Analysing Issues for Applying E-learning to the Subject of Electricity in Higher Education in Turkey

[1]Dursun Akaslan, [2]Effie L-C Law, [3]Sezai Taşkın,
University of Leicester, Leicester, United Kingdom, info@kesfedici.com[1];
University of Leicester, Leicester, United Kingdom, elaw@mcs.le.ac.uk[2];
University of Celal Bayar, Manisa, Turkey, sezai.taskin@bayar.edu.tr[3]

Abstract

Effective integration of e-learning in Higher Education Institutions (HEIs) is influenced by many factors with the learning domain and socio-political context being two of the critical ones. The overarching goal of our research is to investigate how to implement e-learning in HEIs in the field of electricity in Turkey. A survey has been conducted to measure teachers' readiness for e-learning in these HEIs. It consisted of two phases: (i) a web-based questionnaire with close-ended and open-ended questions; (ii) semi-structured online interviews. This paper reports our findings of analysing the qualitative data that address four main aspects: current educational issues in those HEIs; perceptions of academic staff regarding e-learning; advantages and disadvantages of e-learning as a solution for the issues; strategies to implement e-learning. Overall, our results show that e-learning will bring an innovation into the HEIs and it should be integrated with the blended learning approach.

1. Introduction

Information and Communication Technologies (ICTs), especially the Internet and computers, have revolutionized education and training. ICTs are widely employed for delivering multimedia educational resources in the realm of e-learning. Higher Education Institutions (HEIs) are interested in implementing e-learning as it offers many benefits for organizations and individuals, including developing meta-cognitive skills, widening access to resources, supporting disabled students, improving quality of learning outcomes, reducing costs, increasing flexibility, and enhancing sustainability (Akaslan & Law, 2010; Moscinska & Rutkowski, 2011).Nonetheless, several barriers hinder the integration of e-learning into HEIs. Amongst them, the first major concern is how effective strategies for implementing e-learning can be developed; the second concern is whether individuals in HEIs are prepared mentally and physically to adopt and implement e-learning. To address these concerns in the context of HEIs associated with the subject of electricity in Turkey, we have conducted a research study to measure teachers' readiness for e-learning (Akaslan & Law, 2011) and to analyse their views on e-learning. Correspondingly, we administered a questionnaire and semi-structured interviews in tandem. Results of the questionnaire, which have been published elsewhere, can inform the analysis of the interviews. Specifically, the interviews address four main aspects: (i) the current theoretical and practical issues in both education and training in the respective HEIs; (ii) the definition of e-learning; (iii) advantages and disadvantages of e-learning; whether e-learning could be a solution for the current issues identified or whether it may create new issues in the HEIs; (iv) the way e-learning should be implemented to solve actual issues in education and training in those HEIs. Based on the understanding of these four aspects, a model is developed that enables the realization of e-learning as a potential solution for resolving certain issues in the Turkish HEIs offering the subject of electricity. Additionally, the model is supported by the findings derived from the open-ended questions in the questionnaire.

2. Methodology

2.1 A Method for Analyzing Qualitative Data

Generally speaking, there are two reasoning methods: induction and deduction. Inductive approaches work from specific observations to broader generalizations or theories. In contrast, deductive approaches work from more general to more specific. Inductive rather than deductive reasoning allows for the modification of concepts and relationships between concepts to emerge in the research process; the aim is to represent the reality of a situation most accurately (Ratcliff, 1994). Based on the inductive approach that involves generating as well as testing theory, Glaser and Strauss (1967) put forward their notion of 'grounded theory', which has become one of the most influential and widely used approaches of conducting qualitative research when generating theory is the principal aim of researchers (Strauss & Corbin ,1997). Grounded theory is derived from data in contrast to a theory being derived by putting together a series of concepts based on experience or solely through speculation. They also highlighted that grounded theories, as they are drawn from data, are more likely to resemble the reality, to offer insight, to enhance understanding and to provide a meaningful guide to research. Accordingly, in order to analyse qualitative data based on grounded theory, four basic steps identified by Bernard and Ryan (2010) are used through the paper: (1) coding, (2) theorizing, (3) memoing, and (4) building and refining theories, as summarized in Figure 1.

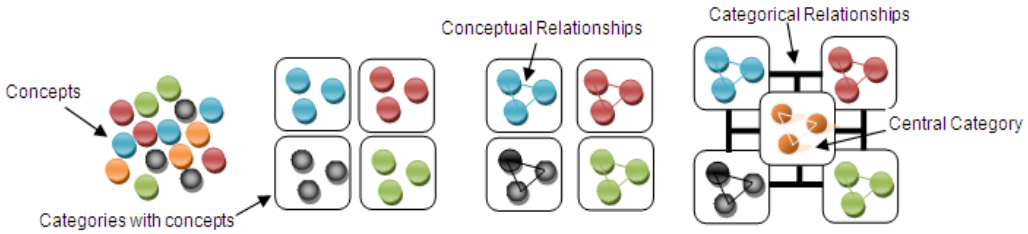

Figure 1: A step-by-step model for analysing qualitative data

2.2 Procedure and Instrument

417 departments/programs in the HEIs in Turkey were selected for the study. The participating institutions were determined by considering whether they were associated with the subject of electricity according to the official data in 2010 provided by the OSYM (the Student Selection and Placement Centre) in Turkey. Two survey techniques, questionnaire and interviews, were employed for the study.

Table 1: List of item identifier, content and number of respondents (N)

I	Interview Items	N
I1	What are issues or inadequacies in your department / program you are currently working?	18
I2	What is the meaning of e-learning for you?	16
I3	How can e-learning solve or help to solve issues in your department or program?	16
I4	How should e-learning be implemented in your department or program?	16
I	**Survey Items**	**F**
Q1	What kind of ICTs do you use in confidence or in difficulty?	43
Q2	Can you elaborate your personal experiences and views on e-learning?	55
Q3	Is e-learning applied in your department / program?	24
Q4	Is e-learning applied in your faculty / high school?	22
Q5	Is e-learning applied in your university?	15
Q6	Can you elaborate how useful and how easy for you to use e-learning in your work?	60
Q7	Can you elaborate the types of training you have in mind before embarking on e-learning?	95
Q8	Would you like to express your ideas how e-learning can help to solve current issues in the science of electricity or to suggest anything to implement e-learning?	56

The questionnaire consists of eight sections with 39 quantitative and 8 open-ended items which measure teachers' readiness for e-learning in the respective HEIs. The interview is semi-structured with 4 questions. 424 staff from the HEIs (e.g. researchers, strategists, lecturers, and administrators) responded to the questionnaire (for its detailed design, see Akaslan & Law, 2011; also the findings of the quantitative items) and 66 of them indicated their willingness to take part in an online interview, but only 18 of them attended it. Of the 18 interviewees, only 2 were female. Nine, six and three are working in the area of "Electricity", "Electrical and Electronic Engineering" and "Electrical Education", respectively. Table 1 displays the 8 open-ended items in the questionnaire and 4 questions of the interviews and the respective number of participants. The responses in the interviews have been transcribed and analysed using the method described in Section 2.1 and Figure 1.

3. Findings

In this section, we report the results of our analysis of the aforementioned items (Table 1). Specifically, our analysis is based on the grounded theory approach (Section 2.1) and focuses on several main issues.

3.1 What is E-learning?

The interviewees were asked to define e-learning in order to find out their interpretation of this notion, which can be instantiated in different forms. The interviewees seemed to converge on the understanding that e-learning is an internet-based and computer-supported learning method. The common understanding of the interviewees aligns with the authors' conception of designing a web-based learning environment, be it open source like Moodle or proprietary like Blackboard. Selecting an accurate form of e-learning to be consistent with the understanding of the interviewees may facilitate the implementation of e-learning and increase the chance for its uptake.

3.2 Issues and E-learning as a Solution

The interviewees were asked to describe issues in their institutes that hamper education and training and to assess whether e-learning could resolve those issues. Issues are firstly conceptualized and then the related concepts are integrated into a category. Some of the main issues for which e-learning can serve as a solution are discussed in the following (NB: Each participant in the survey is designated with an identifier P1, P2… Pn; this identifier and the source of the finding, 'interview' or 'survey', are presented in brackets):

3.2.1 Individual Issues

Learner-Based Issues: Nearly all applicants for undergraduate programs of the universities in Turkey are selected and placed in accordance with the results of two systems: ÖSS and SGH. The ÖSS is used to measure applicants' several abilities, namely, analytical thinking, problem-solving and knowledge of high school curriculum whereas the SGH is used for vocational secondary school graduates to apply for placement in two-year vocational higher education programs which are compatible with their high school majors without measuring applicants' abilities. The SGH is seriously criticized. It is because, to be successful in the ÖSS, applicants need to study hard for a long time (interview, P3). The findings of the interviews have revealed that there is a significant gap between the abilities of the students selected and placed in accordance with the SGH and the expectations of two-year vocational higher education programs because the respective students have no motivation, knowledge and ability required for vocational higher education programs (interview, P2, P3). This lack indicates that the students who expected to complete a higher education program-preparatory curriculum in vocational secondary schools are prepared poorly. The insufficiency of the respective students for vocational higher education has led to rote learning (interview, P3), unprepared attendance

for modules (interview, P2), diploma-oriented learning rather than industry-oriented learning (interview, P2, P3), lower demand for information (interview, P2), lower usage of university facilities or only in exam days (e.g. libraries, photocopy rooms) (interview, P2, P3), note-taking anxiety and lack of competition.

However, there are solutions for issues with e-learning. Firstly students' insufficient knowledge of high school curriculum may be boosted by arranging a variety of online courses, such as mathematics, physics and chemistry, according to the needs of learners. Secondly, as learners have tendency for rote learning, e-learning may offer several different examples and their solutions for each related topic. Furthermore, topics may be enriched utilizing strong graphics, animations and videos to prevent rote learning. Thirdly, e-learning may replace lessons missed (the survey, P352) because students in online courses are no longer dependent on fixed timetables or on classrooms where students sit in front of teachers. Additionally, students can view topics again and again until they better understand them. Fourthly, e-learning can host the digital versions of textbooks, notes and documents and thus reduce the anxiety of students with regard to note taking in classrooms and labs. Fifthly, e-learning can help students to enhance their motivations. As materials with e-learning may be read and processed at anytime, in anywhere and at students' own pace (the survey, P302), students may have more time and interest to study online documents and gain more details about them. Additionally, e-learning may render education and training more appealing. Finally, students may discuss and exchange courses' contents with other students via synchronous (e.g. chat rooms, conference systems, messengers) or asynchronous (e.g. e-mail, forum) tools.

Teacher-Based Issues: The Higher Education Council (YÖK) in Turkey assigns few teaching staff (e.g. one to three) into two-year vocational higher education programs in Turkey and assumes that they will teach the entire curriculum in programs. However, the abilities of these teachers are not sufficient for vocational higher education programs. Firstly, the majority of teaching staff in vocational higher education programs have no research on their fields in national and international areas and no degree in master or PhD. However, they are forced to teach the entire curriculum at higher education level. Secondly, the majority of them have no proficieny of foreign language (interview, P2). Thirdly, teaching staff take several modules whereas they do not have advanced knowledge on these modules. The lack of the competence of researching, foreign language and knowledge significantly reduces the quality of education and training and causes difficulty in providing up-to-dated information. Hence, it is recommended that the Turkish Education Council increase the number of teaching staff in these programs and encourage these teachers to learn a foreign language, to make research on their fields, and to take a higher degree.

However, e-learning may serve as a solution to issues related to teachers. Firstly, teachers in different universities may share ideas with national or international researches online. In this way, more teachers and learners may have up-to-date knowledge according to the needs of the century. Secondly, collaboration between universities may be improved as materials will be electronic. In this manner, institutions may have more up-to-date information. Plus, teachers who get the proficiency of foreign language may translate important parts of international conference or journal publications and distribute to universities across Turkey. In order to achieve these objectives, it seems that e-learning platforms should be enriched with new components. Furthermore, e-learning may not only improve accessibility associated with the place, time and pace that suit the learner best but it may also reduce teaching time considerably. Therefore, teaching staff may have more time for research on their fields and improve their competencies. Finally, teachers may support learners to learn more comfortably at anytime (survey, P146,P39,P53,P324,P316) and can interact with more students (survey, P205). In this manner, teachers may have more opportunities to respond to more questions raised by students and to update their knowledge more frequently (survey, P131).

3.2.2. Financial Issues:

Poor Infrastructure: The strategy of universities in Turkey to gain practical hands-on experience is through laboratories rather than industrial training. However, there are many problems in laboratories across Turkey. Firstly, there are high demands for laboratories due largely to large classes whereas the number of labs is limited (interview, P3). It is therefore not possible for students to conduct sufficient experiments to gain hands-on skills. Secondly, the number of experimental sets in labs is limited. It is therefore not possible to practise in labs individually and thus students are forced to practise in groups (interview, P1). Thirdly, the facilities of labs seem to be out of date (interview, P1). However, it is essential for laboratories like PLC, pneumatic, micro controller and micro processor to have continuous modernization to meet the needs of the century. However, as the cost of equipments in labs is high, the modernization has been cut. Fourthly, experimental sets in labs are designed with the aim of conducting experiments with ease for learners. However, these sets are criticized as their standards are not compatible with commercial standards, because all the parts of experiments in industries should be integrated by students. However, e-learning may offer solutions to help students to gain practical experience to students. It seems that the majority of issues related to laboratories are arisen from insufficient number of laboratories and equipments and insufficient modernization of this infrastructure. E-learning may offer the development of e-laboratory for illustrating the fundamentals of electricity because it is possible to simulate laboratory projects on a computer and on the internet.

***Class Size*:** Young population growth in Turkey is likely to lead to an increase in demand for higher education and also an increase in class size. This is especially true for institutions associated with the field of electricity (survey, p114; interview, P1, P3) because higher education funding to the respective institutions are not sufficient and staffing is inadequate. The large classes in the respective HEIs have an adverse impact on education and training (interview, P3). In order to maintain the education quality in the respective institutions, the class size of the institutions should be between 25 and 30 whereas it varies between 40 and 50. The large classes in the institutions contributes to learning problems associated with noise in classrooms and cause inadequate practice in laboratories (survey, P114) as the number of experimental sets is limited. Furthermore, large classes increase stress and reduce satisfaction for learners, and some students may need extra time to grasp difficult concepts. However, it is not possible to offer more tuition for such students in the classroom. E-learning may reduce the negative impacts of large classes in the respective institutions. It may reduce stress and increase satisfaction of learners because e-learning offers self-pacing for quick and slow learners.

***Insufficient Staffing*:** It seems that the Turkish Higher Education Council have a tendency to maintain education and training with minimum teaching staff and assistants in higher education institutions associated with the field of electricity, especially in 2-year vocational higher schools in Turkey. The lack of research assistants in 2-year vocational higher schools aggravates teachers' teaching load. This causes teachers not to conduct research on their fields at the national or international level. However, this may be solvable by recruitiing top-class students in the classrooms as a research or teaching assistant. In this manner, students may be encouraged to study and appreciate their profession, and the quality of experiments in laboratories may be higher because students can benefit from the experiences of top class students. Besides, there is insufficient staffing in departments of electrical and electronics engineering. Therefore, students are forced to be professional in the field of electrics or electronics. However, these problems may be resolved by offering e-learning in such departments. Universities with sufficient academic staff may offer a support to universities with insufficient staffing by arranging online teacher-led instructions to fix the problem, because e-learning can essentially take place anywhere.

3.2.3 Political Issues

Insufficient Status of Graduates: It is well recognized that vocational and technical education and training is one of the most important factors for the advancement process in developing countries. Accordingly, the main objective of technical education faculties is to qualify students with systematic education and training, thereby accrediting them to be specialists and instructors for vocational and technical high schools in Turkey. Graduates of technical education faculties can work as teachers in schools authorized by the Ministry of Education, but they are not permitted to work in industries as engineers. However, only less than 5 % of graduates are recruited as teachers for vocational and technical high schools. The remaining majority have to face the problem of unemployment, get a low-paid salary job or look for a job which is out of their field after graduation. This gloomy prospect of graduates significantly reduces the motivation of learners in classrooms and laboratories as they may probably be unemployed after graduation. These faculties were therefore closed down on 13 November 2009 whereas the undesirable condition for current students and graduates still continue. This issue is likely to be solved by comparing the curriculum of graduates of technical education faculties (TEFs) with that of engineering faculties. Graduates of the TEFs can be informed which modules required to be qualified as an engineer are missing in their own curriculum and decide accordingly whether to complete them. However, there are thousands of graduates from the TEFs and there is no university in Turkey to offer sufficient place to such graduates. However, all graduates of the TEFs could complete those missing modules online. It is possible to design highly interactive modules for graduates of the TEFs. In this way, students may study e-modules and upon completion of such modules they may be qualified as an engineer.

Double Majors: The term electrical and electronic engineering comprise two double majors namely, electrical engineering covering generation, transmission, control and use of all forms of electrical power and electronic engineering including the expanding fields of electronic communications, computers and electronic components. These very broad and vibrant disciplines are delivered as single undergraduate degree, namely electrical and electronics engineering in Turkey (interview, P1). This increases the number of courses and requires more teaching staff in electrical and electronics engineering in order to ensure that graduates can be well-qualified. However, the existence of this undergraduate program is seriously criticised because there are too many courses in electrical and electronics engineering with insufficient teaching staff. Furthermore, it is not possible for students to study all modules related to both electric and electronics (interview, P1). This constitutes superficial learning because it is not possible to offer detailed course contents. It seems that learners can only learn a few things about everything related to electrics and electronics but they are not able to fully understand the relevance of course contents (interview, P1). The number of optional modules for students to be well qualified in electrics or electronics is not enough (interview, P1). It is therefore important to identify the deficiency between the discipline of electrics and electronics in the respective institutions by offering sufficient optional modules to students or these institutions should be divided into two different branches namely electrical engineering and electronics engineering (interview, P1). Thirdly, it seems those course contents are not compatible with commercial standards (interview, P1).

However, e-learning may be used to resolve the issue of superficial learning engendered by an excessive number of courses. Firstly, students may study with their own pace without teacher-led instruction online. In this manner, e-modules may be prepared using interactive animation, simulation and illustrations of module contents such as electrical machines, electromagnetic fields and electronic circuits. Therefore, students may spend more time on fundamental concepts in order to fully grasp them and may have more time to practise more experiments. Secondly, students may be supported by teacher-led instructions online. In this way, students may get simultaneous feedback for things learned. Additionally, these two approaches may be used at the same time. Furthermore, students may study at their own pace and then meet with teachers to get feedback.

Lack of cooperation between university and industry: The quality of education and training in higher education institutions associated with the subject of electricity highly depends on the

proper acquisition of both theoretical knowledge and practical skills. Academic institutions are supposed to be the best place for acquiring theoretical knowledge whereas industries are the best setting for gaining practical skills (Chukwujekwu, 1976). It is therefore important to set up a close collaboration between universities and industries to achieve optimum education and training in the respective HEIs. However, this strategy is ignored in Turkey. There are many observations indicating this ignorance. Firstly, the duration of students' industrial training is restricted to only 40 days (interview, P2). It is therefore impossible for students to ensure relevance of course content and sufficient exposure of industries. However, the industrial training experience should be between 5 and 15 months according to the duration of the degree programs. Secondly, universities have no responsibility to find industrial training opportunities for students. Thirdly, there is no such a mechanism to monitor students' industrial training performance (interview, P2). However, universities should designate an industrial training officer who should get relief in his teaching load and should be paid for his/her effort and expenses to monitor students' performance. These issues related to industrial training contribute to unemployment, qualified personal shortage and inadequate learning experience (interview, P2).

However, e-learning has the potential for strengthening collaboration between universities and industries. Firstly, institution using e-learning may ensure that training and education standards are in line with occupational standards by acquainting teachers and learners with advancements in labor market across the world. This may be implemented by recording and integrating practices in industries as video or pictures and illustrating them on the internet with technology-enhanced learning. Secondly, e-learning may be used to inform teachers and experts in universities with industrial problems to increase competence. Thirdly, theoretical knowledge of staff in industries may be updated by universities according to the latest developments. This is likely to be conducted developing a network-based database and uploading to the Internet with e-learning. Fourthly, the performance of students' industrial training may be monitored under the framework of e-learning. A monitoring or tracking component may be employed. In this manner, learners can report their daily performance in industries to their industrial training officer.

3.3 How to Implement E-learning

The underlying assumptions of teachers indicate using technology may achieve better learning outcomes. However, a model of e-learning should be illustrated and explained to demonstrate what principles are needed to implement e-learning. The results of interviews have also led us to identify some stages how to implement e-learning. These stages are illustrated in Figure 2 and are briefly explained carefully to indicate what assumptions teacher are making at each stage:

Figure 2: Step-by-step for Implementing E-learning

Stage 1: It is necessary to investigate the extent to which the HEIs associated with the subject of electricity in Turkey are ready for e-learning. This is highly essential as many factors can have impact on e-learning. Firstly, e-learning is essentially based on physical components including computer and internet. An investigation to find out whether individuals in the respective institutions own computer and reliable internet connectivity is deemed useful (interview, P14; survey, P114). Secondly, the characteristics of individuals must be discovered as their confidence, experience, anticipation and attitudes for deploying various information and communication tools have strong effects on the implementation of e-learning (survey, P168).

Stage 2: The finding of the survey indicates that the respective institutions are familiar with these e-learning platforms: Blackboard, ATutor, Moodle, Ninova and also with the following

programming languages C++, C #, HTML, PHP, XML, 3Ds Max, and, Flash CS5. These languages should be the first choice to develop or select an e-learning platform such as Moodle because the respective HEIs are familiar with it. This choice may give them a chance to develop the e-learning platform, to fix errors on it or to add new components when needed. However, international e-learning practices should be examined before introducing e-learning into the respective HEIs. It is therefore essential to identify the properties of e-learning platforms used by universities.

Stage 3: The following software tools are also widely used by the HEIs associated with the field of electricity in Turkey: Microsoft Office, AutoCAD, LabVIEW, Matlab, 3Ds Max, SolidWorks, Flash CS5, Smulink, Vissim, Corel Draw, Google Documents and Wave, Facebook and MSN. Firstly, the above mentioned tools should be considered before and after introducing e-learning into the HEIs as they are familiar with those tools. As an example, LabVIEW rather than MultiSIM should be chosen to develop e-learning materials as being familiar with a tool will save time and give a chance to individuals to understand, improve or change materials in a better way according to needs. Besides, it is essential to describe the stages of developing e-materials. Mayes and Freitas (2000) states four steps for developing materials: (i) to describe intended learning outcomes; (i) to choose learning and teaching activities to allow students to achive learning outcomes; (iii) to design assessment tasks which test whether the learning outcomes has been reached; (iv) to eveluate achievement of outcomes. The styles of teaching staff and institutions should be considered while developing e-metarials. Teaching staff may have intention to make changes on e-materials. Thefore, the source code of e-metarials should also be accessible through e-learning platforms to create oppurtunities for teachers to make changes on e-metarials.

Stage 4: It is also essential to train teachers and their students to implement e-learning. It seems that this should be conducted before delivering e-learning. To train teachers and their students effectively, the types of training that teachers need should be investigated. To address this issue, the interviewees were asked to define the types of training they need for e-learning. The result of the study indicates that the types of training teachers need may be classified as follows. Firstly, it is necessary to inform teachers regarding e-learning in detail (survey, P397). Secondly, it is essential to inform teachers regarding responsibilities that e-learning will bring into the respective HEIs (survey, P304, P276). Thirdly, various seminars should be arranged for teachers regarding how to develop e-materials and thus training for programming languages such as Photoshop, AutoCAD and SolidWorks, Flash CS5 should be provided (survey, P304, P131, P374, P208, P203, P376, P161). Fourthly, teachers need detailed information how to implement e-learning for theoretical and practical parts of the subject of electricity (survey, P357, P408, P242). Fourthly, it is also necessary to arrange seminars to inform teachers about how to integrate e-materials into the e-learning platform (survey, P213). In summary, teachers mostly need training about how to prepare e-learning materials which is interactive.

Stage 5: The final stage is to deliver e-learning to implement e-learning in the respective HEIs in Turkey. However, we have no intention to give details how to deliver e-learning. To address this issue, the perspectives of students in addition to teachers' should be also analysed. However, the results indicate that implementing e-learning will bring an innovation to the respective HEIs. However, e-learning should support face-to-face education and training. Therefore, e-learning should be integrated with classroom methods (the survey, P276, P357, P59, P219, P269). This indicates that teachers mainly support blending learning. However, the details of blending learning will be reported after analysing students' opinions about e-learning.

4. Conclusion

In this study, issues in the HEIs associated with the subject of electricity in Turkey are identified and e-learning as a solution are discussed. The results of our study have clearly indicated that e-learning is perceived as a solution for some of the issues in the respective HEIs. Besides, e-learning is deemed useful for enhancing education and training in those HEIs. Here we highlight our main findings: Firstly, the result of the study has also confirmed, as many previous research

studies did, e-learning should support traditional learning rather than removing it because humankind is social creature and therefore face-to-face interactions will be required. Secondly, the success of implementing e-learning in the respective HEIs is highly dependent on the quality of e-materials as the science of electricity includes theory and practice. Thirdly, the most appealing advantage of e-learning seems to be that it can help increase students' encouragement, motivation, satisfaction and attendance and help reduce stress. Fourthly, it seems that teachers have concerns how e-learning help to increase the practical skills of students. It is therefore important to inform teachers and students about the benefits of e-learning for practical parts of the subject of electricity. Finally, there is a high agreement that teachers believe e-learning will enhance the quality of education and training in the respective HEIs in Turkey because electricity is not a concrete substance but simulations and animations can be employed in the context of e-learning.

A major step of our future research plan is to follow in stages to implement e-learning. Readiness of teachers and students for e-learning were already measured in detail. However, the results of teachers with students' will be compared in order to move into the second stage which involves developing or selecting an e-learning platform. To reach these objectives, existing e-learning platforms will be identified and their properties will be compared to identify the best possible properties for the HEIs associated with the subject of electricity.

References

1. D. Akaslan and E. L.-C. Law, "E-learning in the Science of Electricity in Higher Education in Turkey in terms of Environment and Energy," *Proceedings of Postgraduate Research Student Conference 2010 - Perspectives in Society,* Nottingham, the UK, 2010.
2. D. Akaslan and E. L.-C. Law, "Measuring Teachers Readiness for E-learning in Higher Education Institutions associated with the Subject of Electricity," *Proceedings* of 2011 IEEE Global Engineering Education Conference: Learning Environments and Ecosystems in Engineering Education, EDUCON-2011, Amman, Jordan, 2011.
3. H. R. Bernard and G. W. Ryan, "Analyzing Qualitative Data: Systematic Approaches", SAGE ,Los Angeles, 2010.
4. S. E. Chukwujekwu, "University-Industry Cooperation in Middle Africa in the Field of Engineering. United Nations Educational, Scientific and Cultural Organization", University of Benin, 1976.
5. B. Glaser and A. Strauss, "The discovery of grounded theory", Aldine, Chicago, 1967.
6. T. Mayes and S. Freitas, "JISC e-Learning Models Desk Study: Review of e-learning theories, frameworks and models". JISC, 2000.
7. K. Moscinska and J. Rutkowski, "Barriers to Introduction of E-learning: A Case Study. 2011" *Proceedings of IEEE Global Engineering Education Conference: Learning Environments and Ecosystems in Engineering Education*, Amman. Jordan, 2011.
8. D. E. Ratcliff, "Analytic Induction as a Qualitative Research Method of Analysis", Retrieved April 22, 2011, from The Qualitative Research: http://qualitativeresearch.ratcliffs.net/analytic.pdf, 1994.
9. A. Strauss and J. Corbin, "Grounded Theory in Practice", SAGE, London, 1997.