicating errors of the hypotheses made"*. Considering gender averages of this item, male participants exhibited (M=2.88) neutral attitudes whereas females (M=2.58) answered as moderately disagree.

Based on these results; male participants think that instructors at the vocational high school sometimes indicate the erroneous points of the hypotheses that are formed, whereas female participants think that they do not indicate them. Since male and female participants are in different programs and departments, it is thought that this result stems from the difference of the instructors of the respective classes. In this sense, it can be claimed that the instructors have not displayed adequate guidance in the Explore phase.

T-test results of students' agreement levels according to gender variable regarding "*Explain*" phase of 5E Model take place in Table 5.

Table 5. *T-test Results of Agreement Levels According to Gender Variable Regarding Explain Phase*

Item No	Items	Gender	M	SD	p	t
12	Finding teacher encouragement unnecessary in learning	Male	**3.26**	**1.34**	**.006***	**-2.77**
		Female	**3.55**	**1.23**		
13	Involvement of student experiences in explanations	Male	3.84	1.01	.639	.47
		Female	3.80	1.04		
14	Describing concepts with their own sentences and self-expression	Male	3.74	1.08	.057	-1.91
		Female	3.90	1.01		
16	Listening to their friends' explanations	Male	**2.56**	**1.37**	**.002***	**3.14**
		Female	**2.22**	**1.22**		
19	Making explanations and definitions after interaction takes place	Male	3.58	1.13	.195	-1.30
		Female	3.69	0.97		
31	Using different materials to ease understanding	Male	3.22	1.36	.393	0.85
		Female	3.13	1.30		

*p < 0.05

According to the analysis results of students' views regarding Explain phase; of the six items that belong to this phase, there was a significant difference in two, which did not exist in the others. According to the answers that students gave to the item "*Finding teacher encouragement unnecessary in learning*" there was a significant difference. Moreover, female participants took place within the range of (M=3.55) moderately agree, while male participants were in (M=3.26) neutral. Female participants find instructor encouragement more unnecessary when compared to males in percentage.

When students' answers were analyzed regarding the item "*Listening to their friends' explanations*"; although male participants took place within the range of moderately disagree with a rate of (M=2.56) and female participants with (M=2.22), it was observed that male participants disagreed more than females. A student, answering as moderately disagree, gave answers to the negatively directed question as it should be in the process of implementation and stated that it is important to listen to their friends' explanations. A significant difference wasn't detected in students' answers to the other items of this phase.

The fact that students have indicated that different materials were used in the process of learning, that they were given the chance to express themselves and that explanations were based on their experiences indicates that the required conditions were satisfied for the phase.

T-test results of students' agreement levels according to gender variable regarding "*Elaborate*" phase of 5E Model take place in Table 6.

Table 6. *T-test Results of Agreement Levels According to Gender Variable Regarding Elaborate Phase*

Item No	Items	Gender	M	SD	p	t
15	Reminding Alternative explanations	Male	3.47	1.21	.623	.49
		Female	3.42	1.18		
17	Integration of concepts and definitions with the previous learning	Male	3.47	1.20	.549	-.60
		Female	3.53	1.08		
18	Encouraging students to apply their acquired skills in new conditions	Male	3.38	1.21	.636	-.47
		Female	3.43	1.18		
20	Applying acquired knowledge and experiences to real life	Male	3.78	1.18	.453	-.75
		Female	3.85	1.07		
21	Making logical inferences based on proofs after the subject is learnt	Male	3.82	1.04	.382	-.87
		Female	3.89	0.99		
22	Paying attention that observations and explanations are understood by friends	Male	3.87	1.02	.780	-.28
		Female	3.90	1.03		

*p < 0.05

As a result of the analyses, it was determined that the averages of male and female participants were close to each other in all of the items that belong to the Elaborate phase. Therefore, a significant difference was not found in any of them.

Students' stating that they were encouraged to apply the skills they acquired in new conditions, make new learning meaningful with the previous learning, care about being understood by their friends and apply their experiences to real life show that the Elaborate phase was generally realized.

T-test results of students' agreement levels according to gender variable regarding "*Evaluate*" phase of 5E Model take place in Table 7.

Table 7. *T-test Results of Agreement Levels According to Gender Variable Regarding Evaluate Phase*

Item No	Items	Gender	M	SD	p	t
23	Assessing knowledge and skills	Male	3.59	1.25	.631	-.48
		Female	3.64	1.12		
24	Analyzing idea and behavior differences after the subject is learnt	Male	3.38	1.25	.921	.10
		Female	3.37	1.19		
25	Giving students the chance of self-assessment	Male	3.38	1.24	.495	.68
		Female	3.31	1.22		
26	Giving students the chance of assessing their friends	Male	**3.15**	**1.30**	**.000***	**-4.19**
		Female	**3.58**	**1.20**		
27	Giving students the chance of assessing their group-work skills	Male	3.30	1.29	.175	-1.36
		Female	3.44	1.16		
28	Giving clear answers to the questions by well accepted evidences	Male	**3.12**	**1.28**	**.007***	**-2.69**
		Female	**3.39**	**1.17**		
29	Showing that the subject is understood	Male	3.83	1.04	.900	.13
		Female	3.82	1.03		
30	Posing questions for later phases of the subjects	Male	3.75	1.11	.855	-0.18

*p < 0.05

When students' views regarding the Evaluate phase were analyzed, significant differences were observed in two of the items while none was observed in the other six that belong to the Evaluate phase. A significant difference was determined in the item "*Giving students the chance of assessing their friends*". Considering gender averages regarding this item, male participants were (M=3.15) neutral, while female participants (M=3.58) answered as moderately agree. This situation may be interpreted as female participants being more involved in evaluations in the classroom in comparison to male participants. A significant difference was observed when the students' answers to the item "*Giving clear answers to the questions with well accepted evidences*" were analyzed. In the light of these data, it can be deemed that

female participants are more successful in giving clear answers to the questions with well accepted evidences compared to males although male participants took place within the range of neutral with a rate of (M=3.12) and females (M=3.39). No significant difference was determined regarding the answers to the other items of this phase.

The students' exhibiting neutral attitudes towards articles that assessed their friends, themselves and their group-work skills is one of the most obvious indicators that the evaluate phase has not been made in accordance with the model. As the 5E model can only be completely implemented when each phase has been successfully realized it cannot be said that the model has been fully implemented due to the fact that students have displayed a neutral attitude. Yet, students generally answered as *Moderately Agree* the questions related to the implementation of the stages of 5E model.

5. Conclusions

5E model is an instructional strategy, which first assesses students' misconceptions and then promotes conceptual change. (Karplus & Their, 1967; Lawson, Abraham & Renner, 1989). 5E model promotes scientific understanding and thinking abilities among students. With the infusion of multimedia into the education, multimedia lessons provide the teacher with a more effective way to transfer knowledge and information to students. Multimedia lessons also enable the students to learn in a more productive way.

According to the significant difference observed in the item: "the instructor's revealing my previous knowledge in the Engage-Attention Getting of the 5E model phase doesn't help my learning", it can be claimed that the instructors could not ascertain the students' previous learning at a degree that can affect their learning degree or that students could not make use of their previous learning adequately in the learning process. By using interesting studies or asking motivating questions, the success of the task can be increased. In this regard, the instructors must be equipped with a sound knowledge in their domain. By endowing those instructors with an environment that allows for the opportunity to implement 5E model and by providing them with related training, the model can be implemented with success.

Students do not have an idea on whether they should make positive or negative contributions to the hypotheses that instructors form during their studies. When evaluated in terms of education models, the instructor doesn't interfere in the students' work before all of the phases are completed. This situation may make students think that the instructor is either indifferent or he/she doesn't have enough knowledge in the field. Such misunderstandings can be avoided by informing students about the model. Trainings can be given to allow instructors to implement cooperative work. The idea is to use class time efficiently, by giving a place for seminars on the efficient use of time and by conducting researches in academic studies on the techniques on the efficient use of time. From these, it can be concluded that students and instructors did not exactly know what their tasks were and consequently there were difficulties while implementing the phase. Sezen, Konur and Cimer reached a similar conclusion in a study they made in 2009: it was found that the problems that prospective teachers encountered or could have encountered during the implementation of 5E model were generally related to the teachers or students themselves.

Although students find instructors' encouragement unnecessary in the learning process, they stated that they listened to their friends' explanations. Because students stated that revealing

previous learning does not contribute to learning, we can deduce that students do not like to be interfered. The main problem of this phase where the teacher is the most active arises from an inadequate explanation of the subject in addition to the lack of materials or a failure in using them. Lack of material and equipment is one of the major problems faced during the implementation of 5E model. The findings, similar to the problems that are brought to light in this study regarding the implementation of 5E model, take place in the literature as well (Bozdoğan & Altunçekiç, 2007; Başkan, Alev & Atasoy, 2007; Metin & Özmen, 2009).

In the Elaborate phase, the fact that students are not able to find the opportunity to apply what they have learned in real life or could not associate it with the real world indicate that elaboration has not been made . This phase can be realized as long as students reflect what they have learned into different situations. As each phase is realized subsequent to another one, crowded classrooms or lack of time can render the implementation difficult. Similar results about having problems in cases such as failing in classroom management, having insufficient time for the lesson and problems related to the group works can be found in Bozdogan & Altuncekic's (2007) studies.

In the final phase of the5 E model, Evaluate, students have stated that Instructors have not given the chance to assess themselves and their friends. Since students, who are required to be in interaction, couldn't find this opportunity, it is considered that they were unable to exchange opinions during activities based on group studies. Nas, Coruhlu & Cepni stated that group work provides interaction among students helps exchanging opinions and thus makes learning more meaningful in a study they did in 2010. The instructors failing to give students the chance to evaluate their group works as well as themselves, indicates that are not making an evaluation in accordance with the 5E model. Although students made evaluations indicating that the instructors are not competent, the answers they gave to the item "giving clear answers to the questions by well accepted evidences" may also suggest that they think they are not knowledgeable enough or they have no confidence in their knowledge. The instructors employing the Evaluate phase with traditional methods is thought to be an effective cause of their failure in making a proper evaluation for this model. Akdeniz & Akbulut's (2010) study includes similar results. In order to implement the Evaluate phase of 5E model, different evaluation methods should be presented in the faculties and instructors should proceed in the school environment. Therefore, proceeding to new approaches in the courses covering professional studies associating them with technology especially in the departments that raise teachers shall be useful.

The generally positive answers of students show that 5E model is partly implemented. However, as the phases of 5E model are required to be realized respectively, conducting an experimental study may be useful as a support to this study in order to ensure physical conditions for each phase and to determine whether students have prior knowledge and the whether instructors have field knowledge or qualified enough to implement this model .

To implement the 5E model in full, the instructors should be informed. The school environment should be made suitable for the implementation conditions. In this regard, school administrations and institutions play a significant role. Instructors should be encouraged to move away from traditional methods and give education in the light of new approaches. Especially 5E model should be given a wider place in the departments where the implementation is carried out. Schools that are well equipped in every respect are important for efficient learning. Therefore, students can be brought to a position in which they become active

participants by transforming schools into well equipped places. Every material and equipment may not be suitable for every class and subject, therefore having conscious and informed educators can help diversifying the teaching methods.

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