

Using an Animated Case Scenario based on Constructivist 5E Model to Enhance Pre-service Teachers' Awareness of Electrical Safety*

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Abstract

The objective of this study is to get pre-service teachers to develop an awareness of first aid knowledge and skills related to electrical shocking and safety within a scenario based animation based on a Constructivist 5E model. The sample of the study was composed of 78 (46 girls and 32 boys) pre-service classroom teachers from two faculties of education at two Turkish Universities. For the purpose of this qualitative study, an open-ended "Electrical Safety Awareness Questionnaire" was used to assess the participants' acquisition, retention and awareness levels in the beginning, at the end and five weeks after the implementation of the intervention. A one-group pretest-posttest design was adopted to measure the outcomes. Interpretative analysis was used to analyze the data. Results showed that when the subject was electricity, using an animated case scenario based on a constructivist 5E model was effective in teaching first aid knowledge and helping pre-service teachers acquire and retain technical skills about the electric shock.

Key Word

Animation, Constructivist 5E Model, Electrical Safety, First Aid, Pre-service Teachers.

In recent years, more and more serious injuries have been reported at schools. Some of them were electrical-shock caused injuries. Although computer simulations and web-based learning modules have become valuable tools for bridging gaps in students' understanding of electricity (Finkelstein et al. 2005; Sadaghiani, 2011), we usually avoid learning more about its nature and procedures for prevention due to our everyday life heavily depends on the use of electricity. Therefore, teachers who are usually assume a bystander role in electrical accidents in schools must know how to deal with possible health risks and be able to provide basic help to anyone who may need it. However, studies related to the teachers' acquisition and retention of first aid knowledge and skills generally resulted in poor

outcomes in Turkey (Başer, Çoban, Taşci, Sungur, & Bayat, 2007; Korkusuz, Tüzün, & Saraç, 2005).

Our analysis of previous studies showed that no prior study to our knowledge specifically investigated the teachers' acquisition and retention of first aid cognitive, affective and psychomotor skills in potential electrical-shock-related injuries. Moreover, researches usually evaluate teachers' general first aid knowledge by using multiple-choice and true/false questions by face to face (Başer et al., 2007) and/or by web-based distance education course (Celik, 2013). However, this assessment does not fully measure learning outcomes. Constructivist Theory emphasizes that learning be assessed and evaluated along a learning process taking place in constructivist learning contexts (Gay & Mazur, 1993). In ad-

* This paper was revised after being presented at 6th International Computer and Instructional Technologies Symposium, Gaziantep, Turkey, 4-6 October 2012.

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dition, learning should be authentic, and needs to simulate real life experiences (Huang, 2002).

Constructivism is a theory of learning not an instructional method. The 5E Model of Instruction used in science curriculum is a constructivist model that uses five phases of instruction: engagement, exploration, explanation, elaboration and evaluation. Participants' first aid knowledge for electric shocking can be evaluated and developed through a constructivist 5E Model. In the first phase of the 5E model (engagement), students are asked some questions or showed videos or animation related to real life to get them mentally engaged in the concept, process, or skill to be explored. Teacher also identifies the students' prior knowledge about the concept. In the explore phase, students actively identify and develop current concepts and explore their environment or manipulate materials. In next phase (explanation), guided by the teacher, learners explain what they understand after the explore phase. Through the elaboration phase, it is expected to get students to abandon their misconceptions and help them develop a deeper and broader understanding, acquire more information, and adequate skills through their learning experience. The evaluation phase encourages students to assess their understanding and abilities and provides opportunities for teachers to evaluate student progress toward achieving the educational objectives (Bybee et al., 2006).

Animation has been used successfully to provide students with real life experiences without causing a risk to flesh-and blood patients in the area of medicine (Delpier, 2006). Moreover, the 5E model encourages teachers to use computer-supported learning environments in creative and challenging ways and establishes the right proportion between learner independence and guidance (Hırça, Çalık, & Seven, 2011; Urhahne, Schanze, Bell, Mansfield, & Holmes, 2010).

To train volunteers in first aid, many investigators have introduced several alternative instructional methods for developing a greater skill competence than traditional classroom methods with the use of technology such as mobile training centers (Sarikaya & Serkan, 2006), videotaped (Vnuk, Owen, & Plummer, 2006), e-learning (O'Leary & Janson, 2010), case-based (Saraç, 2008), web-based (Celik, 2013; Kossekova & Güner-Akdoğan, 2010; Saraç, 2008), tele-education (Jain, Agarwal, Chawla, & Deorar, 2010) and game-based instruction (Charlier, 2011). The authors of the present study preferred to use Animated Case Scenario through a Constructivist 5E model platform because of the observed effectiveness of using this combination in

other disciplines (Hırça et al., 2011; Urhahne et al., 2010). The other reason for the author choice is that there are no studies which used this combination in public health interventions. It is expected that, using this combination will be advantageous in teaching electrical shock without causing a risk to flesh-and-blood patients. Furthermore, animation based cases have several advantages when compared to traditional lecture based methods (Delpier, 2006; Kossekova & Güner-Akdoğan; Singh, Singh, & Gautam, 2009; Spinello & Fischbach, 2004; Yip, 2002), such as:

- a. Animation based platform including interactive features and multimedia can allow a problem scenario to be presented by incorporating multiple different perspectives, while modeling the problem environment allows the student to solve the problem in an iterative fashion.
- b. Learning is best achieved when a lecture is coupled with an animation which offers a multidimensional experience for students by associating scenarios with sensory information. That is not available in a text-based environment.
- c. In the animation-based platform, time can be compressed or expanded in a simulation so that the case experience can fit into an academic period.

Given these advantages, an "Electrical Safety Course" that used interactive, animated cases based on a Constructivist 5E Instructional Model was designed to educate pre-service elementary teachers during their undergraduate studies. Current research has been undertaken to investigate the impact of this course on pre-service elementary teachers' understanding regarding the following questions; *a)* to what extent are pre-service elementary teachers aware of the nature of electricity?, *b)* to what extent do pre-service elementary teachers realize issues related to electrical safety? and *c)* to what extent "Electrical Safety Course" will have an effect on pre-service elementary teachers' awareness of electrical safety?

Method

The sample of the study was composed of 78 (46 girls and 32 boys) pre-service classroom teachers from two faculties of education at two Turkish Universities. In the present study, pre-service teachers' awareness of electrical accident was tested without a control group in this study. The assessments were based on pre-test, post-test and delayed retention tests. The one-group pretest-posttest design is a research de-

sign where one group of participants is pretested on the dependent variable and then post-tested after the intervention has been administered (Karasar, 2002). Interpretative analysis was used to analyze the data (LeCompte & Preissle, 1993). Pretest, post-test and delayed retention test results were compared and interpreted to assess the changes in the pre-service teacher's views. The retention test was used in order to increase the validity of our interpretations of the students' responses to the questionnaire.

The Pedagogical Design of the Course

At two different universities in the 2010-2011 and 2011-2012 academic years, in the beginning of the science and technology laboratory course it was announced that students could participate in an experimental study and that they could attend an animated electrical safety course. The course material is Adobe Flash[®] application that can be used offline or online with a Web browser or any corresponding application supporting the Flash content at www.kobiegitim.com/Ilkyardim/index.html. As mentioned earlier, this course was implemented in five stages according to the 5E Model. In the engagement stage of the animation, the author aimed to get students mentally engaged in the concepts, processes, and skills to be explored. In the animation a woman entered a bathroom by singing a song. When she touched the water heater to switch it on, she received an electric shock and fell down on the floor. This stage took approximately five minutes.

In the exploration phase of the animation, there was a problem scenario, which allowed students to actively identify and develop current concepts and explore their environment and manipulate materials. In the animation a woman's husband came home and called her. After this section, the animation stopped and the computer user needed to manage the husband character. The husband guided with the user looked for his wife everywhere at home. Several goods such as dishwashing gloves, slippers, telephone and electrical fuse box were shown in the background to the computer user in this exploration phase. When the user (husband) entered the bathroom, he met his wife lying unconsciously on the wet floor. He said to himself, "*I think the water heater has an electric leakage, what must I do?*" (see in Figure 1).

The real exploration phase began here. Because, the computer user had several option for helping the unconscious woman. The options were the following: a) The user can pull her out of the bathroom, b) s/he can get back and switch off the electrical fuse

box, c) s/he can wear dishwashing gloves and slippers to protect himself from being shocked, d) s/he can call an ambulance or e) s/he can remove metals from his wife's body such as rings, bracelets, earrings. This phase took 15-20 minutes. In next phase (explanation), the participants needed to explain what they understood from the explore phase. In this section, pre-service teachers sorted the options, which constituted the pretest of the study. When the computer user clicks the telephone, a telephone conversation between the husband and a medical officer begins. The husband describes his home address. An ambulance comes and a doctor consults the woman in the ambulance. The doctor says "*She is fine; I think she had a loss of consciousness from the electric shock. Will you take her to the hospital?*". The animation paused here again for their answer. When they answered the question, the animation finished. This phase took 25-30 minutes together with the administration of the pretest. Hereafter, the elaboration phase began. This was a vital phase for students comprehension of concepts and the elimination of their misconceptions through multiple learning styles (Ürey & Çalık, 2008). Thus, a doctor character appeared on the screen and, clarified electricity concepts and the procedure of first aid according to a "conceptual change text" that was identified as an effective method for understanding electricity concepts (Wang & Andre, 1991). Moreover, he not only explained the first aid procedures for an electric shock but also automatically assessed and scored the students' answers given in the previous phase. In other words, the doctor identified electricity concepts on one hand, and on the other challenged the learners' existing schema. In this section, there were fourteen confirmative, explanatory and rebuttal information in order for students to reconcile their new and old knowledge (Vosniadou, 2007). This phase took 10-15 minutes. The evaluation phase encouraged students to assess their understanding and abilities, and provided opportunities for teachers to evaluate student progress toward achieving the educational objectives (Bybee et al, 2006; (Psycharis, Chalatzoglidis, & Kalogiannakis, 2013). In this phase, they were asked ten multiple-choice questions on the animation. They evaluated their own learning in this phase. This phase took 10-15 minutes. The interactive course finished after they had answered interactive multiple-choice questions. After the course, they responded to a posttest. A very short time interval between the administration of two tests leads to carryover effects due to memory and practice (Marx, Bombardier, Hogg-Johnson, & Wright, 1999). Therefore, students' retention of intervention



Figure 1.
Husband Meets His Unconscious Wife in Bathroom

outcomes was tested again five weeks later.

Data Collection Tools

For the purpose of this qualitative study, an open-ended “Electrical Safety Awareness Questionnaire” was used to assess the participants’ acquisition, retention and awareness level in the beginning, at the end and five weeks after the intervention. The questionnaire, which was formed by the researchers, was made up of five open-ended questions. Two of them were about students’ demographics, and the other two were about whether the students attended any first aid course and whether they felt sufficiently prepared for providing a first aid. The last question was a vital question for the study due to specifically examine how they can help the unconscious woman. Finally, they were asked to arrange the options in an order of importance.

After the retention test was administered, it was seen that some answers were not clear. For example, one answer was “*I bury the shocked woman in soil for earthing/grounding*”. It is possible that there may be a problem in understanding the concept of “grounding” in this case, although the responder could notice that the question is about the need to channel electricity safely. For elaboration and explanation, individual follow-up interviews were conducted with some students. On the interview, while explaining their reasoning, the students were allowed to modify their answers.

Data Analysis

After the pre-, post- and retention questionnaires, and interviews, large amounts of qualitative data were obtained from the students. In order to facilitate the analysis of data, students’ all answers were put on an excel sheet. The fifth question was the core question for assessing and evaluating the pre-service teachers’ understanding of main subjects. A range of answers was given to this question including the use of various combinations of the existing options. The answers to this question were analyzed by an interpretive analysis (LeCompte & Preissle, 1993). Then first-aid steps in their answers were enumerated. The enumerated steps were compared between the pre and the post test. Finally, to evaluate the students’ first aid profile, each student’s answers and their demographic characteristics were matched as seen in table 1.

The data were coded by the author and checked by one of his colleagues. The disagreements about the coding were negotiated and a consensus was reached. After that, the two coders interpreted the students’ behaviors for electric safety at the beginning, at the end and five weeks after the intervention, and compared these interpretations to see if there was a change in the students’ views, skills and knowledge on electric safety.

Table 1.
A Pre-service Teachers' First Aid Profile

Name	first aid course / self-confidence	Pretest	Posttest	Delayed retention test
Rudvan	No No	<ol style="list-style-type: none"> 1. I check whether she is alive 2. I carry her to a comfortable place 	<ol style="list-style-type: none"> 1. I switch off electric power 2. I carry and put her on a dry floor 3. I wear insulated gloves and slippers 4. I take off metal objects 5. I check her pulse 6. I call an ambulance 	<ol style="list-style-type: none"> 1. I wear plastic gloves and slippers 2. I switch off electric power 3. I carry and put her to a dry floor 4. I call 112 5. I remove metal objects 6. I control his breathing

Results

Profiles of Pre-service Teachers' First Aid Knowledge and Skills

Before the implementation of the intervention program, students' first aid knowledge was assessed to determine whether the intervention would have an effect on the students' first aid knowledge for electric shock. The students' first aid profiles for electric shock are presented side by side with the results of the retention test below.

Before the course, 28% of the students indicated that they had a basic first aid training course when they attended courses to get a driving license in a driver license school. However, they indicated that it was theoretical. Therefore, 64% of the trained students indicated that they do not have enough knowledge that will make them well-prepared for giving a first aid. Four trained students stated that if they were a bystander of an accident, they could not turn their first aid knowledge into practice. Only two trained students indicated that they had self-confidence to give a first aid treatment. When the previously trained students' responses were analyzed, they did not have a better first aid knowledge compared to the previously non-trained students. For example, while the 58% of the previously trained students indicated that they would be "removing the fuse or turning off the circuit breaker immediately" in pretest, this rate was 68% among the non-trained students. A non-trained student explained in an interview: "my mother always advised me for removing the fuse directly, if any electrical equipment malfunctions or gives off a strange odor". Therefore, there was no reason for evaluating trained and untrained students' responses separately.

As seen in table 2, more than half of the students (62%) indicated that if they were a bystander of an electric-shock event, their first behavior would be to cut the electric current directly. Nevertheless, they did not have sufficient protective and remedial knowledge that would carry them to a later stage. If they saw a victim lying on a wet floor and being within the range of a probable electric current, they would call an am-

bulance or emergency number (15%) and they would wear insulated gloves and/or slippers (3%). Moreover, 20% of the students implicitly indicated that they would touch the victim directly by entering the bathroom without insulated gloves and slippers. An analysis of all steps revealed that, few students indicated that they would cut electric current (18%), call an ambulance or an emergency number (11%) and move the patient (26%). In addition, many students indicated that they would never touch the shocked woman. In this latter case the response is correct. However, six students, two of whom were trained, clarified their responses by saying that they would do so because, "the woman was charged with electricity" in the follow-up interviews. They further explained that before lifting and carrying the shocked woman to a dry soil for electrical grounding, they must wear insulated gloves and/or slippers lest the charged woman shocks them. What is more interesting is that, one of these students recounted an event as a basis for his explanation: "Two men were shocked in our village, their friends buried one of the shocked men in soil. The buried man is still living. But, the other man died after a while".

On the other hand, two non-trained students with a high perceived control indicated that they could perform cardiac (heart) massage. In an interview, one of them expressed that "yes, right..., I was not trained to perform a cardiac massage... I heard of it in my science courses... If there is no trained person around us, what else can I do to save a life?... I don't know how often it must be done but I must press on the chest at regular intervals..."

There were also unusual responses given for how to help the shocked woman, such as "I would throw a blanket on her (because, woman is charged)"; "I would cover her with a blanket (probably thinking that there will be no electric current)", "If she had a shock, I would keep her feet elevated as much as possible", "I would get her to lean against the wall to remove the electric charge", "I would carry her to a dry floor to comfort her", "I would remove metal objects, lest those disturb her".

The Effect of Implementation on Pre-service Students' First Aid Knowledge

In this study, the retention test results were assumed to indicate the retention of knowledge when compared to the posttest directly after the intervention. As can be seen on table 3, the results of the posttest and the retention test were compared to investigate the retention of knowledge.

When we compared the results of the retention test with the pretest (see table 2), we saw that the majority of the students learned sufficient protective and remedial measures about the electric shock. They also kept the information about those in their memory. A student clarified this point on the interview: *"I learned first aid steps through a trial-and-error method. In other words, after a small child touches a hot stove, he never touches it again. In other word, a calamity is better than a thousand advices* (Turkish proverb). One student indicated the effectiveness of the intervention on the interview: *"The whole six weeks were passed after that lesson, I am still living in the moment when the woman got shocked. Her eyes were very big when she was shocked and fell down. I learned the effects of electric shock very well..."* Another student subjectively confirmed the effectiveness of animation by saying; *"I still remember the husband's consternation... help-seeking steps ... dishwashing gloves in the kitchen ...slippers in front of the door."*

This course also had an effect on changing some misconceptions and absurd first aid knowledge of pre-service elementary teachers. In the post and the retention test, no one indicated that s/he would bury the shocked woman or throw a blanket on her without touching. Students would use blanket to keep warm the soaked woman after moving her to a dry place. Moreover, they gained some first aid

skills to help the shocked woman before calling an ambulance. Hence, approximately half of the students responded that they would call an ambulance at the sixth step. Moreover, a total of 31% of the students integrated several helping methods to first aid practices such as covering her body to keep her warm on a dry place outside of the bathroom, clearing her face to help her relax, try to speak with her etc.

First, the findings showed that, the implementation of the program provided pre-service teachers with several first aid skills. Second, it increased most of the students' self-protection knowledge and skills. Considering all first aid steps they listed in the retention test, all of them indicated that they would wear insulated gloves and/or slippers. However, it is important to note here that some students (up to 10%) implied that they would wear insulated gloves and/or slippers after moving the victim to a dry place. Likewise, some students (up to 18%) indicated that they would cut electric current after moving the victim to a dry place.

We compared the results of the post-test with the retention test. Although majority of the students generally agreed with "removing the fuse or turning off the circuit breaker" in first step, there is a difference between distributions of students' answers in the other steps. Table 3 shows differences between the results of the post-test and the retention test.

As seen in table 3, some students reordered their priority of first aid steps. In the retention test, 18% of the students were negligent to cut electric current in first step, 10% of the students left the woman exposed to a probable electric current. However, they preferred to wear insulated gloves and/or slippers (5%) and to call an ambulance or calling 112 (5%). Touching the shocked person was the worst among

Table 2.
The Comparison Results of Pre-test and Retention Test

Firs aid steps	Pre test						Retention test																		
	S1	S2	S3	S4	S5	S6	S1	S2	S3	S4	S5	S6	S7												
	N	%	N	%	N	%	N	%	N	%	N	%	N	%											
Removing the fuse or turning off the circuit breaker	48	62	4	5	4	5	-	-	-	-	-	-	64	82	10	13	4	5	-	-	-	-	-	-	
Wearing insulated gloves and/or slippers	2	3	6	8	-	-	-	-	-	-	-	-	4	5	64	82	6	8	4	5	-	-	-	-	
Calling an ambulance or Calling 112 (emergency number)	12	15	30	38	26	33	-	-	2	3	-	-	4	5	-	-	6	8	6	8	28	36	34	44	-
Moving the victim to a dry place.	12	15	26	33	16	21	4	5	-	-	-	-	4	5	-	-	60	77	8	10	-	-	-	-	-
Removing metal objects	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	2	3	42	54	10	13	-	-
Measuring the pulse rate or/and controlling the breath	4	5	8	10	10	13	12	15	-	-	-	-	2	3	2	3	-	-	12	15	32	41	2	3	-
Applying first aid	-	-	-	-	-	8	10	-	-	-	-	-	-	-	-	-	-	2	3	4	5	4	5	6	8
Other applications	-	-	4	5	6	8	-	-	-	-	-	-	-	2	3	-	-	4	5	4	5	4	5	10	13

the possible behaviors. Some students (3%) completely forgot the existence of the electric current in the retention test. In total, 8% of the students implied that they would touch a shocked person to measure the pulse rate or/and control the breathing (3%) or to move the victim to a dry place (5%). This point was asked to two students on the interviews. One of the students explained their answer by saying that they would do so "... because of little or no prior knowledge on electricity". The other student reasoned that; "if the husband had touched her wife without cutting the electric current, he would have been shocked and fell down like the woman. No one would suggest that s/he move the victim to a dry place where there is no electric current. Five students said "if I had first aid knowledge, I...". So, they were aware of their insufficient knowledge.

In contrast, the students' responses about other possible behaviors became more common such as those related to "measuring the pulse rate or/and controlling the breath" which increased by 9% and "applying first aid" which increased by 9%. The increase in these types of responses led to postponing the "calling of an ambulance". Thus, approximately half of the students indicated that they would call an ambulance in the sixth step. After calling an ambulance, there was also an increase in responses that described helping the victim in different ways, such as "accompanying the victim to the hospital" etc. in the retention test.

Discussion and Conclusion

As we see on the written and visual media, there has recently been an increase in the number of incidents or accidents involving injuries to students in our schools. These injuries damage the school climate by scaring the students, harming the teach-

ers both physically and psychologically, and by ultimately shaking the parents' confidence (Turhan & Turhan, 2012). One of such injuries is electric shock which also disrupts the delivery of effective science teaching. Because of the hazardous effects of the electric shock, the objective of this study was to get pre-service students to develop an awareness of first aid knowledge and skills on electric shock within a scenario based animation based on the Constructivist 5E Model toward helping them reach their full potential academically, socially and emotionally.

The instructional support had an expected effect on the students' understanding of first aid subjects about the potential incidents of electric shock. This outcome is consistent with the previous research, supporting the idea that multimedia tools are one of the effective ways of teaching first aid (Celik, 2013; Charlier, 2011; Saraç, 2008). In this study, students showed a marginal gain in their understanding of the nature of the electricity and the first aid skills for electric shocks when they were instructed in a simulation environment. This result is also consistent with other lines of previous research, which show that there is a significant improvement in knowledge, student confidence and practical first aid skills when students are retested by using a mock scenario after completing an e-learning module (O'Leary & Janson, 2010).

The participants also spent a minimum time on constructing and studying the first aid course during the intervention. If they had received similar instructions in a realistic environment, they would have needed to spend much more time during such an intervention. Thus, it seems that the implicit first aid instruction for electric shock can stimulate thoughtful processing in a simulation medium. This finding is consistent with earlier reports

Table 3.
The Comparison Results of Post-test and Retention Test

First aid steps	Post test						Retention test							
	S1	S2	S3	S4	S5	S6	S1	S2	S3	S4	S5	S6	S7	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Removing the fuse or turning off the circuit breaker	74	95	4	5	-	-	-	-	-	-	-	-	64	82
Wearing insulated gloves and/or slippers	-	-	62	79	4	5	-	-	2	3	-	-	4	5
Calling an ambulance or Calling 112 (emergency number)	-	-	2	3	4	5	10	13	46	59	10	13	4	5
Moving the victim to a dry place.	4	5	6	8	58	74	8	10	-	-	-	-	4	5
Removing metal objects	-	-	-	-	6	8	38	49	14	18	2	3	-	-
Measuring the pulse rate or/and controlling the breath	-	-	4	5	4	5	18	23	14	18	4	5	2	3
Applying first aid	-	-	-	-	4	5	2	3	-	-	-	-	-	-
Other applications	-	-	-	-	-	-	2	3	-	-	2	3	-	-

of Jaakkola, Nurmi, and Veermans (2011). To sum up, students learn better about electrical hazards when a multimedia learning tool is included during instructions as compared with being without such tools (Singh et al., 2009).

Similar results of other studies (Rendas, Pinto, & Gambosa, 1999; Singh et al., 2009) showed that the animation creates a mental picture and stimulating learning environments, and allows long-term memory retention as compared with simple graphics. Therefore, they promote an effective use of information technology and provide clear educational objectives. The results are also consistent with the principles advocated by the constructivist approach (Hırça, Seven, & Azar, 2012) that argues that individuals create meaning of the world through a series of individual constructs. Therefore, the results can also indicate that using different teaching methods and techniques such as CBL, inquiry-based instruction and conceptual change text method together within the 5E model will be effective in eliminating the misunderstandings of students and insufficient knowledge by differentiating their conceptual structures in line with scientific knowledge as well as ensuring the retention of these outcomes (Şahin & Çepni, 2012). Due to the nature of electricity and its hazardous effects, pure procedural guidance may be insufficient to promote the understanding of electric safety. As one of the elementary pre-service teachers said, *“if the husband had touched her wife, he would have been shocked. Therefore, we should be better prepared.”*

The most surprising finding of the study was some students' absurd answers. Therefore, one major challenge is the assessment of the competency of knowledge, skills and attitudes in the first aid training (Charlier, 2011). If this study assessed the pre-service teachers' first aid knowledge through multiple choice questions and true-false exams, the majority of the students would give correct answers. Thus, these assessment methods are not suitable to assess learning outcomes. Assessing and evaluating the first aid knowledge through a self-guided learning process (Gay & Mazur, 1993) revealed the existence of absurd answers. In the exploration phase, students tried to solve the problem. They made mistakes, and they eventually reached the correct answer. Moreover, this whole process was recorded by the animation. There was no emotional reaction of the computer to the incorrect responses. The records of the students' problem solving strategies are recovered and analyzed by the computer (Rendas et al., 1999) in the elaboration phase to get students to comprehend concepts. While multiple choice ques-

tions and true-false tests are most likely to induce a high degree of stress/anxiety resulting in a poor performance, assessments through a self-guided learning process such as games can be fun, motivating, and challenging. Therefore, these may be able to dispel some fears of the students about examinations (Charlier; 2011).

Studies indicate that (Charlier, 2011; O'Leary & Janson, 2010; Saraç, 2008) a major drawback of computer-based simulations is that in most first aid interventions, the intervention focuses on active content rather than passive theoretical information. Therefore, to apply these skills during emergency situations is at least as important as the acquisition of theoretical knowledge. Thus, animation does not provide the opportunity to conduct a real physical examination or demonstrate motor skills. It also can't assess students' practical skills. However, when the subject is electricity and electric shock, testing technical skills requires different methods and assessment instruments that are somewhat different than those used for cognitive skills. Therefore, assessing students' technical first aid skills about the electric shock on manikins may not be all that effective when compared with the animation. Animation has been used successfully and effectively to provide students real life experiences without a serious risk to flesh-and-blood patients in the field of medicine (Delpier, 2006).

The other factor that hinders pre-service teachers' improvement of first aid skills is their insufficient prior knowledge about the scientific concepts. Moreover, electricity is an abstract and a frightening concept for them. Therefore, students do not understand the nature of electricity. The aim of this course was not to teach electricity concepts. Nevertheless, the course gave them some basic electrical knowledge alongside the awareness of electrical safety. Before the course, the pre-service elementary teachers had some misconceptions. These were eliminated during the course. The results have also revealed that even if a person who is trained as the first aider has insufficient grasp of science concepts, s/he may endanger himself or herself and the shocked person.

In the beginning of the study some students who already took first aid course indicated that they could not turn their first aid knowledge into practice. Eisenburger and Safar (1999) stated that the evaluation of confidence in one's ability to deal with the emergency is the psychological factor that starts the first aid behavior. This finding is similar to the result of Sarikaya and Serkan (2006) who reported

that when their participants had encountered an event where first aid was needed, they could not interfere because they had lacked basic skills related to the first aid at that time. Overall, the participants have gained self-confidence and several first aid skills during the intervention. Case based animation has successfully provided students real life experiences without a risk to flesh and blood patients (Delpier, 2006). These skills can be simple. Applying appropriate simple first aid procedures such as protection against direct contact by switching off, opening airway, application of pressure on wound to stop bleeding, or conducting cardiopulmonary resuscitation soon after the accident occurs can save a life (Saraç, 2008).

In conclusion, teachers who may be bystanders at a scene of accident in schools need urgent, correct and repetitive trainings on the first aid process. For that reason when the subject is electricity, using animated case scenario through a constructivist 5E model may be one of the effective ways of teaching and assessing first aid knowledge and providing them with technical skills about the electric shock permanently. Unless teachers take preventive measures, basic knowledge in first aid will be invaluable for both teachers and students in providing emergency care in the event of an accident in schools (Çelik, 2013).

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