A Review on The Use of Video in Education: Advantages and Disadvantages

Ong Ace Hong a/p Ong Long[1], Noor Dayana Abd Halim[2], Mohd Fadzil Abdul Hanid[3]

[1, 2, 3]Universiti Teknologi Malaysia, Malaysia

**Corresponding author: Ong Ace Hong Ong Long (ongacehong@graduate.utm.my)*

Received: 15 Ogos 2023
Received in revised form: 5 Disember 2023
Accepted: 15 December 2023
Published: 31 December 2023

ABSTRACT

Multimedia in the form of video has been widely used in education since the outbreak of the COVID-19 pandemic. It is because the video is one of the tools that provide a lot of visual signals and a core component that stimulates the auditory and visual senses of students and processes information to facilitate the transfer of knowledge and provide students with a clearer understanding. The use of video also has a good effect on students' training and acquiring skills. However, learning by watching videos may create problems for students because the form of learning is more passive. Previous research has identified that videos will create passive learning if the video is not well designed, the content does not meet the specified teaching and learning objectives and lacks interactive elements. It causes the use of video for teaching and learning to fail to stimulate critical thinking skills. Learning by watching video-based learning alone is not enough because there are still ways to increase learning opportunities and students' engagement from videos if the videos are produced correctly and purposefully and used on the right platform. In addition, one of the concerns of using video in teaching and learning is that the video used does not develop students' metacognitive ability because the video is passive learning. Therefore, this review aims to identify the advantages and disadvantages of video in education. This concept paper reviews the previous research on using videos in education. The review describes the advantages and disadvantages of video implementation in several fields of education, including Mathematics, Sciences, Chemistry, Physics, Biology, and Geography. The review results show that the effect of using video for teaching and learning depends on the quality of the video, the learning content, and the interactive elements included in the video. In conclusion, this concept paper provides ideas and research gaps for researchers who want to investigate the use of video in teaching and learning. Besides, gives educators a broad perspective to develop a quality video to help students understand the lesson.

Keywords
Video; Multimedia; Education; Teaching; Learning

Introduction

Since the COVID-19 pandemic outbreak, video has been a popular medium of multimedia in education. This is because video is one of daily life's most commonly used multimedia (Liu et al., 2022). Further, video is one of the tools that provide a lot of sensory support (Ahmet et al., 2018). So, there has been a significant increase in the usage of video in education.

In addition, video is a key component that engages students' auditory and visual senses and processes information to make the transition from working to long-term memory easier and improve students' understanding (Lange & Costley, 2020). This was also supported by Saja et al. (2021), which stated that video remains a great medium of instruction because video combines a variety of content that can appeal to different human senses and fits the use of technology that is now widely used in online learning. Next, Yusrizal et al. (2019), claimed that teachers can create or directly use internet-sourced media in the form of videos that are more practically and effectively suitable for teaching and learning than traditional media with the aid of Information Communication Technology (ICT). According to Ahmet et al. (2018), additional videos used for 3D animation or simulator training have a positive impact on the training process, learning period, skill acquisition, and student satisfaction.

Although the use of videos in teaching and learning has increased significantly, videos do not always result in an improvement of the desired essential skills (Suárez et al., 2021) and may create problems for students (Bryce et al., 2022). This is because passive learning occurs during self-directed online video learning (Bryce et al., 2022; Caruso et al., 2019; Harrison, 2020). Previous studies also have shown that videos can lead to passive learning if they are poorly constructed, their content does not match the specified teaching and learning objectives and lack interactive components. Caruso et al. (2019), stated that online learning through video becomes passive because it does not have immediate feedback that usually occurs during teaching and learning. It prevents the use of video in education from fostering critical thinking abilities.

Besides that, passively watching video-based learning online is insufficient for learning because there are other ways to improve learning opportunities and students' engagement with videos (Bryce et al., 2022). Moreover, they also stated that this can only be done if the videos are produced correctly and on purpose, using the appropriate platform and taking the target audience into consideration. Another issue with using videos in teaching and learning is learning through passive videos may also not develop students' metacognitive abilities because they fail to stimulate critical thinking skills, this problem exists when instructors only roll out PowerPoint presentations in the same way as they teach face-to-face (Harrison, 2020).

Literature Review

Video-Based Learning

A video is a recording of moving visual images and sound (Liu et al., 2022). Video is also one of the most effective tools for providing a variety of visual cues (Ahmet et al., 2018). Video-based learning can be in a variety of styles, such as recorded classroom lectures, Khan-style freehand writing videos, PowerPoint presentations with talk show hosts, PowerPoint presentations with more than one person in conversation, and so on (Hew & Lo, 2018.)
Video is a key component in online learning because it stimulates students' auditory and visual senses and processes information to facilitate the transfer of knowledge from working to long-term memory and provide students with a clearer understanding (Lange & Costley, 2020). This point is also supported by Saja et al. (2021), who stated that video remains a great teaching medium because it combines different types of content that can appeal to different human senses and are appropriate for the use of technology that is now widely used in online learning.

Next, Yusrizal et al. (2019) stated that with the help of ICT, teachers can design or directly use media from the internet in the form of videos that are more practical and effective for teaching and learning than traditional media. According to Ahmet et al. (2018), additional videos used for simulator training or 3D animation have a positive effect on training, learning, skill acquisition, and student satisfaction. Indeed, Chen et al. (2019) discovered that there was an increase in post-test scores after teachers used videos from game-based teaching modules in student learning.

According to Bryce et al. (2022), creating videos with interactive content, such as polls, quizzes, and questions, improves the learning process through media. They state this is because of the reality that student participation is an important component of online learning. Lin et al. (2019) found that student engagement is an important factor in class and that videos must be designed in such a way as to increase engagement. Furthermore, video-based learning that elicits positive emotional responses in students affects cognitive mechanisms that improve learning (Harrison, 2020). As a result, an effective educator should be efficient in selecting video clips with the greatest learning benefits (Zhang et al., 2019).

Characteristics and Platforms/Software Used for Video-Based Learning

The characteristics and platforms/software used for video-based learning are discussed in this section for several academic disciplines, including biology, chemistry, physics, mathematics, science, and geography. In the past five years, from 2019 to 2023, research on the characteristics and platforms/software used for video-based learning in this field has been examined to determine the characteristics and platforms/software used for video-based learning that researchers frequently use when choosing or producing video-based learning. To provide more reliable information, the studies covered in this section have to contain empirical data. Table 1 summarizes some of the characteristics and platforms/software used for video-based learning that have been highlighted in the previous study.

Table 1. Characteristics and platforms/software used for video-based learning

Author/s	Characteristics of a Video-based learning	Video Platforms/Software
Anggraeni et al. (2020)	-Audio -Visual	-
Basriyah et al. (2020)	-Audio -Text -Images -Motion images	Powtoon Application
La Aca et al. (2020)	-Audio -Visual -Questions -Exercises -Scenario -Duration	Adobe Premiere Pro CC 2018
Pulukuri & Abrams (2020)	-Interactive questions -Visual graphic -Audio -Notes -Prevent Skipping -Link	Edpuzzle platform
Wilujeng et al. (2020)	-Audio -Visual	YouTube
Adanır et al. (2022)	Duration	-
Christopoulos et al. (2022)	Storytelling	Amazon Sumerian platform
Costa (2022)	-Visual -Images -Sound -Example used in the videos -Length of video -Animation	Microsoft Office PowerPoint and Audacity
Nandiyanto, Fiandini, et al. (2022)	-Audio -Animation	-

Table 1 lists the characteristics that are used when creating video-based learning. According to the video-based learning characteristics listed, audio is the most frequently used video-based learning characteristic when creating videos. Audio, when combined with other characteristics such as content and animation presented interestingly, can increase student motivation and lead to better learning outcomes (Nandiyanto et al., 2022). As a result, audio has become the most popular format for creating video-based learning. According to Jumintono & Taha (2022), videos with audio narration and visuals from experts who can clearly explain difficult concepts make learning more effective and engaging.

Meanwhile, the second most common characteristic used when creating video-based learning is visual. This is because a combination of audio and visual input can be used as a teaching tool to assist students in understanding learning (Wilujeng et al., 2020). Following that, the length of the video or duration is the third characteristic commonly used by researchers in previous studies when creating video-based learning. La Aca et al. (2020), noted that the percentage of students who watched a video that was less than 6 minutes in length was about 100%. Videos that ranged from 9 to 12 minutes in duration, approximately 50% of students watched, and videos that lasted between 12 and 40 minutes were viewed by approximately 20% of students (La Aca et al., 2020). Hence, it may be inferred that shorter learning videos are more effective compared to longer learning videos.

In addition, creators of video content have access to a variety of tools, including animation, simulation, and teaching images, which can help explain complex concepts more effectively than text alone (Christopoulos et al., 2022). The conclusion is that most previous studies combine various video characteristics to produce high-quality videos. When compared to other characteristics, audio, visual, image, and animation are frequently used by researchers in creating videos because they do not require high technical skills to produce.

The subsequent data in Table 1 shows the video platforms and software employed by the researchers for developing, editing, or presenting instructional videos. A video platform refers to a web-based application or service that enables users to upload, organize, and distribute video content over the Internet. The platform offers a range of tools for modifying, converting, and disseminating videos to a broad viewership. Video software refers to a computer program or application that enables users to generate, edit, and alter video information. It may encompass functionalities like video editing tools, advanced visual effects, filters, and audio editing capabilities.

The Powtoon application, YouTube, Amazon Sumerian Platform (Amazon CloudFront), and Edpuzzle Platform are a few of the platforms used by researchers to create, modify, and present videos. Powtoon is a free online maker of entertaining animation, presentation, and video software that works with cartoons. The result of the study by Basriyah et al. (2020), which employed videos created with the Powtoon application, showed that learning media created with the Powtoon application had a good potential to improve student achievement.

According to Pulukuri & Abrams (2020), Edpuzzle is an online platform that enables educators to change videos by adding questions and creating interactive video-based learning experiences. Students can choose to access videos either through the Edpuzzle platform or the learning management system and instructors also can monitor student's progress and performance by reviewing assignments completed by students in Edpuzzle. Hence, instructors can modify instructional approaches based on student's progress, to improve their academic performance.

While, on the YouTube platform, there is a researcher who posts their produced videos. This is because anyone may use this platform easily and for free to exchange information with other users and obtain information. Wilujeng et al. (2020), claim that YouTube videos are distributed to a bigger audience, particularly audiences from various backgrounds, in the hopes that they will be able to learn and understand the lesson material being offered. Besides that, the Amazon Web Services Platform is a platform that provides developers with a variety of native content creation and animation tools in addition to cross-platform distribution support (Windows, iOS, and Android) and is simple for non-technical users to use Christopoulos et al. (2022).

Besides that, software used by researchers in previous studies for video creation and editing included Microsoft Office PowerPoint, Audacity, and Adobe Premiere Pro CC 2018. Audacity and Microsoft Office PowerPoint are two software used by researchers to create and edit videos due to their easy-to-use. Furthermore, certain researcher used video editing software like Adobe Premiere Pro CC 2018 to edit their video. This leads to the conclusion that most researchers choose a video platform or software that is easy to use and cost-free, even if they use different platforms or software for video creation and presentation.

An Approach Frequently Applied When Using Video

Based on previous research, there are several approaches to using video as teaching material both inside and outside the classroom. The flipped classroom approach, Active learning approach, and Experimental demonstration method are some of the approaches commonly used by researchers in previous studies when using video in teaching and learning. The Flipped classroom learning approach reverses the relationship between classroom learning and homework (Basriyah et al., 2020). According to La Aca et al. (2020), a flipped classroom is a learning model that combines technology to encourage students to become active and efficient problem solvers. The implementation of a flipped classroom also requires the use of learning media, which is an essential component of the learning process (La Aca et al., 2020). One type of learning media used in flipped classroom learning is a video (La Aca et al., 2020).

Aside from that, several researchers use video as an active learning strategy. It is because educational programs are most effective when they incorporate active learning strategies, such as asking students to pause videos and answer questions before continuing to watch the rest of the video (Pulukuri & Abrams, 2020). The key findings of a study by

Christopoulos et al. (2022) suggest that the active learning approach leads to greater knowledge acquisition in the short term compared to the passive learning approach, but no significant differences in the long term (knowledge retention) were identified across the methods.

Video is also used in an experimental demonstration method. Experimental demonstration is one of the teaching methods that can be used to convey abstract material to students, and experimental demonstrations using video can stimulate student interest and curiosity in learning (Anggraeni et al., 2020). Nandiyanto, Fiandini, et al. (2022), found that using the experimental demonstration method resulted in increased achievement and significant student learning. They also stated that when students see experimental demonstrations using accessible materials, they become more interactive because they want to try the process for themselves.

In addition to the approaches discussed above, others use video in teaching and learning, such as the Traditional Approach, Didactical Approach, 5E (Engagement, Exploration, Explanation, Elaboration, and Evaluation) Instructional Approach, and so on. As a result, it is possible to conclude that video can be implemented using a variety of approaches. Video, on the other hand, is still underutilized in the Game-based learning approach.

Methodology

The purpose of this review is to identify the advantages and disadvantages of using video-based learning in different fields of education, such as Mathematics, Sciences, Chemistry, Physics, Biology, and Geography. The following keywords were used in the database search: Video-based learning, televised-based learning, prerecorded-based learning, recorded-based learning, and taped-based learning. The search was conducted in Scopus, Web of Science, and Science Direct. The search produced 721 hits, but only eleven of the advantages and eight of the disadvantages of video-based learning were considered relevant to the study based on the following criteria: (1) the study should state the advantages or disadvantages of using video-based learning, (2) the study must highlight the use of video in several fields of education, including Mathematics, Sciences, Chemistry, Physics, Biology, and Geography, (3) the study was published between the year 2019 and 2023, (4) the article must be open access, and (5) the study should have empirical data. The criteria are set to obtain a high-quality and accurate article that meets the requirements of the article review.

Finding and Discussion

Advantages of Video-Based Learning

There are many advantages when integrating video-based learning into teaching and learning. Table 3 below summarizes past research on the advantages of video-based learning in several fields of education that are highlighted in the literature.

Table 2. Summarizes past research on the advantages of video-based learning in different fields of education

Author/s	Field	Advantages of video-based learning
Costa (2022)	Mathematics (Degree students)	-Can be an effective way to supplement traditional face-to-face instruction. -Can provide step-by-step explanations with clear visuals and sound quality, which can help students understand complex concepts better. -Can be used as a resource to clarify doubts and remember the content. -Can be accessed anytime and anywhere. -Can provide a consistent learning experience for all students, regardless of location or schedule.

Anggraeni et al. (2020)	Science (Secondary school students)	-Help students gain a better knowledge of both the subject matter and the mechanical aspects of objects. -Grabbed students' attention and contributed to the increase in scores. -Can successfully communicate knowledge or happenings without requiring actual participation.
Wilujeng et al. (2020)	Science (State junior high school)	- Useful tools to increase the student's ability and concept mastery. -Can go forward with possibilities for experimentation by following the stages they could directly see and hear throughout the video. -Can be used as a teaching tool to aid students in understanding the material. -Watching the videos again at home allows students to prolong and increase their study time, which enables them to learn more. -Teachers have no trouble managing the class because students are free to watch the videos whenever they like. - Information can be conveyed through realistic representation in the video. -An effective way to capture students' interest and encourage them to become self-motivated learners.
Bayram-Jacobs et al. (2019)	Chemistry (Upper secondary school)	- Help students understand complex concepts more efficiently than just reading text or listening to a lecture. -Can also engage learners by presenting information in an interesting way, which may increase motivation and retention of knowledge. -Can be paused or rewound if needed. This allows students to learn independently without feeling rushed through the material.
Pulukuri & Abrams (2020)	Chemistry (College students)	- It provides a more engaging and interactive learning experience than traditional text-based materials. -Can help students visualize complex concepts or processes that may be difficult to understand through written descriptions alone -Can pause, rewind, and re-watch videos as needed until they fully grasp the presented material.

Adanır et al. (2022)	Chemistry (Undergraduate level)	- It allows students to access course content at their own pace and convenience without being restricted by time or location constraints. - Learners can watch videos whenever they want, wherever they have an internet connection. - Students can pause and rewind or fast-forward through sections as needed for a better understanding. - Videos can be re-watched multiple times if necessary, for revision purposes. - May help keep learners engaged with a visual aid such as animations and graphics, which could enhance comprehension compared to traditional classroom settings.
Nandiyanto et al. (2022)	Chemistry (Vocational school students)	-Can improves students' performance and comprehension. -Help students remember what they have learned and motivate them to continue studying to meet their learning needs and stay motivated. -Can enhance students' motivation and lead to higher learning results. -Can support students' basic learning experiences and clearly and repeatedly explain the procedure.
Basriyah et al. (2020)	Physics (State senior high school)	- Dynamic videos can attract students' interest. - Independent learning occurs when students watch video content. -Can watch the video several times and be able to complete the teacher's assigned task.
La Aca et al. (2020)	Physics (Public senior high school)	-Students can better comprehend physics concepts by watching video-based learning. - Helped the students become more independent. - As the videos may be watched again, the students can easily understand the subject.
Christopoulos et al. (2022)	Biology (Upper secondary school)	-Can be used as a complementary tool to traditional classroom instruction and provide asynchronous learning opportunities. -Animations, simulations, and visual aids help explain complex concepts more effectively than text alone.
Jumintono & Taha (2022)	Geography (Secondary school studens)	- It can help students better understand complex concepts, retain information for longer periods, and

	engage with the material on a deeper level than traditional methods such as lectures or textbooks. - Provide engaging visuals and audio narration from experts who can clearly explain challenging concepts, making learning more effective and interesting. - The student's cognitive ability improved after seeing the tutorial video.

As shown in the summary in Table 2, there are many fields in which video-based learning is applied for teaching and learning. Based on a review of previous studies, it has been discovered that using video-based learning for teaching and learning has numerous advantages. Most research indicates that video-based learning can help students better understand complex concepts (Bayram-Jacobs et al., 2019; Pulukuri & Abrams, 2020; Christopoulos et al., 2022; Costa, 2022; Jumintono & Taha, 2022). This is because the video provides a process (Pulukuri & Abrams, 2020) or step-by-step explanation (Costa, 2022) with visuals (Bayram-Jacobs et al., 2019; Pulukuri & Abrams, 2020; Christopoulos et al., 2022; Costa, 2022), sound (Costa, 2022), and animations and stimulations (Christopoulos et al., 2022) that may be not easy to understand through text (Bayram-Jacobs et al., 2019; Pulukuri & Abrams, 2020; Christopoulos et al., 2022; Jumintono & Taha, 2022) or listening to a lecture (Bayram-Jacobs et al., 2019; Adanır et al., 2022; Jumintono & Taha, 2022).

In addition to this, the video was a useful tool to increase the student's ability and concept mastery (Wilujeng et al., 2020). Therefore, videos can be complementary to traditional classroom instruction and provide asynchronous learning opportunities (Christopoulos et al., 2022). Costa (2022), also states that video-based learning can be an effective way to supplement traditional face-to-face instruction. Besides that, using video-based learning can enhance students' engagement (Bayram-Jacobs et al., 2019; Adanır et al., 2022; Jumintono & Taha, 2022), improve students' performance (Nandiyanto et al., 2022), and comprehension (Bayram-Jacobs et al., 2019; La Aca et al., 2020; Wilujeng et al., 2020; Adanır et al., 2022; Nandiyanto, Fiandini, et al., 2022). It is due to the combination of audio and visual (Wilujeng et al., 2020) as well as visual aids such as animation and graphics (Adanır et al., 2022).

Other than that, information can be conveyed through realistic representation in the video (Wilujeng et al., 2020). Then making a video can explain (Wilujeng et al., 2020; Costa, 2022; Jumintono & Taha, 2022; Nandiyanto, Fiandini, et al., 2022) challenging concept (Jumintono & Taha, 2022), the step-by-step (Wilujeng et al., 2020; Costa, 2022) and procedure (Nandiyanto et al., 2022) with visuals (Costa, 2022; Jumintono & Taha, 2022) and sound (Costa, 2022; Jumintono & Taha, 2022), which can help students understand the complex concept better (Costa, 2022), consistent learning experience (Costa, 2022), interactive learning experience (Pulukuri & Abrams, 2020), and support students' basic learning experiences (Nandiyanto et al., 2022), students can perform the experiment by watching the video (Wilujeng et al., 2020), makes learning more effective and interesting (Jumintono & Taha, 2022).

Basriyah et al. (2020), state that dynamic videos can attract students' interest to learn. While, the videos provide engaging visuals and audio narration (Jumintono & Taha, 2022), making learning more effective and interesting (Bayram-Jacobs et al., 2019) by interestingly presenting information (Bayram-Jacobs et al., 2019), which can capture students' interest (Wilujeng et al., 2020), may increase motivation (Bayram-Jacobs et al., 2019; Wilujeng et al., 2020), retention of knowledge (Bayram-Jacobs et al., 2019), help students gain a better knowledge and communicate knowledge or happening without requiring actual participation (Anggraeni et al., 2020), which leads to enhancing students' learning outcomes (Anggraeni et al., 2020; Nandiyanto, Fiandini, et al., 2022) and increase in scores (Anggraeni et al., 2020). Next, video can be used as a resource to clarify doubts (Costa, 2022), cognitive ability improved (Jumintono & Taha, 2022), and remember content (Costa, 2022) for a longer period (Jumintono & Taha, 2022). Nandiyanto, Fiandini, et al. (2022), state that short demonstration videos help students remember what they have learned and motivate them to continue studying to meet their learning needs and stay motivated.

Next, students can watch videos anytime and anywhere (Costa, 2022), whenever they want (Wilujeng et al., 2020; Adanır et al., 2022), wherever they have an internet connection (Adanır et al., 2022). It allows students to access course content at their own pace and convenience without being restricted by time or location constraints (Adanır et al., 2022; Costa, 2022). Then students can re-watch the videos (Basriyah et al., 2020; La Aca et al., 2020; Pulukuri & Abrams, 2020; Wilujeng et al., 2020; Adanır et al., 2022) for more understanding (Basriyah et al., 2020; La Aca et al., 2020; Pulukuri & Abrams, 2020) of the presented material and be able to complete the assigned task (Basriyah et al., 2020), for revision purposes (Adanır et al., 2022), allows students to prolong and increase their study time, which enables them to learn more (Wilujeng et al., 2020). In addition, video allows for flexibility as they can fast-forward through sections (Adanır et al., 2022), pause or rewind if needed (Bayram-Jacobs et al., 2019; Pulukuri & Abrams, 2020; Adanır et al., 2022). This allows students to learn independently (Bayram-Jacobs et al., 2019; La Aca et al., 2020; Basriyah et al., 2020) without feeling rushed through the material (Bayram-Jacobs et al., 2019).

Table 3. Frequency of Advantages of Video-Based Learning

Author/s	Frequency	Advantages of video-based learning
Bayram-Jacobs et al. (2019); Pulukuri & Abrams (2020); Christopoulos et al. (2022); (Costa (2022); Jumintono & Taha (2022)	5	Video can help students better understand complex concepts.
Pulukuri & Abrams (2020)	1	The video provides a process.
Costa (2022)	1	The video provides a step-by-step explanation.
Bayram-Jacobs et al. (2019); Pulukuri & Abrams (2020); Christopoulos et al. (2022); Costa (2022)	4	The video provides visuals.
Costa (2022)	1	The video provides sound.
Christopoulos et al. (2022)	1	The video provides animation and stimulation.
Wilujeng et al. (2020)	1	The video was a useful tool to increase the student's ability and concept mastery.
Christopoulos et al. (2022)	1	The videos can be used as a complementary tool to traditional classroom instruction and provide asynchronous learning opportunities.
Costa (2022)	1	Video-based learning can be an effective way to supplement traditional face-to-face instruction.
Bayram-Jacobs et al. (2019); Adanır et al. (2022); Jumintono & Taha (2022)	3	Video-based learning can enhance students' engagement.
Nandiyanto, Fiandini, et al. (2022)	1	Video-based learning can improve students' performance.
Bayram-Jacobs et al. (2019); La Aca et al. (2020); Wilujeng et al. (2020); Adanır et al. (2022); Nandiyanto, Fiandini, et al. (2022)	5	Video-based learning can improve students' comprehension.

Wilujeng et al. (2020)	1	Information can be conveyed through realistic representation in the video.
Jumintono & Taha (2022)	1	The video can explain a challenging concept.
Costa (2022)	1	The video can help students understand the complex concept better and consistent learning experience.
Pulukuri & Abrams (2020)	1	The video provides an interactive learning experience.
Nandiyanto, Fiandini, et al. (2022)	1	The video support students' basic learning experiences.
Wilujeng et al. (2020)	1	Students can perform the experiment by watching the video.
Jumintono & Taha (2022)	1	The video makes learning more effective and interesting.
Basriyah et al. (2020)	1	Dynamic videos can attract students' interest to learn.
Jumintono & Taha (2022)	1	The videos provide engaging visuals and audio narration.
Bayram-Jacobs et al. (2019)	1	The video makes learning more effective and interesting by presenting information in an interesting way.
Wilujeng et al. (2020)	1	The video can capture students' interest.
Bayram-Jacobs et al. (2019); Wilujeng et al. (2020)	2	The video may increase students' motivation.
Bayram-Jacobs et al. (2019)	1	Retention of knowledge by watching videos.
Anggraeni et al. (2020)	1	The video helps students gain better knowledge and communicate knowledge or happening without requiring actual participation.
Anggraeni et al. (2020); Nandiyanto, Fiandini, et al. (2022)	2	The video can enhance students' learning outcomes.
(Anggraeni et al. (2020)	1	Watching videos can increase scores.
Costa (2022)	1	The video can be used as a resource to clarify doubts.
Jumintono & Taha (2022)	1	Cognitive ability improve for a longer period by watching the video.
Costa (2022)	1	The video helps students remember the content.
Nandiyanto, Fiandini, et al. (2022)	1	The short demonstration video help students remember what they have learned and motivate them to continue studying to meet their learning needs and stay motivated.
Costa (2022)	1	Students can watch videos anytime and anywhere.
Wilujeng et al. (2020); Adanır et al. (2022)	2	Students can watch it whenever they want.

Adanır et al. (2022)	1	Students can watch it wherever they have an internet connection for revision purposes.
Adanır et al. (2022); Costa (2022)	2	It allows students to access course content at their own pace and convenience without being restricted by time or location constraints.
Basriyah et al. (2020); La Aca et al. (2020); Pulukuri & Abrams, (2020); Wilujeng et al. (2020); Adanır et al. (2022)	5	Students can re-watch the videos.
Wilujeng et al. (2020)	1	The videos allow students to prolong and increase their study time, which enables them to learn more.
Adanır et al. (2022)	1	The video allows for flexibility as they can fast-forward through sections.
Bayram-Jacobs et al. (2019); Pulukuri & Abrams (2020); Adanır et al. (2022)	3	Students can pause or rewind the video if needed.
Bayram-Jacobs et al. (2019) La Aca et al. (2020); Basriyah et al. (2020)	3	The videos allow students to learn independently.

The conclusion that can be drawn based on Table 3 is that video-based learning has many advantages such as increasing engagement, knowledge, understanding, motivation, and retaining information for longer periods if they are designed following the content and learning objectives set. This is because students can watch the videos as many times as they want. Furthermore, videos enable students to learn independently because they can pause or rewind the video as needed.

Disadvantages of Video-Based Learning

There are several disadvantages to incorporating video-based learning into teaching and learning. Table 5 summarizes past research on the disadvantages of video-based learning in several fields of education that have been highlighted in the literature.

Table 4. Summarizes past research on the disadvantages of video-based learning in different fields of education

Author/s	Field	Disadvantages of video-based learning
Costa (2022)	Mathematics (Degree students)	It cannot replace traditional face-to-face classrooms, mainly due to the importance of teacher-student dialogue.
Wilujeng et al. (2020)	Science (State junior high school)	The lack of a hands-on approach in video-based learning is a drawback.
Pulukuri & Abrams (2020)	Chemistry (College students)	Edpuzzle video provides immediate feedback after answering multiple-choice questions incorrectly. This does not allow students to try to self-correct before getting feedback which can limit their ability to learn from mistakes.

Adanır et al. (2022)	Chemistry (Undergraduate level)	- May lack the interactive element that traditional classroom settings offer such as asking questions and receiving immediate feedback from instructors or peers. - Poor internet connection can cause buffering problems which could disrupt learners' concentration during videos leading to frustration and disengagement. - Videos cannot replace hands-on laboratory experiments where students get a chance to apply theoretical concepts in practice under supervision.
Basriyah et al. (2020)	Physics (State senior high school)	- It's still possible to have a misunderstanding or a lack of understanding after viewing the information independently through video. - Require some work on the part of the teacher to prepare the videos.
La Aca et al. (2020)	Physics (Public senior high school)	-The teacher was unable to verify if the students watched the video-based learning for real or whether they were just acting as passive audience members. -Unable to immediately speak with the teacher about any problems they were having.
Christopoulos et al. (2022)	Biology (Upper secondary school)	An increase in cognitive load when watching video-based learning.
Jumintono & Taha (2022)	Geography (Secondary school studens)	Some students prefer to learn through written text rather than visual media.

According to Table 4 analysis of the disadvantages of video-based learning, several weaknesses exist as a result of the use of video-based learning in teaching and learning. Among the disadvantages of video-based learning mentioned by researchers in previous studies is video cannot replace the traditional face-to-face classroom, mainly due to the importance of teacher-student dialogue (Costa, 2022). While, Adanır et al. (2022), state that the disadvantage of using video-based learning in teaching and learning is the limited scope for practical work. It is due to videos cannot replace hands-on laboratory experiments where students get a chance to apply theoretical concepts in practice under supervision (Adanır et al., 2022). This point is supported by the findings of the study by Wilujeng et al. (2020), which state that the lack of a hands-on approach to the subject of micro-hydro power (MHP) plants in video-based learning rather than physically seeing the plants is a disadvantage.

Video-based learning also lacks the interactive element that traditional classroom settings offer such as asking questions and receiving immediate feedback from instructors or peers (La Aca et al., 2020; Adanır et al., 2022). However, receiving immediate feedback after incorrectly answering multiple-choice questions is shown in the Edpuzzle video (Pulukuri & Abrams, 2020). This prevents students from attempting to self-correct before receiving feedback, which limits their ability to learn from mistakes (Pulukuri & Abrams, 2020).

Besides that, some students prefer to learn through written text rather than visual media (Jumintono & Taha, 2022). This is because it is still possible to have a misunderstanding or a lack of understanding after independently viewing the information via video (Basriyah et al., 2020) and an increase in cognitive load when watching video-based learning

(Christopoulos et al., 2022). In addition, passive learning by watching video-based learning by students also causes teachers unable to verify if the students watched the video-based learning for real or whether they were just acting as passive audience members (La Aca et al., 2020) and require some work on the part of the teacher to prepare the videos (Basriyah et al., 2020). In addition to that, technical issues such as poor internet connection can cause buffering problems which could disrupt learners' concentration during videos leading to frustration and disengagement (Adanır et al., 2022).

Table 5. Frequency of disadvantages of video-based learning

Author/s	Frequency	Disadvantages of video-based learning
Costa (2022)	1	Video cannot replace the traditional face-to-face classroom, mainly due to the importance of teacher-student dialogue.
Adanır et al. (2022)	1	The limited scope for practical work. It is due to videos cannot replace hands-on laboratory experiments where students get a chance to apply theoretical concepts in practice under supervision.
La Aca et al. (2020); Adanır et al. (2022)	2	Lacks the interactive element that traditional classroom settings offer such as asking questions and receiving immediate feedback from instructors or peers.
Pulukuri & Abrams (2020)	1	Immediate feedback after incorrectly answering prevents students from attempting to self-correct prior to receiving feedback, which limits their ability to learn from mistakes.
Jumintono & Taha (2022)	1	Students prefer to learn through written text rather than visual media.
Basriyah et al. (2020)	1	It is still possible to have a misunderstanding or a lack of understanding after independently viewing the information via video.
Christopoulos et al. (2022)	1	An increase in cognitive load when watching video-based learning impacts their perceived experience with regard to effective retention.
La Aca et al. (2020)	1	Teachers were unable to verify if the students watched the video-based learning for real or whether they were just acting as passive audience members.
Basriyah et al. (2020)	1	Requires some work on the part of the teacher to prepare the videos.
Adanır et al. (2022)	1	Technical issues such as poor internet connection can cause buffering problems which could disrupt learners' concentration during videos leading to frustration and disengagement.

The conclusion that can be drawn based on Table 5 is that video-based learning has several disadvantages such as the lack of interactive elements that traditional classroom settings offer such as asking questions and receiving immediate feedback from instructors or peers. Because it cannot be used in place of traditional methods. In fact, some students prefer to learn through text rather than visual media. This is due to the fact that it is still possible to have a misunderstanding or lack of understanding after independently viewing the information via video, as well as an increase in cognitive load when watching video-based learning. Furthermore, there is additional work for teachers to prepare the video, and teachers are also unable to determine whether students were truly watching the video or they were simply acting as a passive audience. Moreover, technical issues such as a poor internet connection can cause buffering issues, disrupting learners' concentration during the video and leading to frustration and disengagement. As previously discussed, the use of video-based learning has several disadvantages that can affect student engagement and learning. As a result, teachers must be creative in designing video-based learning in order to increase students' engagement and achievement when using video-based learning in teaching and learning in order to meet the learning objectives.

Conclusion

This review of research conducted in various fields of education shows that video-based learning has the potential to be developed further in education. This is because video-based learning has numerous benefits, including increased engagement, knowledge, understanding, motivation, and the ability to retain information for longer periods of time. This is due to the fact that the combination of various video characteristics can result in high-quality videos. Aside from that, students have given positive feedback on the use of video-based learning. However, there are several disadvantages and limitations in the use of video-based learning that can negatively impact student engagement and learning. Because of the lack of interactive elements, video cannot replace the traditional face-to-face classroom. Aside from that, video can be used in a variety of ways, including the flipped classroom approach, active learning approaches, experimental demonstration methods, and so on, but it is still underutilized in the game-based learning approach. Furthermore, because Geography is a required subject, more researchers, particularly in the Geography field, should look into the potential of video-based learning to improve teaching methods and increase the efficiency of the teaching and learning process. Such limitations can be overcome as research on the integration of video-based learning in education advances. When the potential of video-based learning is fully realized, its beneficial functions will be widely used in Geography and other fields of education, and the efficiency of teaching and learning will be improved.

Limitation of Video-Based Learning or Suggestions for Future Research

Several aspects of video-based learning must be investigated, and numerous future research studies must be conducted. Video-based learning has several limitations. According to Adanır et al. (2022), video-based learning has a limited scope of practical work, and videos cannot replace hands-on laboratory experiments where students can apply theoretical concepts in practice. This issue is supported by the study of Costa (2022), who states that video cannot replace the traditional face-to-face classroom. This is because video lectures lack the interactive elements provided by a traditional classroom, such as asking questions and receiving immediate feedback from the instructor or peers (Adanır et al., 2022). The results of the study by Costa (2022), suggest that using educational videos can be an effective way to supplement traditional face-to-face instruction but cannot replace traditional classrooms due to the importance of Teacher-Student dialogue.

The issue also exists as a result of several researchers who do not emphasize the approach that is appropriate for implementing video. For example, Basriyah et al. (2020) stated in their study's limitations that the study did not pay attention to the approach paired with video development. Whereas learning strategies related to videos are used to assess the impact on learning. Bayram-Jacobs et al. (2019), suggested that a future study would be beneficial to test the lesson and investigate the effectiveness of the lesson's pedagogical elements. Costa (2022) also suggests that more research be conducted to determine aspects of videos that can be changed to improve their quality. As a result, a study on the characteristics of video-based learning is required to determine the characteristics of video-based learning that are appropriate and effective in increasing student engagement and achievement.

Moreover, the replication of studies related to video-based learning is rapidly increasing. Nonetheless, the use of such multimedia in Malaysian education is limited, particularly in the field of Geography. While Geography is a required subject for junior high school students. As a result, more researchers, particularly in the Geography field, should investigate the potential of video-based learning to improve teaching methods and increase the efficiency of the teaching and learning process. Jumintono and Taha's (2022) research findings show a significant difference in the frequency and percentage of students who get the correct answer on the post-test, and students have given positive feedback about video-based learning.

Acknowledgment

This work was supported/funded by Universiti Teknologi Malaysia under Quick Win Research Grant (R.J130000.7753.4J560).

References

Adanır, G. A., Muhametjanova, G., Borkoev, B., & Salieva, K. (2022). University learners' utilisation of online videos in a general chemistry course. *Research in Learning Technology*, *30*. https://doi.org/10.25304/rlt.v30.2660

Ahmet, A., Gamze, K., Rustem, M., & Karaborklu Argut, S. (2018). Is Video-Based Education an Effective Method in Surgical Education? A Systematic Review. *Journal of Surgical Education*, *75*(5), 1150–1158. https://doi.org/10.1016/j.jsurg.2018.01.014

Anggraeni, S., Abadi, H. Y., Hofifah, S. N., Aggraeni, S., Ragadhita, R., & Nandiyanto, A. B. D. (2020). Demonstration of Making Sago (Metroxylon sagu Rottb.) Crackers with Variations in the Comparison of Sago Flour and Wheat Flour to High School Students. *Journal of Engineering Education Transformations*, *34*, 2394–1707.

Basriyah, K., Sulisworo, D., Maruto, G., Toifur, M., & Abd Rahman, N. H. (2020). Effects of the flipped classroom on understanding the thermodynamic concept at high school students. *Universal Journal of Educational Research*, *8*(3 B), 51–58. https://doi.org/10.13189/ujer.2020.081506

Bayram-Jacobs, D., Wieske, G., & Henze, I. (2019). A chemistry lesson for citizenship: Students' use of different perspectives in decision-making about the use and sale of laughing gas. *Education Sciences*, *9*(2). https://doi.org/10.3390/educsci9020100

Bryce, J., Thinakaran, R., & Zakaria, Z. A. (2022). Knowledge Management Applied To Learning English As A Second Language Through Asynchronous Online Instructional Videos. *Journal of Information Technology Education: Innovations in Practice*, *21*, 115–133. https://doi.org/10.28945/5016

Caruso, M., Fraschini, N., & Kuuse, S. (2019). Online tools for feedback engagement in second language learning. *International Journal of Computer-Assisted Language Learning and Teaching*, *9*(1), 58–78. https://doi.org/10.4018/IJCALLT.2019010104

Chen, M. H. M., Tsai, S. T., & Chang, C. C. (2019). Effects of game-based instruction on the results of primary school children taking a natural science course. *Education Sciences*, *9*(2), 79. https://doi.org/10.3390/educsci9020079

Christopoulos, A., Mystakidis, S., Cachafeiro, E., & Laakso, M. J. (2022). Escaping the cell: virtual reality escape rooms in biology education. *Behaviour and Information Technology*. https://doi.org/10.1080/0144929X.2022.2079560

Costa, S. F. (2022). Assessing the Use of a Video to Teach the Laplace Expansion Theorem in Higher Education. *International Journal of Information and Education Technology*, *12*(3), 185–193. https://doi.org/10.18178/ijiet.2022.12.3.1603

Harrison, T. (2020). How distance education students perceive the impact of teaching videos on their learning. *Open Learning*, *35*(3), 260–276. https://doi.org/10.1080/02680513.2019.1702518

Hew, K. F., & Lo, C. K. (2018). Flipped classroom improves student learning in health professions education: A meta-analysis. *BMC Medical Education*, *18*(1). https://doi.org/10.1186/s12909-018-1144-z

Jumintono, & Taha, M. R. bin. (2022). Encouraging Awareness among Secondary School Students on Air Pollution in Supporting Environmental Protection. *Journal of Curriculum and Teaching*, *11*(7), 31–36. https://doi.org/10.5430/JCT.V11N7P31

La Aca, A., Sulisworo, D., & Maruto, G. (2020). The validity of flipped classroom learning videos on the material of parabolic motion. *Universal Journal of Educational Research*, *8*(10), 4863–4869. https://doi.org/10.13189/ujer.2020.081058

Lange, C., & Costley, J. (2020). Improving online video lectures: learning challenges created by media. *International Journal of Educational Technology in Higher Education*, *17*(1). https://doi.org/10.1186/s41239-020-00190-6

Lin, L. C., Hung, I. C., Kinshuk, & Chen, N. S. (2019). The impact of student engagement on learning outcomes in a cyber-flipped course. *Educational Technology Research and Development*, *67*(6), 1573–1591. https://doi.org/10.1007/s11423-019-09698-9

Liu, H., Ruan, Z., Zhao, P., Dong, C., Shang, F., Liu, Y., Yang, L., & Timofte, R. (2022). Video super-resolution based on deep learning: a comprehensive survey. *Artificial Intelligence Review*, *55*(8), 5981–6035. https://doi.org/10.1007/s10462-022-10147-y

Nandiyanto, A. B. D., Fiandini, M., Hofifah, S. N., Ragadhita, R., Husaeni, D. F. al, Husaeni, D. N. al, Maryanti, R., & Masek, A. (2022). Collaborative Practicum with Experimental Demonstration for Teaching the Concept of Production of Bioplastic to Vocational Students to Support the Sustainability Development Goals. *Journal Of Technical Education And Training*, *14*(2), 1–13. https://doi.org/10.30880/jtet

Pulukuri, S., & Abrams, B. (2020). Incorporating an Online Interactive Video Platform to Optimize Active Learning and Improve Student Accountability through Educational Videos. *Journal of Chemical Education*, *97*(12), 4505–4514. https://doi.org/10.1021/acs.jchemed.0c00855

Saja, I. @ M., Ramli, S. M., Sopian, A., & Razak, A. Q. A. (2021). The Use Of Youtube In Arabic Speaking Skills During Open And Distance Learning (Odl). *Journal of Social Sciences and Humanities*, *18*(4), 188–202.

Suárez, F., Feijóo, J. C. M., Chiyón, I., & Alberti, M. G. (2021). Flipped Learning in Engineering Modules Is More Than Watching Videos: The Development of Personal and Professional Skills. *Sustainability*, *13*(21), 12290. https://doi.org/10.3390/su1321

Wilujeng, I., Suryadarma, I. G. P., Ertika, & Dwandaru, W. S. B. (2020). Local potential integrated science video to improve SPS and concept mastery. *International Journal of Instruction*, *13*(4), 197–214. https://doi.org/10.29333/iji.2020.13413a

Yusrizal, Y., Hajar, I., & Tanjung, S. (2019). Analysis of Elementary School Teachers' Ability in Using ICT Media and Its Impact on the Interest to Learn of Students in Banda Aceh. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, *2*(3), 37–49. https://doi.org/10.33258/birle.v2i3.352

Zhang, H., Goh, S. H. L., Wu, X. v., Wang, W., & Mörelius, E. (2019). Prelicensure nursing students' perspectives on video-assisted debriefing following high fidelity simulation: A qualitative study. *Nurse Education Today*, *79*, 1–7. https://doi.org/10.1016/j.nedt.2019.05.001