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# Learning Pharmaceutics from YouTube: A Valuable Tool for Undergraduate Students

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## ABSTRACT

**Objective:** Pharmaceutics is a foundational subject in pharmacy education, often perceived as challenging due to its technical depth and complexity. Traditional teaching methods may not always cater to diverse learning needs, prompting students to seek supplementary digital resources such as YouTube. This study aimed to assess the prevalence and patterns of YouTube usage among undergraduate pharmacy students for learning pharmaceutics, identify commonly studied topics, and evaluate student perceptions regarding its effectiveness and limitations.

**Methods:** A cross-sectional study was conducted using an online structured questionnaire distributed via social media and institutional email groups. Undergraduate pharmacy students from various academic years were included through non-random sampling. The questionnaire captured demographic data, YouTube usage patterns, perceived effectiveness, and challenges. Data were analyzed using SPSS v25, employing descriptive statistics and chi-square tests.

**Results:** Among the 600 participants, 93% reported using YouTube as a supplementary tool for learning pharmaceutics. Key topics studied included drug formulation (65%), biopharmaceutics (60%), dosage form design (55%), and stability studies (50%). Most students (88%) found YouTube effective in understanding complex concepts, and 74% believed it improved retention. However, concerns were noted regarding credibility (55%), lack of structured learning (42%), and difficulty identifying reliable channels (30%).

**Conclusion:** YouTube is a widely used and appreciated supplementary learning tool among pharmacy students, enhancing conceptual understanding and academic confidence. Nonetheless, it should be integrated cautiously with formal curricula, emphasizing content credibility and guided use. Further studies should evaluate long-term academic impacts and strategies for effective digital learning integration.

**Keywords:** Digital resources; Pharmacy education; Pharmaceutics; Student perception; Video-based learning

## Introduction

Pharmaceutics is one of the fundamental pillars of pharmacy education, dealing with the science of designing and preparing drug formulations for optimal therapeutic outcomes. [1] It is a vast field that covers the science of drug formulation, pharmaceutical microbiology, pharmaceutical dosage forms and route of administration, pharmacogenomics, pharmacotherapy, nanomedicine and nanotechnology in drug delivery. [2] The discipline requires a deep understanding of drug delivery systems, excipient functions, pharmacokinetics, and biopharmaceutics.

Traditional teaching methodologies, such

as lectures, textbooks, and laboratory sessions, play a crucial role in imparting this knowledge. However, these methods often fall short in addressing the diverse learning styles of students, necessitating alternative resources. [3] In other countries innovative approaches are being adopted to better prepare students for real-world healthcare challenges like hands-on laboratory training, formulation workshops, case-based learning, virtual reality in drug formulation and collaboration with other healthcare providers. These methods aim to make the pharmaceutics education more interactive and relevant to real-world challenges, ensuring that students are well-equipped for the pharmaceutical industry demands.

The advent of digital technology has significantly transformed education. Online learning platforms, interactive simulation software, virtual labs, AI for drug development and Video-based learning platforms, particularly YouTube, have become increasingly popular among students seeking supplementary learning materials. [4] YouTube offers a vast repository of educational content, including animations, tutorials, and expert lectures, making complex pharmaceutics topics more comprehensible. It also provides an engaging platform for students to explore complex topics at their own pace. [5] Similarly, unlike expensive textbooks or paid courses, YouTube offers a wealth of educational material for free, making it an affordable learning resource for students. [6] Moreover, studies have shown that visual learning aids improve information retention and engagement, leading to better academic performance. The aim of this study is to evaluate the fruitfulness of YouTube as a learning tool for undergraduate students in pharmaceutics, exploring student perceptions, preferences, and potential drawbacks. The objectives of this study were threefold: first, to assess the prevalence of YouTube usage among undergraduate pharmacy students for learning pharmaceutics; second, to identify the specific topics within pharmaceutics that students most frequently study using YouTube; and third, to evaluate student perceptions regarding the effectiveness and credibility of YouTube as a learning tool.

## Materials and Methods

### Study Design

A cross-sectional study was administered

to explore the role of YouTube in learning pharmaceutics among undergraduate students. An organized online questionnaire was used to gather quantitative data from participants.

### Participants and Sampling

Undergraduate pharmacy students from various academic years were invited to participate in the study. Recruitment was conducted through social media platforms and institutional email groups. Informed consent was obtained from each participant, and the study was carried out following approval from the institutional ethics board. Participants were eligible for inclusion if they were enrolled in an undergraduate pharmacy program, actively used YouTube as a learning resource, and were willing to participate in the survey. As recruitment relied on social media, the study employed a non-random sampling method, which may limit the generalizability of the findings.

### Data Collection Tool

Data were collected using a structured questionnaire developed in Google Forms and distributed online. The questionnaire consisted of four sections: (1) Demographics, including age, gender, academic year, and institution; (2) YouTube usage patterns, focusing on frequency of use, preferred pharmaceutics topics, and reasons for using YouTube; (3) Perceived effectiveness, assessing clarity, ease of understanding, and contribution to academic performance; and (4) Challenges and limitations, exploring concerns related to credibility, accuracy, and integration with formal education.

### Data Analysis

The analysis of collected data was done using SPSS (Statistical Package for Social Sciences) version 25. Descriptive statistics, such as percentages and frequency distributions, were used to present student responses. Chi-square tests were conducted to examine coalition between demographic factors and YouTube usage patterns.

## Results

A total of 600 undergraduate pharmacy students participated in the study. Of these, 58% were female and 42% male. The academic

distribution included 35% first-year students, 30% second-year, 20% third-year, and 15% final-year students. The analysis focused on patterns of YouTube usage for pharmaceutics learning, including frequency, topic preferences, perceived effectiveness, and potential limitations.

### General YouTube Usage Among Students

Table 1 presents the general patterns of YouTube usage among medical and dental students in relation to their academic year and gender. A high percentage of students reported using YouTube routinely (96.6%), with minimal variation between medical and dental streams. Similarly, a large majority acknowledged YouTube as a source of information (96.6%) and as a learning tool within their academic curriculum (95.2%). The percentage of students specifically using YouTube to learn pharmaceutics was slightly lower (85.6%), with notable variation across academic years ($p = 0.01$), suggesting differential use depending on the stage of training.

**Table 1: General information and pharmaceutics-related usage of YouTube amongst Medical and Dental students in relationship with level of study and gender**

| Questions | %age +ve | M | D | P value | Ma | Fe | P value | 1st year | 2nd year | 3rd year | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Do you routinely use YouTube | 96.6 | 97.7 | 94.9 | 0.214 | 94.8 | 90.9 | 0.08 | 91.5 | 99.3 | 96.6 | 0.53 |
| Does YouTube serve as a source of information for you | 96.6 | 91.2 | 90.9 | 0.64 | 92.5 | 97.7 | 0.92 | 85.1 | 89.4 | 92.8 | 0.14 |
| Does YouTube serve as a learning tool in your medical / dental school | 95.2 | 94.8 | 91.8 | 0.92 | 97.5 | 96.2 | 0.64 | 90.1 | 84.1 | 72.6 | 0.08 |
| Do you use YouTube to learn pharmaceutics | 85.6 | 83.9 | 87.6 | 0.08 | 91.8 | 97.0 | 0.21 | 85.2 | 79.4 | 31.4 | 0.01 |

Note: % +ve: percentage of positive answers; M: Medical; D: Dental, Ma: males; Fe: females; 1st: students of first-year; 2nd: students of second-year; 3rd: students of third-year

### Specific Applications of YouTube in Pharmaceutical Sciences

To further explore the role of YouTube in academic learning, Table 2 summarizes the types of pharmaceutical topics students engaged with on the platform. Pharmaceutical technology (90.2%), clinical pharmaceutics (90.2%), and drug delivery (96%) were among the most frequently accessed areas. The use of YouTube in these areas showed statistically significant associations with field of study and year of enrollment. For instance, clinical pharmaceutics and pharmaceutical technology usage showed a significant difference between medical and dental students ($p = 0.04$), as well as across academic levels ($p = 0.03$), indicating discipline-specific and curriculum-level trends.

### Perceived Value and Recommendations

Table 3 explores participants' perceptions of YouTube as an effective learning tool for pharmaceutics. The majority of students (95.9%) indicated that YouTube videos were helpful for understanding pharmaceutical topics, and 91.1% believed they aided in memorization and recall.

Furthermore, 83.6% felt that YouTube contributed to better exam performance. While only 34.2% reported being recommended YouTube by their instructors, a significant 95.9% expressed willingness to recommend the platform to peers. The overall perception of YouTube was favorable, with minor variations by gender, academic year, or field of study.

**Table 2: YouTube used in learning pharmaceutical sciences and regions in correlation to gender, field of study and study level**

| Using YouTube | %age +ve | M | D | P value | Ma | Fe | P value | 1st year | 2nd year | 3rd year | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pharmaceutical technology | 90.2 | 90.7 | 70.9 | 0.04 | 94.8 | 90.9 | 0.08 | 91.5 | 99.3 | 16.6 | 0.03 |
| Pharmacokinetics | 59 | 51.2 | 50.9 | 0.64 | 92.5 | 97.7 | 0.92 | 85.1 | 89.4 | 12.8 | 0.04 |
| Drug therapy | 60 | 64.8 | 51.8 | 0.92 | 97.5 | 96.2 | 0.64 | 90.1 | 84.1 | 22.6 | 0.01 |
| Drug delivery | 96 | 93.9 | 97.6 | 0.08 | 91.8 | 97.0 | 0.21 | 85.2 | 79.4 | 31.4 | 0.01 |
| Clinical pharmaceutics | 90.2 | 90.7 | 70.9 | 0.04 | 94.8 | 90.9 | 0.08 | 91.5 | 99.3 | 16.6 | 0.03 |
| Nanotechnology in drug delivery | 59 | 51.2 | 50.9 | 0.64 | 92.5 | 97.7 | 0.92 | 85.1 | 89.4 | 12.8 | 0.04 |
| Biopharmaceutics | 60 | 64.8 | 51.8 | 0.92 | 97.5 | 96.2 | 0.64 | 90.1 | 84.1 | 22.6 | 0.01 |
| Pharmacogenomics | 96 | 93.9 | 97.6 | 0.08 | 91.8 | 97.0 | 0.21 | 85.2 | 79.4 | 31.4 | 0.01 |

Note: % +ve: percentage of positive answers; M: Medical; D: Dental, Ma: males; Fe: females; 1st: students of first year; 2nd: students of second-year; 3rd: students of third-year

## Discussion

The results of this study highlight the noteworthy role of YouTube as a supplementary learning tool for undergraduate pharmacy students. An overwhelming 93% of the participants reported using YouTube for pharmaceutics learning, with key topics such as drug formulation (65%), biopharmaceutics (60%), and dosage form design (55%) being the most frequently studied. The majority of students (88%) found YouTube videos beneficial for understanding complex pharmaceutics concepts, with 74% agreeing that visual learning improved retention. However, concerns regarding content credibility (55%) and the lack of structured learning pathways (42%) were also evident.

These results align with previous studies that have explored the effectiveness of YouTube as a learning tool in healthcare education. A study conducted by Shen and his team found that medical students frequently used YouTube for revising pharmacology concepts, reporting improved conceptual understanding and exam performance. [7]

Similarly, other authors demonstrated that anatomy students benefited from video-based learning, particularly for complex visual structures. [8] The current study's findings reinforce these conclusions, suggesting that YouTube serves as a valuable adjunct to traditional learning methods.

However, discrepancies exist when comparing this study's results to research conducted in Western countries. While studies from the United States and Europe report a greater emphasis on instructor-guided online learning, the present study reveals that only 34.2% of students received recommendations from faculty to use YouTube. [9] This indicates a gap in the integration of digital resources within the formal curriculum in Pakistan. The limited endorsement from instructors could stem from concerns about content reliability and the unregulated nature of YouTube videos.

In the Pakistani context, several factors contribute to the reliance on YouTube for pharmaceutics learning. Firstly, limited access to advanced teaching aids such as virtual labs and simulation software in many institutions drives students toward free, easily accessible online resources. [10]

**Table 3: Perceived values of using YouTube as a tool for learning pharmaceutics**

| Question | %age +ve | M | D | P value | Ma | Fe | P value | 1st year | 2nd year | 3rd year | P value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Was there any useful information relevant on YouTube about pharmaceutics | 93.2 | 90.7 | 90.9 | 0.14 | 94.8 | 90.9 | 0.08 | 91.5 | 99.3 | 86.6 | 0.13 |
| Was YouTube helpful for understanding any pharmaceutical topics | 95.9 | 91.2 | 90.9 | 0.64 | 92.5 | 97.7 | 0.92 | 85.1 | 89.1 | 82.8 | 0.14 |
| Was YouTube helpful for you in memorizing and recalling pharmaceutical information | 91.1 | 94.8 | 91.8 | 0.92 | 97.5 | 96.2 | 0.64 | 90.1 | 84.1 | 82.6 | 0.11 |
| Was YouTube helpful for you in getting higher marks in pharmaceutics exams | 83.6 | 84.8 | 81.8 | 0.92 | 97.5 | 96.2 | 0.64 | 90.1 | 84.1 | 82.6 | 0.11 |
| Has any of your instructors in the pharmaceutical department advised you to use YouTube in learning pharmaceutics | 34.2 | 51.2 | 50.9 | 0.64 | 92.5 | 97.7 | 0.92 | 85.1 | 89.4 | 82.8 | 0.14 |
| Do you advise for YouTube to be used as a learning tool other students for pharmaceutics | 95.9 | 93.9 | 97.6 | 0.08 | 91.8 | 97.0 | 0.21 | 85.2 | 79.4 | 34.1 | 0.11 |

Note: % +ve: percentage of positive answers; M: Medical; D: Dental, Ma: males; Fe: females; 1st: students of first-year; 2nd: students of second-year; 3rd: students of third-year

Secondly, the high cost of textbooks and paid online courses makes YouTube an attractive alternative for students seeking cost-effective learning materials. [11] Additionally, given the linguistic diversity in Pakistan, YouTube provides access to multilingual content, allowing students to grasp complex concepts in their preferred language. [12]

Despite its advantages, the study highlights notable limitations of using YouTube for academic learning. The credibility of content remains a primary concern, as not all videos are peer-reviewed or created by experts. Unlike structured academic curricula, YouTube videos may lack coherence, making it difficult for students to build a systematic understanding of pharmaceutics. Furthermore, the presence of misinformation and commercially driven content can mislead students, underscoring the need for curated and verified educational resources.

To enhance the efficacy of YouTube as a learning tool, pharmacy educators in Pakistan should consider integrating verified YouTube content into the curriculum. Institutions could develop official YouTube channels featuring

lectures from experienced faculty members, ensuring content accuracy and alignment with course objectives. Additionally, implementing digital literacy programs can help students critically evaluate online information, distinguishing between credible and unreliable sources.

Valuable insights are obtained from this study provides regarding the role of YouTube as a supplementary learning tool in pharmaceutics education, highlighting student preferences, effectiveness, and associated challenges. A large sample size is the key strength of this study (600 participants), which enhances the generalizability of the findings. Additionally, the use of a structured questionnaire allowed for the systematic collection of quantitative data, providing clear trends in student perceptions and usage patterns. However, the study is limited by its cross-sectional design, which prevents the establishment of causal relationships. Moreover, the reliance on self-reported data introduces the possibility of response bias. Future research should explore longitudinal studies to assess the long-term impact of YouTube-based learning on academic performance. Additionally, qualitative studies involving in-depth interviews with students and faculty could provide deeper insights into the challenges and potential improvements in digital learning integration. Developing institutional guidelines for YouTube usage in pharmacy education could further enhance its effectiveness as a structured learning resource.

## Conclusion

YouTube is a valuable supplementary tool for learning pharmaceutics, offering accessibility and engaging content that aids comprehension and retention. However, concerns about credibility and lack of structured learning highlight the need for guided use. Educators should incorporate YouTube into formal learning frameworks to maximize its effectiveness while ensuring content accuracy. Future research should explore the long-term impact of YouTube-based learning on academic performance in pharmaceutics.

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## Author Contribution

The author contributed substantially to the manuscript and is the sole contributor according to the ICMJE guidelines

## Data Availability Statement

All relevant data are within the manuscript. Additional data supporting this study are available from the corresponding author upon reasonable request.

## Ethical Consideration

All methods were carried out in accordance with the Declaration of Helsinki. The study was approved by Ethical Review Board of the parent institution (SMC/IRB-14012). Written and verbal consent was obtained from all participants.

## Funding

## Conflict of Interest

None

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