



## Absenteeism and Self-Efficacy on 3D Schematic Drawing and PCB Design Course

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### Abstract

Absenteeism as a global issue is defined as the situation in which students stay away from school with no valid rationales. Additionally, the concept of self-efficacy is considered as the personal judgments of individuals about what they can do in possible situations. Much attention is paid to the effects of absenteeism on the school success, whereas little one is placed on the effects of absenteeism on self-efficacy. This study aims to find the effects of absenteeism on the self-efficacy of students before and after a specific 3D Schematic Drawing and PCB Design course. The course, lasted 4 weeks, was held online-and face-to-face in Harran University. To assess students' self-efficacy, the General Self-Efficacy scale developed by [Sherer et al. \(1982\)](#), is used in our study. The demographic distribution of the students such as gender, birth of year, learning mode and organization is surveyed at the beginning and at the end of the course. Our findings indicate that the overall scores of the self-efficacy of students increase when they regularly attend the course. Moreover, our study revealed that the expected level of self-efficacy of the students in our study are sufficient based on our assessment scale. The attendance rate of students has a positive impact on the self-efficacy of students in distance education, whereas it plays a negative role in face-to-face one.

### Contents

1	<b>Introduction</b>	26
2	<b>Literature Review</b>	27
3	<b>Materials and Methods</b>	28
3.1	Self-efficacy Scale	28
3.2	Assesment Scale	28
3.3	Sampling of Participants	29
3.4	Data Analysis	29
3.5	Ethics Committee Approval	29
4	<b>Findings and Discussion</b>	30
4.1	Descriptive Statistics	30
4.2	Inferential Statistics	30
5	<b>Conclusion</b>	32
	<b>Acknowledgments</b>	33

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### 1. Introduction

Absenteeism is defined as a situation in which students stay away from school with no valid rationales. Absenteeism is mainly studied to find out an answer to two main questions: what causes absenteeism and the causal effects of absenteeism ([Goodman and Atkin, 1984](#)). Absence from classes among students are accepted as a global issue ([Mohamed et al., 2018](#)).

[Akaslan \(2017\)](#) reveals that there is a negative relationship between student absenteeism and school achievement, which is clearly observed in the final and make-up exams. The effect of absenteeism is also examined from the perspective of employees ([Muchinsky, 1977](#)). For instance, the effects of absenteeism on nurses are examined by [Masenyani et al. \(2018\)](#) and they found that absenteeism creates a burden for nurses and causes an unhealthy working environment.

Much attention has been drawn to the effects of absenteeism on academic achievement. However, little attention has been placed on the effects of absenteeism on students' self-efficacy. The self-efficacy is described from various perspectives.

The concept of self-efficacy has been considered as one of the most influential factors in student success in scientific studies conducted around the world for over forty years and in Türkiye for the last decade (Yıldırım and İlhan, 2010; Sakız, 2013). It is mainly defined as the personal judgments of people about what they can do in possible situations (Bandura, 1982) (as cited in Birişçi et al. (2018)). Yıldırım and İlhan (2010) consider the self-efficacy as the belief of people in their ability to start, to continue and to end an action in a way which would have an impact on their environment. An individual self-efficacy is perceived as a strong determinant about the effort, persistence, strategizing, subsequent training and job performance of people (Heslin and Klehe, 2006). The self-efficacy is gained gradually with the development of cognitive, social, linguistic and/or physical abilities acquired through experience (Bandura, 1982; Gist, 1987) (as cited in, Kızanıklı and Silik (2019)).

Cervone (2000) emphasizes that people's perceptions of their capabilities for performance are a cognitive system underlying behavioral change. Bandura (1997) (as cited in Luszczynska and Schwarzer (2015)) postulates that four informational sources might give a rise to self-efficacy: personal accomplishment, various experience, verbal persuasion and emotional arousal. The effect of self-efficacy on various tasks has been examined by several researchers. For example, Igbaria and Iivari (1995) examined the effect of self-efficacy on computer usage by analyzing the belief of people in their capabilities of using a computer in the accomplishment of specific tasks and found that computer experience has a strong positive effect on self-efficacy. The purpose of this study is to compare the self-efficacy of students before and after applying the 3D Schematic Drawing and Printed Circuit Board Design course using a PCB CAD software namely DipTrace (Diptrace, 2023b). To achieve our purpose, the following questions have been addressed:

- Is there any change between the students' self-efficacy before and after the delivery of the course?
- Do learning methods, face to face and distance, affect self-efficacy of participants?
- Is there any difference in students' self-efficacy based on their gender?
- Does attendance affect the students' self-efficacy?

## 2. Literature Review

Self-efficacy is described by Bandura as a person's belief in their capabilities to perform a particular task with a success (Heslin and Klehe, 2006). However, highly experienced people in success might have more positive self-efficacy than lowly experienced one in success in a greater variety of situations for carrying out a particular task.

Sherer et al. (1982) emphasize that individuals with various and numerous experiences of success might be expected to have positive self-efficacy expectancies in a greater variety of situations than individuals with experiences of limited success and of failure. A particular task might be anything such as computer use. Individuals' beliefs about the successful use of computers to solve tasks and manage situations might refer to computer self-efficacy (Compeau and Higgins (1995)). Much attention has been drawn to the computer self-efficacy. However, little attention has been paid to software usage such as 3D Schematic Drawing and Printed Circuit Board Design in our case.

Printed Circuit Boards (PCB) are described by the Ministry of Education as the plates on which the electronic circuit elements are placed and the electrical connections between the elements are provided by copper means (MEB, 2018). Printed Circuit Boards (PCBs) are used in almost all electronics application from mobile phones to air-crafts (Silvestre et al., 2019). The PCBs are mainly used to perform a particular task by soldering or connecting components by wires together (Sreedhar et al., 2021). The development of the circuit elements placed on the PCB, especially transistors, increases the complexity of the printed circuit board design and also prolongs the placement time of the elements (Altıntaş et al., 2018).

Moreover, most advanced systems utilize multilayer PCBs up to eight or more layers (Zumbahlen, 2008). Even an eight-layer board can be folded in a thousands of different ways (Burkhert, 2022). Additionally, electromagnetic compatibility (EMC) affects the functional capability of electrical and electronic equipment within a defined margin of safety and at design levels without suffering from electromagnetic interference (Montrose, 2000). A more controlled precision design is easily affected by numerous factors such as number of holes, different tool changes to drill those holes, size of the board, thickness of copper material, type of insulating material, and trace tolerances (Kwashnak, 2020). Therefore, PCB CAD software such as Altium, DipTrace, Eagle, KiCad and OrCAD play a critical role to minimize such problems.

As an example, the KiCad is suitable for creating designs of all complexities up to 32 copper layers (Charras et al., 2023). PCB CADs are also used to 3D-preview the model of the PCB with all components installed on, rotating the board on three axes, zooming in and out, changing colors of the components (e.g., board, copper areas, solder mask, silkscreen, and background) and exporting to STEP and VRML formats (Diptrace, 2023a). The term "3D" is defined as the dimensionality of the raw data that constitutes the basis of the visualization process Wood et al. (2005). 3D technology has gained an increasing momentum recently as a game changer in the challenge to meet performance, cost, and size demands Sadaka et al. (2010).

3D modeling is first used in the military flight simulators, and the aerospace and automobile industries of the 1950s with the computer-aided design (CAD) systems [Vernon and Peckham \(2002\)](#). Nowadays, 3D modeling is frequently used in supporting PCB design ([Pérez et al., 2022](#); [Raj et al., 2019](#)).

### 3. Materials and Methods

#### 3.1 Self-efficacy Scale

Efficacy items should accurately reflect the construct by concerning with perceived capability in terms of "can do" rather than "will do" ([Bandura, 2006](#)). The self-efficacy scale used in our study is developed by [Sherer et al. \(1982\)](#) and named as the General Self-Efficacy Scale. The validity and reliability of the scale in Turkish is implemented by [Yıldırım and İlhan \(2010\)](#). The scale contains 17 items and measures self-efficacy without reference to any specific behavioral domain as illustrated in [Table 1](#) in English and [Table 2](#) in Turkish. The letter N and P in the tables denotes negative and positive items, respectively. The self-efficacy scale contains negative and positive items such as planning, distraction and perseverance.

**Planning** is described as an arrangement for what people intend to do or how they intend to do something. The ability to plan, organize and prioritize work is considered as one of the most important ten skills sought after by employers ([Adams, 2014](#)). The findings of a study carried out by [Gauvain and Rogoff \(1989\)](#) demonstrates that older children are more skilled at planning in advance of action than younger ones. Moreover, [Chuvgunova and Kostromina \(2016\)](#) found that lower planning strategies than cognitive and meta-cognitive learning strategies might conclude that planning skills of learning are not sufficient. Therefore, it is important to understand to what extent people are certain that they can make plans work.

The ability to think carefully about something we are doing and nothing else is called motivation and considered highly important to focus at work. However, **distractions** such as social media, phone calls, and busy settings affect the focus of individuals. [Purvis et al. \(2016\)](#) emphasize that social media absorbs valuable time because it quickly distracts people by taking them into a number of unfruitful channels. [Dontre \(2021\)](#) also points that there is ample evidence to indicate that social media use in classrooms is largely disruptive and generally increases academic distraction. Much attention have been already drawn to the social media distractions. However, [Williams et al. \(2004\)](#) note that numerous attributions play a critical role for learners' success (e.g. effort, strategy, and interest) and learners' failures (e.g. distractions by others, difficulty of work and poor teaching). For that reason, understanding whether people can get to work or not does matter as part of self-efficacy.

The ability to keep doing something difficulty is defined as **perseverance**. Perseverance is gained over time and based on experiences through failures and success ([Ingham, 2018](#)). [Ashraf et al. \(2018\)](#) notes that when a determined student encounters difficulties or repeated unsuccessful results while following a certain path, they will adjust and update their expectation and preferences. Moreover, individuals who have the passion and perseverance to extensively work and study through challenges and adversity to achieve a set of goals are likely to achieve higher achievement compared to others who lack similar aspects ([Hernández et al., 2020](#)). Hence, it is import to understand whether students will keep trying until they can if they cannot do a job the first time.

**Table 1.** General Self-Efficacy Scale in English

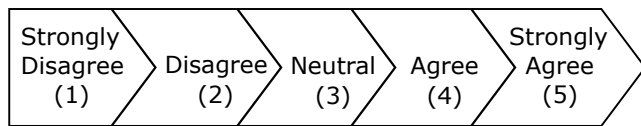
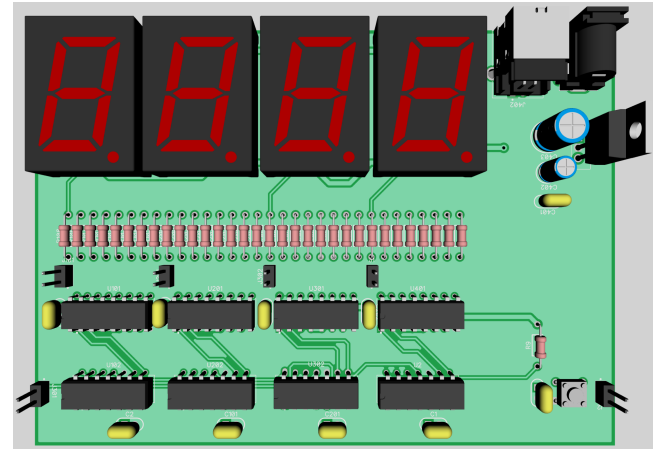
No	Item	Rev.
1	When I make plans, I am certain I can make them work.	P
2	One of my problems is that I cannot get down to work when I should.	N
3	If I cannot do a job the first time, I keep trying until I can.	P
4	When I set important goals for myself, I rarely achieve them.	N
5	I give up on things before completing them.	N
6	I avoid facing difficulties.	N
7	If something looks too complicated, I will not even bother to try it.	N
8	When I have something unpleasant to do, I stick to it until I finish it.	P
9	When I decide to do something, I go right to work on it.	P
10	When trying to learning something new, I soon give up if I am not initially successful.	N
11	When unexpected problems occur, I do not handle them well.	N
12	I avoid trying to learn new things when they look too difficult for me.	N
13	Failure just makes me try harder.	P
14	I feel insecure about my ability to do things.	N
15	I am a self-reliant person.	P
16	I give up easily.	N
17	I do not seem capable of dealing with most problems that come up in life.	N

#### 3.2 Assesment Scale

The items in the questionnaire are evaluated with a five-point Likert-scale with the leftmost and rightmost anchors being "Strongly Disagree" and "Strongly Agree" respectively as illustrated in [Fig. 1](#). Moreover, a new option "No Idea" is also included in the Likert-scale. It is important to note here that the assessment scale for the negative items will be recoded in direction of high self-efficacy to find out the overall scores of the items. The recommendation of [Aydin and Tasci \(2005\)](#) is also considered in our study, that the mean score of 3.40 is identified as expected level of self-efficacy for each item.

**Table 2.** General Self-Efficacy Scale in Turkish

No	Item	Rev.
1	Planlar yaparken, onları hayata geçirebileceğimden eminimdir.	P
2	Sorunlarımdan birisi, bir işe zamanında başlayamamamdır.	N
3	Eğer bir işi ilk denemede yapamazsam başarana kadar uğraşırım.	P
4	Belirlediğim önemli hedeflere ulaşmada, pek başarılı olamam.	N
5	Her şeyi yarım bırakırım.	N
6	Zorluklarla yüz yüze gelmekten kaçınırım.	N
7	Eğer bir iş çok karmaşık görünüyorsa onu denemeye bile girişmem.	N
8	Hoşuma gitmeyen bir şey yapmak zorunda kaldığımda onu bitirinceye kadar kendimi zorlarım	P
9	Bir şey yapmaya karar verdiğimde hemen işe girişirim.	P
10	Yeni bir şey denerken başlangıçta başarılı olmazsam çabucak vazgeçerim.	N
11	Beklenmedik sorunlarla karşılaştığımda kolayca onların üstesinden gelemem.	N
12	Bana zor görünen yeni şeyleri öğrenmeye çalışmaktan kaçınırım.	N
13	Başarısızlık benim azmimi arttırır.	P
14	Yeteneklerime her zaman çok güvenmem.	N
15	Kendime güvenen biriyim.	P
16	Kolayca pes ederim.	N
17	Hayatta karşıma çıkacak sorunların çoğuyla baş edebileceğimi sanmıyorum.	N

**Figure 1.** Assessment Scale**Figure 2.** Four Digit Decimal Counter Design using Diptrace**Table 3.** Number and percentage of participants

Institutions	F	%
Adıyaman Sanayi Geliştirme Merkezi	1	1.8
Atatürk University	1	1.8
Bingöl University	1	1.8
Bursa Teknik University	1	1.8
Gümüşhane University	1	1.8
Harran University	42	73.7
Iğdır University	1	1.8
İstanbul Medipol University	1	1.8
İstanbul University	1	1.8
Marmara University	1	1.8
Milli Eğitim Bakanlığı	1	1.8
Şehit Muhammed Cihangir Çubukçu Anadolu Lise	1	1.8
Siirt University	1	1.8
Tarım ve Kırsal Kalkınmayı Destekleme Kurum	1	1.8
Yıldız Teknik University	1	1.8
Yükseliş Fen ve Teknoloji Lisesi	1	1.8
Total	57	100.0

### 3.3 Sampling of Participants

The course is designed in four parts namely Schematic Design, Printed Circuit Design, Library and 3-D Modeling on September 19<sup>th</sup>, 2021. The designed course is announced on November 10<sup>th</sup>, 2021, through social media and the website of Harran University by using a poster. 79 individuals applied for the course by November 24<sup>th</sup>, 2021. After the delivery of the course, students were able to implement a sample design as shown in Fig. 2. However, 22 of them did not attend any of the lectures. Table 3 illustrates the number of attended participants based on their affiliations.

As seen from the Table 3, majority of the participants are from Harran University (f: 42, %: 73.7). The course lasted 4 weeks and held both online and face-to-face from November 29, 2021, to December 24, 2021, in Harran University. 57 students filled the self-efficacy scale at the beginning of the course, whereas it was 29 at the end. The gender, birth of year, learning mode and organization of the students are surveyed at the beginning (female: 28.07% and male: 71.93%) and at the end (female: 31.03% and male: 68.97%).

### 3.4 Data Analysis

Microsoft Excel is used to edit and organize raw data in several steps. First, the questions and answers are listed respectively and coded using numbers starting from zero (e.g., female: 0, male: 1). Second, the answers of the participants are updated with the code given in the first step. Third, the coded data is then analyzed to extract the results.

### 3.5 Ethics Committee Approval

Ethics Committee Approval is obtained for the research with the consent of the Harran University Social and Human Sciences Ethics Committee at the session dated February 11, 2020 and with the decision numbered 2020/11. Upon obtaining the Ethics Committee Approval, the self-efficacy of students are measured before and after the delivery of the course.

### 4. Findings and Discussion

This section is divided into two parts: The first part reports the descriptive statistics among items in the study whereas the second part compares the mean scores of variables namely gender and learning mode of the participants to find out whether there is any significant difference with respect to these variables. Moreover, the mean scores of each variable are compared with the attendance rate. Male and female participants with at least %50 or more attendance rate are also analyzed for the self-efficacy. Additionally, based on the assessment scale of our study, each item in the self-efficacy scale is evaluated as sufficiency ( $\mu \geq 3.40$ ) and insufficiency ( $\mu < 3.40$ ). Insufficient items are highlighted (as bold) in the tables.

#### 4.1 Descriptive Statistics

This part is divided into two sub-parts. The first sub-part analyzes the descriptive statistics of items for the participants without taking absenteeism into account whereas the second part only analyzes the mean scores of the items for the participants with at least %50 or more attendance rate to find out whether there are significant difference among the participants with regular attendance.

##### 4.1.1 General Self-Efficacy without Absenteeism

The number, mean and standard deviation of the scores of the items in the study are presented in the Table 4. The overall score of the items is calculated as 3.93 at the beginning and, 3.91 at the end of the course. It seems that there is subtle decrease in the self-efficacy of the students at the first glance. For example, the item 1 in Table 1 illustrates the confidence of participants for "making plans" is increased from 3.96 to 4.14 after the delivery of the course. On the other hand, the item 3 indicates that the self-efficacy of the participants related to "doing a job" had decreased after the course. As seen in the Table 4, the mean score of all the items, except the item 2, are computed to be sufficient. To conclude, regardless of the course delivery, it can easily be interpreted that the expected level of self-efficacy for all items except the item 2 is sufficient for the participants.

##### 4.1.2 General Self-Efficacy with Absenteeism

The mean and standard deviation of the items are recalculated based on the attendance of the students as illustrated in Table 5. All the students in Table 5 attended at least 50% of the courses either face-to-face or through distance education or both. The overall scores of the students in the Table 5 are calculated as 4.03 at the beginning and 4.14 at the end of the course. As seen in the Table 5, the self-efficacy of students who attend the course regularly (at least 50% of the course) has increased. As seen in the Table 5, expected level of self-efficacy is calculated as sufficient for all items except the item 2.

Table 4. Analysis Results of the Self-Efficacy Scale without Absenteeism

Item	Pre-Test			Pro-Test			Change
	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	
1	57	3.96	0.597	28	4.14	0.651	+
2	55	<b>3.18</b>	1.002	28	<b>3.00</b>	1.089	-
3	55	4.40	0.596	28	4.11	0.629	-
4	57	3.91	0.912	28	3.86	0.705	-
5	57	4.19	0.875	27	3.89	1.050	-
6	55	4.18	0.865	28	4.18	0.863	o
7	57	4.26	0.745	28	4.11	0.786	-
8	57	3.86	0.766	27	3.59	0.971	-
9	55	3.91	0.823	27	4.04	0.706	+
10	53	4.00	0.832	28	4.04	0.793	+
11	57	3.72	0.861	28	3.93	0.858	+
12	56	4.21	0.680	28	4.21	0.686	o
13	55	3.49	1.136	27	3.63	0.742	+
14	56	3.59	1.005	27	3.52	0.975	-
15	56	3.54	1.250	26	4.23	0.652	+
16	57	4.30	0.823	28	4.18	0.905	-
17	52	4.02	0.960	28	4.21	0.630	+
Avg.		3.93			3.91		-

Yet, the overall mean scores of the items has increased from 4.03 to 4.14. Moreover, the number of the items with positive change has also increased.

#### 4.2 Inferential Statistics

The mean scores of the items used in the study are compared for the participants with various variables such as gender and learning mode to verify significance of differences, namely between male and female and between face-to-face and distance learning modes.

Table 5. Analysis Results of the Self-Efficacy Scale with Absenteeism

Item	Pre-Test			Pro-Test			Change
	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	
1	10	3.70	0.949	10	4.40	0.516	+
2	10	3.50	0.850	10	<b>3.30</b>	0.949	-
3	9	4.44	0.527	10	4.10	0.876	-
4	10	4.00	0.816	10	4.20	0.422	+
5	10	4.50	0.527	10	4.40	0.699	-
6	10	4.30	0.675	10	4.60	0.516	+
7	10	4.50	0.528	10	4.20	0.789	-
8	10	4.10	0.568	10	3.80	1.033	-
9	10	4.10	0.876	10	4.20	0.789	-
10	9	4.00	0.866	10	4.40	0.699	+
11	10	3.60	1.174	10	3.80	1.033	+
12	9	4.44	0.527	10	4.40	0.699	-
13	10	3.40	0.843	10	3.60	0.699	+
14	10	3.40	0.966	10	3.70	1.059	+
15	10	3.50	1.269	10	4.20	0.632	+
16	10	4.20	1.229	10	4.70	0.483	+
17	8	4.13	0.641	10	4.40	0.699	+
Avg.		4.03			4.14		+

Moreover, the mean scores of all the items that are lower than the expected level of sufficiency ( $\mu = 3.40$ ) are highlighted in bold.

**4.2.1 Learning Mode without Absenteeism**

Much attention has been drawn to differences between distance and face-to-face education in several aspects such as attendance, school success, undergraduate and graduate programs.

Akaslan (2019) found that there is a significant difference between distance and face-to-face education on the students' school success. Similarly, the self-efficacy of students in distance and face-to-face education are compared in our study. As seen in Table 6, the overall mean scores of the students' self-efficacy in terms of their learning mode are different.

While the overall mean score of the students in distance education increased from 3.86 to 3.99, it decreased from 4.06 to 4.00 without considering the attendance rate of the students in the course. Moreover, the assessment scale used in our study indicates that the mean score of the item 2 in the stage of pre- and pro-test for both distance and face-to-face learning mode and item 8 in the stage of pro-test for only distance learning mode is under the expected level of efficacy.

**Table 6.** Analysis Results of the Self-Efficacy Scale for Learning Mode Differences without Absenteeism

Item	Distance						F2F					
	Pre-Test			Pro-Test			Pre-Test			Pro-Test		
	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$
1	30	3.97	0.490	15	4.20	0.676	11	3.82	0.874	8	4.13	0.641
2	28	<b>3.21</b>	1.031	15	<b>3.20</b>	1.207	11	<b>3.09</b>	1.044	8	<b>2.50</b>	0.926
3	30	4.33	0.661	15	4.27	0.594	10	4.50	0.527	8	4.00	0.756
4	30	3.77	0.935	15	4.00	0.756	11	4.27	0.647	8	4.00	0.535
5	30	4.17	0.874	15	4.07	1.163	11	4.18	1.168	8	4.00	0.756
6	29	4.07	0.961	15	4.27	0.799	11	4.36	0.505	8	4.38	0.744
7	30	4.17	0.834	15	4.07	0.884	11	4.55	0.522	8	4.38	0.744
8	30	3.80	0.847	14	<b>3.36</b>	1.082	11	3.91	0.701	8	3.88	0.991
9	29	4.07	0.651	14	4.14	0.770	11	3.91	0.944	8	4.00	0.756
10	26	4.12	0.766	15	4.13	0.834	11	4.00	0.775	8	4.25	0.707
11	30	3.83	0.699	15	4.07	0.799	11	3.45	1.128	8	3.88	1.126
12	29	4.21	0.726	15	4.40	0.632	11	4.36	0.505	8	4.25	0.707
13	30	3.40	1.133	14	3.93	0.616	11	3.73	1.009	8	3.50	0.756
14	29	3.48	1.056	14	3.71	1.139	11	3.64	0.924	8	3.38	0.916
15	30	3.50	1.280	13	4.31	0.630	11	3.55	1.293	8	4.25	0.707
16	30	4.13	0.973	15	4.07	1.100	11	4.45	0.522	8	4.63	0.518
17	28	3.82	1.020	15	4.20	0.561	10	4.50	0.527	8	4.63	0.518
Avg.		3.86			3.99			4.06			4.00	

**4.2.2 Learning Mode with Absenteeism**

Akaslan (2019) found that the compulsory school attendance in distance education has a positive effect on the success of the students registered in English course.

Therefore, the results of the self-efficacy scale are analyzed for learning mode differences by considering the attendance rate of the students in the course. Table 7 illustrates the analysis results of the self-efficacy scale for the students with attendance rate of 50 percent or more. As illustrated in the Table 7, the overall mean scores of the items increased from 3.96 to 4.24 in distance education and from 3.78 to 3.97 in face-to-face education. Moreover, the mean scores of all the items in distance education after the course are computed as more than the expected level of efficacy based on our assessment scale. However, the item 14 is still under the expected level of efficacy in face-to-face education.

**Table 7.** Analysis Results of the Self-Efficacy Scale for Learning Mode Differences with Absenteeism

Item	Distance						F2F					
	Pre-Test			Pro-Test			Pre-Test			Pro-Test		
	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$
1	5	3.80	0.447	4	4.50	0.577	6	3.50	1.049	5	4.40	0.548
2	5	3.80	0.837	4	4.00	0.816	6	<b>3.17</b>	0.983	5	<b>2.80</b>	0.837
3	5	4.20	0.447	4	4.25	0.957	5	4.40	0.548	5	3.80	0.837
4	5	3.60	1.140	4	4.25	0.500	6	4.00	0.000	5	4.00	0.000
5	5	4.60	0.548	4	4.75	0.500	6	4.33	0.516	5	4.20	0.837
6	5	4.20	0.837	4	4.50	0.577	6	4.17	0.408	5	4.60	0.548
7	5	4.40	0.548	4	3.75	0.957	6	4.33	0.516	5	4.40	0.548
8	5	4.00	0.707	4	3.75	0.957	6	4.00	0.632	5	3.60	1.140
9	5	4.20	0.837	4	4.25	0.957	6	3.50	1.049	5	4.00	0.707
10	4	4.25	0.500	4	4.50	0.577	6	3.67	0.816	5	4.20	0.837
11	5	4.00	0.707	4	3.75	0.957	6	<b>3.00</b>	1.095	5	3.60	1.140
12	4	4.75	0.500	4	4.75	0.500	6	4.00	0.000	5	4.00	0.707
13	5	3.60	0.548	4	3.75	0.500	6	<b>3.17</b>	0.753	5	3.40	0.894
14	5	<b>3.20</b>	0.837	4	4.25	0.957	6	<b>3.33</b>	0.816	5	<b>3.20</b>	1.095
15	5	<b>3.20</b>	1.304	4	4.25	0.500	6	3.50	1.049	5	4.00	0.707
16	5	4.00	1.732	4	4.75	0.500	6	4.17	0.408	5	4.60	0.548
17	4	3.75	0.500	4	4.00	0.816	5	4.20	0.447	5	4.60	0.548
Avg.		3.96			4.24			3.78			3.97	

**4.2.3 Gender without Absenteeism**

Keung and So (2005) states that the difference between female and male is always posited to be a controversial issue as it is not consistently observed. Table 8 shows that male participants ( $\mu = 4.00$  and  $\mu = 3.96$ ) show higher self-efficacy comparing to the female ones ( $\mu = 3.72$  and  $\mu = 3.81$ ) with respect to the use of overall mean score of the 17 items for the pre-test and pro-test of the study, respectively. However, after the course, although the self-efficacy of male respondents is still higher, the self-efficacy of female counterparts has increased notably. Moreover, Table 8 also indicates whether the expected level of sufficiency of items is sufficient or not. As seen in the Table 8, the items 2, 13, 14, and 15 for pre-test and item 2, and 11 for pro-test are highlighted as insufficiency for female participants since the mean score is lower than 3.40. On the other hand, the items 2 for pre-test and pro-test are highlighted as insufficiency for male individuals since the mean score is lower than 3.40.

**Table 8.** Analysis Results of the Self-Efficacy Scale for Gender Differences without Absenteeism

Item	Female						Male					
	Pre-Test			Pro-Test			Pre-Test			Pro-Test		
	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$
1	16	3.69	0.704	9	4.11	0.601	41	4.07	0.519	19	4.16	0.688
2	15	<b>3.13</b>	0.834	9	<b>2.78</b>	0.833	40	<b>3.20</b>	1.067	19	<b>3.11</b>	1.197
3	15	4.20	0.676	9	3.89	0.601	40	4.48	0.554	19	4.21	0.631
4	16	3.75	0.931	9	3.78	0.441	41	3.98	0.908	19	3.89	0.809
5	16	4.13	0.719	9	4.00	1.000	41	4.22	0.936	18	3.83	1.098
6	16	3.94	0.680	9	4.22	0.441	39	4.28	0.916	19	4.16	1.015
7	16	4.31	0.602	9	4.11	0.601	41	4.24	0.799	19	4.11	0.875
8	16	3.81	0.834	9	3.56	0.726	41	3.88	0.748	18	3.61	1.092
9	16	4.00	0.632	9	4.00	0.500	39	3.87	0.894	18	4.06	0.802
10	13	3.77	0.725	9	4.00	0.707	40	4.08	0.859	19	4.05	0.848
11	16	3.56	0.814	9	<b>3.33</b>	0.707	41	3.78	0.881	19	4.21	0.787
12	15	4.20	0.414	9	4.00	0.707	41	4.22	0.759	19	4.32	0.671
13	16	<b>3.19</b>	1.047	9	3.56	0.726	39	3.62	1.161	18	3.67	0.767
14	15	<b>3.13</b>	1.060	9	3.56	0.882	41	3.76	0.943	18	3.50	1.043
15	16	<b>3.31</b>	1.078	8	3.75	0.463	40	3.63	1.314	18	4.44	0.616
16	16	4.13	0.619	9	4.22	0.667	41	4.37	0.888	19	4.16	1.015
17	14	3.93	0.997	9	4.00	0.707	38	4.05	0.957	19	4.32	0.582
Avg.		3.72			3.81			4.00			3.96	

**4.2.4 Gender with Absenteeism**

Table 9 shows that male participants ( $\mu = 4.12$  and  $\mu = 4.35$ ) show higher self-efficacy comparing to the female ones ( $\mu = 3.69$  and  $\mu = 3.93$ ) with respect to the use of overall mean score of all the items for the pre-test and pro-test of the study, respectively. However, after the course, although the self-efficacy of male respondents is still higher, the self-efficacy of female counterparts has increased notably.

Moreover, Table 9 also indicates whether the expected level of sufficiency of items is sufficient or not. As seen in the Table 9, the items 1, 11, 13, 14, and 15 for pre-test and item 2, and 11 for pro-test are highlighted as insufficiency for female participants since the mean score is lower than 3.40. On the other hand, the items 2 for pre-test are highlighted as insufficiency for male individuals since the mean score is lower than 3.40.

**5. Conclusion**

The purpose of our study is to compare the self-efficacy of the students before and after attending a course. The 3D Schematic Drawing and PCB Design has been taught within the 4 weeks. The students had the opportunity to attend the course either face-to-face or online.

Moreover, the course records are published in our YouTube Channel to ensure students do not miss any topics while they keep attending the course (Leukolion Informatics, 2021). Our findings indicate that the overall scores of the self-efficacy of students changes when they regularly attend the course.

**Table 9.** Analysis Results of the Self-Efficacy Scale for Gender Differences with Absenteeism

Item	Female						Male					
	Pre-Test			Pro-Test			Pre-Test			Pro-Test		
	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$	f	$\mu$	$\sigma$
1	6	<b>3.33</b>	0.816	5	4.40	0.548	6	4.17	0.753	5	4.40	0.548
2	6	3.67	0.516	5	<b>3.20</b>	0.837	6	<b>3.17</b>	1.169	5	3.40	1.140
3	5	4.20	0.447	5	3.80	0.837	6	4.50	0.548	5	4.40	0.894
4	6	3.50	0.837	5	4.00	0.000	6	4.33	0.516	5	4.40	0.548
5	6	4.33	0.516	5	4.40	0.894	6	4.67	0.516	5	4.40	0.548
6	6	4.00	0.000	5	4.40	0.548	6	4.50	0.837	5	4.80	0.447
7	6	4.33	0.516	5	4.00	0.707	6	4.50	0.548	5	4.40	0.894
8	6	3.83	0.753	5	3.80	0.837	6	4.17	0.408	5	3.80	1.304
9	6	3.83	0.753	5	4.00	0.707	6	4.00	1.265	5	4.40	0.894
10	5	3.60	0.894	5	4.20	0.837	6	4.33	0.516	5	4.60	0.548
11	6	<b>3.33</b>	0.516	5	<b>3.20</b>	0.837	6	3.83	1.472	5	4.40	0.894
12	5	4.00	0.000	5	4.00	0.707	6	4.67	0.516	5	4.80	0.447
13	6	<b>3.33</b>	0.516	5	3.40	0.894	6	3.67	1.033	5	3.80	0.447
14	6	<b>3.33</b>	0.816	5	3.40	1.140	6	3.50	1.049	5	4.00	1.000
15	6	<b>3.17</b>	0.753	5	3.80	0.447	6	3.83	1.472	5	4.60	0.548
16	6	4.17	0.408	5	4.60	0.548	6	4.17	1.602	5	4.80	0.447
17	4	4.25	0.500	5	4.20	0.837	6	4.00	0.632	5	4.60	0.548
Avg.		3.69			3.93			4.12			4.35	

The results of our study reveals that the mean scores of almost all items are computed over our expected level of efficacy without considering any variables such as gender, attendance rate and learning mode. This indicates that the students registered in our course have sufficient level of self-efficacy.

Moreover, our study also suggests that the attendance rate has significant impact on the self-efficacy of the students. Analysis results of the self-efficacy points that students with more attendance rate have more level of self-efficacy regardless of their gender or learning mode.

Whilst the findings of our study reveals that the self-efficacy of the students before and after the course is sufficient, it is important to take the limitation of our study into account when interpreting its findings. For example, the designed course is announced through social media and the website of Harran University by using a poster. Therefore, some potential students cannot be reached because of the type of announcement.

Moreover, announcing the course via the Internet might be also criticized for finding out the difference between the face-to-face and distance learning modes because individuals who are already online might be already motivated to take our course in distance learning mode. However, we tend to conclude that such a bias is remarkably low in our study because all the students are invited through the Internet, whereas several participants preferred taking the course face-to-face.

The implication for researchers is that it is critical to examine the effects of self-efficacy on students by applying more specific tasks relevant to software usage in engineering like 3D Schematic Drawing and PCB Design in our case. For example, the effects of self-efficacy on students might be analyzed by applying more specific courses related to 3-D such as modeling, texturing, animating, lighting and rendering. Moreover, students should be encouraged to design and generate a product at the end of the course. In our case, the students were able to design a counter at the end of the course as illustrated in Fig. 2.

The study is limited to 79 individuals registered the course. Hence, inferential statistics such as independent sample T-test, one-way ANOVA and chi-square test are not used to verify statistical significance of differences in mean scores on gender and learning mode variables. Hence, future studies can explore the effect of more specific tasks on students and can apply more advanced inferential statistics with sufficient number of students.

In addition, we have conducted a pre-achievement and a pro-achievement test consisting of approximately 100 questions to determine the increase or decrease in the learning level of the students. The data analysis is ongoing. We plan to publish the analysis of these results in our future work.

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