A Comparison of Students' Anxiety and Attitude towards Laboratory Skills among Students Attending Online Education in the Covid-19 Process in Turkey

İbrahim Çankaya*
Department of Education Sciences, Faculty of Education, Uşak University, Turkey
Email: i.cankayaa23@gmail.com
*Corresponding author

Nevin Çankaya
Department of Chemistry, Faculty of Sciences, Uşak University, Turkey
Email: nevin.cankaya@usak.edu.tr

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Abstract

Aim of this study is to compare the laboratory anxiety levels and attitudes towards laboratory skills of students who participated in online education only and those who participated in online education and laboratory exercises in the Covid-19 pandemic. The study is in the quantitative research method. The second and third grade students attended the training directly and online but fourth grade students participated in the training only online in the pandemic period (total 250 students). The scales that 180 students answered without error were evaluated. It has been revealed that anxiety levels of the students who could not participate in the laboratory exercises in pandemic period were higher than the anxiety levels of the students who participated in the exercises. The laboratory skill attitude of the fourth grade students is more negative than the laboratory skill attitude of the second and third grade students. There is an inverse and significant relationship between students' laboratory skill attitudes and laboratory anxiety.

Keywords: Comparative study, Covid-19 pandemic, Anxiety, Laboratory skills attitude, online education

1. Introduction

Laboratory practice is a method in which knowledge is transferred directly to students through experience and demonstration. In the laboratory, students are active in learning. The laboratory is the space where full learning takes place. Laboratory exercises are very important in higher education (Akgün and Deryakulu, 2007). Laboratory practice; It aims to develop the skills of critical thinking, using and transferring knowledge.

Laboratory exercises are an indispensable element of teaching in basic sciences. The target acquisitions of laboratory practice are: encouraging entrepreneurship, questioning, observation, classifying information, collecting data and explaining the data collected (Aydoğdu et al., 2004). Laboratory exercises facilitates students to learn by doing and experiencing. The aim of laboratory practice is to provide students with observation and discussion skills (Tan and Temiz, 2003). The strategy of laboratory practice is to enable students to learn through invention. The basis of acquiring laboratory skills is to have a positive attitude towards the laboratory (Tao and Gunstone, 1999). Having a positive attitude towards the laboratory directly affects student performance in the laboratory. Camacho Limon Pana and et al. (2022) in their research, they determined that the anxiety levels of the students who could not participate in the application during the Covid-19 period were high and their academic performance decreased. Islam et al. (2020) in their study, they determined that the anxiety levels of university students were high in the Covid-19 process. Gonzalez et al. (2021) in their research at students in the Covid 19 period, they determined that students in the e-learning process had higher levels of anxiety. Whang Zhao and Zhang (2020) in their study determined that the anxiety of university students were high in the Covid-19 process.

1.1 Theoretical Framework

The aim of laboratory exercises; to raise individuals who are interested in nature, ask questions, observe, analyze data and access new information (Akgün, 2004). Laboratory practice requires scientific discipline (Gücüm, 1998). In order for students to gain scientific discipline in the laboratory, they must first have a positive attitude towards the laboratory. The factors affecting the student's attitude towards the laboratory are as follows (Çakır and Şenler, 2007):

- Self-confidence of the student,
- The socio-economic status of the family,
- Gender,
- Age,
- Motivation,
- The teacher's attitude towards the lesson and students,
- Teaching methods and techniques.

Among the factors mentioned above, motivation, attitude towards the course, methods and techniques are controllable variables. There are findings showing that students who have negative attitudes towards laboratory courses have low academic achievement (Çakır and Şenler, 2007). Students' attitudes in the laboratory directly affect laboratory motivation and anxiety. The anxiety of students in the laboratory makes it difficult to focus on the lesson (Arfiani, 2017).

Anxiety is classified into three groups: anxiety arising from the reality state, neurotic anxiety and moral anxiety (Freud, 2020). Real anxiety comes from real dangers in the outside world. Neurotic anxiety stems from self-centered behaviors and is originally based on childhood experiences. Punishment, which is often used by parents, forms the basis of neurotic

anxiety. According to Freud, real anxiety differs from neurotic anxiety in many aspects. Real anxieties can often be seen in everyday life. Real anxiety differs from neurotic anxiety in that it has a logical explanation. Genuine anxiety occurs as a result of feeling or perceiving an impending danger. Moral anxiety stems from the guilt, shame and fear of conscience experienced by the person (Freud, 2020). While it is normal for anxiety to be at a certain level in human life, its persistence is a negative situation for students' success. Trait anxiety is caused by the individual feeling constantly stressed in the face of events (İşlek, 2016). In trait anxiety, the individual may perceive a situation that does not pose a threat to him/herself as dangerous. An individual with high anxiety is easily hurt and may show pessimism in the face of events (Kula and Saraç, 2017). The most common anxiety situation among students is momentary anxiety. According to Köknel (2020), momentary concerns originate from the process individuals experience.

1.2 Problem of Research

In the literature, it is seen that there is no current research on how students evaluate their staying away from practice courses during the pandemic period. During Covid 19 pandemic process, formal education has been suspended in many countries. There has increased in the stress levels of students who stay away from academic applications (Kırmızıgül, 2020). It is estimated that the interruption of formal education during the pandemic period increases the anxiety in students due to stress. During the Covid-19 period, students could not participate in laboratory exercises and continued online education. There is a need for research that explains how the online education process affects students during the pandemic period. Determining how students who receive online education during the pandemic process since 2020 are affected by this situation can help explain possible student anxiety. Identifying students who have anxiety by not participating in the exercises during the pandemic period will facilitate the solution of problems that may occur in the future.

Aim of this research is to compare the attitudes of students who participated in only online education and students who directly participated in education regarding laboratory anxiety levels and laboratory skills in Covid-19 pandemic period. The sub-problems of the research are;

- What’s the average of the students' views on their laboratory anxiety levels?
- What’s the average of students' attitudes towards laboratory skill?
- Does the level of laboratory anxiety show a significant difference according to grade level and gender?
- Does the attitude towards laboratory skills differ significantly according to experience?
- Is there a significant relationship between students' anxiety and laboratory skill attitude?

2. Research Method

The method of this research is a quantitative research method. Quantitative research is a method that reveals existing facts, events and perceptions as they are and generalizes the results

(Aypay, 2020). This research is a quantitative research method with relational screening model. Relational survey model is a type of research that aims to reveal the relationship between social facts and approaches (Aypay 2020; Kalaycı, 2019).

2.1 Study Group

The study group of the research consists of students enrolled in the Department of Molecular Biology and Genetics of the Faculty of Science at Uşak University (Turkey) in the 2021-2022 academic year. A face-to-face scale was applied to all students (250 students) in the study group. The scales that 180 students answered without error were evaluated (second grade students: 57, third grade students: 60, fourth grade students: 63). This research was limited to the opinions of the students of the relevant department due to the high number of laboratory courses in Molecular Biology and Genetics Departments. The study group of the research was determined according to the criterion sampling technique.

2.2 Data Collection Tools

Laboratory Anxiety Scale: The scale was developed by Azizoğlu and Uzuntiryaki (2006) and is a 5-point Likert type scale. The reliability coefficient of the scale was determined as (.86). In this study, the Cronbach Alpha reliability coefficient of the scale was determined as (.88).

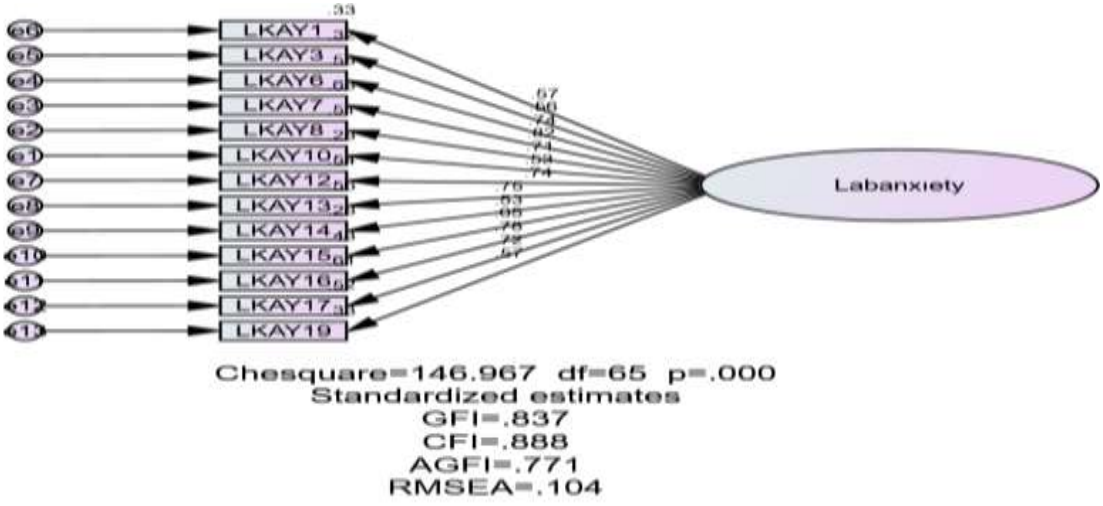

Figure 1 Laboratory anxiety scale confirmatory factor analysis

As a result of the confirmatory factor analysis on the scale. It was seen that the fit values of the scale (GFI: .887; CFI: 888; AGFI: .771) were at a good level and the scale was valid (Bayram, 2020).

Laboratory Skills Attitude Scale: The scale was developed by Alkan and Erdem (2012). The scale is a 5-point Likert-type scale. The reliability coefficient of the scale was determined as (.84). In this study, the Cronbach Alpha reliability coefficient of the scale was determined as (.87).

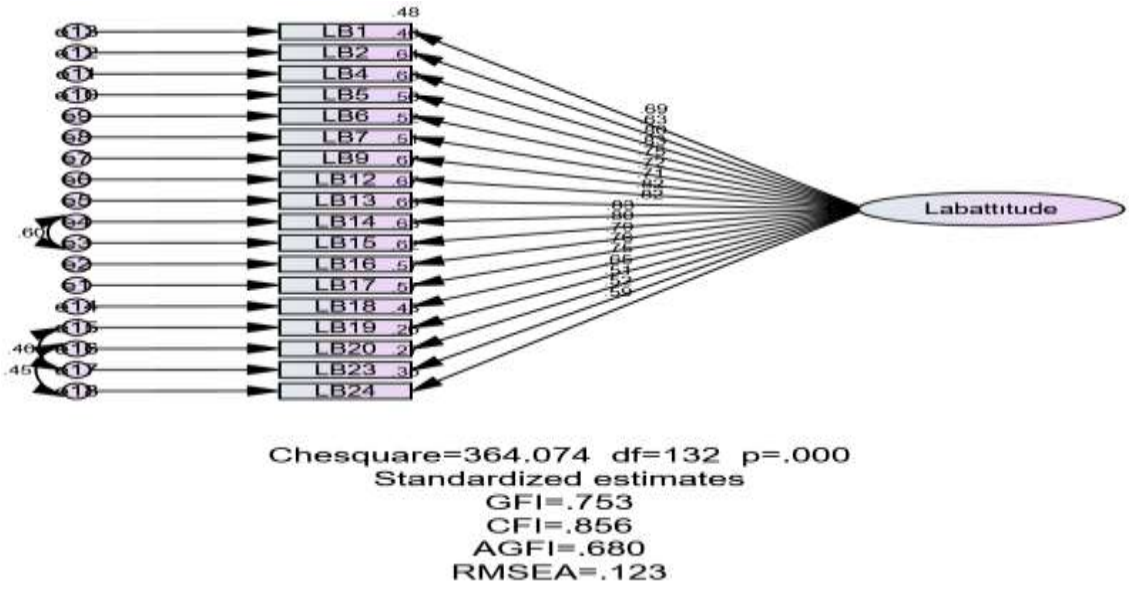

Figure 2 Laboratory skills attitude scale confirmatory factor analysis

As a result of the confirmatory factor analysis on the scale. It was seen that the fit values of the scale (GFI: .753; CFI: 856; AGFI: .680) were acceptable level and the scale was valid (Bayram, 2020).

2.3 Application of Scales

The researcher applied the scale simultaneously with the senior students of the Molecular Biology and Genetics Department in the study group. A separate application was carried out simultaneously with the second and third year students. Before the application, the students were informed about the research.

2.4 Analysis of Data

According to the Kolmogorov–Smirnov test performed in SPSS 24 program it was determined that the data ($p > .05$) showed normal distribution. The Z values of the data were calculated and it was determined that they ranged between (+2….−2). In the context of these criteria, it is considered sufficient in the literature that the data set is normally distributed (Yeşilyurt, 2020). It was deemed appropriate to perform parametric tests on the data.

3. Research Results

In this section, there are findings regarding the arithmetic mean of the views of the students participating in the research on laboratory anxiety and laboratory attitude, and the relationship between laboratory anxiety and laboratory skill attitude.

Table 1 Classes participating and online participating in laboratory practice during the pandemic period

Department of Molecular Biology and Genetics	Directly Participating in Laboratory Practice during Covid-19	Participating in Online Education during Covid-19
Second Grade	✓	✓
Third Grade	✓	✓
Fourth Grade	X	✓

Fourth grade students did not participate in laboratory exercises during the pandemic period. Lessons were held online. Second grade and third grade students participated in laboratory exercises and online education in Covid-19 pandemic. While calculating the arithmetic average of the answers given by the students to the laboratory anxiety and laboratory attitude scales, they were evaluated according to following category. The arithmetic mean of opinions on laboratory anxiety and laboratory attitude scales; 0 - 1.60 points "very low",1.61 -2.80 points “low level”, 2.81 - 3.20 “intermediate”, 3.21 - 4.00 “high level”, 4.01 - 5.00 were rated “very high”.

Table 2 shows the findings regarding the first sub-problem of the research.

Table 2. Averages of students' opinions on laboratory anxiety levels

Grade	Number of Students	$\bar{x}$	Std
Second Grade	57	***2.59***	.553
Third Grade	60	***2.61***	.412
Fourth Grade	63	***2.95***	.669

Considering the laboratory anxiety levels of Molecular Biology and Genetics Department students; In the post-pandemic period, laboratory anxiety of fourth grade students ($\bar{x}$: 2.95) was moderate, third grade students' laboratory anxiety ($\bar{x}$: 2.61) was low, and second grade students' anxiety levels were low ($\bar{x}$: 2.59). The high anxiety levels of the fourth grade can be attributed to the fact that the laboratory courses were not applied during the pandemic period (2020-2022) and the courses were held online. During the Covid-19 process, fourth grade students only attended online education.

Table 3 show the findings related to the second sub-problem of the research.

Table 3. Average of students' attitudes towards laboratory skills

Grade	Number of Students	$\bar{x}$	Std
Second	57	***3.53***	.459
Third	60	***3.14***	.476
Fourth	63	***2.71***	.780

Considering attitudes towards laboratory skills of Molecular Biology and Genetics Department students; In the post-pandemic period, it was determined that the skill attitude of the fourth grade students ($\bar{x}$: 2.71) was low, the laboratory skill attitude of the third grade students ($\bar{x}$: 3.14) was moderate and the skill attitude of the second grade students was higher ($\bar{x}$: 3.53).

Tables 4 and 5 show the findings related to the third sub-problem of the research.

Table 4. Comparison of laboratory anxiety level by gender

Gender	Number of Students	$\bar{x}$	Std	t	P
Female	105	2.75	.709	-.1.89	**.005***
Male	75	2.51	.594		

*P<.05

There is a significant difference (p<.05) between students' attitudes towards laboratory skills depending on gender. Laboratory anxiety of female is higher than male. This can be attributed to the fact that laboratory work requires more physical strength.

Table 5. Comparison of laboratory anxiety by grade level

Grade	Number of Students	$\bar{x}$	Std	F	P	Mean Difference
Second	57	2.56	.412			
Third	60	2.59	.553	3.98	.002*	Between grades
Fourth	63	***2.95***	.669			Third and fourth grades

*P<.05

It was observed significant difference (p<.05) between the anxiety of fourth grade students ($\bar{x}$: 2.95) and third grade students' anxiety ($\bar{x}$**:** 2.59) according to grade level. With the transition to online education in pandemic process fourth grade students have been away from applied education longer than third grade students.

Tables 6 and 7 show the findings related to the fourth sub-problem of the research.

Table 6. Comparison of attitudes towards using laboratory skills by grade level

Grade	Number of Students	x̄	Std	F	P	Mean Difference
Second	57	3.53	.459			
Third	60	3.14	.476	12.21	.000*	Between grades first, third and fourth
Fourth	63	***2.71***	.780			

*P<.05

According to the grade level there is a significant difference (p<.05) between the laboratory skill attitudes of the fourth grade students (**x̄**: 2.71) and the skill attitudes of the third grade students (**x̄**: 3.14) and second grade students (**x̄**: 3.53). During the Covid-19 period fourth grade students attended practice training for less time than third grade and second grade students.

Table 7. Comparison of student attitudes according to laboratory experience

Laboratory Experience	Number of Students	x̄	Std	F	t	P
Yes	98	3.23	.594	1.36	3.35	.001
No	82	2.76	.845			

**P<.05*

According to laboratory experience there is a significant difference (p<.05) between students' attitudes towards laboratory skills. Students with laboratory experience have a positive attitude towards laboratory skills compared to those without experience. Laboratory experience directly affects the attitude towards the laboratory.

Table 8 includes the findings regarding the fifth sub-problem of the research.

Table 8. Correlation matris between students' laboratory anxiety and skill attitudes

	Laboratory Anxiety	Laboratory Skill Attitude
Laboratory Anxiety	1	***- .21****

**P<.001*

There is an inverse and significant (r = - .21) relationship between laboratory anxiety and laboratory attitude of Molecular Biology and Genetics students. As laboratory attitude increases positively, laboratory anxiety tends to decrease. Students should be more motivated about the importance of the laboratory.

4. Discussion

The findings of this study are compared with the findings of different studies in the literature. It was found significant difference (p<.05) between students' attitudes towards laboratory skills and laboratory experience in this study. As a result of their research, Kurbanoğlu and Akın (2010) determined that students with more laboratory experience have positive attitudes towards the laboratory. The findings of both studies confirm each other.

It was found significant difference (p<.05) between students' attitudes towards laboratory skills depending on gender in this study. According to the results of the research conducted by Oskay, Özyalçın, Erdem, and Yılmaz (2009), the laboratory course attitudes of the education faculty students differed significantly in terms of gender. There is a significant difference between the opinions of female students and male students about laboratory anxiety in this study. The findings of both studies confirm each other.

It was found inverse and significant (r = -.21) relationship between laboratory anxiety and laboratory attitude of students in this study. According to the research results of Tan (2008), Anılan, Görgülü and Balbağ (2009), Erökten (2010), and Borkovec (1983), there is an inverse relationship between students' laboratory attitudes and laboratory concerns. İn their research, they determined that the anxiety levels of the students who could not participate in the application during the Covid-19 period were high and their academic performance decreased (Camacho Limon Pana and et al, 2022 ; Garcia and et al, 2021). It is seen that the findings in the literature and these research findings confirm each other.

5. Conclusions

The results of the analysis made on the data in the research can be summarized as follows; after the pandemic, laboratory anxiety levels of the fourth grade students of the Department of Molecular Biology and Genetics are higher than the laboratory anxiety level of the third year students. Second grade students have lower anxiety levels. There is a significant difference (p<.05) between the laboratory skill attitudes of the fourth grade students and the laboratory skill attitudes of the third and second grade students. In the post-pandemic period, fourth grade students' attitudes towards laboratory skills are more negative than third grade students' attitudes. There is a significant difference (p<.05) between the laboratory anxiety of the fourth grade students and the laboratory anxiety of the third and second grade students. Fourth grade students have higher laboratory anxiety*:* In terms of laboratory experience, it was seen significant difference (p<.05) between students' attitudes towards laboratory skills. Laboratory attitudes of students with laboratory experience are more positive. There was an inverse and significant relationship between students' laboratory anxiety and laboratory attitudes.

6. Recommendations

Based on the research findings, the following recommendations were developed: In terms of applied courses, instead of online theoretical training in epidemic periods in Universities; augmented reality application should be expanded in universities. The virtual lab application

should be expanded in practical lessons. Hybrid teaching programs involving simple experiments at home should be implemented. Students' learning gaps can be reduced by switching to the flipped teaching model in applied courses.

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