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# Distance Education through the Perspective of Students of Anesthetic Technician, Emergency Medical Technician, and Medical Imaging Technician Programs

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## Abstract

**Aim**: The study aimed to evaluate the distance education process through the perspective of associate degree programs and to identify crucial issues for potential future pandemics.
**Methods:** The study group (n=166) consisted of associate degree students of the Anesthetic Technician, Emergency Medical Technician, and Medical Imaging Technician Programs. Data were collected through an electronic questionnaire regarding main headings: "Theoretical Courses, Practical Courses, and Professional Development", "Course Participation and Motivation", "Measurement and Evaluation", and "Student Suggestions for Distance Education". Questions and statements were scored by 5-point Likert.
**Results:** When the effects of distance education *"On the level of internalization of the profession"* and *"On the effect on professional competencies"* were assessed, the scores of Medical Imaging Technician Program students were lower than the scores of Anesthetic Technician Program students and Emergency Medical Technician Program students ($p<0.05$). Most of students from Anesthetic Technician Program (96.7%) prefer *"YouTube content to support their learning, in addition to the course content offered by the faculty member"*. In addition, 55.7% of Anesthetic Technician Program students stated that the *"Ideal education model is a hybrid model that combines face-to-face and distance education".*
**Conclusion**: Different acceptance levels for distance education were observed. A hybrid model may be an option for future education models when appropriate conditions are provided.


**Keywords:** Distance Learning, Measurement and Evaluation, Anaesthesia Program, Emergency Medical Technician Program, Medical Imaging Technician Program.

## INTRODUCTION

During the pandemic, with the mandatory change over to distance education, problems arose in process management, adaptation of educational contents to the new system, ensuring an effective communication environment between the faculty members and the students, management of exams, evaluation and measurement processes (Al-Balas vd., 2020) and continuity in delivering healthcare with a patient safety-oriented team approach (Puljak vd., 2020). However, no research or assessments exist on how the compulsory distance education process has affected the students of the Anesthetic Technician, Emergency Medical Technician, and Medical Imaging Technician Programs at the associate degree level, an intensive education program for clinical practice. In the same context, Anesthetic Technician Program students at the associate degree level are healthcare professionals who carry out the necessary preparations for anesthesia applications before surgery (Shallik vd., 2022), Emergency Medical Technician Program students are health care professionals who can perform emergency medical intervention during pre-hospital medical care (Ozainne vd.,

2023), and Medical Imaging Technician Program students are healthcare professionals actively involved in the process of radiological examinations (Kasban vd., 2015).

In this context, the study aimed to evaluate the distance education process through the perspective of Anesthetic Technician, Emergency Medical Technician, and Medical Imaging Technician associate degree programs and to identify crucial issues for potential future pandemics.

During the online education process in the field of health sciences, the interruption of clinical practice training and the inability to support theoretical knowledge with practice caused associate degree students to be concerned about their professional development (Mortagy vd., 2022) (Abbasi vd., 2020) (Chakraborty vd., 2020). Interprofessional learning is essential for improving patient safety and continuity of service in healthcare delivery (Jones vd., 2020) (Ozainne vd., 2023). During the pandemic, ensuring the stable continuity in delivering healthcare with a patient safety-oriented team approach was an element that could also affect the interprofessional learning process (Khalil et al., 2020; Merga, 2016; Singh & Matthees, 2021).

When studies in this field are examined in general, it is observed that the adverse effects of COVID-19 have been experienced intensively at undergraduate education levels in medicine (Holzmann-Littig et al., 2022), nursing (Wallace et al., 2021) and dentistry (Lollobrigida vd., 2022; Mumcu vd., 2022) (Al-Balas vd., 2020; Arain vd., 2022; Elshami vd., 2021; Holzmann-Littig vd., 2022; Hsu vd., 2022; Kanagaraj vd., 2022; Nguyen vd., 2022; Puljak vd., 2020; Wallace vd., 2021; Yousry & Azab, 2022). However, no research or assessments exist on how the compulsory distance education process has affected the students of the Anesthetic Technician, Emergency Medical Technician, and Medical Imaging Technician Programs at the associate degree level, an intensive education program for clinical practice.

## 1. RESEARCH METHODOLOGY

**Study design:** This cross-sectional study was conducted at a Foundation University on the Anatolian side of Istanbul, providing education with 320 students in associate degree programs. The study group consisted of associate degree students of the Anesthetic Technician, Emergency Medical Technician, and Medical Imaging Technician Programs in a Foundation University (Table 1).

Although all students were invited to the online survey, the minimum sample size was calculated as 160 at 90% confidence level with an absolute precision of 5% for the study by using G power 3.1. In the study, 166 associate degree students participated to the online survey.

**Setting:** On-line "Blackboard Learn" is the learning management system used by all students participating in the study. As of the 2021-2022 academic year, with the prevailing pandemic, theoretical courses were held online while practical courses were taught primarily face-to-face, and also online when necessary, depending on the course of the pandemic. In addition to theoretical courses, practical courses, and summer internships were also held as hybrid. Students of the Anesthetic Technician and Emergency Medical Technician Departments at the associate degree level also worked in hospitals as student interns once a week during the semester. The Medical Imaging Technician Program includes theoretical courses, practical courses, and summer internships. Student subjects attending all the three programs at the associate degree level completed the "Summer internship" programs in their curricula, either by doing assigned projects or by working in a hospital environment, according to their preferences during the 2021-2022 academic year.

**Participants:** A total of 166 students (F/M:127/39; mean age: 20.70±2.51 years) studying at the Associate levels participated in this research.

**Data sources:** The study data were obtained by performing an e-survey with students via e-mail and SMS by the university at which the research was conducted between September 10. 2021, an d March 08. 2022. Before starting the e-survey, an information screen was established for the stu dents, and they were allowed to participate in the research upon their consent. The permission wa s approved by the Ethics Committee of Maltepe University (No: 2021/16-05).

Data for the distance education process were collected using a structured e-questionnaire form. The questions in this form were prepared by the researchers, taking into account the existing literature (Al-Balas vd., 2020; Bal, 2017; Chandrasinghe vd., 2020; Ibrahim vd., 2021; Khalil vd., 2020; Khoshhal vd., 2017; Kurtgöz, 2020; Mumcu vd., 2022; Puljak vd., 2020).

The students' answers to the e-survey/e-questionnaire were classified under the following main headings: "Theoretical Courses, Practical Courses, and Professional Development", "Course Participation and Motivation", "Measurement and Evaluation", and "Students' Suggestions for Distance Education". Items and statements were assessed by the 5-point Likert scoring method (1: Strongly disagree - 5: Strongly agree), while the questions and statements covering professional

development were evaluated with the 3-point scoring system (1: Decreased, 2: Neither decreased nor increased, 3: Increased).

Since the distribution of measurement data, including item scores in the e-survey form did not comply with normal distribution, non-parametric tests, Mann-Whitney U test, and Kruskal-Wallis test were used in the analysis. The chi-square test was used to compare categorical data. The statistical significance level was accepted as $p<0.05$. Data were analyzed using the IBM SPSS 28.0 (SPSS Inc., Chicago, IL, USA) statistical software.

**Ethics statement:** The study was approved by the Ethics Committee of Maltepe University (No: 2021/16-05), and informed consent was obtained from the students to participate in this study.

## 2. ANALYSIS

**Theoretical Courses, Practical Courses, and Professional Development:** According to the study data, when the scores given by the students to the statements "I am able to associate theoretical knowledge with clinical applications" and "Theoretical courses are more efficient" were analyzed, it was observed that the scores of the Anesthetic Technician Program students in the Associate Degree group (3.36±0.93),(2.66±1.28) were higher than the scores of the Emergency Medical Technician Program students (3.04±1.21),(2.36±1.20) and Medical Imaging Technician Program students (2.49±0.84), (2.15±1.01) ($p<0.05$) (Table 1).

When the scores given by the students to the statements "Not being able to practice what I learned theoretically negatively affects my professional development" and "I have difficulty focusing on practical courses" were analyzed, it was observed that the scores of Medical Imaging Technician Program students in the associate degree group (4.29±1.06),(3.87±1.13) were higher than those of Anesthetic Technician Program students (3.73±1.17),(2.79±1.44) and Emergency Medical Technician Program students (3.64±1.42),(2.88±1.42) ($p< 0,05$) (Table 1).

Another point to be noted was the effect of distance education "On the level of internalization of the profession" and "On the effect on professional competencies". In the analysis of the responses, it was observed that the scores of Medical Imaging Technician Program students (1.65±0.55), (1.65±0.48) were lower than the scores of Anesthetic Technician Program students (2.02±0.62),(2.00±0.57) and Emergency Medical Technician Program students (2.04±0.77),(1.98±0.76) ($p<0.05$) (Table 1).

**Participation in Courses and Motivation:** The next point we analyzed was the correlation between participation in courses and motivation, based on the scores given by the students to the statements "Motivation to participate in courses is higher than in face-to-face education", "Motivation to learn is higher than in face-to-face education", and "Time to study in courses is higher than in face-to-face education", It was observed that the scores of Anesthetic Technician Program students (2.31±1.20),(2.33±1.26),(3.26±1.23) were higher than the scores of Emergency Medical Technician Program students (1.82±1.08),(1.73±0.91),(2.39±1.16) and Medical Imaging Technician Program students (1.66±0.97),(1.64±0.85),(2.45±1.35) ($p<0.05$) (Table 1).

**Table 1. The effects of distance education on theoretical courses, practical courses, professional development, course participation and learning motivation**

| | Associate Degree Programs | | | | | |
|---|---|---|---|---|---|---|
| | Anesthetic Technician (F/M: 49/12) | | Emergency Medical Technician (F/M: 36/15) | | Medical Imaging Technician (F/M: 42/12) | |
| | Mean | SD | Mean | SD | Mean | SD |
| **I was able to associate theoretical knowledge with clinical applications** | 3.36 | 0.93 | 3.04 | 1.21 | 2.49 | 0.84 |
| **Theoretical courses are more efficient** | 2.66 | 1.28 | 2.36 | 1.20 | 2.15 | 1.01 |
| **Not being able to practice what I learned theoretically negatively affects my professional development** | 3.73 | 1.17 | 3.64 | 1.42 | 4.29 | 1.06 |
| **I had difficulty focusing on practical courses** | 2.79 | 1.44 | 2.88 | 1.42 | 3.87 | 1.13 |
| **The effect on the level of internalization of the profession** [x] | 2.02 | 0.62 | 2.04 | 0.77 | 1.65 | 0.55 |
| **The effect of distance education on the effect on professional competencies** [y] | 2.00 | 0.57 | 1.98 | 0.76 | 1.65 | 0.48 |
| **Motivation to participate in courses is higher than in face-to-face education** | 2.31 | 1.20 | 1.82 | 1.08 | 1.66 | 0.97 |
| **Motivation to learn is higher than in face-to-face education** | 2.33 | 1.26 | 1.73 | 0.91 | 1.64 | 0.85 |
| **Time to study in courses is higher than in face-to-face education** | 3.26 | 1.23 | 2.39 | 1.16 | 2.45 | 1.35 |

**Data were collected with 5-point Likert Scale Scoring Method (1: Strongly Disagree - 5: Strongly Agree).*

**Measurement and Evaluation:** The next topic that was covered in the study was "Measurement and Evaluation" of the students' output in the forms of assignments and exams. According to the data obtained, 86% of Medical Imaging Technician Program students (n=43) stated that "Faculty members organized activities for measurement and evaluation in addition to midterm and final

exams" (Table 2). The results were as follows: 81.6% of First and Emergency Aid Program students (n=40) stated that "Faculty members provide feedback to students after evaluation of assignments/cases" (Table 2).

83.7% of First and Emergency Medical Technician Program students (n=41) stated *"Feedback is received by students regarding the evaluation and assessment processes of the course"* (Table 2).

Another challenging aspect of the distance education for students was the management of the process and exam anxiety. The research results were as follows: 62.0% of Medical Imaging Technician Program students (n=31) determined *"The difficulty of process management" as one of the factors causing exam anxiety in the distance education process"* (Table 2).

In addition to the "Process management", "Time management" was also stated as a factor causing anxiety.

78.0% of Medical Imaging Technician Program students (n=39) determined *"Insufficient exam time" as one of the factors causing exam anxiety during the distance education process* (Table 2).

The third factor which caused exam anxiety was noted as "Technical difficulties", and the responses were thus: 73.4% of Anesthetic Technician Program students (n=44) stated that *"Technical difficulties" are one of the main factors that caused exam anxiety during the distance education process* (Table 2).

**Students' Suggestions for Distance Education:** The students also came up with responses suggesting practices to overcome the predicaments of distance education. 70.6% of *Emergency Medical Technician Program* students (n=36), stated that *"Case discussion is an effective method in their professional development"*. The ideal education model was rated by the same groups of students as follows: 55.7% of Anesthetic Technician Program students (n=34) stated that the *"Ideal education model is a hybrid model that combines face-to-face and distance education"*. 96.7% of Anesthetic Technician Program students (n=58) prefer *"YouTube content" to support their learning, in addition to the course content offered by the faculty member*.

**Table 2. Measurement and evaluation process and factors causing exam anxiety in distance education**

| | | Associate Degree Programs | | | | | |
|---|---|---|---|---|---|---|---|
| | | Anesthetic Technician | | Emergency Medical Technician | | Medical Imaging Technician | |
| | | n | % | n | % | n | % |
| Faculty members organize activities for measurement and evaluation in addition to midterm and final exams (quiz, homework, presentation, etc.) | Never/Rarely/Some times | 9 | 15.0 | 14 | 28.0 | 7 | 14.0 |
| | Very Often/Always | 51 | 85.0 | 36 | 72.0 | 43 | 86.0 |
| | Total | 60 | 100 | 50 | 100 | 50 | 100 |
| Faculty members provide feedback to students after evaluation of assignments/cases | Never/Rarely/Some times | 14 | 23.3 | 9 | 18.4 | 14 | 28.6 |
| | Very Often/Always | 46 | 76.7 | 40 | 81.6 | 35 | 71.4 |
| | Total | 60 | 100 | 49 | 100 | 49 | 100 |
| Feedback is received from students regarding the measurement and evaluation processes of the course | Never/Rarely/Some times | 16 | 28.1 | 8 | 16.3 | 15 | 30.0 |
| | Very Often/Always | 41 | 71.9 | 41 | 83.7 | 35 | 70.0 |
| | Total | 57 | 100 | 49 | 100 | 50 | 100 |
| Process management is difficult in distance education | Never/Rarely/Some times | 27 | 45.8 | 29 | 58.0 | 31 | 62.0 |
| | Very Often/Always | 32 | 54.2 | 21 | 42.0 | 19 | 38.0 |
| | Total | 59 | 100 | 50 | 100 | 50 | 100 |
| Exam times are insufficient | Never/Rarely/Some times | 34 | 56.6 | 28 | 55.0 | 39 | 78.0 |
| | Very Often/Always | 26 | 43.3 | 23 | 45.1 | 11 | 22.0 |
| | Total | 60 | 100 | 51 | 100 | 50 | 100 |
| Technical difficulties may be experienced during the exam | Never/Rarely/Some times | 44 | 73.4 | 34 | 68.0 | 35 | 70.0 |
| | Very Often/Always | 16 | 26.7 | 16 | 32.0 | 15 | 30.0 |
| | Total | 60 | 100 | 50 | 100 | 50 | 100 |

## 3. CONCLUSION/DISCUSSION AND RECOMMENDATIONS

Recently, it has become critical to ensure the continuation of the education processes for health professionals during national and/or global emergencies (Dost vd., 2020). Since the weaknesses in the educational processes regarding associate degree students, whose education is mainly based on practice, was not evaluated comprehensively during the COVID-19 pandemic, this cross-sectional study aimed to evaluate the distance education process during the COVID-19 pandemic through the perspective of associate degree and to identify crucial issues.

The lowest scores for the statements *"I was able to associate theoretical knowledge with clinical applications", "Theoretical courses are more efficient", "Motivation to participate in courses is higher than in face-to-face education", "Motivation to learn is higher than in face-to-face education"*, and *"Time to study in courses is higher than in face-to-face education"* were received from students of the *Medical Imaging Technician Program*.

Confirming their negative responses to the previous statements, the same group of students gave the highest scores to the statements, *"Not being able to practice what I learned theoretically negatively affects my professional development", "I had difficulty focusing on practical courses", "Distance education affected my level of internalization of the profession negatively", and "Distance education adversely affected my professional competencies".* The responses given to these two sets of responses, determined that the students of the Medical Imaging Technician Program are the group that experienced the highest degree of difficulty in internalizing job processes required specifically for their profession. It could be interpreted that medical Imaging Technician Program is a program which relies little on communicating with patients; whereas, technical teaching (and practising) is more intensive compared to the Anesthetic and Emergency Medical Technician Programs. It has been observed that these students constitute the cohort facing the greatest challenge in internalizing profession-specific job applications. This observation may be attributed to the nature of Medical Imaging Technician Program, which places a higher emphasis on technical instruction and involves relatively less patient communication when compared to the Anesthetic and Emergency Medical Technician Programs.

As the results suggest, the students of the Anesthetic Technician Program are less affected by the on-line education process, and their motivation is higher than the other groups. This could be due to the fact that *Anesthetic Technicians* work in the operating rooms and pain rooms of hospitals. The higher motivation of these students may be because they consider themselves as part of the solution in medical case management, and challenging situations can be managed in accordance with the curricula and professional definitions of the *Anesthetic Technician* Programs. The heightened motivation of these students may arise from their perception of being integrated into the solution for the management of a medical case, and their belief that challenging situations can be managed in accordance with the curricula and professional standards set by *Anesthetic Technician* Programs. (Hsu vd., 2022; Ozainne vd., 2023).

It has been ascertained that *Emergency Medical Technician* Program students had difficulty in internalizing theory and practice via distance learning, however, they were able to focus on theoretical courses and relate clinical and practical applications to a certain extent. Considering the diversity of cases that may be encountered within the scope of the Emergency Medical Technician Program, the limitation on clinical practices during the pandemic caused students to have difficulty in internalizing theoretical courses during actual practice with patients. This situation corresponds to the literature (Ozainne vd., 2023) and is confirmed by the responses of the students in the associate; for example, the rate of agreement with the statement *"Motivation to learn is higher than in face-to-face education"* is low.

Two of the most challenging aspects within the context of distance education are "Measurement and Evaluation". Approximately three-quarters of the *Medical Imaging Technician* Program students in the associate degree group stated that *factors that cause exam anxiety in distance education are the "Difficulty of process management"* and *"Insufficient exam time"*. Approximately three-quarters of the Anesthetic Technician Program students stated that *"Technical difficulties" are the main factors that cause exam anxiety during the distance education process*. Technical difficulties experienced during the exam due to systemic failures may have occurred because the number of students in the *Anesthetic Technician Program* was higher than the number of students in other programs. Technical difficulties regarding problems with the internet connection during the exam coupled with the confusing and time-consuming nature of navigating through the questions can be considered a stress factor leading to time pressure anxiety about completing the exam within the given time (Abbasi vd., 2020).

Significant feedback was received when students were asked about the methods they considered to be beneficial for the Distance Education process. Approximately three-quarters of the Emergency Medical Technician Program students stated that the effective method for their professional development during the distance education process was *"Case discussion"*, and half of them stated that the ideal education model was "*Only face-to-face education*". Unlike the Emergency Medical Technician Program students, three-quarters of the Anesthetic Technician and Medical Imaging Technician Program students favored "*Video watching*" as the effective method for their professional development during the distance education process, and the other half preferred "*Face-to-face and distance education together*" as the ideal education model. Almost all of the Anesthetic Technician Program students prefer "*YouTube content*" to support their learning

in addition to the course content offered by the faculty member. The reason for this preference must be the regular and visually well-designed content on the YouTube platform, addressing the viewers' needs and preferences. (Dost vd., 2020).

The main limitation of the study was performed only one university. Therefore, the result of this study could not be generalised.

The results of this study encompass significant indications as they include the evaluation of distance education from the student at the associate degree level perspective for the foundation university where the study was conducted. However, it also seems that a hybrid model that can meet the needs of each group when appropriate conditions are provided may be an option for future education models.

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