THE COMPUTER ASSISTED EDUCATION AND ITS EFFECTS ON THE ACADEMIC SUCCESS OF STUDENTS IN THE LIGHTING TECHNIQUE AND INDOOR INSTALLATION PROJECT COURSE

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ABSTRACT

The purpose of this study is to investigate the effects on students' academic success of a visual didactic material developed in a computing environment which is believed it will enlighten the sudents during the process of completing the project and the explanation of "the Lighting Technique and Internal Installation Project" course that is taught in the curriculum of the electrical and electronic parts from institutions who are given formal and widely education such as Technical Education and Engineering Faculties, Vocational Colleges, Public Education Centers, Indrustrial Vocational High schools which are the bakcbone of vocational and technical education. In addition, the use of the educational software as in this area as a didactic material that is developed for the mentioned course is determined as a subsequent goal. To test the effectiveness of the developed educational software in the learning process there are two measurement tools for the cognitive dimension developed according experts and accordant findings of these measurement tools the effectiveness is examined.

KEYWORDS: Computer-assisted teaching, Computer-assisted education, Electrical Installation Project, Visual Education

I. INTRODUCTION

Vocational and technical education can be defined as "the whole teaching, supervision, magament with coordination, organization, development, research and planning activities of any kind vocational and technical training in the industry, agriculture and service sectors within the integrity of the national education" [1].

In developed western countries is vocational training defined as a vocation branch that aims to gain a career through practical activities or manual skills [2]. The purpose of vocational-technical education is in generally to educate and train individuals as qualified work force for employment in the industry, trade and service sectors, and to give the basic education that is required for the transition to higher education institutions which is the continuation of their vocation [3].

During examination of the curricula from developed countries and European countries in particular, there is a presence of a linear proportionality observed between their development and their importance for vocational and technical training.

The self-sufficiency of the countries at the point of producing goods and services and getting healthy along with other countries with which they have economic relations, using the current technology and producing new technologies is related with the importance they show for vocational and technical

training in their development plans. Therefore, instructors strive to make the content more effectively when programming the learning processes.

An effective education can be achieved by discussing and eliminating time, space and economic concerns which limit the instructors as well as the students. This discussion encloses a wide area that includes the systematic and reflective transfering process of the teaching design on the teaching and learning principles, didactic materials, didactic activities, information sources and evaluation plans [4].

While these concepts are discussed, the learning of the student by internalizing the given information comes to the fore in the 'teacher, student and environment triangle' which has an important role in the teaching process. By thinking that each learner has different psychological, social and cognitive development characteristics, the importance remains of converting the teacher-centered education into student-centered and preparing in this context the teaching desing by taken the learning style of the learner into account [5].

According research [6,7], it is determined that taking the learner to the center of the learning process and the education processes that are established by considering the learning methods ameliorate the creativity, motivation and the acamedic achievement. It is putting forth that in an education designed by including the learning methods into the learning process, the learner can use the information more effective by remembering it for a longer time [8]. When on the other hand studies on learning styles are examined [9,10,11], it is observed that as a result of teaching designs that are configured by the participation of the learner in the learner process and that are supported with technologies, the academic success and performance increased and that a more positive attitude to learning is developed. The concerned findings of the research puts forth that the teacher need to prepare the learning environment; method, technique and didactic materials according the properties of the student and the lesson [5]. Crowded classrooms, unmet education demands, facilities, equipment inability, unbalanced distribution in terms of equality of opportunity, unmet individual needs, yield losses of students' success and similar problems are considered as the crucial characteristic problems of the traditional education systems. The Turkish vocational and technical education remained behind the developed countries in terms of the number students per teaching staff. The number of student per teaching staff ranges in the four-year vocational and technical training faculties from 22,7 to 33,6, in the Vocational School of Higher Education it is 60,8 and in the secondary school it is 31,7. In developed countries these numbers mainly ranges from 5 to 10. The most important problems of the vocational and technical education institutions in addition to the problems around the number of student and lack of teaching staff are infrastructure, technological equipment and the deficit of laboratory and workshop [12].

The sheer number of students per teaching staff will negativly affect the learning process in classes where computers are used as tool. The elimination of these problems will be possible with bringing the invididual to the fore during the education process, with a student-centered education, by designing, applying, evaluating and developing the techniques to be applied during the process, with a contemporary understanding and in accordance with the needs of the time [13].

The each day growing complexity of education, the rise of the information to learn, the need for qualified and modern education require the use of computers as a tool in education. The use of technology in education will provide that the education will be carried out in accordance with the needs of the era as well as that the highest appropriate yield will be received from education [14]. The computer which is one of the technological capabilities and a basic element of culture in our century, has become a tool which use is rapidly spread [15].

Computer-assisted education is the set of applications about the use of the computer as a tool for a directly offer of the course contents, for repeating knowledge gained in other ways, for solving problems, for practice and for similar activities [15]. The education technology that will meet the specified requirements includes the targeted application of human power and other resources so learning can be convert to easy, concrete, rich, meaningful, motivational, encouraging, efficient and qualified activities by optimizing the teaching-learning processes [16].

In this study it is aimed to present the above-mentioned advantages of educational technology in a particular course. The research model has an experimental – control group pattern, and the work group consist the fourth grade students who follow the Lighting Technique and Internal Installation Project course of the Electricity Teacher Training Department from the Faculty of Technical

Education which is located in the Southeast Anatolia Region. The experimental and control group are obtained by randomly splitting 30 students of the same branch into equal groups.

The nature of the executed course includes a project-based process for the experimental group as well as for the control group. After the theoretical dimension of the course was explained to the students during five weeks in the same environment and equal time frames, the students in the control group received a single purpose educational software CD that is developed by researchers. The studenst of the control group were released to take advantage of any kind of material including internet after the theoretical process of the instructor. Both groups of students were asked to project the strong and weak current installation on their own architectural projects. This is the common method troughout the country to train students in this course. There has been no intervention in the experimental-control groups.

1.1 Educational Technology

Educational Technology is the functional structuration of the learning or education processes by running knowledge and skills to dominate education in general and learning in particular.

According to another definition, educational technology is a branch of science that studies the ways to carry individuals to the special purposes of education by using wisely and skillfully the accessible human power and other sources related to education and based on relevant data about communication and learning from behavioral sciences with appropriate methods and techniques and by evaluating the results.

The current sense of educational technology is a technology related to education sciences that developes, applies, evaluates and manages appropriate designs by running the whole concerning elements (human power, knowledge, method and techniques, tools and necessary arrangements) for a systematic and scientific analysis of all aspects of the phenomenon of human learning and to bring solutions. In other words, educational technology is an original discipline about learning and teaching processes [17].

The reflections of the effective use of education technologies on the learning process can be listed as follows:

Technologies:
*   improves the quality of learning.
*   reduces the time spent to reach the goal of the students and teachers.
*   improves the effectiveness of teaching.
*   reduces the cost of education without reducing the quality.
*   involves the student in the environment [18].

Some of the facilities of the modern educational technology provided for educational applications can be listed as follows:
*   Providing freedom and initiative,
*   Enlarging options,
*   Saving the individual from the monopoly of the group,
*   Providing the student the opportunity of individual and independent learning,
*   Providing information of the first source,
*   Solving the inequality of opportunities,
*   Providing quality in education,
*   Providing standardization, diversity and flexibility in education programs,
*   Increasing the speed of learning,
*   Adding at the same time individuation and popularization properties to the educational services,
*   Providing the opportunity to increase the efficiency and effectiveness of the learning-teaching processes [17].

1.2 Computer-Assisted Teaching

Thanks to the features like quickly processing, saving and delivering information, the computer has become the most wanted tool in education. The use of an intensive technology is indeed regarded as strange because of the human labor in the activities of measuring and evaluating the success, in the

student guidance-consultancy work and in the running of educational services that have become complicated depending on the growing number of student in researchs on education. The intensive usage of technological resources in education has received a wide acceptation and the applications has increased. Therefore the apply in education of computers which are used in every stage of life can not be opposed. Computers are filling an important gap in several topics in which the tools and materials used in traditional education are insufficient. Many matters that are difficult or impossible to perform in traditional education can be accomplished with computers.

In computer-assisted education, the computer has an application area where it can be used supportive, with the teacher or individually or with other methods and techniques. Therefore, the computer-assisted education is seen as the most promising between the methods in education services. It is indicated that using a virtual lab in engineering education has a positive impact on factors such as the involvement of students in class, the self-confidence and motivation [19], provides students an individual learning environment [20], gives the students the opportunity to gain a wide variety of experiences about different approaches and helps to learn in an interactive and meaningful way [21].

The computer-assisted education as an educational environment where the teacher prepares the learning environment, recognizes the students abilities, accomplishes the activities like repeating, practising, directing and personalization according to the students' capabilities requires the usage of the computer in different place, time and ways according to the learning objectives which are determined in agreement with the structure of the teaching matter [22].

The following findings were obtained in some international researchs about the usage of the computer in education;

1. The computer helps the students to achieve their academic goals.
2. Compared to the traditional education, computer programs provide a saving of the learning time between 20% and 40%.
3. Using the computer in the field of education has a positive impact on the students' success and increases the motivation.
4. The effectiveness of educational software is playing an important role in the success of the computer-assisted education [23].

1.2.1 Benefits of Computer-Assisted Teaching

The benefits of computer-assisted teaching can be listed as followed;

The materials that were not understood can be repeated several times by the students.
There is no dependency on someone else and each student learns at own pace.
During the implementation of the computer-assisted training the student must participate actively in class.

- Errors and shortages will be discovered and corrected while learning
- The student has always a chance to answer again.
- It keeps the students' interest to the class always alive.
- Gives the teacher the opportunity to deal more closely with the students by saving them from works like repeating and correction etc.
- Dangerous and expensive studies can be easily simulated with computer-assisted teaching
- The students can learn more quickly and in a systematic way.
- The level of students' attention can be held very high through drawings, colors, figures, and images the students see while following the class.
- Learning is demoted into small units so that success can be achieved step by step by testing it on these units [22].

In addition, according to performed research [24], the most import benefit of the use of computers for education is the facilitation of the access to information.

II.   METHOD / PROCEDURE

2.1 The Goal and Importance of Research

The current teaching in our education institutions are not going forward than an activity aimed to memorise rules by using the blackboard and the textbook which is a teacher-centered education. In

addition to the didactic methods applied in the existing system there is need for taking advantage of computer-assisted training applications like demonstration, simulation, practice and exercise, establishing a dialogue, problem solving, didactic games, information store, creative activities and testing [25]. The declines in computer prices and the need for computer in the communication and information age made the computer indispensable for especially new generation people. The disadvantages faced in education institutions like the insufficiency of time, place, technology and teaching staff created the need for learning activities outside of the school. At this point the widespread of computers that are present in almost every household has played an important role. University students, high school and even elementary school students are using computers to reinforce the treated material at school.

While in many branches of science the effects of the computer-assisted education on the motivation of students and their academic success are examined, there is no found any research in electrical and electronical science branch in literature containing the project of a building's electrical installation.

In this research is the following subject examined: The effects on students' academic success from the software that is developed to support the traditional education method in the Electrical Installation Project course which is an important part of the Electrical and Electronical Science branch.

2.2 Work Group

The workgroup of this research is formed by the students of the fourth class who follow the Lighting Technique and Indoor Installation Project course in the Electricity Teacher Training department of the Faculty of Technical Education of the University of Batman. The experimental group is obtained by randomly splitting 30 students studying at the same branch into 2 groups of 15 students. There is no significant difference identified between the grade point averages of the groups belonging to earlier periods. All members of the group are male.

The members of group A an B received with a projection device at the same time periods and by the same instructor the required theoretical knowledge to project the strong and low current installation of a building in an AutoCAD software environment. Both groups received resources which contain the theoretical information about the course. The members of group B received also an audio-visual education CD that is developed by researchers through various programs in a computer environment. This education CD contains an audio-visual description in an AutoCAD drawing program environment of how to achieve all required processes from the creation of the symbols in the program environment that will be used in the electrical installation's project of a building, as well as the drawing of the strong and low current installation from the same building to the required calculations. This CD includes also the theoretical materials that are sorted systematically so that students can easily access when they require it. After that the groups of students are equiped with theoretical knowledge, they were asked to project the strong and low current installation on an architectural plan provided by the instructor or by the students.

2.3 Private Educational Software

High-tech products such as computers, television and internet are used in education area to support the training. Many educational institutions are choosing to develop new alternatives to take advantage of the benefits provided by new technologies and to improve the usability of their current education programs. It is intended to give more people an education outside of the traditional education approach by using this new methods thans to these alternatives [13]. The private didactic software which is prepared in a computer environment contains the audio-visual media that describes on a sample architectural plan the required processes for the project of an electrical installation of a building. With this software the students can repeat the issues that remain limited with the commentaries of the instructor in the classroom. Again, thank to the software including CD, they can see the path to follow to achieve the required calculation and the drawing of the electrical project.

In the drawing of the project the AutoCAD program were prefered. Although the students master the principles of project drawing some students have had problems on the use of the program and they have transfered these problems to the instructor during the class as well as outside the classroom. This leads to a loss of time in the educational process. The explanation in the private didactic software is mostly done through the AutoCAD program. Thus the students can watch infinitely the processes so one assumes that the students will ask less questions to the instructors. The required operations to

make the necessary calculations and to draw the project are systematically determined so that the resolution of the problems faced by the students can be reached quickly.

The prepared private didactic software also contains regulations for the drawing of the electrical installation project whereby the students possess an offline source about legislation. In short, the students who will project the electrical installation of a building can reach all required operations to execute and complete the project independently from space and time thanks to these private educational software.

The videos which constitute the most important leg of a private didactic software were prepared by the Screen Recorder module of the Blueberry Flashback Professional software. The video comments that were created with the same module are technically optimized in terms of quality and performance. Audio files that were mounted on some videos are recorded with the Polderbits Sound Recorder and Editor software and the essential quality optimization were done. The image files used in the software were optimized for use with the Adobe Photoshop editor. All of these media has been turned into an autorun CD within in a suitable menu structure and duplicated through the Camtasia Studio software.

Before the prepared private didactic software were applied on the experimental group, it is applied by researchers in the computer lab to detect and eliminate unforeseen technical problems by getting the views on the software of 30 final year students who are studying Computer and Instructional Technologies at the Education Faculty of the 'Yüzüncü Yıl' University. The percentage and frequency results concerning the obtained views are presented in Table 1.

Table 1. View of students about the Private Educational Software

CRITERIA	Very bad		Bad		Mediocre		Good		Very Good	
N=30	f	%	f	%	f	%	f	%	f	%
1. The level of attractiveness of video and animations	-	-	-	-	9	30	15	50	6	20
2. Easy usage of interfaces	-	-	-	-	4	13,3	16	53,3	10	33,3
3. Understandability of the content	-	-	-	-	9	30	14	46,6	7	23,3
4. Systematic transitions between topics	-	-	-	-	7	23,3	18	60	5	16,6
5. Color matching between text and graphics	-	-	-	-	5	16,6	15	50	10	33,3
6. Functionality of the transition buttons	-	-	-	-	7	23,3	20	66,6	3	10
7. Density of the graphics display	-	-	-	-	6	20	15	50	9	30
8. Readability of the screen	-	-	-	-	6	20	19	63,3	5	16,6
9. Flexibility of the video playback buttons	-	-	-	-	4	13,3	11	36,6	15	50
10. The sound quality and adjustability	-	-	-	-	16	53,3	14	46,6	-	-
11. Loading and execution speeds of videos	-	-	-	-	15	50	12	40	3	10
12. Suitability of the font and point values of the characters	-	-	-	-	7	23,3	13	43,3	10	33,3

By analyse Table 1 we can see that the students' views about the articles 10 and 11 are middle and about the other articles it is good or very good.

The reason of the high frequency at the middle selection of students' views about the article concerning the sound quality and adjustability is that 22050 Hz-48 Kbs-Mono were selected to provide that the audio files take a small place. These selections were changed as 44100 Hz-64 Kbs-Mono and converted into a Compact Disc quality. The reason that the students' view on the article concerning the load and execution speeds of videos are concentrated at the middle selection is that the graphic intensity is kept at a high level to obtain a clear image.

The different hardware values of the computers used by the students produced such a result. Thinking about the hardware sufficiency of the computers belonging to the members of the group that will receive a CD; the resolution, frequency and color quality are reduced from 800x600-70 Hz-32 Bit to 800x600-60 Hz-16 so that the negativity stipulated in article 11 will disappear.

2.3.1 Operation principle of the Private Educational Software

The private didactic software developed by researchers through a variety of media development software is transformed into an autorun CD. After the installation of the CD on the computer, the main page of the software appears on the screen (Figure 1).
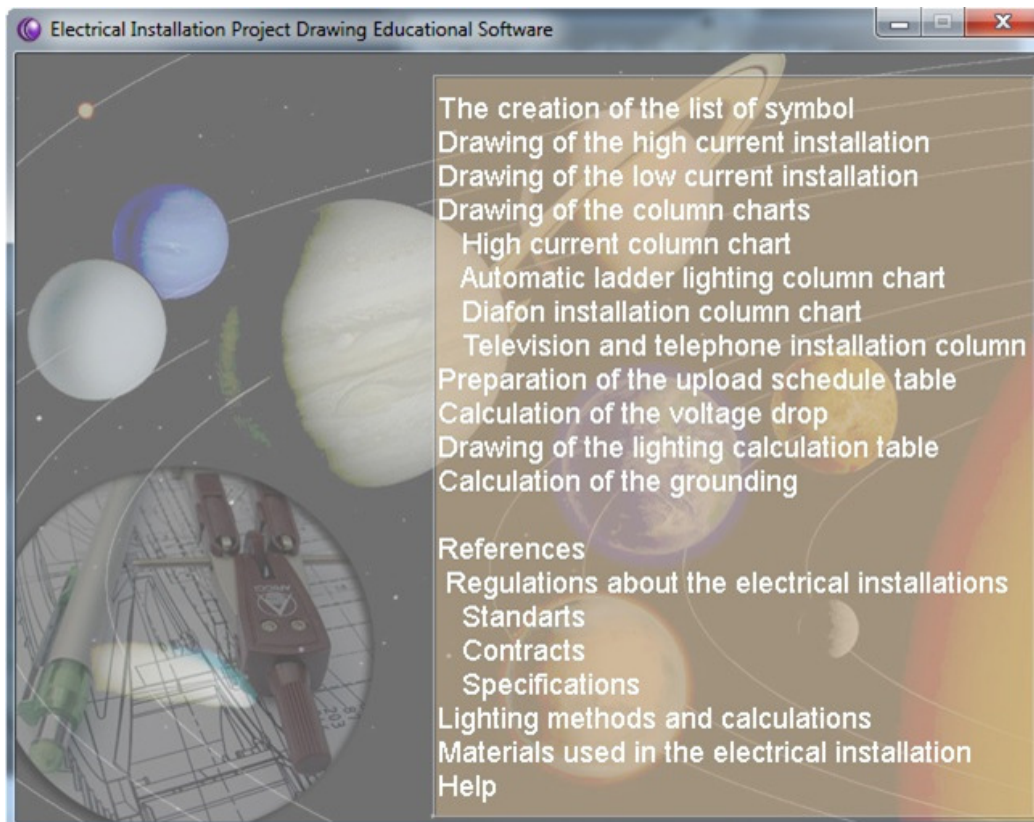

Figure 1. Main page of the Electrical Installation Project Drawing Educational Software

The main page of the software consists 3 parts:
1. Visual and audio videos commentary: This part contains the visual and audio videos on the architectural project prepared by researchers. The students can get support on concerning issues in the process of creating the project.
2. Referenced documents: This section contains the offline sources which includes the principles of the Electrical Installation Project drawing developed by researchers. It is assumed that the students can faster attain the desired information thanks to this feature.
3. Help: This part contains the help topics that include the operation principle of the program for an effective use of the private educational software by students.

The crucial part of the software is formed by audio and videos developed by researchers that systematically demonstrate from start to finish the project of an electrical installation on an architecectural plan (Figure 2). Thanks to these videos, students can resolve the problems they face in the executing process of their own projects. In this way, the need to communicate with the instructor for every encountered problem will be eliminated.
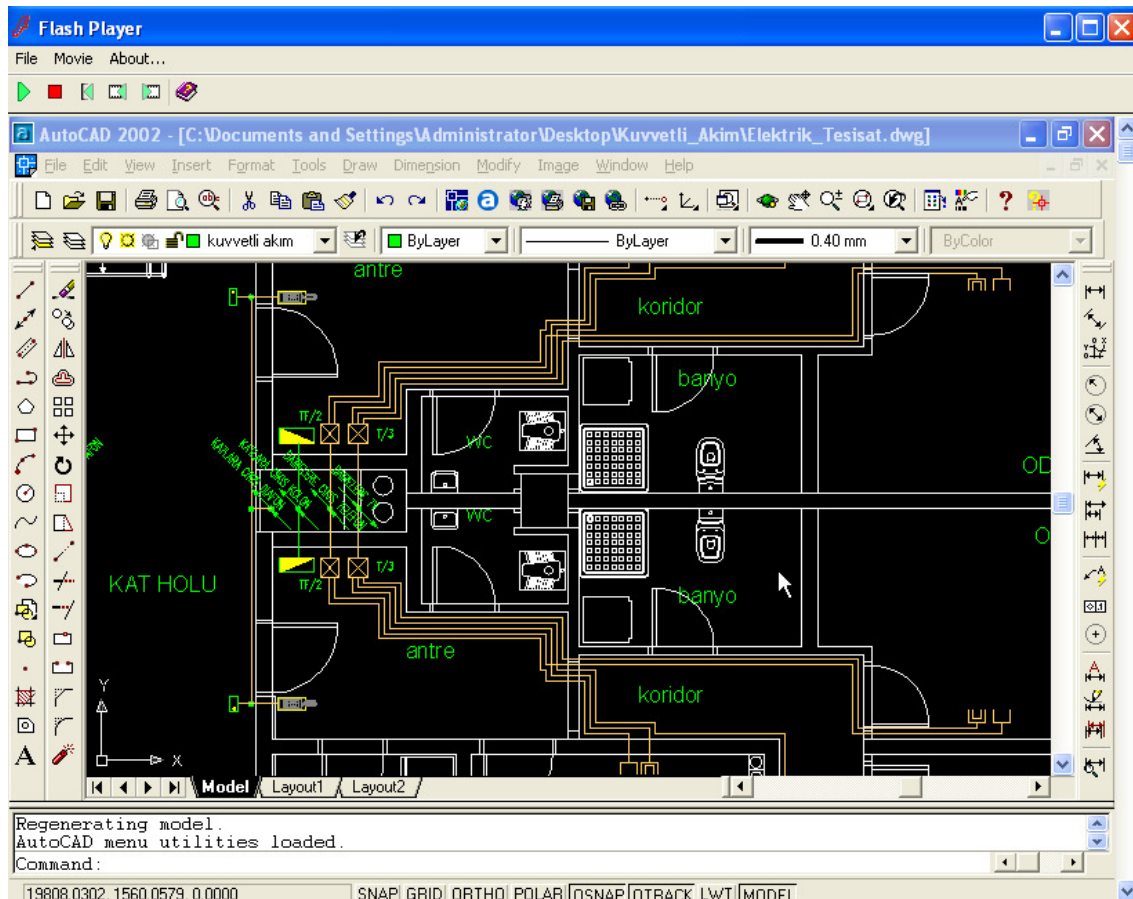
Figure 2. A screenshot of a video from the Educational software

III.   FINDINGS AND COMMENTARY

After the transfer of the necessary theoretical knowledge by the traditional education system on equal terms and times to the groups A and B that constitute the research groups, were exercises made on sample projects with a projection device. The students of group A and B began to undertake their projects after the suitability of the students' architectural projects has been confirmed by the instructors. The developments about the conduct of the students' projects were assessed through scales prepared by researchers during a process of approximately 30 days (Table 2).

In the scale showing that the students in group B are in general more successful the remarkable items of success are as followed:

- The accuracy of drawn symbols to be used in the Project
- Compliance of drawing elements with the regulation places
- Conformity of the socket number and forces with regulation
- Adequacy of management in the drawing layer
- Accuracy of calculation of the voltage drop
- Accuracy of the upload table
- Accuracy of calculation of the grounding
- The correct use of time in the project execution process

The research shows that the prepared training Cd assisted the students in the required calculations and drawings of the project. Item 13 of the scale especially shows that the students who utilized the training Cd did used the time correctly, while the students in group A couldn't use it correctly because they often felt the need to consult the educational staff.

Table 2. Findings concerning the undertake of the project from the group member

CRITERIA	Students group A										Students group B									
	Weak		Passes		Mediocre		Good		Very Good		Weak		Passes		Mediocre		Good		Very Good	
N=15	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
1.The accuracy of drawn symbols to be used in the project	1	6,6	3	20	7	46,6	4	26,6	-	-	-	-	1	6,6	2	13,3	6	40	6	40
2. The accuracy of the line type and thickness used in the project	-	-	3	20	8	53,3	3	20	1	6,66	-	-	-	-	4	26,6	7	46,6	4	26,6
3. Compliance of drawing elements with the regulation places	-	-	2	13,3	11	73,3	2	13,3	-	-	-	-	1	6,6	-	-	5	33,3	9	60
4. Suitability of regulation with lamp location, number and forces	1	6,6	4	26,6	6	40	4	26,6	-	-	-	-	-	-	4	26,6	5	33,3	6	40
5. Conformity of the socket number and forces with regulation	-	-	2	13,3	5	33,3	6	40	2	13,3	-	-	-	-	3	20	8	53,3	4	26,6
6. Adequacy of management in the drawing layer	-	-	4	26,6	7	46,6	3	20	1	6,66	-	-	-	-	4	26,6	3	20	8	53,3
7.Accuracy of the strong current colon chart	-	-	5	33,3	3	20	6	40	1	6,66	-	-	2	13,3	6	40	3	20	4	26,6
8. Accuracy of the low current colon chart	-	-	4	26,6	5	33,3	6	40	-	-	-	-	1	6,6	5	33,3	4	26,6	5	33,3
9. Accuracy of calculation of the voltage drop	2	13,3	4	26,6	7	46,6	2	13,3	-	-	-	-	-	-	6	40	4	26,6	5	33,3
10. Conformity of scaling	-	-	1	6,6	7	46,6	5	33,3	2	13,3	-	-	-	-	4	26,6	8	53,3	3	20
11. Accuracy of the upload table	-	-	5	33,3	5	33,3	5	33,3	-	-	-	-	-	-	7	46,6	3	20	5	33,3
12. Accuracy of calculation of the grounding	-	-	4	26,6	6	40	3	20	2	13,3	-	-	-	-	3	20	5	33,3	7	46,6
13. The correct use of time in the project execution process	5	33,3	8	53,3	2	13,3	-	-	-	-	-	-	-	-	3	20	6	40	6	40

IV. CONCLUSION

In recent years, the effects from computer-assisted education on learning is extensively examined by researchers in different fields. Computer-assisted education is been used frequently in modern educational systems because of its benefits like providing persistence in learning in general, providing a learner-centered learning process, getting the event of learning out of four walls and making it independent from space and time, providing the possibility to practice frequently and providing a quick access to information.

In this experimental study, the effects from computer-assisted education on the success of students taking the course Electrical Installation Project drawning were researched. The results obtained in the light of research findings are presented in the following items:

According the results of the scale developed by researchers, was the academic success of the group that had received a visual training CD as a supllement to the traditional education was higher than the success of the group that had learned only with the traditional education system.

It is observed that the students of the group that possesed a private didactic software during a process of approximately one month, asked the instructors for less help. This shows that the visual education CD contributed to the development of the individual competences of the students.

According these results it can be defend that in project-based courses the targeted and specially developed visual and auditory didactic materials that the students can consult independent of time or place during the project are more effective than other materials in scattered places.

There may be some disadvantages besides the benefits that the study revealed. For example, the teamspirit may weaken because the students work individually. This and similar disadvantages are waiting for researchers as a subject of an other study.

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