


The effect of emergency remote teaching on the university students' end-of-term achievement

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Article Info	Abstract
<p>Keywords:</p> <p>Emergency remote teaching Face- to-face education End-of-term achievement Higher education</p>	<p>This study aimed to examine the effect of emergency remote teaching (ERT) on the end-of-term achievement of university students. Accordingly, two sets of end-of-term achievement scores of all students attending Kahramanmaraş Sütçü İmam University, a Turkish state university were compared in terms of educational modality. More specifically, the first set was comprised of scores the students obtained from the tests at the end of 2019-2020 academic year when the courses were delivered via face-to-face education while the second set consisted of scores they obtained from the tests at the end of 2020-2021 academic year when the courses were virtually conducted due to ERT exerted by Covid-19 pandemic. In addition, the views of students and instructors about the differences between the achievement scores driven by ERT and reflection of actual learning in scores during this period were analyzed. The findings indicated that the achievement scores obtained in associate degree and undergraduate degree programs were significantly increased during ERT while no statistically significant difference was found in the scores obtained in graduate degree programs. The findings also showed that the students and instructors are well aware of the increase in achievement scores, which they attributed to various factors such as lack of exam security and devoting more time to the lesson. They generally agreed that the achievement scores obtained in ERT do not reflect the actual learning level of students. Finally, it was revealed that the subjective perceptions about the change in the achievement scores largely overlapped with the objective statistical results.</p>
Research Article	

1. Introduction

Events that deeply affect large masses such as war, disaster and pandemic cause very serious changes in the communal living. The most recent example of this is the Coronavirus (Covid-19) pandemic which has had a lasting effect worldwide since the early months of 2020. Global and large-scale changes have been introduced in many facets of life by the pandemic. Within a few months of its declaration as a global pandemic (World Health Organization, 2020), schools were closed down in 190 countries and 1.57 billion students stayed away from their schools (Giannini et al., 2020). Considering these students with their families, education has been one of the areas severely affected by the pandemic. The transition from face-to-face education to emergency remote teaching has been the most serious change introduced in education during this period.

Although it dates back to the 18th century (Holmberg, 2005), remote teaching has become a worldwide must –beyond a common need- as a result of the latest pandemic. Due to the sudden and compulsory

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occurrence of this transition, the proposal of the concept of emergency remote teaching (ERT) for this type of distance education (Bozkurt & Sharma, 2020; Hodges et al. 2020) can be considered as an indication that the process has unique characteristics. In this process, traditional education methods had to be abandoned and new applications such as learning management systems, educational social media platforms and television channels were implemented (Gonzalez et al., 2020). Similarly, activities for measurement and evaluation, which are among the basic elements of education programs, have undergone remarkable changes through ERT. During this process, many tools including synchronous and asynchronous tests, assignments and portfolio tasks were utilized to conduct enriched measurement and evaluation practices (Khan & Jawaid, 2020). By doing so, the instructors aimed to overcome the limitations of the assessment and evaluation practices employed in ERT and to obtain similar results that could be obtained from the non-virtual practices. However, all these remote measurement and assessment practices have entailed a couple of significant questions such as whether the test questions are responded by the students who are supposed to take the tests in concern, how to evaluate the practice-based skills, and how to design reliable remote evaluation processes (OECD, 2020).

End-of-term achievement scores and grades are the most concrete indicators of the student's academic achievement. Displaying a student's ultimate achievement in a given course, grades serve as a notification to the students themselves, their families, teachers and all future stakeholders who want to be informed about their educational achievements (Yakar, 2020). Moreover, they can affect students' further education (Sari, 2020). To be more specific, cumulative grade point average is one of the factors that largely determine admission to graduate programs in Turkey as the applicants with higher cumulative GPA are likely to be admitted to such programs unless they obtained significantly lower scores on other tests such as Academic Personnel and Postgraduate Education Entrance Exam. Grades also fulfil such functions as encouraging and guiding students, and rewarding their individual efforts (Ebel & Frisbie, 1991). Considering all these issues, it is necessary to investigate how grades, which are of critical importance in education, are affected by the radical change in the regular education system.

Although the change in the scores is put forward objectively, this change and its reasons may be perceived and interpreted differently by the subjects and parties of the change. Expectations and opinions of students and instructors may differ due to their different roles with ERT (Bork & Rucks-Ahidiana, 2013). For example, the student may attribute the increase in grades to external help when responding to the difficult questions (Eastman et al., 2008) or the increase in study time for classes (Hansen et al., 2020) while the instructors may attribute it to cheating behavior (Rane & MacKenzie, 2020). It is important to examine views of students and lecturers, who are the most important stakeholders of higher education, about the possible change in their achievement scores during this period and the underlying factors in order to gain a multi-faceted insight into the concrete outcomes of ERT.

Many studies have been conducted to compare academic achievement scores obtained from courses delivered in the form of remote education and face-to-education and/or to reveal students' views on remote measurement and evaluation practices. Some of them were experimental studies that were conducted with a focus on a single course for which the test setting was differentiated in the pre-pandemic period (Alexander et al., 2001; Brallier et al., 2015; Stowell & Bennett, 2010; Yağcı, 2012). Other studies have investigated the views of students and instructors on e-tests (Wibowo et al., 2016), and compared achievement scores of students and reported on students' views on e-tests (Al Salmi et al., 2019; Ilgaz & Afacan-Adanır, 2020; Rane & MacKenzie, 2020). Further studies have been mostly intended to compare achievement scores obtained pre-pandemic period when the courses were taught face-to-face and those obtained during the pandemic when the courses were delivered in the form of remote education (Gonzalez et al., 2020; El Said, 2021; Hansen et al., 2020; Iglesias-Pradas et al., 2021; Tinjić & Halilić, 2020). Some other studies, on the other hand, exclusively probed the views of students on remote measurement and evaluation practices (Aksu- Dünya et al., 2021; Şenel & Şenel, 2021a). Review of the existing literature shows that the possible differences between the achievement scores of tertiary level students obtained from

face-to-face evaluation practices and those from remote evaluation practices were not previously analyzed based on students and instructors' views. Hence, this study is hoped to bridge the research gap in concern and to contribute to the literature via its findings and practical implications developed in the light of these findings.

The study aims to reveal to what extent the end-of-term achievement scores of university students in ERT differ from the ones they got during face-to-face education, and to elicit students and instructors' views on (possible) differences and the reflection of actual learning levels in the achievement scores obtained in ERT. For this purpose, answers to the following research questions were sought:

- 1) Is there a statistical difference between the students' end-of-term achievement scores obtained in the 2019-2020 fall semester (face-to-face) and 2020-2021 fall semester (remote)?
- 2) Is there a statistical difference between the associate degree, undergraduate and graduate students' end-of-term achievement scores in the 2019-2020 fall semester (face-to-face) and 2020-2021 fall semester (remote)?
- 3) Is there a statistical difference between the students' end-of-semester course scores of the 2019-2020 fall semester (face-to-face) and 2020-2021 fall semester (remote) for the programs offered via daytime education, evening education and remote education?
- 4) Do students and instructors think the students' end-of-term achievement scores in the 2019-2020 fall semester (face-to-face) differ from the ones in 2020-2021 fall semester (remote)? If so, what are their views on the underlying factors?
- 5) What are students and instructors' views on the reflection of actual learning level in the end of term achievement scores in ERT?
- 6) To what extent does the possible quantitative difference in the students' end-of-term achievement scores overlap with the students' and instructors' views on it?

2. Methodology

In this study, it was aimed to compare the university students' achievement scores obtained in face-to-face and remote education and to examine the views of students and instructors on the end-of-term achievement scores the students obtained from the courses which were offered in the form of ERT. In line with the research objective, a mixture of quantitative and qualitative research methods was adopted in it and quantitative and qualitative data were collected, respectively. It is noteworthy that the qualitative data collection tool was not formed based on the quantitative results and that the participants' views on the situation as well as underlying factors were scrutinized. Objective and subjective reality were tried to be brought together. Considering that the participants of the qualitative part of the research represented a small part of the universe of its quantitative part, this mixed research employed an embedded design (Creswell & Plano Clark, 2015).

2.1. Sampling

Two sets of data were used in the study. The quantitative data were comprised of end-of-term achievement scores of all students registered in Kahramanmaraş Sütçü İmam University, a state university in Turkey in the fall semesters of 2019-2020 and 2020-2021 academic years. There were 33,000 enrolled students in both years. All data were used for analysis without constructing a particular sampling. Since the data were drawn from the submitted end-of-term achievement scores for a specific semester, scores of the students who were studying at the faculties of Medicine and Dentistry were not included in the data sets due to the

distinctive nature of the programs implemented at these faculties. More specifically, each academic year does not consist of two semesters as in other degree programs; therefore, they did not have any test scores submitted to the students' information system at the time of data collection. As a result, the first set of the quantitative research data were comprised of 215271 end-of-term tests scores obtained from 5707 courses identified in 273 programs offered by 151 departments in a total of 23 academic units affiliated to the university during 2019-2020 academic year (eight vocational schools, three colleges, nine faculties and three institutes). The second set of the quantitative data consisted of 235392 end-of-term test scores for 5985 courses identified in 287 programs offered by 158 departments in the same 23 academic units during 2020-2021 academic year. As such, the data were used only to compare letter grades across years.

In the selection of the sample in the qualitative part of the research, it was aimed to elicit the views of the students and instructors in all units. For this purpose, at least one instructor and one student from each unit were tried to be reached. However, no student response was received from nine units. Thereupon, views of two students from two units and two instructors from four units were obtained in order to recruit the target number of participants. In order for the students to have both face-to-face education and ERT experiences, the participants were chosen among the 2nd grade students. Similarly, the participant instructors were chosen from those with administrative duties considering that they know the unit well and reflect it correctly. The participants from whom the qualitative data were elicited were selected using the criterion sampling, which is one of the non-random purposeful sampling methods. Distribution of these participants across degree programs are summarized in Table 1.

Table 1.

Number of Participants for Degree and Status

Degree	Student	Instructor	Total
Associate	5	9	14
Undergraduate	10	15	25
Graduate	1	3	4
Total	16	27	43

As seen in Table 1, the qualitative data were gathered from 14 participants from associate degree programs offered in 8 units, 25 from undergraduate degree programs offered in 12 units and 4 from graduate degree programs offered in 3 units.

2.2. Data Collection and Processing Procedure

Quantitative data of the research were taken from the Directorate of Student Affairs affiliated to Kahramanmaraş Sütçü İmam University. The data drawn from the student information system include the units, departments and degree programs the students are enrolled in as well as the course code, course title, end-of-term achievement scores and the end-of-term letter grades attained by the students. The end-of-term achievement scores are calculated by taking 40% of the midterm exam score and 60% of the end-of-term exam score. In remote education programs, which can also be offered under normal circumstances, only end-of-term tests are held face-to-face and the scores obtained from these tests constitute 80% of the end-of-term achievement.

During the pandemic, midterm and end-of-term tests were conducted over the learning management system (LMS) and only open-ended written tests, multiple-choice tests or assignments were allowed to evaluate the students' achievement. Non-proctored written tests comprised of open-ended items were held simultaneously and required the students to upload the answer sheets, prepared either electronically or in handwriting, to the LMS within the given duration. Likewise, non-proctored multiple-choice tests were conducted online and simultaneously. For the multiple-choice tests, certain criteria such as consisting of 20 to 40 items and lasting for 30 to 60 minutes were established. In order to ensure the test security, the instructors were supposed to prepare at least twice as many items to be posed in the multiple-choice test.

In addition, the test security was attempted to be increased with the randomly asked multiple-choice items and options for each student in LMS. The assignment option covered process-oriented activities such as project assignments, performance-based assignments and oral presentations. Different from the pre-pandemic assessment practices, all students who could not attend these tests were allowed to attend re-sit tests irrespective of having an excuse (Kahramanmaraş Sütçü İmam University, 2020). End-of-term achievement scores were calculated on the scores students obtained from the afore-mentioned single or multiple measurement tools developed and utilized based on the course contents.

Qualitative data of the research were collected through an online questionnaire administered on May 07-20, 2021. The ethical consent for data collection was obtained from the Social and Human Sciences Ethics Committee of Kahramanmaraş Sütçü İmam University, Turkey. The initial section of the questionnaire was designed to elicit the programs participants were studying/teaching and their title (for instructors). Subsequently, the questionnaire required the participants to complete the following statement with “decreased”, “not changed” or “increased: *“When I compare it with face-to-face education, the end-of-term achievement scores of the students generally during the emergency remote teaching”*”. As a follow-up question, they were asked to justify the option they chose. Lastly, they were asked to share their opinions as to what extent actual learning levels are reflected in the end-of-term achievement scores in ERT. It is significant to note that similar studies in the existing literature were extensively reviewed prior to the generation of the questionnaire items (Aksu-Dünya et al., 2021; Iglesias-Pradas, et al., 2021; Şenel & Şenel, 2021a). In addition, the tool was piloted with an instructor specialized in the field of teacher education after obtaining the expert opinion from another instructor with the same specialization and finalized based on their feedback.

2.3. Data Analysis

The above-mentioned quantitative and qualitative research data were analyzed in accordance with their nature and research questions.

2.3.1. Quantitative data analysis

There are two main indicators of academic achievement in the quantitative data obtained. End-of-term achievement is graded from 0 to 100 while some end-of-term letter grades, which are formed independently from the end-of-term test scores, are listed as DS (Failed due to absenteeism), B (Successful), BS (Failed) and MF (Exempted). The other letter grades are obtained by transforming the end-of-term achievement scores to the equivalents of the 4-point-score grade system based on absolute criteria for graduate level and relative or absolute criteria for other levels. Equivalents of letter grades for 4-point-score grades are AA (4.00), BA (3.50), BB (3.00), CB (2.50), CC (2.00), DC (1.50), DD (1.00), FD (0.50) and FF (0.00) (Kahramanmaraş Sütçü İmam University, 2017).

Categorical letter grades were used in the descriptive analysis of the university achievement in general. In order to better reflect the general situation of this review, raw data covering all units except faculties of dentistry and medicine were used. Being numeric in nature, the data set including end-of-term achievement scores were primarily included into quantitative analysis. In the use of the end-of-term achievement scores, only the data with a success score were included in the analysis; therefore, the scores corresponding to the grade letters of B/BS, MF and DS were excluded from the data set. Since the compulsory attendance to virtual classes was abolished during ERT (Kahramanmaraş Sütçü İmam University, 2020), it has been observed that DS letter grade was not submitted for the registered students who did not attend the classes and tests. Instead, their end-of-term achievement was graded “0”. In order to eliminate the effect of this situation on the analysis results, these scores were excluded from the data sets analyzed. In conclusion, a set of data comprised of 183145 end-of-term tests scores obtained from 5292 courses identified in 258 programs offered by 146 departments in a total of 23 academic units affiliated to the university during 2019-2020 fall and another set of data consisting of 209985 end-of-term tests scores obtained from 5653 courses identified in 275 programs offered by 154 departments in a total of 23 academic units affiliated to the

university during 2019-2020 fall semester were analyzed to provide answers to the first three research questions.

Before the analysis, whether the data sets have a normal distribution or not, the skewness and kurtosis statistics were examined with a normal distribution graph. After this examination, which was done separately for the groups used in the analysis, it was decided to use parametric or non-parametric statistics. In the analysis of the whole data, the skewness (-.27) and kurtosis (-.48) values of the data 19-20 and the skewness (-.59) and kurtosis (-.05) values of the data 20-21 were within the ± 1 limits. Similar results were obtained in the examinations of the subgroups. However, data for both years of graduate programs were an exception for the normal distribution.

Students, courses and thus the samples were different in the fall semesters of the 2019-2020 and 2020-2021 academic years. For this reason, the academic year was taken as the independent variable and the independent samples t-test or the Mann Whitney U test was used to answer the first three research questions. For responding to the first research question, the independent samples t-test was conducted to see whether the students' end-of-term achievement scores significantly differ across two academic semesters. Independent samples t-tests were separately carried out for the registered programs (associate / undergraduate / graduate) and the types of program (daytime education/ evening education and remote education) for responding to the second and third research questions, respectively. For the latter, a two-way ANOVA analysis was also conducted to examine whether the use of virtual tests instead of face-to-face tests is a source of the score increase found in emergency remote assessment practices. For this analysis, in addition to the academic years (2019-2020 face-to-face, 2020-2021 remote education), two separate groups, namely remote education programs and face-to-face education (daytime and evening education) programs, were treated as independent variables. Mann Whitney U test, which is one of the non-parametric methods, was used in the analysis of data that did not display normal distribution. The independent samples t-test was used for the data with normal distribution. Finally, for responding to the fifth research question, which is a mixed research question, separate analyzes were performed according to 23 units (eight vocational schools, three colleges, nine faculties and three institutes) and related effect sizes were calculated.

Hedge's g effect size statistic was used to examine the size of the possible difference in the independent samples t-tests due to the different sample sizes. The effect sizes of possible differences in Mann Whitney U tests were examined with Cohen d statistics (Lenhard & Lenhard, 2016). Cohen's d statistic and Hedge's g value indicate weak when it is between 0-0.2, low between 0.21 and 0.5, and between 0.51 and 1.00 moderate and above 1.00 a strong effect (Cohen, Manion, & Morrison, 2007).

2.3.2 *Qualitative data analysis*

With the analysis of the qualitative data, it is aimed to reveal the students and instructors' views on the end-of-term achievement scores in ERT. Content analysis method was used in the qualitative analysis of the data to respond to the fourth research question which was designed to reveal their views on the underlying factors that trigger possible differences in the scores obtained in ERT and face-to-face education. For this process, codes were detected by the researcher and a doctor in the field of teacher training. After that, three themes were created, "Scores decreased", "Scores not change", and "Scores increased" and matched with related codes. Similarly, content analysis method was used to respond to the fifth research question with a focus on the reflection of the actual learning level in the scores in ERT and its possible reasons. The obtained data were associated with the created themes as "True reflecting" and "False reflecting".

2.4. *Validity and Reliability*

The quantitative data set comprised of the end-of-term achievement scores obtained from various measurement tools such as virtual tests, project assignments and oral presentations were accepted as reliable and valid due to the fact that examination of the score sources was beyond the research. To ensure credibility in the research concerning the qualitative data, the research model, the collection and analysis of data and

all processes of the research were explained in detail. In addition, the expert opinion was elicited from two instructors with specialization in teacher training. In this research, every stage of the study was presented to the reader in detail in order to ensure transferability and serious attention was paid to the production of a reader-friendly text throughout the manuscript. In addition, in order to ensure credibility, direct quotations from the views of the participants were included into the interpretations of the findings and participant confirmation was elicited (Yıldırım & Şimşek, 2018). For the latter, a student and an instructor’s views as to what extent the given codes reflect their views correctly were obtained.

In order to ensure consistency in the research, the researcher and a PhD degree holder in the field of teacher training independently created codes and processed them into the themes. The common codes were combined and unnecessary codes were removed. Subsequently, disagreements on codes were resolved after discussion. For the confirmation review, all research components including data collection tools, the raw data, the codes constructed and data analysis results were stored in the researcher’s personal computer and a hard disc (Yıldırım & Şimşek, 2018).

3. Findings

In this section, the results of the analysis related to the research questions are given respectively. For the first research question of the study, the students’ end-of-term achievement scores in the 2019-2020 (face-to-face) and 2020-2021 (remote) fall semesters were compared and the result of the independent samples t-test were given in Table 2.

Table 2.

End-Of-Term Scores Comparison for University-Wide

Year	Score <i>N</i>	\bar{X}	Sd	<i>t</i>	Hedge <i>g</i>
19-20	183145	57.11	22.61	164.33*	.53
20-21	209985	68.33	19.82		

**p* < .001.

As indicated in Table 2, the mean of the end-of-term achievement scores obtained from ERT courses were found to be 11.22 points higher than that of the courses conducted face-to-face. It was seen that the difference was statistically significant ($t(367100) = 164.33, p < .001$) and the difference had a moderate ($g > .5$) effect size according to the Hedge *g* statistics.

Figure 1 displays the way the difference in scores was reflected on letter grades across years.

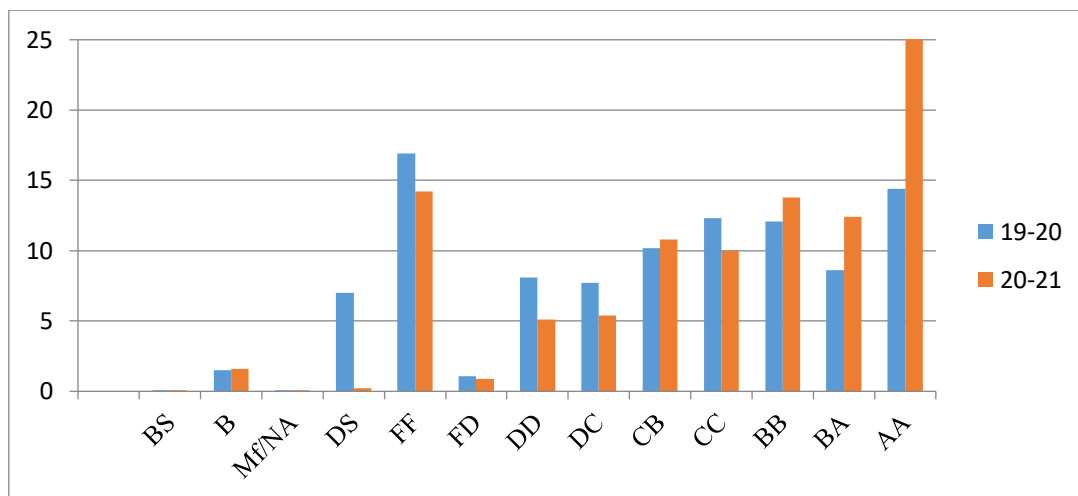


Fig. 1. Prevalence of End-Of-Term Letter Grades for University-Wide

As shown in Figure 1, the significant increase in the end-of-term achievement scores was mirrored in the end-of-term letter grades. While the percentage of the letter grades was close to each other in the 2019-2020 fall semester, the higher letter grades prevailed in the 2020-2021 fall semester. The most frequented letter grade in the 2019-2020 fall semester was FF whereas AA was seen in one of every four letter grades, making it the most frequented letter grade in the 2020-2021 fall semester.

For the second research question, the end-of-term achievement scores obtained in the 2019-2020 (face-to-face) and 20-21 (distance) fall semesters were compared for each degree program and the analysis results were presented in Table 3.

Table 3.

End-Of-Term Scores Comparison for Each Degree

Degree	Year	Score <i>N</i>	\bar{X} / Mean Rank	Sd	<i>t</i> / <i>U</i>	<i>g</i>
Associate	19-20	65866	57.13	20.54	-89.42*	.48
	20-21	77553	66.68	19.69		
Undergraduate	19-20	112434	55.95	23.19	-143.66*	.59
	20-21	126749	68.66	19.65		
Graduate	19-20	4845	5297.27		13608307	-
	20-21	5863	5236.56			

* $p < .001$.

It was indicated that mean of the end-of-term achievements scores obtained in associate degree programs during ERT were 9.55 points higher than that obtained in face-to-face education. Besides, the difference was found statistically significant ($t(137592.6) = -89.42, p < .001$) and had an effect size very close to the medium level ($g = .48$) although the its effect size was in the low range according to the Hedge *g* statistics. It was also found that the mean of the end-of-term achievement scores obtained in the undergraduate degree programs during ERT was 12.71 points higher than that obtained during face-to-face education. It was seen that the difference was statistically significant ($t(221551.84) = -143.66, p < .001$) and had a medium level effect size according to the Hedge *g* statistics ($g > .5$). When the Mann Whitney U results for the graduate degree are examined, no significant difference was found in ranks of end-of-term course scores of the face-to-face and ERT ($p > .05$).

For the third research question, the end-of-term achievement scores obtained in the 2019-2020 (face-to-face) and 20-21 (distance) fall semesters were compared for each program type and the related results were demonstrated in Table 4.

Table 4.

End-Of-Term Scores Comparison for Each Program Type

Program Type	Year	Score <i>N</i>	\bar{X}	Sd	<i>t</i>	<i>g</i>
Daytime	19-20	133377	58.22	22.38	-135.90*	.51
	20-21	157047	68.95	19.79		
Evening	19-20	46879	53.25	22.63	-91.16*	.59
	20-21	48987	65.81	19.87		
Remote	19-20	2889	68.56	23.32	-11.98*	.27
	20-21	3951	74.85	18.60		

* $p < .001$.

Table 4 displays that the mean of the end-of-term achievement scores obtained in daytime education programs during ERT were found 10.73 points higher than that obtained during face-to-face education. This difference was statistically significant ($t(268409.04) = -135.901, p < .001$) and had a moderate effect size according to the Hedge g statistics ($g > .5$). In the evening education programs, the mean of the end-of-term achievement scores obtained during ERT were found 12.56 points higher than that obtained during face-to-face education. This difference was also statistically significant ($t(93085.258) = -91.162, p < .001$) and had a moderate effect size according to the Hedge g statistics ($g > .5$). Considering the mean of the end-of-term achievement scores obtained in the remote education programs, which were also offered in pre-pandemic period, during ERT was calculated 6.29 points higher than that obtained during face-to-face education period. The difference was found statistically significant ($t(5353.34) = -11.98, p < .001$) had a low effect size according to the Hedge g statistics ($g > .2$).

In order to compare the increases in the end-of-term achievement scores across the given academic years, two-way ANOVA was performed and the type of program was established as the independent variable. The statistical results were presented in Table 5.

Table 5.

Two-way ANOVA Results for Programs Type and Year

Source	Type III Sum of Squares	df	F
Intercept	118291299.69	1	264916.99*
ProgType.* Year	12871283.48	3	9608.55*
Error	175539457.55	393126	

* $p < .001$.

Table 5 indicated a significant interaction between the independent variable of program type and the academic year [$F(3-393126) = 9608.55, p < .001$]. Accordingly, the score increases observed during the ERT differ according to the type of programs. The increase seen in remote education programs (6.29/100 points) was less than face-to-face programs (11.27/100 points).

Concerning the fourth research question, the participants' views on the effect of ERT on the end-of-term achievement scores were analyzed and the statistical results were provided in Table 6.

Table 6.

Participants' views on the end-of-term achievement in ERT

Participant view	Student (f)	Instructor (f)
Decreased	-	3
Not Changed	4	3
Increased	12	21

As displayed in Table 6, the majority of the participants, comprised of students and instructors, are of the opinion that the end-of-term achievement scores obtained in ERT were increased when compared to those obtained in face-to-face education. Three instructors expressed that there was a decrease in the scores (11%) while none of the students agreed on that. In return, four students (25%) and three instructors (11%) stated that there was no change in the scores.

Content analysis results of the participants' views on the underlying factors that triggered changes in the end-of-term achievement scores were given in Table 7.

Table 7.

Reported Factors that Entailed the Change in End-of-term Achievement Scores

Theme	Code	Student	Instructor	Total
Decreased	Nonattendance in classes		3	3
	Ignoring homework		2	2
	Watching the video-record of the classes instead of joining them online		2	2
Not Chanced	Lack of variety in the teaching/learning methods used	2	2	4
	Theoretical nature of courses		1	1
	Use of measurement tools consisting of many questions in ERT-oriented evaluation practices	1		1
Increased	Lack of test security	5	12	17
	Devoting more time to the courses	4	1	5
	Changing structure of classes (regardless of time and place)	3	1	4
	Benefiting from technological facilities	1	2	3
	Emphasizing the sections that could be tested more during classes		3	3
	Elimination of the test anxiety	2		2
	Tests being conducted online		2	2
	Less challenging tests (comprised of easy-to-answer items)		2	2
	Instructors' disregarding the significance of the tests	1		1
Easy access to the answers of the test items over the internet		1	1	

In general, Table 7 displays that the reported factors that contributed to the increase in the end-of-term achievement scores during ERT are prevalent. The participant students did not report any possible reasons for decreasing scores since, as noted above, they did not believe there was a decrease in the end-of-term scores during ERT. On the other hand, three instructors attributed the decrease in the scores to the students' nonattendance in classes, ignoring homework and watching the video-record of the classes instead of joining them online. For example, an instructor working at the institute of natural sciences, who expressed his opinion about ignoring homework and watching the video-record of classes instead of the joining them online, said, "I think that the overall success has decreased because the indifferent students do not fulfill the given tasks and they try to learn subjects, which could be better understood by joining the online classes, by watching their video-records."

Some of the participants who reported no change in the end-of-term achievement scores during ERT attributed this to the lack of variety in teaching and learning methods used ($f=4$). In that regard, a college student stated that "*I learned best from the lecture notes in face-to-face education, now I do the same in remote education*". Besides, the coexistence of the factors that increase the scores and those that decrease them was reported as one of the reasons why the mean of end-of-term achievement did not change. For example, an instructor who teaches at the faculty said, "*There can be many reasons for this. First of all, the fact that the courses I teach were theoretical in nature may have been effective. In addition to this, as in face-to-face education, my synchronous teaching through the zoom program may have been effective in students' success. Furthermore, ..., the students' overcoming the disadvantages exerted by the change in educational modality by accessing to answers of the questions asked on the internet and getting help from someone else while responding to these questions... Another reason may be that I explain the questions I will ask in the exam in more detail during emergency remote education.*"

The reasons mostly reported by the students and instructors for the increase in the end-of-term achievement scores were evaluated under the code of lack of test security. Students ($f=5$) and instructors ($f=12$) exemplified this with such expressions as cheating in the tests, non-proctored tests and students' getting help from peers. It is seen that the students differed from the instructors in the other reasons they reported the most. They frequently stated that they could devote more time to the courses during remote education ($f=4$) and that the classes became independent of time and place ($f=3$). Stressing both the increased time

devoted to courses and lack of test security, an undergraduate student stated that "*Students who stay away from social life and stay at home may focus on their courses, or, as a more possible possibility, the remote education process makes it easy to cheat in the tests and do similar things*". Similarly, an instructor who teaches at a vocational school noted that "*You cannot monitor the students during the exams because they are not conducted in physical classrooms. The probability of cheating in the exam is high. The students have an access to technological facilities that will help them answer the questions*".

For the fifth research question, the participants' views on the reflection of the learning level in ERT were analyzed via content analysis and the results were displayed in Table 8.

Table 8.

Reported Reasons for Reflecting of Learning Level in Score in ERT

Theme	Code	Student	Instructor	Total
False Reflecting	Answers not given by the students	4	5	9
	Getting high scores without studying	3	1	4
	Availability of the answers on the Internet	1	2	3
	Low learning level	2		2
	Lack of participation in classes		2	2
	The scores being very different from the face-to-face exam		2	2
	Taking the make-up exams without excuses		1	1
	Lack of reliability in measurement and evaluation		1	1
	Low efficiency	1		1
	Memorization-based questions	1		1
True Reflecting	Studying to pass the course not to learn it		1	1
	Students with high motivation learn more	1	2	3
	Practice-based classes		2	2
	Correlation between decreased scores and reduced learning		2	2
	Study regularly and effectively	1		1
	Low probability of cheating in applied courses		1	1
	Asking high quality questions		1	1
	Use of similar teaching/learning strategies	1		1

It is seen in Table 8 which shows the frequency of the codes according to the participant groups that 82% and 65% of the total codes used by the students and instructors, respectively refer to the reasons for false reflection. Both students ($f=4$) and instructors ($f=5$) attributed the fact that the scores did not reflect the learning level correctly to the answers originally not given by the students. The other reasons most frequently mentioned by the students were getting high scores without studying ($f=3$) and low learning level ($f=2$). For example, an undergraduate student said, "*I mean it depends on the student. Because if a student works regularly and effectively, their learning level and grade point average may increase. However, a student not of this type may also have a high-grade point average. How? Getting help in the exam increases the grade, but I cannot say that the learning level is directly proportional to the grade. ...*", indicating that the scores reflect actual learning for the students who work regularly and effectively, and they do not for the students whose do not answer the questions on their own. The other reasons most frequently mentioned by the instructors were that the answers of the questions were available on the internet ($f=2$), the obtained scores were very different from those obtained in the face-to-face exam ($f=2$) and the lack of participation in classes ($f=2$). For example, an instructor at a vocational school noted, "*I don't think it reflects actual learning. Students create groups and answer the questions together. In addition, because of finding the answers to the questions with "CTRL+f" from the electronically stored lecture notes, or asking someone who knows the subject well to attend the online tests for themselves by having them do so with their username and password.*".

It has been seen that the reasons for the students to reflect the actual learning level have emphasized the codes of motivated students' learning more, studying regularly and effectively, and using of similar learning strategies. For example, a vocational school student argued that the use of similar learning strategies in face-to-face and remote education ensures the scores' reflecting actual learning levels by saying, "..., *the education was offered in the same way it was during face-to-face education, and those who listened to the lessons attentively and understood the instructions well got very high scores.*" On the other hand, it was seen that the instructors emphasized the codes of the high level of learning of the motivated students, the practice-based classes, and the decrease in the scores with a decrease in learning, twice at most, in the reasons related to the reflection of actual learning level in scores. For example, a faculty member said, "*While I think it reflects correctly for some students, I do not think it reflects correctly for others. Even through Zoom, students learn a lot and get high grades. ...*", indicating that the learning levels of the motivated students are high.

For the sixth research question, the effect size (EF) of difference between scores (not presented in the findings) of the ERT and face-to-face education and the participants' perceived differences in them across units were examined. The related results were provided in Table 9.

Table 9.

The Effect Size of Score Comparisons and Perception of Participants across Units

Unit Type	Unit Name	Quantitative Result	Student	Instructor
Vocational School	Afşin	Mod. EF Increase	-	Increased
	Andırın	Mod. EF Increase	Increased	Increased
	Göksun	Low EF Increase	Not changed	Increased
	K.Maraş Health	Mod. EF Increase	-	Increased
	Pazarcık	Low EF Increase	-	Increased
	Social Sciences	Mod. EF Increase	-	Increased
	Technical Sciences	Low EF Increase	Not changed	Increased
	Türkoğlu	Low EF Increase	Not changed	Increased
College	Afşin Health	Mod. EF Increase	Increased	Increased
	Phys. Edu.&Sport	Mod. EF Increase	Increased	Increased
	Göksun App. Sci.	Mod. EF Increase	Increased	Increased
Faculty	Education	Low EF Increase	Increased	Not changed
	Science-Letters	Mod. EF Increase	Increased	Increased
	Fine Arts	Low EF Increase	-	Increased
	Eco. & Admin. Sci.	Mod. EF Increase	Increased	Increased
	Relegion	Low EF Increase	Increased	Not changed
	Engineer&Architec	Mod. EF Increase	Increased	Decreased
	Forest	Low EF Increase	-	Increased
	Health Sci.	Mod. EF Increase	Increased	Increased
Institute	Agriculture	Mod. EF Increase	-	Increased
	Naturel Sci.	No Change	Increased	Decreased
	Health Sci.	Mod. EF Increase	-	Decreased
	Social Sci.	Weak EF Decrease	-	Not changed

The students and instructors' views on the change in the students' end-of-term achievement scores that do not coincide with the quantitative analysis results are highlighted in Table 9. Considering the extent to which the results overlapped, it was seen that all students perceived the change in scores in accordance with the quantitative results except for those who were studying in three vocational schools and who believed that the scores did not change. It was revealed that two and one instructors' views in favor of decrease in the scores were contradicted by the quantitative results with low and moderate effect sizes, respectively. In addition, it was seen that views of the participants from the three institutes did not match with the observed situation. However, the weak effect size of the significant change observed in the institute of social sciences

somewhat coincided with the view of one of the instructors teaching at this institute who stated that there was no change in the end-of-term achievement scores of the students during emergency remote education.

4. Discussion, Conclusion and Suggestions

In this study, the effect of emergency remote teaching (ERT) on university students' end-of-term achievement scores and views of students and instructors on the scores obtained in ERT were investigated. For this purpose, the end-of-term achievement scores and letter grades of the students enrolled in all degree programs at Kahramanmaraş Sütçü İmam University, a state university in Turkey except for the programs offered in the faculties of dentistry and medicine were examined in the 2019-2020 fall semester, the last semester when the courses were taught completely face-to-face, and the 2020-2021 fall semester, the first semester during which all courses were taught virtually. In addition, the views of the lecturers and students about the end-of-term course scores in ERT were obtained and evaluated together with the results of the quantitative analysis.

It has been observed that ERT, which was necessitated by the Covid-19 pandemic, brought a significant increase of 11 points in the end-of-term achievement scores based on the 100-point system. The most frequented letter grades obtained in the 2019-2020 fall semester (face-to-face) were FF (0.0; 17%) and AA (4.0; 14%) and those obtained in the 2020-2021 fall semester (ERT) were AA (4.0; 25%) and FF (0.0; 14%). This result shows that the success indicator has dramatically changed. Similar results were previously found in other studies conducted with a similar focus in Madrid, Spain (Iglesias-Pradas, et al, 2021; Gonzalez, et al, 2020), in Cologne, Germany (Hansen, et al, 2020), in Victoria, Australia (Loton, et al, 2020) and in the southwestern US (Supriya, et al., 2020). However, unlike these results, no difference was reported between the achievement scores obtained during ERT and face-to-face in a study conducted in Egypt (El Said, 2021) while the study conducted in Sweden (Tinjić, & Halilić, 2020) concluded that the difference was in favor of face-to-face education. In the studies comparing the face-to-face and online exam results of university students in the pre-pandemic period, Brallier et al. (2015), and Rane and MacKenzie, (2020) reported a difference in favor of the online exam whereas Ilgaz and Afacan-Adanır (2020) found no difference between the two modalities of education concerning the score in concern. The overall results indicated that the increase in the end-of-term achievement scores obtained in ERT was usually informed by many studies conducted in different countries. This increase may be attributed to various factors especially the novel teaching methods or measurement settings (Gonzalez et al., 2020). Without revealing all these factors, it would be far from reality to say that ERT is superior to face-to-face education only because of the increase in scores (Iglesias-Pradas, et al., 2021).

The analysis results for individual degree programs showed that the end-of-term achievement scores obtained in associate and undergraduate courses were higher in ERT while those obtained from graduate courses did not differ concerning modality. The result obtained for the graduate program courses may be due to the fact that the end-of-term achievement scores in the graduate programs were also very high ($M=83.68$) in the face-to-face education period. In addition, the fact that homework is frequently used as a measurement tool in graduate education during face-to-face education (Yağan & Çubukçu, 2019) and this situation continues in the ERT process can be shown as the reason for the similarity in scores.

When the end-of-term course scores were analyzed across program types (daytime education, evening education and remote education), it is seen that the scores obtained in the ERT were higher than those obtained in face-to-face education for all program types. Courses offered in remote education programs were already virtually taught in the pre-pandemic period. The situation that differs with the transition to ERT for this program is that the final exam, which constitutes of 80% of the end-of-term achievement score, was started to be conducted online rather than face-to-face. From this point of view, although the settings in which the classes were held remained the same, the change in the testing setting brought about an increase in the end-of-term achievement scores. This indicates that the setting of remote testing has an influence on the increase in scores. This increase may be attributed to the increased access to resources such as books

and study notes in remote non-proctored exams (Brallier, et al., 2015). At the same time, students' tendency to cheating, which they also describe as helping each other (Rane & MacKenzie, 2020), can be considered as another possible factor for the increase in scores. On the other hand, the effect size in remote programs ($g=.29$) was not found as high as the one calculated for daytime education ($g=.51$) and evening education ($g=.59$) regarding the increase in scores. Moreover, the increased scores observed in remote education programs were statistically lower than the ones obtained in face-to-face types programs. Hence, it can be interpreted that the change in the learning setting may lead to increased scores, as previously reported by Gonzalez et al. (2020). In this case, as expressed in the current and other studies previously conducted with a similar focus (Elsalem et al., 2021; Hansen et al., 2021), students may have attained higher scores by studying harder.

The qualitative findings of the study demonstrated that both students and instructors who stated there was an increase in the end-of-term achievement scores in favor of ERT significantly outnumbered those who did not. They attributed the increase in concern to the lack of test security during ERT. It has been observed that the instructors extensively held this view most probably due to the non-proctored tests or the use of similar software in the tests. In addition, the students' views on the factors that contributed to the increase in scores were different from those reported in other studies on the ERT such as studying more and studying whenever and wherever they want (Akdemir & Kılıç, 2020; Elsalem et al., 2021; Er Türküresin, 2020; Hansen et al., 2021; Şeren et al., 2020). It is seen that the reasons stated by the students regarding the increase in scores are generally positive. On the other hand, students and lecturers who agree on the view that there is an increase in the scores obtained in ERT partially differ on the stated reasons in concern. It can be concluded that the increase in scores is generally considered fair and partially unfair by the students and mostly as unfair by the instructors. This disagreement may be attributed to the fact that students and instructors have different perspectives due to their different roles (Bork & Rucks-Ahidiana, 2013). In addition, some of the instructors stated that they helped students increase their scores by asking easy questions or by emphasizing the questions likely to be asked in the tests during the virtual classes. This may be seen as a help given by the instructors in order not to make the lives of the students more difficult in the face of the worsening living conditions (Dodd et al, 2021) and education (Aristovnik et al., 2020) due to the pandemic. Another remarkable result is that students' getting away from test anxiety thanks to the remote measurement practices as they entailed an increase in their end-of-term achievement scores. This inference coincides with the opinion that the use of homework as an assessment tool in the ERT process can reduce test anxiety (Şenel & Şenel, 2021b).

Students and instructors also agree on the opinion that the scores obtained in ERT do not reflect actual learning level of the students. It is noteworthy that this view was more frequently reported by the students. Namely, they stated that the scores do not reflect their actual learning levels, since they did not answer the questions on their own. This situation can be considered as a confirmation that students use resources (Brallier, et al., 2015) and cheating behaviors (Rane & MacKenzie, 2020) in the remote testing. Students also criticize the instructors and the assessment system by conveying the opinion that high grades can be obtained without studying hard. The instructors self-criticized about this issue by stating that the scores do not reflect the truth since the questions and answers were already available on the internet. This particular finding is in line with those reported in other studies (Akdemir & Kılıç, 2020; Er Türküresin, 2020).

For the mixed method question, it is seen that the quantitative and qualitative results obtained for the units largely overlapped. The quantitative increase observed in many of its units was correctly perceived by students and instructors. Although they stated different reasons, both students and instructors were aware of the truth. It has also been observed that especially the students enrolled in undergraduate degree programs had a more consistent perception of change with the quantitative results. In other words, the quantitative and qualitative results concerning these students support each other. The clearest example of this is seen in the results obtained for remote education programs. The only thing that changed in remote education programs was that the end-of-term tests started to be held online. The statistical result that the scores

increased with this change is consistent with the participants' opinion that the scores were increased due to the lack of test security in the remote assessment. In addition, the statistical result showing that the increase in these programs was not as high as the one in other programs is compatible with the opinion of the participants that the scores were increased as the students spent more time on study.

To summarize the results, a significant increase observed in the students' end-of-term achievement scores obtained in associate and undergraduate degree programs, and throughout the university selected in the pandemic period during which the courses were offered through ERT. In return, no significant change was found in the scores obtained in graduate programs. The participant students and instructors attributed the increase in the scores during ERT to different factors. They also argued that the scores obtained in this period did not reflect the actual success of the students.

This research has some limitations due to some reasons. Initially, the end-of-term achievement scores obtained in the faculties of Medicine and Dentistry could not be included in the data set and data analysis. It was also restricted to the data elicited from the end-of-term achievement scores obtained in a state university in Turkey; so, its results cannot be generalized to other settings. Although there are many factors affecting course achievement in face-to-face education and ERT, these factors were ignored data collection and data analysis in this research.

In the light of the research results, the following can be offered for researchers for further directions:

- The study can be repeated for the universities that employ proctored online tests and/or proctor software in ERT and the results can be compared with the ones reported here.
- By examining the data of the 2019-2020 and 2020-2021 spring semesters, as et of data comprised of end-of-term achievement scores of the students studying at the Faculties of Medicine and Dentistry can be analyzed and the results can be compared with the ones reported here.
- A similar set of data could be analyzed by considering such variables as the course structure (theoretical vs. applied), the type of modality the classes are offered (synchronous or asynchronous) and the assessment tools utilized in emergency remote education.
- The research could be furthered to investigate to what extent student-related factors such as their characteristics, grade point averages, study habits and frequency of attending virtual classes contributed to the increase in their end-of-term achievement scores.

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