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VIRTUAL LEARNING TECHNOLOGIES COURSE ACHIEVEMENT TEST DEVELOPMENT STUDY

Abstract:

This research was carried out to develop a multiple-choice measurement tool to measure the academic achievement of non-thesis master's degree students in '3D Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of Virtual Learning Technologies course by considering the achievement test development processes. For this purpose, in accordance with the achievement test development processes, the purpose of developing the test, the objectives and achievements of the course were determined and an item pool consisting of 53 items and a specification table were created. In order to ensure the content validity of the achievement test, the specification table was presented to 9 experts in the field. After the feedback from the field experts, the 25-item achievement test was made ready for the trial application after the expert comments were analyzed and the items to be corrected were rearranged and the items recommended to be removed were examined. The sample group of the trial application consisted of 27 non-thesis master's students who were studying at Anadolu University Graduate School of Graduate Education in the autumn semester of the 2024-2025 academic year and who took the Virtual Reality in Visual Communication course coded GIT 509 remotely. The 25-item achievement test was applied to the sample group online via Google Form on 09.01.2025. As a result of the trial application, the reliability coefficient (KR-20) of the achievement test was calculated as .763, the average item difficulty index was 0.64, and the average item discrimination was 0.38. Items requiring revision were rearranged in accordance with the results of item discrimination analysis. According to the results of the item distraction analysis, the items that did not undertake the task of distraction were rearranged. As a result of the research, the virtual learning technologies achievement test consisting of 25 items was developed as a valid and reliable measurement tool that can be used for distance learning non-thesis master's degree students.

Keywords:

Virtual learning technologies, Test development, Achievement test

1. Introduction

In the measurement and evaluation processes, it is necessary to measure the academic achievement levels of the students in order to determine whether the students have achieved the outcomes of the course. Achievement tests are one of the measurement tools used to measure students' academic achievement (Turgut & Baykul, 2021).

In this study, it was aimed to develop a valid and reliable measurement tool to determine the academic achievement of non-thesis master's degree students in the 'History of Three Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of the Virtual Learning Technologies course by taking into account the achievement test development steps. When the literature was examined, no similar achievement test development study was found within the scope of Virtual Learning Technologies course or in the 'History of Three-Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of Virtual Learning Technologies course. In this context, the aim of the research is to develop a valid and reliable achievement test that measures the academic achievement of non-thesis master's degree students in the 'History of Three-Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of the Virtual Learning Technologies course.

2. Method

This research is a study to develop a valid and reliable achievement test on the subjects of 'History of Three Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and "Metaverse" of the 'Virtual Learning Technologies' course, which is taught as an elective course to students enrolled in non-thesis master's programmes at Anadolu University Graduate School of Education. While developing the achievement test, the achievements in the Virtual Learning Technologies course curriculum of the 2024-2025 academic year autumn term were taken into consideration. Survey model, one of the quantitative research methods, was used in the study.

2.1. Population and Sample of the Study

The study population of the research consisted of 27 non-thesis master's degree students studying at Anadolu University Graduate School of Postgraduate Education in the autumn term of the 2024-2025 academic year and taking the Virtual Reality in Visual Communication course coded GIT 509.

2.2. Data Collection Tool

In this study, a 25-question multiple-choice achievement test consisting of four options was developed in order to develop a valid and reliable achievement test to determine the achievements of distance education non-thesis master's degree students in the 'History of Three Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of the Virtual Learning Technologies course.

2.3. Development Process of Virtual Learning Technologies Course Achievement Test

While developing the achievement test within the scope of this research, Turgut and Baykul (2021)'s achievement test development steps were used. In this context, firstly, the purpose of the achievement test was determined. Objectives were written for the acquisitions in the curriculum of the Virtual Learning Technologies course. After the purpose of the achievement test was determined, a specification table was created. The created specification table is shown in Figure 1.

Figure 1: Table of Specifications

Outcomes	Knowledge	Comprehension	Application	Analysis	Synthesis	Number of Questions
To be able to remember the history of three-dimensional technologies	1,2					2
To be able to list the chronological development processes of reality types used in three-dimensional technologies		3				1
To be able to give examples of chronological development processes of three-dimensional technologies		4,5				2
To be able to analyse the main differences between three-dimensional technologies by comparing their features				6		1
To be able to explain augmented reality technologies		7				1
To be able to define the concept of augmented reality	8					1
To be able to remember the basic features of augmented reality	9					1
To be able to give examples of augmented reality technologies	10					1
To be able to associate augmented reality applications with examples			11			1
To be able to analyse the main differences between them by comparing augmented reality classifications				12		1
To be able to define the concept of virtual reality	13					1
To be able to give examples from daily life by comparing the concepts of augmented reality and virtual reality				14,15		2
To be able to explain the superior aspects of virtual reality		16				1
To be able to associate virtual reality applications with examples			17			1
To be able to give examples of virtual reality technologies		18				1
To be able to define the concept of Metaverse	19					1
To be able to remember the history of the concept of Metaverse	20					1
To be able to explain the benefits of using the Metaverse universe		21				1
To be able to associate with the concept of Metaverse (Blockchain, NFT, 5G, Web 3. 0) technologies		22,23				2
To be able to give examples from daily life by comparing the differences between technologies that can be associated with the concept of metaverse				24		1
To be able to create possible usage scenarios of these technologies in the field of education by associating the concept of metaverse with technologies such as blockchain, NFT, 5G and Web 3.0					25	1
Total	8	9	2	5	1	25

An item pool of 53 items to be used in the achievement test to be developed in accordance with the specification table was created in order to determine the academic achievement of non-thesis master's degree students regarding the 'History of Three-Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of the Virtual Learning Technologies course.

For the construct and content validity of the achievement test, 1 faculty member who is an expert in the field of Measurement and Evaluation in Education, 4 faculty members who are experts in the field of Curriculum and Instruction, and 4 faculty members who are experts in the field of Open and Distance Learning were consulted and their opinions were taken.

In the expert opinion form presented to the field experts, they were asked to evaluate the items and give their opinions on whether the items were prepared in accordance with the knowledge level and outcomes specified in the specification table. The opinions of the field experts were analysed, the items that needed to be corrected were corrected and the items that needed to be removed from the test were removed as a result of the evaluations and the 25-item achievement test was made ready for the trial application.

The trial application was applied to 27 non-thesis master's degree students studying at Anadolu University Graduate School of Postgraduate Education in the autumn semester of the 2024-2025 academic year and taking the Virtual Reality in Visual Communication course coded GIT 509.

3. Findings

After the trial application, item analysis of the achievement test was carried out. While preparing the achievement test for item analysis, correct answers were entered as 1 and incorrect answers as 0 in Microsoft Excel table. Since the students were asked to respond to all items, there were no items left blank. Students can get a minimum score of 0 and a maximum score of 100 points from the achievement test.

Figure 2: Item Analysis Results

Item Number	Number of Students Responding Correctly	Difficulty Index	Item Discrimination Index	Results
1	26	0.96	0.38	A good item (Fairly easy)
2	21	0.78	0.40	A very good item (Fairly easy)
3	8	0.30	0.06	The item should be completely revised or removed from the test (Difficult)
4	14	0.52	0.54	A very good item (Moderately difficult)
5	11	0.41	0.62	A very good item (Difficult)
6	15	0.56	0.47	A very good item (Moderately difficult)
7	13	0.48	0.45	A very good item (Moderately difficult)
8	10	0.37	0.33	A good item (Difficult)
9	24	0.89	0.46	A very good item (Fairly easy)
10	19	0.70	0.40	A very good item (Fairly easy)
11	10	0.37	0.31	A good item (Difficult)
12	19	0.70	0.60	A very good item (Fairly easy)
13	26	0.96	-0.04	The item should be completely revised or removed from the test should be removed (Fairly easy)
14	19	0.70	0.65	A very good item (Fairly easy)
15	23	0.85	0.61	A very good item (Fairly easy)
16	22	0.81	0.58	A very good item (Fairly easy) A very good item (Fairly easy)
17	19	0.70	0.48	A very good item (Fairly easy)
18	19	0.70	0.46	A very good item (Fairly easy)
19	16	0.59	0.34	A good item (Moderately difficult)
20	16	0.59	0.34	A good item (Moderately difficult)
21	19	0.70	0.50	A very good item (Fairly easy)
22	6	0.22	-0.33	The item should be completely revised or removed from the test (Difficult)
23	21	0.78	0.33	A good item (Fairly easy)
24	16	0.59	0.38	A good item (Moderately difficult)
25	23	0.85	0.23	The item should be corrected (Fairly easy)

When Figure 2 is analysed, it can be said that the items are distributed evenly when the item difficulties and discriminations of the items are considered. The items with very low item discrimination indexes and the items that should be completely revised were included in the test by reorganising the item root and item choices.

The statistical values obtained for the achievement test as a result of the trial application are summarised in Figure 3.

Figure 3: Achievement Test Statistical Values

Number of questions	25
General success average	64.14
Maximum score	92
Minimum score	32
Average Difficulty Index	0.64
Average Distinctiveness Index	0.38
KR-20	0.763

As a result of the trial application, the reliability coefficient of the achievement test (KR-20) was calculated as .763, the average item difficulty index as 0.64, and the average item discrimination as 0.38. As a result of the achievement test development process, a valid and reliable measurement tool that can be used for virtual learning technologies achievement test consisting of 25 items was developed for non-thesis master's degree students.

4. Discussion and Conclusion

As a result of the studies, a valid and highly reliable achievement test was developed to determine the achievement of the students in the 'History of Three-Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of the Virtual Learning Technologies course. While developing the achievement test in this study, similar test development steps developed by Turgut and Baykul (2021) were followed. The achievement test was administered to 27 non-thesis master's students studying at Anadolu University Graduate School of Postgraduate Education in the autumn semester of the 2024-2025 academic year and taking the Virtual Reality in Visual Communication course coded GIT 509 online. When the literature was examined, no similar achievement test development study was found within the scope of the Virtual Learning Technologies course or in the 'History of Three-Dimensional Technologies', 'Augmented Reality', 'Virtual Reality' and 'Metaverse' subjects of the Virtual Learning Technologies course. As a result of the item analysis performed after the application, the reliability coefficient (KR-20) of the achievement test was calculated as .763. According to Büyüköztürk et al. (2024) and Heale and Twycross (2017), the reliability coefficient of the achievement test should be 0.70 and more than 0.70. Therefore, the .763 value obtained in this study can be said that the achievement test is reliable.

As a result of the item analysis performed after the application, the average item difficulty index of the achievement test was calculated as 0.64. The value of 0.64 obtained from this study indicates that the achievement test is at medium difficulty level. As a result of the item analysis performed after the application, the average item discrimination of the achievement test was calculated as 0.38. According to Ebel (1965), items with item discrimination values between 0.30 and 0.39 have good discrimination values. The value of 0.38 obtained in this study shows that the discrimination of the achievement test is at a good level.

Note: This study constitutes a part of the doctoral thesis prepared by the second author under the supervision of the first author.

5. References

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