

Comparison of classical and distance histology education taken by daytime and evening education students of health services at a vocational high school

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Ethics Committee Approval

The study was conducted with ethics approval (dated 12.30.2022 and numbered 4047) obtained from the Ethics Committee of Siirt University. All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

Conflict of Interest

No conflict of interest was declared by the authors.

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Abstract

Background/Aim: Distance education applications can improve histology education. This study aimed to compare the classical and distance histology education given to the daytime and evening education students of the Health Services Vocational High School Medical Laboratory Techniques course. The students' academic achievement, motivation, and mood were compared.

Methods: The students (n=134) that participated in the study were divided into four groups. The daytime and evening education students to whom the classical education model was applied were identified as the control group (Groups 1 and 3). The daytime and evening education students who received distance education were identified as the experimental group (Groups 2 and 4). Before and after the study, a pretest and posttest, the State-Trait Anxiety Inventory, and the Academic Motivation Scale were applied to the students who received nervous system histology education.

Results: The state-trait anxiety scores did not differ significantly according to the groups ($P>0.05$). The state anxiety scores obtained after the posttest were significantly lower than the state anxiety scores obtained before the pretest. According to the Academic Motivation Scale scores, the extrinsic motivation - external regulation subscale was significantly lower in Group 3 compared to the other groups ($P<0.05$). For the knowledge test results, there was a significant difference between the pretest and posttest scores in all groups, and the mean posttest scores were higher than the mean pretest scores. The posttest score of the daytime education face-to-face group (Classical education, Group 1) was significantly higher than the other groups ($P=0.011$).

Conclusion: In our study, the daytime education face-to-face group was the most effective among the different teaching styles and training methods in nervous system histology education. Our finding that the efficiency of distance education applications was not as high as face-to-face education suggests that such digital applications require further optimization. The lower success rates observed in the evening education groups can be increased by integrating face-to-face and distance education.

Keywords: histology education, daytime (formal) education, distance education, evening education

Introduction

Advances in digitalization have resulted in a new era in education, changing the duties and responsibilities of educators. Recent developments have revealed that education should not be limited within the faculty and can continue outside the faculty. It has been demonstrated that education can become independent of space. In classical education, the concept of space is limited to the environment within universities, whereas digital education can be accessed from almost anywhere. Besides face-to-face education, various digital education platforms are also established. These digital platforms provide students with a much more flexible learning opportunity [1]. Thus, distance education platforms for histology education may provide benefits in addition to those of classical education.

Daytime (formal) education students attend classes during the daytime, while evening education students attend classes in the evening [2]. It is claimed that there would be no change in the quality of education if daytime (formal) education and evening education students receiving education at similar levels and under similar conditions [3]. Furthermore, some studies have reported negative opinions about evening education. Some disadvantages regarding evening education have been reported, such as a decrease in the quality of education and the decrease in scientific studies [4]. Therefore, there is a need for more comprehensive studies evaluating daytime and evening education students in terms of academic achievement, motivation, and mood.

Histology is an important aspect of basic medical sciences education [5]. Histology addresses examines the structural organization and functions of cells that form tissues [6]. It has been stated that new technological applications and distance education options will contribute to the histology course students generally describe as difficult [5]. The coronavirus 2019 (COVID-19) pandemic has negatively affected the health system [7] and medical and health education [8]. Unexpected conditions such as pandemics necessitate the development of alternative teaching methods, including online education, in basic medical courses such as histology and anatomy [9].

To our knowledge, no study has compared histology education to different education styles (daytime and evening education), including both face-to-face and distance education. This study aimed to compare the classical and distance histology education given to the daytime and evening education students of the Department of Medical Laboratory Techniques at the Health Services Vocational High School. The students' academic achievement, motivation, and mood were compared.

Materials and methods

The study was conducted with ethics approval (dated 12.30.2022 and numbered 4047) obtained from the Ethics Committee of Siirt University. All applications were carried out considering the ethical rules and the Declaration of Helsinki. The "Research Permission Form" required for the research was obtained from the institution where the study was conducted. The students that participated in the study were informed about the study and completed the "Informed Voluntary Consent Form".

Learning environment

The students that participated in the study were divided into four groups. The daytime and evening education students receiving classical education were identified as the control group (Groups 1 and 3, respectively). The daytime and evening education students who received distance education were identified as the experimental group (Groups 2 and 4, respectively). The information in the "Nervous System Histology" section in the "General Histology" book [10] was given to both groups. Education was given to Group 1 (classical education) and Group 2 (distance education) between 10:00 and 11:00 in the morning in two different classrooms. Group 3 (classical education) and Group 4 (distance education) were given a 1-h theoretical course between 19:00 and 20:00 in the evening in two classrooms. The content of the education given to each group was prepared to be similar. The nervous system histology course given to Groups 2 and 4 was recorded before the study for distance education. The link to the relevant course was shared with the students, who accessed these recordings online. For this purpose, smart devices and internet access were provided to the students in these groups.

Data collection

Before the education, the daytime education students (Groups 1 and 2) were given a Structured Student Introduction Form that included questions regarding demographic information and a "Knowledge exam (pretest)" that they were asked to complete. After completing the pretest, the students were divided into two groups and two classes. Both groups were asked to complete the "State-Trait Anxiety Inventory (STAI)" and the "Academic Motivation Scale (AMS)" forms. Group 1 received a face-to-face classical education, and Group 2 received the same course online, accessed via the provided link to the relevant course. The students accessed the recorded lecture asynchronously by clicking on the link on their smart devices before the study. Next, the "Knowledge exam (posttest)" and the "State Anxiety Inventory" forms were distributed to both groups, and they were asked to complete these forms. The same procedures were applied to the evening education students (Groups 3 and 4), and all obtained data were analyzed.

Study participants

The research population consists of 134 students out of a total of 176 students receiving education in the second year of Siirt University Health Services Vocational School Medical Laboratory Techniques Department between September 26, 2022, and January 9, 2023. Forty-two students who did not accept to participate in the study or did not meet the criteria were excluded from the study. Daytime and evening education students studying in this department were included in the study. A power analysis was performed to create a sample and to determine the number of students required for the research. Power analysis was performed using a statistical power analysis software, G*Power, version 3.1.9.7 (Heinrich Heine University, Düsseldorf, Germany) [11]. The number of students in the groups needed to be at least 30 at the $P \leq 0.05$ level.

The sampling criteria were not having graduated from high schools providing health education, not having received any education on mobile learning, taking the histology course for the first time, and giving verbal and written consent to participate in

the study. Students who did not meet these criteria were not included in the study.

Study design and randomization

The research followed a randomized, controlled experimental design. In terms of transparency of the study, randomization was made by a researcher outside the study using a website, and the students were divided into four groups: Group 1 (daytime education, classical education: n=31), Group 2 (daytime education, distance education: n=34), Group 3 (evening education, classical education: n=35), and Group 4 (evening education, distance education: n=34).

Data collection tools

A Structured Student Introduction Form, a "Knowledge exam" on nervous system histology (pretest and posttest), the STAI, and the AMS were used for data collection.

Student introduction form

Sociodemographic information such as age, gender, and the high school the students graduated from was obtained from the students using the Structured Student Introduction Form. In addition, two close-ended and two open-ended questions were asked. The close-ended questions were about the information tools the students used the most (phone, computer, and tablet) and their opinions about using technological methods in education (useful, complex, and unnecessary). The first open-ended question prompted the students' opinions in Group 2 (daytime education, distance education) and Group 4 (evening education, distance education) about the benefit of the histology course taken by the distance education method. The second open-ended question asked the students' opinions in Group 3 (evening education, classical education) and Group 4 (evening education, distance education) about the distance or face-to-face histology course taken in the evening.

State-Trait Anxiety Inventory

The STAI was first developed in 1970. It consists of the State Anxiety Inventory (STAI-S) and the Trait Anxiety Inventory (STAI-T) subscales. These subscales were adapted to Turkish by Öner [12]. Both subscales consisted of 20 items and were scored on a four-point Likert-type scale. The scoring on the scale was between 1 and 4. Responses in the STAI-S subscale were (1) Not at all, (2) Somewhat, (3) Moderately so, and (4) Very much so. Responses in the STAI-T subscale were (1) Rarely, (2) Sometimes, (3) Often, and (4) Almost always. The score obtained from both scales varied between 20 and 80. A high score on the scale indicated a high level of anxiety, while a low score indicated a low level of anxiety.

Academic Motivation Scale

The AMS was developed by Vallerand et al. in Canada in 1992 [13] and adapted into Turkish by Karagüven [14]. The scale was used to measure the academic motivation of the participants. It consisted of 28 items and seven subscales, three of which belonged to intrinsic motivation, three to extrinsic motivation, and one to amotivation, each of which consists of four items. These subscales are Intrinsic Motivation to Know-IMBI, Intrinsic Motivation to Accomplish-IMBA, Intrinsic Motivation to Experience Stimulation-IMES, Extrinsic Motivation External-EME, Extrinsic Motivation Introjection-EMIJ, Extrinsic Motivation Identified-EMI, and Amotivation-AM. The scores on the subtests ranged from 4 to 28. Since the

subscales were separately evaluated, a value close to 28 on each subscale indicated that the dimension was high in the individual. The AMS can be easily applied to large groups quickly [14]. The application was carried out over seven responses between 1 (does not correspond at all) and 7 (corresponds exactly).

Knowledge Exam on Nervous System Histology

Nervous system histology exam questions were prepared according to the literature [10] and consisted of ten multiple-choice questions. The score for each question was calculated as 1. The lowest score that could be obtained from the exam was 0, and the highest score was 10 (100%). Exams were applied to all groups in the same format. The pretest and posttest exam questions included the same questions.

Statistical analysis

The data were analyzed using the IBM SPSS Statistics 23 package program. Categorical variables were given as frequencies (number and percentage), and numerical variables were presented as descriptive statistics (standard deviation and mean). For the numerical variables (scale and subscale scores) to be statistically tested, the normality test was performed separately for the control and experimental groups, and skewness and kurtosis coefficients were checked. Parametric methods were used for the normally distributed features, and non-parametric statistical methods were used for the non-normally distributed features.

The groups' pretest and posttest knowledge scores were compared using the dependent samples t-test. The mean knowledge test scores of the groups and whether the difference between them was significant were examined using a one-way analysis of variance (ANOVA). The Tukey test was applied to determine from which group a difference originated. The mean state and trait anxiety levels of the groups and whether the difference between them was significant were examined using one-way ANOVA. The state anxiety scores of the groups were compared using the dependent samples t-test. The mean motivation levels of the groups and whether the difference between them was significant were examined using one-way ANOVA, and then the TUKEY test was performed to determine from which group the difference originated.

Results

The research population consisted of 134 students receiving education at the Department of Medical Laboratory Techniques at the Siirt University Health Services Vocational High School between September 26, 2022, and January 9, 2023 (fall semester of the 2022–2023 academic year). The demographic data of the students participating in the study were analyzed. The mean age of the students was 21.21 years. Of the students, 76 (56.7%) were female and 58 (43.3%) were male. Seventy-two (53.7%) of the students were Anatolian high school graduates, and the rest were general (26.1%) and vocational (20.2%) high school graduates. For information tools, the students in the study mostly used smartphones (87.6%), computers (7%), and tablets (5.4%). Of the students, 105 (78.4%) found technological methods useful, 23 (17.2%) found these methods complex, and six (4.4%) found these methods unnecessary.

The results of the descriptive analysis of the data obtained from the two open-ended questions are given below.

1. What are your opinions on the benefit of the histology course given by distance education? Compared with face-to-face education.

Two main themes were identified based on the answer to this question, which was asked to Group 2 (daytime education, distance education) and Group 4 (evening education, distance education). The first main theme had three sub-themes, and the second had five sub-themes (Table 1).

The students' opinions about the sub-themes of the main themes are given below:

- 1a) "I think it will be useful, especially for students whose home is far away."
- 1b) "Sometimes we get distracted while listening to the lecture, or we may not understand at first. It would be nice to have the opportunity to listen for the second time."
- 1c) "Sometimes we do not attend the lecture for private reasons. It would be nice to watch the lecture we missed."
- 2a) "It would be better if I had the opportunity to ask questions to the educator."
- 2b) "Constantly watching the video prevents me from concentrating over time."
- 2c) "I always have difficulty accessing technological applications. This repulses from distance education."
- 2d) "In face-to-face education, I feel it is compulsory to attend the lecture. The same seriousness does not exist in distance education."
- 2e) "In face-to-face education, the educator's gestures and acts or how he uses the board makes the lecture more efficient and enjoyable. I find distance education more boring because there are no such opportunities."

Table 1: Themes and sub-themes regarding the question: "What are your thoughts on the benefit of the histology course given by distance education?"

Themes	Sub-themes
1. Positive aspects of the method (distance education)	a. Ease of access to the lecture from anywhere b. Opportunity to listen repeatedly c. Ability to make up for the missed lecture
2. Negative aspects of the method (distance education)	a. inability to communicate effectively b. Problems in concentrating on the lecture c. Difficulty accessing technological tools d. Failure to ensure course discipline e. Boring learning style

2. What are your opinions on the distance or face-to-face histology course in evening education? What are the advantages or disadvantages?

Two main themes were identified based on the answer to this question, which was asked to Group 3 (evening education, classical education) and Group 4 (evening education, distance education). The first main theme had two sub-themes, and the second main theme had three sub-themes (Table 2).

The students' opinions about the sub-themes of the main themes are as follows:

- 1a) "I don't experience sleep problems because I don't need to get up early in the morning. I can also come to class rested."
- 1b) "I can spare more time for my personal work and social activities during the day."
- 2a) "I have problems because the time I leave the faculty is late. I have a hard time finding public transportation, especially at late hours. Coming home is tiring."
- 2b) "I think that the lectures taken in the morning will be more bearable in mind. I also feel more absent-minded in the evening."

- 2c) "Educators are more tired in the evening hours because they teach all day long. They are less efficient in lectures."

Table 2: Themes and sub-themes regarding the question: "What are your opinions on the distance or face-to-face histology course taken in evening education?"

Themes	Sub-themes
1. Advantages of evening education	a. More comfortable b. Allowing other activities during the day
2. Disadvantages of evening education	a. Continuation of education until late hours b. Less lecture efficiency c. Fatigue-related low performance among educators

Change in STAI scores by group

The mean state and trait anxiety levels of the groups and whether the difference between them was significant were examined using one-way ANOVA. According to the one-way ANOVA results, the state and trait anxiety scores of the groups did not differ significantly ($P>0.05$). In other words, the state and trait anxiety levels of the groups were similar (Table 3).

Table 3: Analysis of STAI levels

	n	Mean	SD	F	P-value	
State anxiety inventory	Group 1	31	51.19	15.02	0.300	0.826
	Group 2	34	49.38	13.05		
	Group 3	35	49.97	15.64		
	Group 4	34	52.62	16.89		
	Total	134	50.76	15.10		
Trait anxiety inventory	Group 1	31	36.19	12.06	0.233	0.658
	Group 2	34	34.38	8.26		
	Group 3	35	34.97	12.28		
	Group 4	34	37.62	14.55		
	Total	134	35.76	14.98		
State anxiety inventory - 2	Group 1	31	42.04	12.14	0.710	0.548
	Group 2	34	41.03	7.96		
	Group 3	35	42.94	10.71		
	Group 4	34	44.56	10.41		
	Total	134	42.68	10.26		

Comparison of State Anxiety Inventory

The state anxiety inventory scores of the groups were compared using the dependent samples t-test. There was a significant difference between the state anxiety scores in all four groups before the pretest and after the posttest. The state anxiety scores after the posttest were significantly lower than the state anxiety scores before the pretest (Table 4).

Table 4: Comparative analysis of the state anxiety inventory scores before and after the study

	State		State 2		P-value
	Mean	SD	Mean	SD	
Group 1	51.19	15.02	42.04	12.14	<0.001
Group 2	49.38	13.05	41.03	7.96	<0.001
Group 3	49.97	15.64	42.94	10.71	<0.001
Group 4	52.62	16.89	44.56	10.41	<0.001

Change in AMS scores by group

The mean AMS levels of the groups and whether the difference between them was significant were examined using one-way ANOVA. According to the one-way ANOVA results, the extrinsic motivation - external regulation subscale differed significantly between the groups ($P<0.05$), but the other subscales did not differ significantly. According to the results of the Tukey test, which was performed to determine which group the difference originated from, the mean scores of Groups 1, 2, and 4 were significantly higher than that of Group 3 (evening education, classical education) (Table 5).

Table 5: Analysis of AMS scores of the groups

		n	Mean	SD	F	P-value
Intrinsic motivation to know	Group 1	31	21.15	5.40	0.914	0.436
	Group 2	34	21.41	4.90		
	Group 3	35	19.43	5.85		
	Group 4	34	20.74	5.25		
	Total	134	20.64	5.36		
Intrinsic motivation to accomplish	Group 1	31	15.62	5.34	0.458	0.712
	Group 2	34	16.82	4.98		
	Group 3	35	15.89	5.90		
	Group 4	34	16.82	4.36		
	Total	134	16.33	5.14		
Intrinsic motivation to experience stimulation	Group 1	31	17.04	5.35	0.342	0.795
	Group 2	34	16.24	5.45		
	Group 3	35	15.83	5.83		
	Group 4	34	16.94	5.72		
	Total	134	16.47	5.56		
Extrinsic motivation identified	Group 1	31	19.81	5.28	0.633	0.595
	Group 2	34	20.38	5.16		
	Group 3	35	18.86	6.58		
	Group 4	34	20.47	4.67		
	Total	134	19.88	5.47		
Extrinsic motivation introjection	Group 1	31	15.85	4.97	0.182	0.908
	Group 2	34	16.09	5.74		
	Group 3	35	16.83	6.64		
	Group 4	34	16.03	5.53		
	Total	134	16.22	5.75		
Extrinsic motivation external	Group 1	31	22.19	3.45	3.840	0.011*
	Group 2	34	22.88	4.26		
	Group 3	35	19.37	5.43		
	Group 4	34	21.59	4.47		
	Total	134	21.45	4.67		
Amotivation	Group 1	31	10.12	4.93	1.174	0.322
	Group 2	34	8.76	5.20		
	Group 3	35	10.26	5.83		
	Group 4	34	11.26	5.94		
	Total	134	10.10	5.54		

* P<0.05

Comparison of knowledge test scores

The pretest and posttest knowledge scores of the groups were compared using the dependent samples t-test. There was a significant difference between the pretest and posttest scores in all four groups, and the mean posttest scores were significantly higher than the mean pretest scores (Table 6).

Table 6: Comparative analysis of the pretest and posttest scores of the groups

	Pretest		Posttest		P-value
	Mean	SD	Mean	SD	
Group 1	2.15	0.97	4.81	0.80	<0.001
Group 2	2.12	0.81	4.03	1.60	<0.001
Group 3	2.14	1.17	3.83	1.62	<0.001
Group 4	2.18	1.09	3.56	1.52	<0.001

Comparison of knowledge test scores according to groups

The mean knowledge test scores of the groups and whether the difference between them was significant were examined using one-way ANOVA. According to the one-way ANOVA results, the posttest knowledge scores of the groups differed significantly (P<0.05). According to the Tukey test results performed to determine which group the difference originated from, the posttest knowledge score of Group 1 (daytime education, classical education) was significantly higher than that of the other groups. There was no significant difference between the other groups (Table 7).

Table 7: Analysis of the significance of the knowledge tests between the groups

		n	Mean	SD	F	P-value
Knowledge pretest	Group 1	31	2.15	0.97	0.019	0.996
	Group 2	34	2.12	0.81		
	Group 3	35	2.14	1.17		
	Group 4	34	2.18	1.09		
	Total	134	2.15	1.01		
Knowledge posttest	Group 1	31	4.81	0.80	3.853	0.011*
	Group 2	34	4.03	1.60		
	Group 3	35	3.83	1.62		
	Group 4	34	3.56	1.52		
	Total	134	4.01	1.51		

* P<0.05

Discussion

This study evaluated the success of students who took the nervous system histology course via distance and face-to-face (classical) education using pre- and posttests. The most significant difference was found in the group who received face-to-face education in daytime education. The posttest results were significantly higher in all groups than in the pretest. There was no significant difference between the groups in terms of STAI scores. It was observed that the state anxiety scores obtained after the posttest were significantly lower compared to the state anxiety scores before the pretest. There was no significant difference for the AMS except for the extrinsic motivation - external regulation subscale.

During university education, stress and anxiety are common among many students. Psychosocial stress may occur in students receiving education in health fields such as medicine due to the lecture load, exam anxiety, and communication problems with patients and their relatives [15]. It is known that exam anxiety harms the academic achievement of students. A study found in the literature reported that students who did not have methods for coping with test anxiety had higher anxiety levels [16]. Furthermore, the increase in social expectations regarding students and concerns for their professional future are the main factors that increase students' anxiety levels during the university period [16,17]. Therefore, it may be beneficial to implement supportive measures to reduce individuals' stress and anxiety levels [18].

In this study, the state anxiety inventory scores of the students were examined before the pretest and after the posttest, and the posttest state anxiety level was low in all groups (Table 4). Therefore, the high state anxiety level observed before the education significantly decreased after the education. This result can be explained by the fact that the students were relaxed and self-confident after their education. The trait anxiety score of the students was also compared between the groups, and no significant difference was observed. Considering that mood factors may affect students' academic achievement [19], the fact that the groups had similar characteristics in terms of state and trait anxiety levels (Table 3) is important for the reliability of the knowledge test (pretest/posttest).

Motivation is a key factor that arouses interest in students and ensures that they actively participate in a lecture. Successful termination of academic education and professional progress is possible with motivation [20]. This concept can be examined in three ways: intrinsic, extrinsic, and amotivation [21]. It has been reported that there was a positive relationship between extrinsic motivation and academic achievement [22]. In another study conducted with university students, it was determined that there was a significant difference in extrinsic motivation in individuals who were aware of their department in high school compared to individuals who were not [21]. On the contrary, several studies have also stated a negative relationship between extrinsic motivation and academic achievement [23].

In this study, no significant difference was found between the groups in terms of academic motivation in general (except for extrinsic motivation – external regulation subscale in Group 3). On the other hand, only the score of Group 1 (daytime education, classical education) was significantly higher than the

other groups for the posttest knowledge scores. Based on these data, it is difficult to reach a conclusion regarding extrinsic motivation and its effect on academic achievement among daytime and evening education students. Considering the contradictory results in the literature regarding extrinsic motivation and academic achievement [22,23], more comprehensive studies are required on this subject.

Today, besides daytime (formal) education, alternative methods such as distance education and evening education are applied to expand university education. Evening education following the end of formal daytime education brings some difficulties and shortages [24]. In this study, the evening education students expressed their concerns about this method (e.g., low lecture efficiency, low educator performance), which can be an example of these shortages. In a study conducted with students learning foreign languages, it was reported that the students enrolled in the daytime education (formal) program were more successful than the students enrolled in the evening education program [25]. Therefore, both students and academic staff participating in evening education experience fatigue. This disadvantage harms the implementation of courses and students' perception of field proficiency [2]. With today's rapidly developing technology, the involvement of distance education applications can solve the problems experienced in evening education. The positive approaches of some students in the present study about distance education (e.g., ability to access the lecture anywhere and anytime, the opportunity to make up) support the authors' opinion.

Distance education models, such as mobile learning and technological applications, are applied in cases where face-to-face education cannot be appropriately provided, such as during the pandemic [26-28]. The development of internet technologies and the increased use of smart devices have extended distance education. Although these practices are not as effective as face-to-face education, they contribute to students' learning [27]. In a study in which histology and anatomy education was facilitated with face-to-face and mobile learning methods, it was reported that the most successful group was the group that received education using both methods, suggesting that face-to-face and digital education models would be more successful when integrated [29]. During the development of distance education applications, it is also important to structure courses by obtaining feedback from students [27]. In the current study, some students stated they had concerns about distance education (e.g., inability to communicate effectively with educators, insufficient technological structure). Therefore, to maximize academic achievement in education, it can be said that it would be more beneficial to minimize the disadvantages of distance education and integrate it with face-to-face (classical) education.

This study compared face-to-face and distance education to different education styles (daytime and evening education). It was seen that the most successful group was the group that received face-to-face education in daytime education (Group 1). Although there was a significant difference between the pretest and posttest scores in all groups, the most significant difference was observed in the group receiving face-to-face daytime education. In another study, it was reported that the efficiency of distance anatomy education was lower than that of

traditional (face-to-face) anatomy education [30], supporting the results of the current study. Another remarkable finding of the current study was that the posttest scores for daytime education (face-to-face and distance) were higher than those for evening education (face-to-face and distance). A study showed that melatonin positively affects daytime-dependent synaptic plasticity and learning efficiency [31], which may explain this situation. In a study carried out with medical faculty students and educators, it was stated that the lectures given during the daytime were more productive than the lectures given in the evening [32], supporting these results. According to all these data, it can be stated that evening or distance education is not as effective as formal and face-to-face education but does not prevent academic achievement. Moreover, it can be considered that hybrid education models in which distance education methods are integrated to support face-to-face education will further increase the quality of education. The flipped learning model applied to nurse students was reported to increase learning skills and academic achievement more than traditional methods [33], supporting the opinions of the current study's authors.

Limitations

This study was conducted with the Health Services Vocational High School students at Siirt University. Similar studies could be carried out in other health-related faculties (e.g., medicine and dentistry) to support the study's results. Secondly, the effectiveness of face-to-face (classical) and distance education in the study groups was evaluated separately. The scope of the study can be expanded with hybrid education models in which both models are applied together.

Conclusion

In our study, we show that among the different teaching styles and training methods in histology education, the most effective was the daytime education, face-to-face group. The fact that the efficiency of distance education applications was not as high as face-to-face education suggests that such digital applications require further optimization. Furthermore, the lower success rates observed in the evening education groups can be increased by integrating face-to-face and distance education. Therefore, we recommend applying hybrid education models so that students can show similar success performances in different teaching styles. The fact that similar findings were obtained from the groups regarding the state-trait anxiety inventory and the academic motivation scale is important for the reliability of the study.

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