

## YouTube Usage Patterns, Content Types, and Access Conditions for Science Learning Among Applied Sciences Students at a Malaysian Public University

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### ABSTRACT

This cross-sectional survey examined YouTube usage patterns, types of science-related content accessed, content-discovery pathways, and access conditions among diploma and bachelor's degree students in the Faculty of Applied Sciences at Universiti Teknologi MARA (UiTM), Malaysia. Using convenience sampling, 215 students from six UiTM campuses completed an online questionnaire. Regarding usage frequency, 47.0% of respondents reported using YouTube for science-related learning a few times a week, while 7.4% reported daily use. The most frequently accessed science-related content types were concept explanation videos (87%), demonstrations (75%), and problem-solving tutorials (64%). Direct searching on YouTube was the dominant content-discovery pathway (91%), followed by lecturer recommendations (45%) and other online platforms (42%). For internet access, 62.3% of respondents relied primarily on mobile data, while laptops were the most commonly reported device for accessing online learning materials (38.1%). These findings indicate that YouTube forms a recurring component of science-related learning among the surveyed students, particularly through concept explanation, demonstration, and problem-solving videos. The findings also highlight the importance of accessible, credible, and curriculum-relevant video resources, particularly when students rely substantially on mobile connectivity. The study provides contextual evidence on YouTube-supported science learning in a Malaysian public university and offers practical considerations for educators seeking to incorporate video resources into Applied Sciences teaching.

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## 1. INTRODUCTION

The integration of digital platforms into higher education has transformed how students access and engage with learning resources. Beyond formal learning management systems, video-sharing platforms such as YouTube have become part of students' informal and supplementary learning environments, providing on-demand access to instructional explanations, demonstrations, tutorials, and other educational content (Alvarez-Alvarez & Ruthven, 2024; Pires et al., 2022). This flexibility is especially relevant in science education, where students often encounter abstract concepts, technical procedures, and problem-solving tasks that may benefit from visual, step-by-step explanations (Hermann et al., 2026).

YouTube's multimedia format allows scientific information to be presented through combinations of narration, visuals, demonstrations, animation, and on-screen text. These formats may be particularly relevant to science learning because they can give students alternative ways to access explanations and observe processes that may be difficult to represent through text alone (Beautemps & Bresges, 2021). However, the present study does not directly test multimedia learning processes or learning outcomes. Instead, it focuses on students' actual usage patterns, the types of science-related content they access, access conditions, and sources of video discovery.

For students in Applied Sciences disciplines, online video can provide visual explanations, demonstrations, and worked examples that complement formal classroom resources (Moghavvemi et al., 2018; Noetel et al., 2021). YouTube's on-demand format also lets students pause, replay, and revisit explanations as needed (Duffy, 2008).

In Malaysia, the expansion of digital learning during the COVID-19 pandemic accelerated the adoption of online educational resources in higher education (Jafar et al., 2023; Nordin & Nordin, 2020). However, the continued use of digital platforms in contemporary higher education warrants attention beyond emergency remote teaching (Mustapha et al., 2021). Issues such as internet accessibility, device availability, digital literacy, content credibility, and students' independent selection of online resources remain relevant to digital learning. For science education in particular, understanding how students use YouTube, what content they seek, and how they access and discover such resources can provide useful evidence for developing targeted digital learning strategies.

This study therefore aims to examine YouTube usage frequency, types of science-related content accessed, access conditions, and content-discovery pathways among students in the Faculty of Applied Sciences at Universiti Teknologi MARA (UiTM). Based on the identified research gap, the study addresses the following research questions:

- RQ1: What types of science-related content do Applied Sciences students commonly access on YouTube for academic purposes?
- RQ2: How frequently do Applied Sciences students use YouTube for science-related learning?
- RQ3: What devices and internet access methods do students use to access online learning resources?
- RQ4: How do students discover science-related educational videos on YouTube?

By examining these dimensions, the study provides contextual evidence that may inform the purposeful selection and integration of YouTube-based resources in Applied Sciences teaching and learning.

## 2. YOUTUBE IN SCIENCE EDUCATION

Over the past decade, YouTube has emerged as a major educational resource in higher education, giving learners flexible access to diverse instructional content (Yuliansah et al., 2026). Its wide accessibility and user-driven nature make it an attractive platform for informal and self-paced learning. YouTube allows educators to reach broad audiences while enabling students to revisit and review complex topics at their own pace.

Studies have highlighted that YouTube supports various teaching and learning strategies, such as flipped classrooms, blended learning, and microlearning modules. Broader research on educational video shows that video design can influence learner engagement. For example, Guo et al. (2014) found that shorter, focused MOOC videos were associated with higher engagement. YouTube also allows instructional information to be presented through combined visual and auditory modes (Khubayi et al., 2024).

In science education, YouTube videos often feature demonstrations, simulations, and animations that help learners visualise abstract concepts (Noetel et al., 2021). These formats may be particularly relevant in subjects such as physics, chemistry, and biology, where conceptual understanding is closely connected with practical and procedural knowledge (Moghavvemi et al., 2018). However, open video platforms also raise concerns regarding content quality and curricular alignment (Kohler & Dietrich, 2021).

While the use of YouTube in education is well documented, more empirical evidence is needed on how students in different higher-education contexts use the platform for academic learning. In Malaysia, particularly within public universities, differences in digital access, learning environments, and students' digital practices may influence how YouTube is incorporated into their learning (Subramaniam et al., 2024).

## **2.1 YouTube as an Educational Tool**

YouTube gives students substantial autonomy to select and revisit educational content, but this openness also creates quality-control challenges. When students search independently, they may encounter inaccurate, oversimplified, or poorly aligned material (Abed & Barzilai, 2023; Cihangir & Çoklar, 2021; Kohler & Dietrich, 2021). In Malaysian higher education, these content-selection issues intersect with differences in digital access and connectivity (Abd Rahim & Abd Rahim, 2021). These considerations justify examining both the resources students seek and the conditions under which they access online learning materials.

## **2.2 YouTube and Student Learning in STEM Fields**

Video can be particularly relevant in science, technology, engineering, and mathematics (STEM) disciplines because it can represent dynamic, procedural, and visually complex phenomena that static text alone may struggle to convey (Brame, 2016).

YouTube's role in supporting science learning extends beyond content delivery. Previous studies report that educational videos may support student engagement, conceptual explanation, and access to demonstrations, although effects depend on factors such as instructional design, content quality, and learning context (Brame, 2016; Yuliansah et al., 2026). However, the benefits reported in previous studies should not be taken as evidence that all YouTube use improves learning outcomes. A video's educational value depends on factors such as content quality, alignment with learning objectives, duration, instructional design, and how actively students engage with the material. These considerations highlight the importance of understanding what students actually seek and consume when using YouTube for science learning. For example, YouTube-based resources have been incorporated into flipped classroom approaches to provide students with opportunities to review instructional content before class (Jiménez & Ponce, 2022).

## **2.3 Accessibility and Usage Challenges in Higher Education**

Access to online video may be constrained by connectivity, data costs, and device availability in resource-limited higher-education settings (Umoh E., 2024). These conditions may contribute to differences in students' ability to access and use online learning resources (Selvanathan et al., 2023).

In addition, not all students possess the digital literacy skills required to critically evaluate the accuracy, relevance, and pedagogical value of online content. Without adequate guidance, students may encounter unverified or misleading videos or struggle to identify materials that align with local curricula and assessment requirements.

Language and cultural context may also influence the relevance and accessibility of online educational videos. For Malaysian students, differences in terminology, language proficiency, curriculum expectations, and teaching approaches may affect how useful particular videos are perceived to be (Rosli & Abdullah, 2022). These limitations are particularly problematic in science education, where accuracy and curriculum alignment are essential for comprehension and assessment preparation.

These accessibility considerations are particularly relevant to the present study because students' ability to benefit from video-based learning may depend not only on the availability of educational content but also on the infrastructure through which they access it. Examining students' primary internet connection and devices therefore provides an important contextual dimension to understanding YouTube use in Malaysian higher education.

## 2.4 Research Gap and Contribution of The Current Study

Prior research has examined students' perceptions of YouTube, educational-video interventions, and video use within particular instructional settings (Greeves & Oz, 2024; Kay, 2012; Kohler & Dietrich, 2021; Rosli & Abdullah, 2022). Within the literature reviewed for this study, comparatively less attention has been given to examining, within the same Applied Sciences student population, the types of science-related content students access, how frequently they use YouTube, the digital access conditions associated with online learning, and the pathways through which educational videos are discovered.

The present study addresses this descriptive gap among Applied Sciences students across six UiTM campuses. It does not evaluate whether YouTube improves learning outcomes. Instead, it characterises the types of science-related content students report accessing, usage frequency, access conditions, and content-discovery pathways, providing contextual evidence for selecting and curating science-related video resources in Malaysian public higher education. A related analysis of the broader survey dataset previously examined students' perceptions of YouTube usability, adoption, learning support, and pedagogical integration (Abdul Ghani et al., 2026). The present study extends that work by examining different descriptive dimensions of students' YouTube use.

## 3. METHODOLOGY

### 3.1 Research Design

This study employed a quantitative, cross-sectional survey design to examine YouTube usage frequency, types of science-related content accessed, access conditions, and content-discovery pathways among students in the Faculty of Applied Sciences at Universiti Teknologi MARA (UiTM). A survey approach was selected because the study aimed to describe students' reported behaviours across multiple UiTM campuses. Descriptive statistics, including frequencies and percentages, were used to characterise these patterns.

### 3.2 Participants and Sampling

The study involved diploma and bachelor's degree students enrolled in the Faculty of Applied Sciences at six UiTM campuses. The participating students represented four disciplinary areas: Biology, Physics and Materials, Industrial Technology, and Chemistry and Environment.

We obtained 215 completed responses. A convenience sampling approach was employed. Data collection was conducted from January to June 2025. Participants were recruited through survey links distributed by lecturers and through student communication groups, including WhatsApp groups. Eligible participants were diploma or bachelor's degree students enrolled in the Faculty of Applied Sciences at the participating UiTM campuses. Because the survey link was distributed through multiple communication channels and the total number of students who received the invitation could not be determined, we could not calculate a response rate.

The respondents analysed in the present study were drawn from the same broader survey dataset previously reported by Abdul Ghani et al. (2026). The earlier publication examined students' perceptions of YouTube usability, adoption, perceived learning support, and pedagogical integration. In contrast, the present study analyses questionnaire items on types of science-related content accessed, usage frequency, access conditions, and content-discovery pathways that the earlier analysis did not address.

### 3.3 Questionnaire Development

Data were collected using a structured online questionnaire administered through Google Forms. The questionnaire was organised into several sections covering demographic characteristics, internet accessibility, device use, YouTube usage patterns, science-related content accessed, sources of content discovery, and perceived academic use of YouTube.

The questionnaire comprised eight sections containing multiple-choice, multiple-response, and open-ended items. The present article reports the closed-ended items relevant to the four research questions, while the open-ended responses were not included in the present analysis. The researcher developed the questionnaire items based on the study objectives and literature on YouTube use and digital learning.

### 3.4 Questionnaire Validity and Reliability

The questionnaire was researcher-developed and was not subjected to formal psychometric validation. Because the items primarily comprised categorical and multiple-response measures rather than indicators of a single latent construct, the researchers did not calculate internal-consistency statistics. The research team reviewed the instrument for item clarity, relevance to the study objectives, and alignment with the research questions. Formal content-validity testing was not conducted. Accordingly, interpret the findings as descriptive responses to individual questionnaire items rather than scores derived from a validated measurement scale.

### 3.5 Ethical Considerations

Participants were informed of the study's purpose, the voluntary nature of participation, and their right to decline participation. Informed consent was obtained before respondents proceeded with the questionnaire. No personally identifying information was collected, and the responses were treated confidentially and used solely for research purposes.

### 3.6 Data Analysis

The completed responses were analysed using descriptive statistics. Frequencies and percentages were calculated to summarise respondents' demographic characteristics, internet access, device use, YouTube usage frequency, types of content accessed, and sources of video discovery. Because the study aimed to provide a descriptive account, no inferential statistical tests were conducted, and no associations or group differences were tested. For multiple-response items, percentages were calculated using the total sample ( $N = 215$ ) as the denominator, and summed percentages could therefore exceed 100%.

## 4. RESULTS

### 4.1 Student Demographics

A total of 215 students enrolled in the Faculty of Applied Sciences across six UiTM campuses participated in this study. Most respondents were female, accounting for 78% of the sample. Students from Industrial Technology represented the largest disciplinary group, accounting for 46% of respondents. Figure 1 presents the distribution of respondents by gender and field of study.

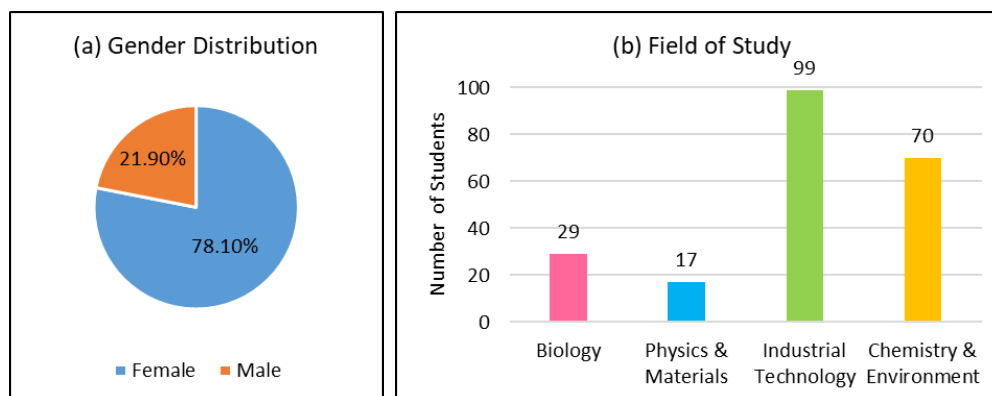


**Figure 1** Demographic distribution of respondents: (a) Gender; (b) Field of study  
Source: Author (2026)

## 4.2 Science-related YouTube Content Accessed

Lectures or explanations of concepts were the most frequently reported type of science-related YouTube content (87%), followed by demonstrations of experiments or procedures (75%), problem-solving tutorials (64%), and visualisations or animations of scientific processes (54%), as shown in Figure 2. Study tips or academic advice (21%) and general scientific facts (14%) were less frequently reported. Because respondents could select more than one content type, these percentages are not mutually exclusive.

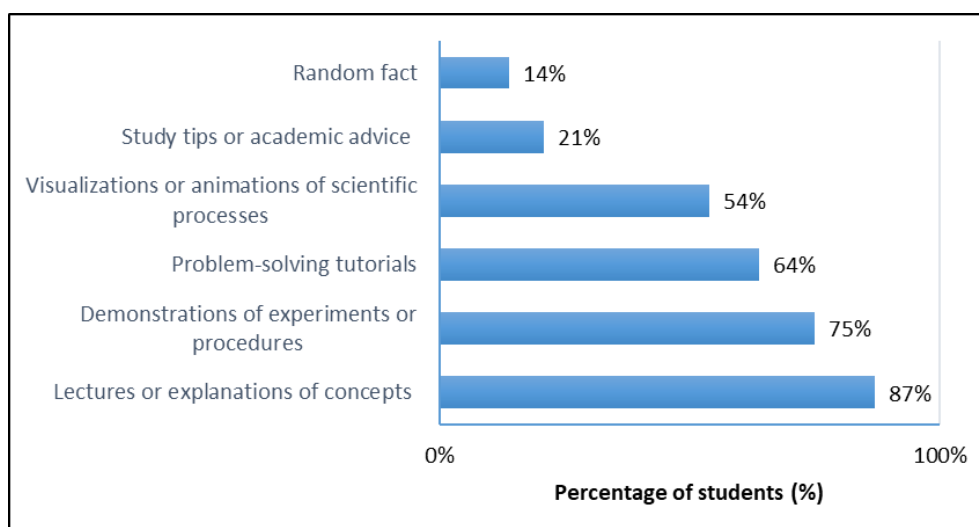


**Figure 2** Types of science-related content students watch on YouTube for their studies  
Source: Author (2026)

## 4.3 Frequency of YouTube Use for Science-related Learning

Regarding the frequency of YouTube use for science-related learning (as shown in Figure 3), 47.0% of respondents ( $n = 101$ ) reported using YouTube a few times a week, 17.7% ( $n = 38$ ) reported weekly use, and 7.4% ( $n = 16$ ) reported daily use. A further 18.1% ( $n = 39$ ) used YouTube a few times a month, while 9.8% ( $n = 21$ ) reported rare use. Overall, 72.1% of respondents reported using YouTube for science-related learning at least weekly.

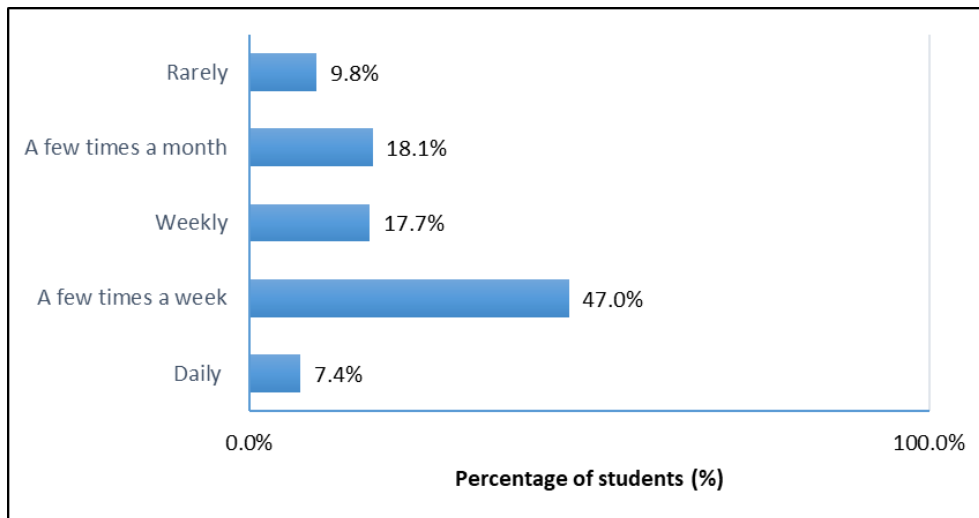


**Figure 3** Frequency of YouTube use for science-related learning among respondents  
Source: Author (2026)

#### 4.4 Device and Internet Access

For study purposes, 62.3% of respondents reported using mobile data as their primary connection, while 30.7% reported using campus Wi-Fi. For devices used to access online learning materials, laptops were the most frequently reported primary device (38.1%), followed by smartphones (30.2%). The remaining distributions are presented in Figure 4 and Figure 5.

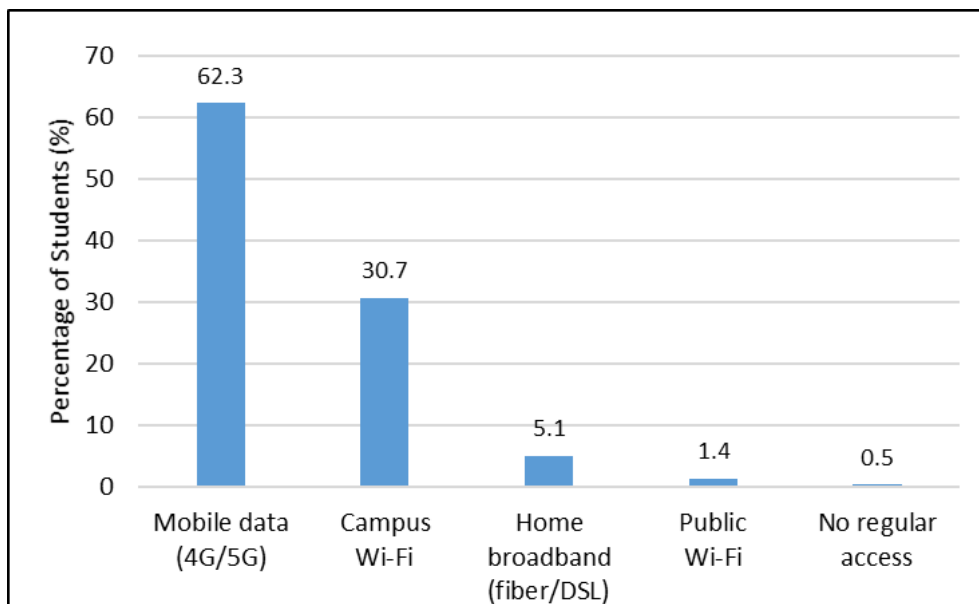


**Figure 4** Primary internet connection used for studies by respondents  
Source: Author (2026)

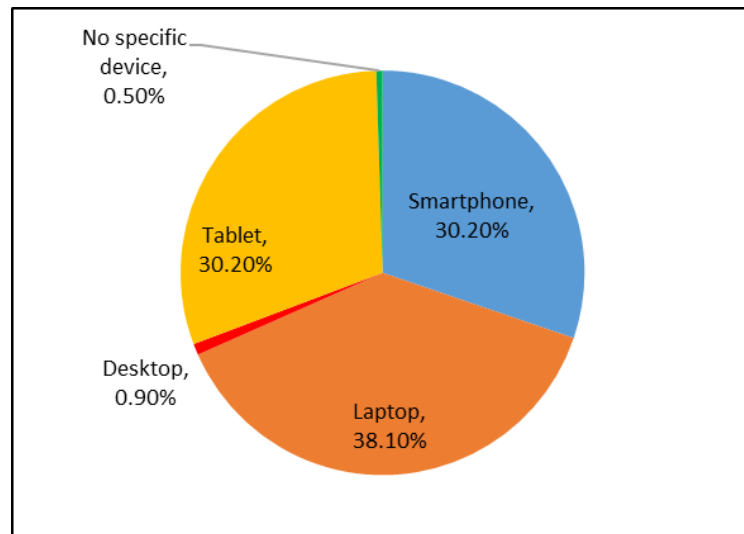


**Figure 5** Primary devices used by students to access online learning materials  
Source: Author (2026)

#### 4.5 Content Discovery Pathways

Direct searching on YouTube was the most frequently reported content-discovery pathway (91%), followed by lecturer or tutor recommendations (45%), other online platforms (42%), sharing by classmates or peers (34%), and subscriptions to specific science channels (20%). Because respondents could select more than one discovery source, these percentages are not mutually exclusive, as shown in Figure 6.

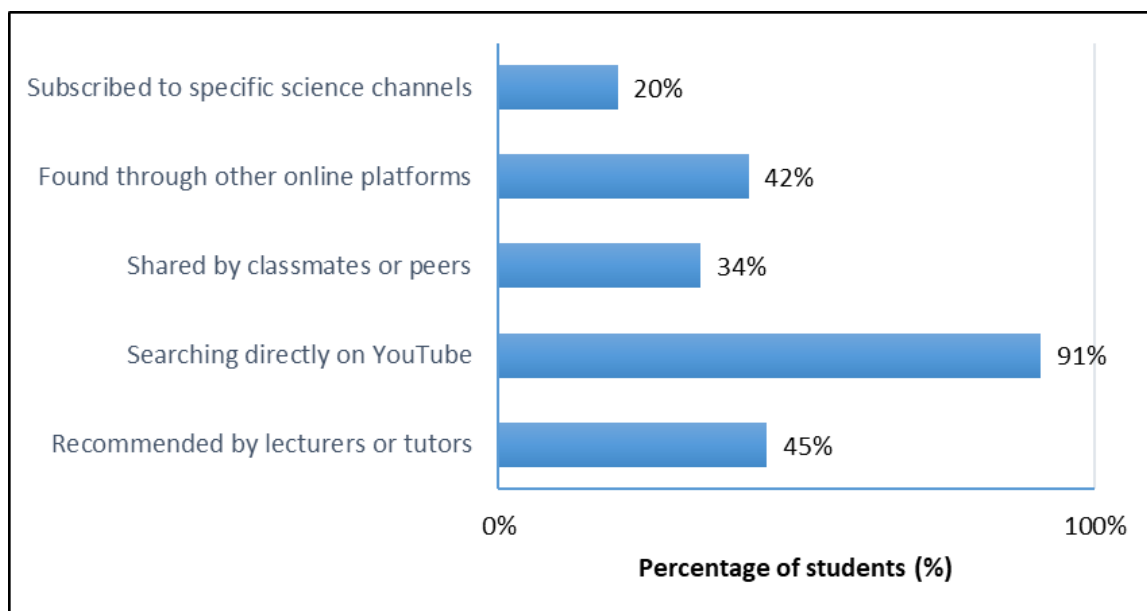


**Figure 6** Sources of discovery for science-related YouTube videos among students  
Source: Author (2026)

## 5. DISCUSSION

### 5.1 Frequency of YouTube Use for Science-related Learning

The frequency data indicate that YouTube formed a recurring part of science-related learning for many respondents. Nearly half of the students (47.0%) reported using YouTube a few times a week, and 72.1% reported using it at least once a week. Daily use, however, was reported by only 7.4%. These findings indicate regular rather than merely occasional use among much of the sample, but frequency alone does not establish whether YouTube functions as a primary or supplementary learning resource.

This pattern aligns with the on-demand nature of educational video, which lets students access and revisit instructional material outside scheduled classroom sessions (Haagsman et al., 2020). When considered alongside the high reported access to concept explanations and demonstrations, the frequency results suggest that students incorporate YouTube into their learning routines for identifiable academic purposes. The present study does not establish whether this use replaces formal instruction or improves academic achievement.

### 5.2 Science-related Video Content Accessed by Students

The high reported access to concept explanation videos (87%), followed by demonstrations (75%) and problem-solving tutorials (64%), identifies the types of science-related video content respondents most commonly access.

This finding is particularly relevant to Applied Sciences, where learning often combines theoretical concepts with practical procedures and problem-solving. Demonstration videos may offer an accessible way to observe processes that students may not be able to observe repeatedly in laboratory or classroom settings. In contrast, problem-solving videos may provide additional examples for students who need more practice (Lacey & Wall, 2021).

This pattern is broadly consistent with previous research indicating that educational videos can support the presentation of complex concepts, demonstrations, and visually oriented scientific information (Beautemps & Bresges, 2021). However, frequently reported access to a particular type of video should not be interpreted as evidence that the content necessarily improves comprehension or academic performance. The present study measured students' reported patterns of content access rather than objective learning outcomes. Future studies should therefore examine whether particular types of YouTube content are associated with measurable improvements in conceptual understanding or academic achievement.

### 5.3 Independent Search and Lecturer Curation

Direct searching was the dominant method of discovering science-related YouTube content, reported by 91% of respondents. This finding suggests that students actively search for digital resources they perceive as relevant to their academic needs. At the same time, 45% of respondents reported lecturer recommendations, suggesting that formal academic guidance remains an important way to direct students to potentially relevant resources.

The coexistence of independent searching and lecturer recommendations has practical implications for teaching. Students may have considerable autonomy in selecting videos, but independent searching also exposes them to variation in content quality, accuracy, curriculum alignment, and pedagogical suitability. This finding aligns with YouTube's role as an open-access platform where learners can independently search for and select content based on their perceived needs. However, the platform's open nature also places greater responsibility on students to evaluate content quality and credibility.

Previous research has identified credibility and content quality as important concerns when students select scientific information from open video platforms (Abed & Barzilai, 2023; Kohler & Dietrich, 2021). Consequently, lecturers can play a useful role by recommending or curating selected videos while still allowing students to explore additional resources independently.

These percentages describe reported discovery pathways only. They do not establish whether lecturer recommendations change students' search behaviour, improve video-selection quality, or influence subsequent learning.

#### 5.4 Internet Accessibility and Implications for Video-based Learning

Mobile data was the primary internet connection reported by 62.3% of respondents. This result identifies the predominant access mode within the sample, but it does not establish that respondents experienced poor connectivity, high data costs, or limitations in accessing video content. Nevertheless, previous research has shown that connectivity and affordability can shape students' participation in online learning (Johnson et al., 2021). These factors therefore remain relevant considerations when video-based resources are incorporated into teaching.

This finding supports the importance of designing digital learning resources with accessibility in mind. When lecturers incorporate YouTube videos into courses, they may consider selecting concise videos, providing alternative learning materials, and ensuring essential course information is not available exclusively through video. These measures may help reduce barriers related to connectivity and data consumption.

#### 5.5 Pedagogical Implications

The findings provide several practical implications for Applied Sciences educators. First, because concept explanation, demonstration, and problem-solving videos were the most frequently accessed content types, lecturers may prioritise these functions when selecting YouTube resources for course-related use. Rather than incorporating videos simply because they are available, lecturers can select resources according to the learning function they are intended to support.

Second, the high proportion of students who independently search for educational videos highlights the importance of digital information literacy. Students may benefit from guidance on evaluating the credibility, accuracy, relevance, and currency of online science content (Marttunen et al., 2021). Lecturer-curated playlists or recommended channels may provide a practical way to direct students to reliable resources while retaining their autonomy to explore additional materials.

Third, the substantial reliance on mobile data indicates that accessibility should be considered when implementing video-based learning. Shorter videos, appropriate video quality, downloadable or alternative resources, and concise supporting materials may help accommodate students with different connectivity conditions (Patterson et al., 2020).

Overall, the findings support selective, purposeful integration of YouTube-based resources aligned with course objectives, while retaining appropriate alternative learning materials.

#### 5.6 Limitations

This study has several limitations. First, the cross-sectional design and reliance on self-reported responses describe reported behaviour at one point in time. They cannot establish causal relationships between YouTube use and learning outcomes. Second, convenience sampling and distribution of the survey through lecturers, student communication groups, and WhatsApp created an unknown invitation denominator. Therefore, the study could not calculate a response rate or assess non-response bias. The uneven distribution of respondents by gender and field of study also limits generalisation beyond the participating sample. Third, the device and internet-access items referred to online learning generally rather than YouTube specifically. These variables should therefore be interpreted as contextual access conditions rather than direct measures of YouTube access. The study also did not evaluate the accuracy, pedagogical quality, or curriculum alignment of the individual videos respondents accessed. Finally, the researcher-developed questionnaire was not formally psychometrically validated. Future studies should include more diverse samples and use additional qualitative or behavioural evidence to examine how students select and use educational videos.

### 6. CONCLUSION

This study provides a descriptive account of YouTube use for science-related learning among 215 Applied Sciences students across six UiTM campuses. Lectures or concept explanations were the most frequently reported content type, followed by demonstrations and problem-solving tutorials. Most respondents reported using YouTube regularly, with 72.1% accessing it for science-related learning at least weekly. Direct searching on YouTube was the dominant content-

discovery pathway, while lecturer or tutor recommendations and other online platforms were also commonly reported. Mobile data was the predominant primary internet connection for study, while laptops were the most frequently reported device for accessing online learning materials.

These findings identify patterns that can inform the selection and curation of video resources in Applied Sciences teaching. In particular, educators should consider the science-related content students access most and the conditions under which they use online resources. Because the study measured reported practices rather than learning outcomes, it does not establish that YouTube improves academic achievement or that reliance on mobile data produces access difficulties.

Future research should examine whether particular patterns of YouTube use or lecturer-curated resources are associated with conceptual understanding, engagement, or academic performance. Comparisons across disciplines, campuses, and more diverse student populations would also help determine whether the patterns observed in this convenience sample extend to other higher-education contexts.

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## **9. AUTHORS' CONTRIBUTIONS**

Norazura Ibrahim: Conceptualisation, methodology, formal analysis, investigation, writing-original draft and writing- review and editing; Fazni Susila Abdul Ghani: Conceptualisation, methodology, formal analysis, validation, writing- review and editing; Suzana Ratim: Conceptualisation, writing- review and editing, visualisation and validation.

## **10. CONFLICT OF INTEREST DECLARATION**

We certify that the article is the Authors' and Co-Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This research/manuscript has not been submitted for publication, nor has it been published in whole or in part elsewhere. We confirm that all authors contributed significantly to the work, the validity and legitimacy of the data, and its interpretation for submission to IJELHE.

## **11. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS**

During the preparation of this work, the authors used ChatGPT for brainstorming ideas, planning, and drafting. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

## **12. DATA AVAILABILITY/SUPPLEMENTARY MATERIALS**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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