Development of Interactive Videos for Learning Management System Usage and Investigation of Users' Experiences

Öğrenme Yönetim Sistemi Kullanımına Yönelik Etkileşimli Videoların Geliştirilmesi ve Kullanıcıların Deneyimlerinin İncelenmesi

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Abstract: Having a support system that provides novice users with quick and practical assistance for navigating learning management systems (LMS) is essential. This research aims to develop an interactive, video-based online tutorial with engaging elements for LMS usage at the Afyon Kocetepe University and to examine users' experiences. Despite the availability of a help-support structure for navigating the LMS interface, instructors have faced difficulties in adapting to it. To address this, we created a new modular and flexible online tutorial enhanced with multimedia components to assist users in navigating the LMS. The study employed a formative research method, presenting the tutorial to real users for evaluation. The findings revealed that the average usability score of the tutorial was 76.8. Additionally, the average scores for knowledge retention and transfer testscores related to the interactive video content were 73.2. No significant differences were found in usability scores, retention, or transfer test scores based on gender or field of study. In conclusion, the online tutorial, featuring interactive video content, demonstrated usability scores well above average and had a positive impact on both conceptual and procedural learning. These findings will provide valuable insights for the literature and inform future research focused on designing and implementing similar systems.

Keywords: Online tutorial, interactive video, user experience, software training, learning management system, usability

Öz: Öğrenme yönetim sistemlerini (ÖYS) kullanırken sorun yaşayan acemi kullanıcıların hızlı ve pratik yardım alabileceği bir destek sistemine sahip olmak çok önemlidir. Bu araştırma, Afyon Kocatepe Üniversitesi'nde ÖYS kullanımı için etkileşimli ögeleri çeren, video tabanlı bir çevrim içi öğretici geliştirmeyi ve kullanıcı deneyimlerini incelemeyi amaçlamaktadır. ÖYS'yi kullanmak için bir yardım-destek yapısı mevcut olmasına rağmen, eğitmenler buna uyum sağlamakta zorluk çekmektedirler. Bu çerçevede ÖYS'ye yönelik çoklu ortam ögeleri ile zenginleştirilmiş, modüler ve esnek bir yapıya sahip yeni bir çevrimiçi öğretici tasarımı gerçekleştirilmiştir. Araştırma sürecinde biçimlendirici araştırma yöntemi temel alınmıştır. Bu kapsamda tasarım otantik kullanıcıların değerlendirmesine sunularak kullanılabilir bir yapıya sahip olmasına çalışılmıştır. Araştırma neticesinde geliştirilen çevrimiçi öğreticinin kullanılabilirlik düzeyi ortalama puanının 76.8 olduğu; hatırda tutma ve transfer testi ortalama puanının ise 73.2 olduğu görülmüştür. Gerek kullanılabilirlik puanlarının gerekse hatırda tutma ve transfer testi puanlarının cinsiyet ve çalışma alanına göre istatistiksel olarak farklılık göstermediği ortaya çıkmıştır. Neticede, etkileşimli video içeriklere sahip çevrim içi öğreticinin kullanılabilirliğinin ortalamanın oldukça üzerinde olduğu, kavramsal ve prosedürel öğrenme üzerinde olumlu katkılarının olduğu söylenebilir. Araştırma sonuçlarının ilgili alanyazınına katkı sunacağı, benzer kapsamda tasarım ve uygulama yürütecek araştırmacılara yapacakları çalışmalarda ışık tutacağı öngörülmektedir.

Anahtar Kelimeler: Çevrim içi öğretici, etkileşimli video, kullanıcı deneyimi, yazılım eğitimi, öğrenme yönetim sistemi, kullanılabilirlik

Introduction

A Learning Management System (LMS) is an integrated framework designed to present and manage learning content, monitor users, customize learning experiences, and facilitate collaboration (Ozan, 2008; Thuseethan et al., 2014). These systems enhance the effectiveness of educational processes in a digital environment, significantly improving teaching and learning activities.

LMSs provide the necessary infrastructure for distance education and are increasingly used in higher education to support face-to-face training within blended learning frameworks (Anthony et al., 2022; Torrisi-Steele & Drew, 2013). This approach ensures continuous interaction between students and instructors, thereby enriching the overall learning experience. Each academic year, new students and instructors are introduced to these systems as they begin their first-time use. They must learn how to navigate the system effectively. While text-based guides are commonly available, they often fall short in helping users quickly adapt to system updates. Therefore, multimedia-supported tutorials are considered promising tools for improving user learning and system adoption. This study aims to design an interactive video-based tutorial to assist users in utilizing the LMS and to explore their experiences, specifically their perceptions of usability regarding this material.

Problem Statement

The most critical success factors for distance education in higher education include efforts made to develop infrastructure and support systems (Angolia& Pagliari, 2016). At Afyon Kocetepe University, a new version of the LMS, which has long been used to facilitate distance education, was implemented in the fall semester of the 2023-2024 academic year. As part of this transition, text-based user manuals for the new LMS interface were published. However, during this period, it became apparent that some instructors struggled to adapt to the new system. Many of them frequently reached out to the university's support unit via phone or email, rather than relying solely on the available text-based resources.

This study aims to design an interactive, video-based online tutorial that includes engaging elements to enhance the effectiveness of the current support structure and encourage active use of the new version of the LMS. The objective is to

examine users' experiences with this tutorial. To achieve this, the tutorial will focus on specific topics related to LMS usage through the interactive video content created for this research. If the video-based online content is effective, efficient, satisfying, and easy to learn—based on a needs analysis—the improvements made will inform the development of future interactive videos on other topics related to LMS usage. The relevant literature emphasizes that video-based materials, designed according to the principles of multimedia learning, are more effective in enhancing learning than text-based materials (Choi & Johnson, 2005; Clark & Mayer, 2023; Clark et al., 2015; Heemsoth et al., 2022; Kormos, 2022). It is also highlighted that conducting usability studies for technological products or systems is crucial (Bayrak et al., 2014). Usability is considered a crucial factor that influences users' learning experiences and outcomes (Ardito et al., 2006; Vlachogianni& Tselios, 2022). Therefore, examining the effectiveness of online tutorial content that applies multimedia learning principles, along with its usability, is believed to enhance the existing literature on multimedia learning and usability.

Literature Review

Learning Management Systems (LMS) and User Support

From the students' perspective in higher education, LMS facilitate participation in all course activities, from university enrollment to graduation, especially in distance education. They also offer access to additional written, visual, and auditory resources that support in-person learning. This creates an environment where learners can seamlessly interact with peers and instructors from anywhere. Such a shared platform enhances accessibility in education, thereby expanding learning opportunities. For instructors, LMS platforms are essential for delivering and managing distance course activities. They provide supplementary resources, content, and activities to enhance face-to-face courses. This adaptability enriches the teaching process, ensuring that materials are suitable for diverse learning styles.

Universities admit new students and faculty members every year, resulting in a regular influx of new users for their LMS. These new users must have access to support structures that can quickly resolve any issues they encounter while using the LMS. These support systems are most effective when they include updated and accessible online tutorials that adhere to relevant regulations. Training for any software platform requires users to engage in self-regulated learning strategies to achieve their individual goals. Software training can be delivered through various formats, including face-to-face sessions or online courses. Research suggests that web-based, asynchronous education can address the shortage of teaching resources while also reducing educational costs (Gravill & Compeau, 2008; Pakdaman et al., 2019).

Online tutorials enable individuals to learn independently in various contexts, from using software to operating a device. Their usage is on the rise, effectively meeting both personal and institutional needs. Particularly in higher education, the demand to reach a larger number of users with limited personnel makes online tutorials increasingly necessary. They offer flexibility by providing 24/7 access to materials (Naing & Hlaing, 2020; Stiwinter, 2013), allowing learners to study at their own pace, independent of time and place (Castro, 2019;Naing& Hlaing, 2020).Another significant advantage of online tutorials is their ability to create a versatile learning environment by integrating text, graphics, videos, animations, and sound, which caters to various learning styles (Zhang et al., 2020). Furthermore, the growing preference for online learning, which eliminates the need for physical attendance at a specific location, has become increasingly apparent, especially in recent times (Brown, 2021; Stiwinter, 2013). Given these advantages, online tutorials are being utilized across various educational settings.

Video-based Tutorials

Online tutorials come in various formats, with text-based tutorials having been widely used for a long time (Van der Meij& Van der Meij, 2015). However, recent evaluations indicate that learners generally perceive video-based tutorials as less effective, particularly in terms of motivation, understanding, and retention, as well as social and instructional presence, perceived instructor effectiveness, and skill development (Clark et al., 2015; Choi & Johnson, 2005; Heemsoth et al., 2022; Kormos, 2022). As a result, there has been a growing emphasis on the use of multimedia-enriched tutorials.

With technological advances, creating and distributing video content has become significantly easier. This change has also led to the use of videos for various purposes, including enhancing learning. As a result, digital platforms have rapidly expanded, and the capacity for content production has increased, enabling a wider audience to reach. Research indicates that video-based tutorials can effectively provide a general and comprehensive introduction to the practical use of technology (Khan et al., 2024; Ponzanelli et al., 2016). Users often turn to these tutorials to address immediate problems without requiring in-depth information. Consequently, video content meets the needs for quick and effective problem-solving, saving both time and effort in the learning process.

Studies suggest that video content is more effective than static text for teaching specific tasks (Carter et al., 2018; Clark & Mayer, 2023). This is primarily because the combination of visual and auditory elements enhances information retention and contributes positively to learning by reducing distractions. In recent years, there has been a growing preference for platforms like YouTube to fulfil various learning needs, which further supports this trend (Giannakos, 2013). The ease of access and the variety of content options on these platforms have increased their popularity and user preference. Major companies such as Adobe, Apple, HP, Microsoft, and TechSmith have replaced text-based software training with video content (Van der Meij& Van der Meij, 2015). This trend is indicative of a significant transformation in educational and learning approaches, driven by technological advancements and changing user expectations.

Mayer's multimedia theory is grounded in three key assumptions. It emphasizes the use of dual channels (visual and auditory) during information processing. The theory acknowledges that each channel has a limited capacity in working memory and asserts that information is actively processed during learning (Clark & Mayer, 2023). The dual coding theory further supports the notion that using both visual and auditory channels enhances learning and retention (Clark & Mayer, 2023; Clark & Paivio, 1991). This theory explains the effectiveness of video content in educational contexts, as it leverages multiple channels for information delivery. Videos facilitate the simultaneous presentation of different types of information related to specific instructions. As a result, learners can access information in various formats and at different times. Moreover, video tutorials allow users to observe a real task in action, simulating the experience of performing it themselves, while providing real-time assistance

during task execution. This approach reinforces the learning context and supports hands-on learning processes. It is also important to evaluate the cognitive effects, usability, technical aspects, and pedagogical features of materials developed in accordance with multimedia learning principles. Such evaluation provides a comprehensive assessment of these materials (Jiang et al., 2017; Mayer, 2008). This represents a crucial step toward the effective and appropriate use of educational technologies, guiding the development and improvement of this field.

Usability and User Experience in Video Tutorials

The effectiveness of an online tutorial in achieving its goals is closely tied to its high usability, particularly from the perspective of authentic users. The term "usability" emerged in the 1980s to replace earlier concepts like "user-friendliness" and "ease of use" (Sauer et al., 2020). A widely accepted definition of usability emphasizes three key aspects: effectiveness (the users' ability to complete tasks qualitatively using the system), efficiency (the resources required for completing tasks), and satisfaction (the subjective responses of users to system use) (International Organization for Standardization [ISO], 2019). While the definitions of usability may vary, there is a general consensus that it encompasses common elements, such as performance metrics (e.g., error rates, recall rates, and learning rates), as well as subjective measures like satisfaction, enjoyment, and pleasure (Sauer et al., 2020). According to another definition, usability is characterized by being easy to learn, effective to use, and enjoyable from the user's perspective (Nathoo et al., 2019; Sharp et al., 2007).

The concept of "user experience (UX)" has emerged with an expanded understanding of usability (Sauer et al., 2020). User experience is defined as the perceptions and responses users have when using, or anticipating the use of, a system, product, or service (ISO, 2019). This definition suggests that user experience extends beyond traditional usability by encompassing factors such as usefulness, emotional responses, and aesthetic design (Vosinakis&Koutsabasis, 2018). Understanding and improving user experience is essential for increasing a product or service's success and ensuring user satisfaction. The quality of the user experience can be assessed through various methods, including quantitative performance tests, physiological measurements, and subjective feedback gathered through surveys (Neumann & Westbury, 2011; Vermeeren et al., 2010). These approaches help to gain insights into users' perceptions and emotional reactions to the system, facilitating design improvements and enhancing ease of use, ultimately leading to more interactive and user-centered design solutions.

Research on the use of information and communication technologies (ICT) has explored various demographic variables, with a particular emphasis on gender. This aspect has garnered significant interest from researchers over the years and remains a critical concern in the educational context (Cai et al., 2017; Top et al., 2011). Studies examining how technology use varies by gender have produced mixed results (Hohlfeld et al., 2013; Kaarakainen et al., 2017; Taşçı et al., 2023; Teo et al., 2016). Additionally, research indicates that a participant's field of study significantly influences their use of ICT, as shown in the relevant literature (Çelik, 2019; Sengir, 2019; Sırakaya, 2019).The participants in this research include graduates from quantitative fields, such as science and mathematics, as well as those from verbal or interdisciplinary fields, such as Turkish Language Education, Logistics,

International Trade, and Finance (UTF). Therefore, it is relevant to investigate whether the usability of the online tutorial and users' performance after utilizing it differ based on these demographic variables.

Research Aim and Research Questions

The purpose of this research is to develop an interactive, video-based online tutorial with engagement elements for the LMS utilized at Afyon Kocatepe University, and to analyze users' experiences. In this context, the following questions were investigated:

1. Regarding LMS usage:
   a. What is the current state of the existing support structure?
   b. What are the needs and expectations?
   c. What authentic tasks should be included in the content of the designed video-based online tutorial?
   d. What types of materials can be used to create the content of the designed video-based online tutorial?
   e. How can the design of the video-based online tutorial be structured?
2. Regarding the usability of the video-based online tutorial for LMS:
   a. To what extent is the tutorial usable?
   b. Does its usability differ significantly based on the participants' gender?
   c. Does its usability differ significantly based on the participants' field of study?
3. How do participants perform after using the video-based online tutorial for the LMS?
   a. Do the participants' performances in LMS usage differ significantly by gender?
   b. Do the participants' performances in LMS usage differ significantly by field of study?
4. What are the participants' opinions regarding the video-based online tutorial for the LMS?

Method

This section provides information about research design, participants, and measurement tools.

Research Design

The study is designed according to the formative research methodology proposed by Reigeluth and Frick (1999), which aims to develop and refine design theories. The goal of formative research is to create or enhance instructional practices by establishing the models or key frameworks necessary for the design process (Reigeluth, 1999). In this context, an in-vivo naturalist design approach was employed (Reigeluth& Frick, 1999). This approach involves designers collecting formative data from current or existing situations to inform the design process. For the development of the video-based online tutorial, the designers followed these steps from an in-vivo naturalist perspective: (1) identifying and explaining a problem situation, (2) collecting and analyzing formal data related to the problem, (3) reviewing and improving the problem situation, and (4) sharing the experiences gained throughout the process (Reigeluth& Frick, 1999).

The video-based online tutorial was developed in four phases from an in-vivo naturalistic perspective, with each phase comprising sub-steps conducted at different times and durations. In the first phase, the problem situation was identified and explained. The second phase involved using existing documentation related to the current user support

system and needs analysis data as sources of information. Based on this data, a task analysis was performed for the planned video-based online tutorial, outlining the task boundaries and guiding the development of content that aligned with the aims and objectives set forth in the study. During the creation of interactive videos, we followed the steps proposed by Van der Meij and Van der Meij (2013) for developing instructional videos in software training contexts. The final step of this phase involved presenting the developed content within the existing LMS. Following this, we evaluated the usability of the online tutorial among participants and examined its impact on learning. In the final stage, all findings from the process were collectively assessed.

Participants of the Study

The study focuses on faculty members who use the LMS. When selecting participants for usability studies, two key considerations must be taken into account: First, participants should be authentic users of the system or product being evaluated (Dumash& Redish, 1994). Second, to ensure a high representation of the target users, participants should come from diverse backgrounds (Rubin, 1994). Research indicates that approximately 85% of usability issues related to a product can be identified with just five participants (Nielsen, 2000).

In this study, participants were selected voluntarily from among faculty members across different units who had not previously used the LMS. A total of 14 individuals took part in the study. Demographic information about the participants is presented in Table 1.

Table 1. Demographic information of the participants

Participants	Gender	Field of Study
P1	F	Department of Mathematics and Science Education
P2	F	Department of Primary Education
P3	F	Department of Primary Education
P4	F	Department of Mathematics and Science Education
P5	M	Department of Mathematics
P6	F	Department of Mathematics and Science Education
P7	F	Department of Mathematics
P8	M	Department of Mathematics
P9	M	Department of Logistics Management
P10	M	Department of Logistics Management
P11	M	Department of International Trade and Finance
P12	F	Department of International Trade and Finance
P13	M	Department of Turkish and Social Sciences Education
P14	M	Department of Logistics Management

According to Table 1, there are 7 male participants (50%) and 7 female participants (50%). Additionally, 6 participants have graduated from a quantitative field and are employed in a related field (Department of Mathematics and Science Education and Department of Mathematics). Similarly, 8 participants have graduated from an equally weighted field and work in a relevant department (Department of Primary Education, Department of Logistics Management, Department of International Trade and Finance Department of Turkish and Social Sciences Education).

Data Collection Tools and Process

Both quantitative and qualitative data collection techniques were utilized within the framework of formative research. This approach aimed to enhance the validity of the measurements by employing multiple tools (McMillan & Schumacher, 2010). For qualitative data collection, we used Document Review (DR) and Interviews. For quantitative data collection, the System Usability Scale (SUS) and Performance Test (PT) were implemented. Table 2 outlines the stages at which these data collection tools were used in the study.

Table 2. Data collection tools and their use stages

Data Collection Tools	Before Implementation	After Implementation
Document Review (DR)	✓	
Interviews	✓	✓
System Usability Scale (SUS)		✓
Performance Test (PT)		✓

Document Review (DR)

Research data were mainly collected by reviewing written sources. In this context, we analyzed existing text-based online tutorial content related to the use of LMS. To establish the theoretical framework for the design, define the design model, and identify the types of materials that will make up the new online tutorial content, we also reviewed relevant literature and gathered information from these sources.

Interviews

As part of the research, unstructured interviews were conducted with faculty members responsible for managing and organizing the LMS. The goal was to identify current issues and needs related to the use of the LMS. An unstructured interview is a type of interview that occurs without a predefined protocol, allowing for a natural and spontaneous flow of conversation between participants (Gall et al., 1996).

Participants in the study were asked two open-ended questions about their experiences with the video-based online tutorial: "(1) What positive aspects did you find in the interactive videos? (2) What negative aspects did you find in the interactive videos?" These questions were posed verbally, and participants' responses were recorded. The goal was to gather in-depth opinions from participants regarding the usability of the video-based online tutorial and its impact on their performance related to the LMS.

System Usability Scale (SUS)

Considering factors that will impact interactions with authentic users from the design phase of a system can lead to the creation of a more usable system (Nielsen, 1993). The literature categorizes various usability evaluation methods into three main groups: design-based, expert-based, and user-based (Çakıçı et al., 2017). In this context, user experiences were consulted to assess the usability of the online tutorial at the end of its design process. User experience refers to the feelings and thoughts that users have during and after using a system (Buley, 2013).

In this context, the System Usability Scale (SUS), originally developed by Brooke in 1996 and later adapted into Turkish by Çağıltay in 2011, was utilized. The scale's reliability and validity were confirmed by Kadirhan et al. in 2015. SUS consists of 10 items and uses a 5-point Likert scale to evaluate overall usability, allowing for individual administration. In the application process, users are first given the opportunity to interact with the system. Afterward, they are asked to complete the SUS questionnaire without prior notification or interviews within a short timeframe. If users

experience hesitation with certain items, they are encouraged to select the midpoint of the scale (Çağıltay, 2011).

For scoring, each item is rated from 0 to 4. Odd-numbered items are scored using the formula "Scale Position - 1," while even-numbered items are scored as "5 - Scale Position." The total scores are then multiplied by 2.5 to determine the final usability score of the system (Çağıltay, 2011). The reliability of the scale was calculated using Cronbach's Alpha, resulting in a value of .924. Since this value exceeds .70, it indicates that the scale scores are reliable (Büyüköztürk, 2012).

LMS Usage Performance Test (PT)

The impact of the topics presented in the video-based online tutorial on knowledge retention and transfer was evaluated through a performance test conducted by the design team. This test was developed based on the main topics and tasks covered in the online tutorial. First, a specification table was created, outlining the learning outcomes related to the relevant topics and tasks. Questions were then developed within the scope of these topics and learning outcomes. These questions were reviewed by two domain experts and one measurement and evaluation specialist. Based on their feedback, the final version of the performance test was completed.

To assess the content validity of the performance test developed, we calculated the content validity indices based on Davis's (1992) method. This approach involves having experts rate each item on a four-point scale: "A - Item content is representative," "B - Item needs minor revision," "C - Item needs major revision," and "D - Item is not representative of the content." For each item, we sum the ratings of categories "A" and "B" across all evaluation forms and then divide by the number of experts to obtain the Content Validity Index (CVI). If the CVI is above .80, the item is deemed sufficiently valid concerning its content. Items with a CVI below .80 are excluded from the test. It is recommended that evaluations be conducted by a minimum of 3 and a maximum of 20 experts (Davis, 1992). In this study, all items except one had a CVI greater than .80, indicating sufficient content validity. Consequently, we finalized a performance test comprising 9 items. Furthermore, a measurement and evaluation expert suggested using a structured grid for scoring, as some items have only one correct answer while others have multiple correct answers. This method allows participants' responses to be scored on a scale from 0 to 10 (Başol, 2019). Therefore, the highest possible score on the 9-item test is 90, while the lowest is 0. Within this framework, after creating the video-based online tutorial content, we expect to use participants' evaluations and performance results related to LMS usage as data sources for the subsequent development process of the design.

Data Analysis

Various analysis methods were employed due to the different types of data collected in the study. The processes involved in data analysis are explained below.

Qualitative Data Analysis

The qualitative data for the research were primarily gathered through an analysis of existing video-based online instructional content related to the use of the LMS. At this stage, a content analysis was conducted to assess the current situation. Throughout this process, the researchers collaborated closely, and the relevant findings were reported subsequently. The analysis of the interview data was conducted using content analysis methodology. First, the recordings of the interviews were converted to digital format. Then, thematic categories were developed based on a conceptual framework, and the data were coded accordingly. Throughout this process, new conceptual themes that emerged were added to the coding list, while existing codes were modified in light of these new themes. An intercoder reliability study was conducted as part of the data analysis process, focusing on the established themes. To calculate reliability, the frequency of codes where there was consensus among coders was divided by the total frequency of all codes. In qualitative data analysis involving multiple researchers, the reliability level should be at least 70% (Yıldırım & Şimşek, 2013). In this study, the inter-coder reliability was determined to be 94%, ensuring a high level of agreement among coders. Participants' information was kept confidential in accordance with ethical standards. When quoting their views, identifiers such as P1, P2, ..., P14 were used to maintain their anonymity.

Quantitative Data Analysis

The methods used to analyze the quantitative data collected in this study are as follows: (1) Descriptive statistics were applied to evaluate the usability of the video-based online tutorial and to assess performance related to the use of the LMS. (2) Additionally, inferential statistics were utilized to investigate whether the scores for usability and LMS usage performance tests varied based on factors such as gender and field of study.

Findings

This section presents the findings derived from analyzing the data collected in relation to the research questions identified in the study.

Design and Development of a Video-based Online Tutorial for LMS Use

Existing Support Structure for LMS Use

Before designing a video-based online tutorial for LMS use, a study was conducted to assess the current situation. As part of this investigation, web pages and other documents related to teaching the LMS interfaces and functionalities were examined. It was discovered that a PDF document titled "Instructor's User Guide" was available on the X website. Additionally, two text-based web pages, supported by visuals and titled "Frequently Asked Questions" and "Common Issues and Solutions," were found on the same site (https://x.edu.tr/). It was noted that the related videos were entirely non-interactive and consisted of content explaining how to use the LMS, presented in various durations.

Consequently, it was noted that with the introduction of the new LMS interface, various efforts were initiated within X. A thorough text-based help and support system regarding the usage and functions of the LMS was established.

The Requirements of Faculty Members for Learning How to Use The LMS

The design team conducted an interview. The purpose of the interview was to identify the specific training needs of users regarding the LMS interface and its functionalities. The data collected from the interview were analyzed using content analysis, and the findings are summarized below:

- Faculty members, particularly those new to the LMS, require support in creating question banks within the system.
- Faculty members new to the LMS need assistance in creating online exams.

- There is a demand for assistance in setting up online exam sessions, particularly for faculty members who are new to the platform and starting their courses for the first time.
- As new faculty members join the university each year, there is an ongoing need for interactive support to aid their integration into the LMS.

Findings From the Task Analysis of Video-based Online Tutorial Design for LMS Use

Task analysis helps identify the content that needs to be taught. Several techniques are available in the literature for conducting task analysis. In this study, we have selected the "Goals, Methods, Operators (Operands), and Choices (HYOS)" method, which is a cognitive task analysis technique. This method was specifically developed to analyze user tasks, particularly goal-oriented tasks, in computer environments (Jonassen et al., 1998). The effectiveness of the HYOS method is well-established in the field of human-computer interaction and is particularly suitable for designing educational programs and help systems. The components of the HYOS method involve the following process steps: (1) Setting goals, (2) Determining methods, (3) Identifying operators, and (4) Establishing decision rules. This study summarizes the execution of these processes under the following headings:

Goal Setting

In this step of the task analysis method, we identify the expected performances from users. This process involves cataloguing all tasks within the LMS through an inventory. From this catalogue, we prioritize specific goals, taking into account our limited resources. Next, we break down these tasks into the smallest possible units and organize all main tasks, along with their subtasks, in a hierarchical structure.

Determining Methods

At this stage of the analysis, we identified methods to achieve the previously established goals. Based on the situational and needs analysis data, we concluded that videos featuring screen recordings and voice-overs would be suitable, and we proceeded with the analysis process accordingly.

Identifying Tools

In this phase of the analysis, we identified the tools that users would utilize to achieve the previously established goals and methods. These tools are essentially the instruments necessary for accomplishing the targeted objectives and can be categorized as either internal or external tools (Jonassen et al., 1998). According to Jonassen et al. (1998), external tools involve interactions with physical objects, while internal tools consist of mental processes. In this study, the content of the prepared videos is classified as external tools that enhance user interactions. For the internal tools, we selected various video production techniques and design principles that align with users' cognitive processes.

Determining Decision Rules

In this step of the analysis method, we conducted the selection process. Selection involves choosing the most suitable approach when multiple alternative methods are available to achieve a task or goal. In the context of the LMS platform under examination, we considered various alternative methods and focused on selecting those that would allow users to complete tasks in the shortest time possible.

As a result of the needs analysis conducted for the LMS and the interface review, the design team performed a task analysis related to the tasks included in the online interactive videos. Following this analysis, the team identified three main goals along with their respective sub-goals for the online instructional content, as outlined in Table 3.

As shown in Table 3, most tasks fall under the category "Creating and Editing Exam Activities," while the fewest tasks are categorized as "Defining and Editing Exam Sessions." Specifically, there are nine different tasks identified under the "Creating and Editing Exam Activities" heading. This larger number of tasks can be attributed to the fact that the processes involved in creating and editing exam activities are more complex. Furthermore, the emergence of more issues during the needs analysis reinforces this observation.

Although the number of critical tasks varies across these three categories, it is important to note that the tasks within each category are closely interconnected. For instance, all tasks listed in the table are equally important and have either direct or indirect relationships with one another. In other words, all the tasks presented in Table 3 collectively represent essential components of the overall process.

Selection of Material Type for Content Creation of the Video-based Online Tutorial

Online tutorials can differ widely in terms of content, length, format, and distribution methods. As the use of videos for teaching software applications becomes increasingly common, it is crucial to consider how video content is processed and how to design an effective tutorial environment (Van der Meij, 2014). This study highlights the use of video materials in the development of online tutorials, supported by various theoretical and empirical foundations:

- The principles of the Multimedia Cognitive Learning Theory (Mayer, 2005; Moreno, 2006, 2009), and the expanded Media Cognitive-Affective Learning Theory (Van der Meij, 2014).

Table 3. Findings of task analysis for the online tutorial designed for LMS use

Question Bank Creation and Editing	Creating and Editing Exam Activities	Defining and Editing Exam Sessions
• Searching based on search criteria. • Editing previously added questions. • Adding new questions. • Adding questions of multiple-choice type. • Adding questions of multiple response type. • Adding open-ended questions. • Adding ranking questions.	• Steps for creating an exam activity • Creating messages before/after the exam • Selecting the class section for the exam • Setting the start and end dates of the exam • Determining the entry time for the exam • Modifying the timing options for the exam activity • Configuring the exam category and question weighting settings • Establishing prerequisites for the exam activity • Setting the exam session parameters	• Steps for creating an exam session • Adding/removing students from the exam session • Adding/removing questions from the exam session • Assigning a password for exam access • Publishing the exam session

- Research findings indicate that video-based online tutorials are more effective than text-based tutorials in promoting conceptual and procedural learning (Alexander, 2013; Clark et al., 2015; Choi & Johnson, 2005; Heemsoth et al., 2022; Kormos, 2022; Lloyd & Robertson, 2012).

As a result, the design team decided to incorporate interactive learning materials in video format into the online tutorial content, aligning the design process with the principles outlined by Van der Meij and Van der Meij (2013).

Development of Video-based Online Tutorial Content

Prior to recording the videos, we planned the content carefully and prepared the video scripts in written form. To ensure consistency and accuracy, both the video and text content contained the same information. Each video was paired with its corresponding text by assigning them the same number for verification purposes. In total, we produced five interactive video contents as part of the research (Figure 1).

Figure 1. Example screenshots of interactive video content

In preparing the interactive video materials, we followed the 8-step process developed by Van der Meij and Van der Meij (2013) specifically for creating educational videos focused on software training. The relevant steps and procedures carried out in this study are outlined as follows:

Ensuring Easy Access

We focused on selecting appropriate video titles to ensure easy access. Each title was crafted to be concise and explanatory, using action verbs to convey the subject matter clearly. We also prioritized consistency, ensuring that videos appeared uniform across various locations. Additionally, we considered the full dimensions of the videos and the horizontal scrolling features to eliminate any obstacles to usage, thereby ensuring smooth accessibility.

Use of Meaningful Animations

To make the videos as realistic as possible, we included human voiceovers and applications that users might encounter in real tasks. The mouse cursor's appearance during events was used to enhance clarity, and we highlighted features to emphasize important elements. Narration was presented verbally, with all steps synchronized with the visuals in the videos, ensuring coherence between the spoken content and what is displayed.

Activating Functional Interactivity

At this stage, where interaction is essential, the speed of the videos was carefully adjusted. They were prepared with a conversational pace to encourage user engagement. Different colour-highlighted animations were used at key steps to draw attention. Furthermore, to enhance engagement, various assessment components were integrated using the platform's development capabilities. These assessments included various formats, such as true/false, fill-in-the-blank, multiple-choice, multiple-response, and drag-and-drop matching. This approach aimed to reinforce both conceptual and procedural

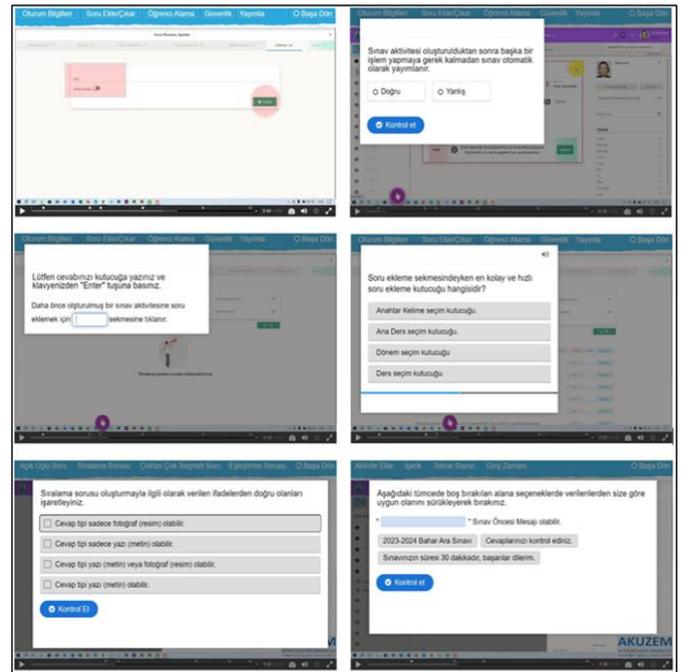knowledge through formative and summative assessments (Figure 2).

Figure 2. Examples of highlighting and question interactions used in video content

Previewing the Task

Each video begins with a preview of the task to be taught, followed by a clear conversational narration of the task. Any new concepts are introduced at this stage. This structure has been incorporated into the prepared videos.

Emphasizing Procedural Knowledge Over Conceptual Knowledge

In the videos, conceptual knowledge was only included when necessary for clarity. When the videos contained dense conceptual content, the focus was on pausing during step-by-step procedures to aid comprehension.

Making Tasks Clear and Simple

All the videos offer clear instructions on how to perform each task. They use attention-grabbing colours to enhance engagement. When tasks involve multiple steps, the videos are segmented into distinct sections for clarity. Furthermore, important points are highlighted, and related data is presented consecutively to emphasize key information.

Keeping Videos Short

Plaisant and Shneiderman (2005) recommend that instructional videos be between 15 and 60 seconds long; however, Chan et al. (2010) observe that videos around three minutes in length are considered acceptable in certain contexts. Pausing during these videos is essential for reducing cognitive load, and pause points allow for repeat viewing or resumption (Van der Meij and Van der Meij, 2013). Therefore, the videos created for this study are all less than three minutes long and include "play" and "pause" buttons.

Application and Demonstration

The videos primarily aim to blend teaching with practical application (Van der Meij and Van der Meij, 2013). Consequently, the intended learning objectives are illustrated through example applications within the videos.

Integration and Presentation of Video-based Online Tutorial Content Into the LMS

The online instructional content was created as part of a course within the LMS. Following a task analysis conducted for the study, all task titles were organized and presented in a linear sequence within this course. Each instructional video, which corresponded to a specific task, was individually retrieved from the system's hosting environment. As a result, the integration of the online tutorial content into the learning management system was successfully completed (see Figure 3).
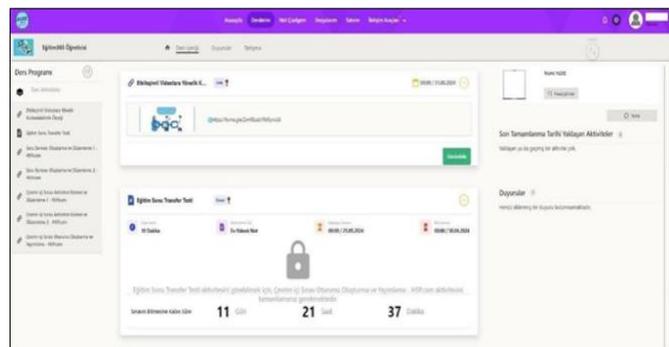

Figure 3. LMS course interface displaying the video content

Findings From Usability Testing of the Video-based Online Instructor

In this research, participants were first asked to watch the interactive video content in sequence before completing the System Usability Scale (SUS). Before starting the process, researchers explained the key points participants should consider while responding to the scale items. According to SUS score, the lowest usability score among participants was 37.5 (Participant 14), while the highest score was 100 (Participant 7), as shown in Table 4.

Table 4. Test results for the video-based online tutorial

Participants	Test Scores	
	SUS	Performance
P1	75	90
P2	80	83.3
P3	82.5	58.3
P4	90	70.8
P5	72.5	72.3
P6	57.5	72.3
P7	100	52.3
P8	97.5	88.3
P9	77.5	70.8
P10	40	84
P11	92.5	71.5
P12	80	77.3
P13	92.5	65.6
P14	37.5	68.1
Average Test Scores	76.8	73.2

The overall usability score for the video-based online tutorial was calculated to be 76.8. Given that the score range is between 0 and 100, it indicates that the usability of the developed system is significantly above average.

To assess whether the usability test scores differ based on participants' gender and field of work, the Mann-Whitney U test was conducted. This test is suitable for situations where the sample size is small and the scores do not follow a normal distribution, as it evaluates whether two independent groups have significantly different scores regarding the variable of interest (Büyüköztürk, 2012). Due to the small sample size and the non-normal distribution of the scale scores in this study, the U-test was deemed the most appropriate statistical test. The results of the analysis are presented in Table 5.

Based on the analysis results, the mean ranks indicate that female participants had higher usability scores. However, the analysis also revealed that there is no statistically significant difference in usability scores for interactive videos based on gender, with a U statistic of 22.50 and a p-value greater than 0.05. Similarly, when examining the results by field of study, the mean ranks indicate that those working in the Quantitative Field reported higher usability scores. Nonetheless, the scores did not show a significant difference based on the participants' field of study, with a U statistic of 20.00 and a p-value greater than 0.05.

Performance Test Results

In this study, participants were first encouraged to watch a series of interactive online instructional videos. After viewing the videos, they were asked to complete a performance test designed to evaluate their recall and transfer abilities through nine questions related to the educational content. Before taking the test, all participants were informed about its purpose and procedures. The highest score achieved was 90, obtained by Participant 1, while the lowest score was 52.30, recorded by Participant 7 (see Table 4).

Based on the findings, the average score across all participants was calculated to be 73.20. It can be inferred that participants exhibited a strong ability to recall both conceptual and procedural knowledge related to authentic tasks delivered through interactive videos. Furthermore, this knowledge was successfully transferred to similar contexts. This indicates that education delivered via interactive video content has achieved highly effective results in terms of learners' memory retention and knowledge transfer performance. To assess whether performance test scores varied based on participants' gender or field of study, we conducted the Mann-Whitney U test. This non-parametric test was suitable due to the small sample size and the non-normal distribution of the scores. The results of the analysis are presented in Table 5.

Table 5. Mann-Whitney U test results for test scores

Test Scores	Group	n	Mean Rank	Sum of Ranks	U	P
Usability Test Score	Male	7	7.21	50.50	22.50	.798
	Female	7	7.79	54.50		
	Quantitative Field	6	8.17	49.00	20.00	.605
	Equal Weighting Field	8	7.00	56.00		
Performance Test Score	Male	7	8.29	58.00	19.00	.481
	Female	7	6.71	41.00		
	Quantitative Field	6	8.17	49.00	20.00	.605
	Equal Weighting Field	8	7.00	56.00		

The analysis results presented in Table 5 indicate that male participants scored higher on the Performance Test. However, the difference in Performance Test scores based on gender was not statistically significant ($U = 19.00$, $p > .05$). At the same time, the mean ranks suggest that participants from Quantitative Field achieved higher scores on the Performance Test, the results also showed no statistically significant difference in scores based on field of study ($U = 20.00$, $p > .05$).

User Feedback on the Video-based Online Tutorial

User feedback on the video-based online tutorial was organized into positive and negative aspects. These categories were thematically analysed and summarised in Tables 6. The positive feedback was grouped into three main themes: "Learning," "Motivation," and "Interaction" (see Table 6).

Table 6. Feedback on the video-based online tutorial

	Themes	Related Feedback	f
Positive Feedback	Learning	Reinforced learning (2) Facilitated learning (4)	6
	Motivation	Increased interest and focus (3) Reduced monotony (2)	5
	Interaction	Micro-content increased interaction (3) Questions increased interaction (3)	6
Negative Feedback	Interaction	Lack of flexibility in question-and-answer sessions (2) Lack of variety in questions (1) Limitation on transitioning from questions to videos (1)	4
	Memory Retention	Direct questioning of the content (1) Rote-based questions (2)	3

The predominant views within these themes suggest that the content simplifies the learning process, that the step-by-step presentation and embedded questions enhance interaction, and that the content effectively reinforces learning. Furthermore, participants noted that the videos increase motivation and help alleviate monotony.

Among those who provided positive feedback about the videos, the theme of "learning" was most frequently linked to the idea that the videos enhance learning. Some examples of participant comments include:

"The interactive and short nature of the videos enhanced attention, facilitating focus and learning." (P7)
"It was informative and simplified the learning process." (P13)

Participants who held positive views about the interactive videos noted that the embedded questions significantly enhanced engagement, particularly within the "interaction" theme. Here are some examples of their statements:

"I think that asking questions helped ensure understanding and increased interaction with the content." (P12)
"I find the questions that appear within the videos helpful in reinforcing learning and increasing interaction." (P8)

Participants also noted that the content increased motivation and eliminated monotony in the presentation. Examples of their statements are as follows:

"Interactive videos clearly explain the system operation, which helps prevent monotony." (P11)

"Incorporating different types of questions into the videos made the process more engaging and educational, which helped alleviate some monotony. (P2)

Users highlighted some negative aspects of the video-based online tutorial. Their feedback was thematically analyzed and summarized in Table 6. The responses were categorized into two main themes: "Interaction" and "Memory Retention" (see Table 6).

The most commonly expressed concerns fell under two themes: the inflexibility in responding to questions during interactions and the emphasis on memorisation in the questions asked.

Participants who expressed negative feedback about the interactive videos often mentioned, under the theme of interaction, that there was a lack of flexibility in addressing the embedded questions. Examples of their statements are as follows:

"When questions appear in the video, a button could be added to allow returning to the relevant section of the video to confirm their answers." (P7)
"I could not follow some clearly visible questions word for word while watching the video. In short, when using an application, I think there is no need to ask some very obvious things as questions in the videos." (P8)

Participants who expressed negative opinions regarding the interactive videos most frequently indicated, under the "memory retention" theme, that this issue was primarily due to questions being based on rote memorisation. Below are examples of their statements:

"Asking for exact answers. For example, even a minor spelling mistake can lead to the answer being marked incorrect." (P12)
"The questions require memorising tab names. However, some learning is better acquired through observation during practice." (P1)

Discussion, Conclusion, and Recommendations

One of the new tools introduced for learning and teaching in the management of information is LMS, as noted by Conde et al. (2014). An LMS can be defined from the user's perspective as a virtual environment designed to replicate face-to-face learning experiences using information technology (Oliveira et al., 2016). The role of LMSs allows for interaction between learners and instructors with diverse characteristics. As with all software, it is essential for users to engage actively with LMSs. Establishing a structure that supports users in learning about the interface components and their functions is equally important, particularly for those new to the system.

At Afyon Kocatepe University, the LMS was updated with a new interface beginning in the fall semester of 2023-2024. Although a text- and video-based support system has been created to help users learn the new interface features, it has been observed that teaching staff do not utilize this structure as much as expected. Therefore, plans are underway to develop a new online tutorial that will help users understand the components and functions of the LMS interface. During the initial design process, a needs analysis was conducted to assess the current situation. Conducting a needs analysis at the outset helps identify priorities and provides a rational approach to using available resources (Stufflebeam et al., 1985). Through this analysis, it was determined that instructors primarily need assistance in three areas: adding different types of questions to the question bank, editing questions, creating exams, and setting up sessions for these exams. Consequently, it was

decided to develop the online tutorial with interactive video content.

The online tutorial design process was conducted using a formative methodology. While developing the video content, adherence to the eight principles proposed by Van der Meij and Van der Meij (2013) for educational videos was maintained. Once the video materials were created, they were integrated into the LMS and presented to research participants for usability evaluation. The evaluations revealed that the usability of the designed video-based online tutorial was above average. Additionally, it was observed that the usability levels did not differ based on participants' gender or field of study. A review of the literature indicates that usability evaluation studies for new technologies, including web technologies, often show variations according to gender, with results sometimes favoring either males or females (Adamo-Villani et al., 2008; Baran and Ata, 2013; Huang and Mou, 2021; Huang and Yuan, 2017; Khairat et al., 2019; Lin et al., 2013). Consequently, the findings from this study support recent research suggesting that the usability of new technologies does not differ based on gender.

Another notable finding is that the usability level of the online tutorial did not differ based on the participants' field of study. The existing literature on usability in relation to demographic variables in the context of new technologies is limited, and conflicting results have been reported in previous studies. While some research indicates that usability varies by field of study (Kaipio et al., 2020; Lloyd et al., 2021; Taqi et al., 2024), other studies have shown no significant differences, which align with the results obtained in this study (Khalika Banda and Gombachika, 2012; Rosman et al., 2023). This suggests that the variable "field of study" is still inadequately addressed in usability research.

The study also explored how online tutorials affected participants' ability to recall and transfer knowledge. Performance test results indicated that their performance was significantly above average. These findings align with previous research conducted by Van der Meij and Van der Meij (2013) and Van der Meij (2017), which demonstrated that instructional videos for word processing software improved attention, motivation, recall, and procedural learning performance. A similar study was conducted by Brar and van der Meij (2017) on video contents developed for teaching statistics. Their results indicated that the videos did not significantly impact learning performance; however, they were effective in increasing motivation and attention. Moreover, Özdemir and Yıldız (2015) found that students who learned through streaming videos performed similarly to those who used non-streaming videos. More recently, Preradovic et al. (2020) investigated the satisfaction of learners and the effectiveness of procedural learning through two types of videos: interactive videos enriched with interactive elements designed for software training, and non-interactive demonstration videos. Their findings showed that both types of videos had positive effects on learning, with interactive videos contributing more significantly. The study also concluded that interactive videos lead to higher satisfaction levels. Since satisfaction is considered an important component of usability, these findings support the high usability average and high-performance test results observed in this study. In summary, instructional systems designed with high usability levels can facilitate learning, increase retention, maintain motivation, sustain interest, and enhance satisfaction—especially in procedural areas.

The performance test results of the participants did not differ based on gender or field of study. Existing literature supports these findings, with some studies indicating that participants' performance after applying such content does not vary by gender in different contexts (Szczygiel, 2020; Williams et al., 2024). In contrast, other research conducted in varying contexts has revealed performance differences based on gender after application (Eriksson et al., 2020; Kupczynski et al., 2014; Kuśnierz et al., 2020; Luo et al., 2021). These discrepancies may arise from differences in research contexts or other influencing factors. Similarly, this study found no difference in participants' performance based on their field of study. This finding suggests that the content and design of the tutorial did not favor any particular field, demonstrating its applicability across diverse learner profiles.

Finally, participants were asked to evaluate their experiences with the online tutorial. They shared both positive and negative opinions about the interactive video content. The positive feedback regarding the interactive videos was categorised into three themes: learning, motivation, and interaction. Participants commonly reported that interactive videos enhanced their learning, broke the monotony of traditional content presentation, increased their interest, and that the formative and summarizing assessments integrated within the videos improved interaction. The performance test results from this study support these positive perceptions expressed by the participants. Additionally, findings from other research collectively demonstrate that interactive video content positively affects variables such as learning, motivation, and satisfaction (Brar and van der Meij, 2017; Kokoç et al., 2020; Preradovic et al., 2020; Van der Meij and Van der Meij, 2013; Van der Meij, 2017). However, the relationship between interaction in online synchronous distance education and learning outcomes may not always be straightforward. Yıldız (2025) discovered that university students in a medium-interaction group performed better than those in a high-interaction group. He interpreted this finding to mean that the level of interaction can impact learners' achievements, suggesting that higher levels of interaction in distance learning environments do not always lead to improved academic success.

Participants expressed negative opinions about interactive videos, which were categorised into themes of interaction and memory retention. They noted issues such as inflexibility in responding to formative and summative assessment questions, the availability of different interaction formats for evaluation questions, and a heavy reliance on rote memorization in assessments. During the needs analysis conducted at the beginning of the process, several functions were explicitly designed for the LMS content. These included adding questions to the question bank, editing questions, creating exam activities, and defining exam sessions. It was deemed essential to first present conceptual information related to these topics within the context of the LMS. For example, creating an exam activity and creating an exam session in LMS are two distinct concepts that involve procedural knowledge that complements one another. Under these conceptual headings, multiple sub-concepts exist. For instance, the actions performed within the window and the tabs opened via the "Add Exam Activity" link differ from those carried out through the "Create Exam Session" link, with each set of actions corresponding to distinct conceptual information. Given these explanations, it became necessary to incorporate various types of formative and summative assessment questions aimed at enhancing recall and transfer performance in the online tutorial

content. Furthermore, participants' positive feedback indicating that these assessment questions increased interaction and reduced monotony should be taken into account when evaluating the interaction opportunities offered by the content.

The findings of this study suggest that users perceive the usability of teaching processes using interactive videos, developed based on cognitive multimedia learning theory and established principles for educational video content, as high. Furthermore, the study demonstrated positive effects of the interactive content on recall and transfer performance. The analyses of both the quantitative and qualitative data collected during the research complement each other. However, a limitation of the study is that it focused specifically on a particular LMS interface and its functions, and it was conducted exclusively with faculty members. The sample was limited to 14 faculty members at Afyon Kocatepe University; therefore, the findings may not be generalizable to larger populations. To strengthen the study, future research could include a broader participant group, such as students who are also users of the system, and address additional LMS functions that were not covered in this research. Additionally, the study was conducted within a formative methodology framework. For example, comparing the online tutorial designed with interactive videos to a text-based tutorial in terms of knowledge recall and transfer performance could be the focus of a future experimental study. This would enable an examination of the effects of multimedia content on learning in a contemporary context. Finally, a web editor with limitations was used to create the interactive video content. Employing a more flexible editor that provides diverse interaction opportunities to design a different online tutorial could yield valuable insights. It would be important for future research to observe whether participants' opinions regarding the interaction limitations of the content used in this study change in such a scenario.

Author Contributions

All authors were equally involved in all processes of the manuscript. All authors have read and approved the final version of the manuscript.

Ethical Declaration

This study was carried out with the approval decision taken at the meeting dated 26/06/2024 (2024/10) of the Scientific Research and Publication Ethics Committee of Afyon Kocatepe University Social and Humanities Sciences (Protocol No. 277994).

Conflict of Interest

The authors declare that there is no conflict of interest with any institution or person within the scope of the study.

Declaration of Generative AI Use

The authors declare that they did not use any artificial intelligence tools in this study.

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