

# The Potential of YouTube as a Source of Mathematics Learning Education

## ABSTRACT

The rapid progress in technology and information has facilitated the integration of computer-based technology into the realm of education. Utilizing computer technology as a learning medium or learning resource is something that must be done. Indeed, a plethora of educational resources are readily available on the internet in the form of electronic learning (e-learning). The predominant format of content in e-learning platforms is textual, which poses challenges for students in comprehending mathematical concepts due to the nature of mathematical material that often involves detailed explanations of problem-solving procedures. Due to this rationale, instructional materials presented in the format of videos serve as a viable substitute for textual media. The educational videos that have been produced can be published on online platforms dedicated to video sharing, such as YouTube. The objective of this study is to assess the viability of YouTube as an educational resource for mathematical education. The present study employs a qualitative descriptive methodology, wherein the researcher assumes the role of the primary instrument. The study involved an examination of mathematics learning materials that were released by various channels on the YouTube platform. Additionally, interviews were performed with mathematics educators and high school students to gather their perspectives on the use of YouTube as a resource for studying mathematics. The findings of the study indicate the existence of YouTube channels that offer mathematics educational content suitable for student learning purposes. In the study, it was found that 30% of the participating students utilised YouTube as a means of acquiring knowledge in the field of mathematics. However, it is worth noting that participants inadvertently stumbled into mathematics learning videos on YouTube while utilising the platform as a source for learning mathematics. Students utilise the Google search engine to seek for relevant material, subsequently employing YouTube as a platform to locate videos that align with their specific preferences. Based on interviews conducted with mathematics educators and students, it is evident that YouTube has the potential to serve as a viable platform for mathematical education. However, it is crucial to acknowledge and evaluate the various advantages and disadvantages associated with its use in this context.

*Keywords: e-learning, educational, YouTube, channels*

## 1. INTRODUCTION

According to available data from 2012, over 22% of the population in Indonesia were identified as internet users [1], [2]. Projections suggest that this percentage will experience a consistent annual growth rate in subsequent years [3]. Online learning can be employed in the field of education. According to scholarly study, the utilization of online learning platforms has the potential to foster more independence among students [4]. Hence, there is a necessity for the provision of online learning resources in the form of e-learning. E-learning possesses numerous advantages in comparison to conventional learning methods [5]. When studying mathematics, the curriculum includes acquiring knowledge and requires a comprehensive explanation of each procedural step involved in solving a mathematical problem. If transcribed into textual format, this explanation would cover many pages [6]. As a study shows, video allows condensing information into short segments [7]. Based on the

25 statement above, e-learning in mathematics education is mainly realized in video  
26 presentation media. Mathematics learning resources in the form of educational films can be  
27 easily distributed via the Internet, making it possible for students to learn online [8]. YouTube  
28 is a leading online platform that facilitates video sharing, allowing users to upload, view, and  
29 distribute videos [9]-[12]. According to these sources, YouTube is a platform where users  
30 can freely upload and distribute videos, attracting millions of viewers daily [13]-[16].  
31 YouTube, a video-sharing website, has experienced a significant surge in popularity since its  
32 founding in 2005. According to available data, YouTube experienced a substantial increase  
33 in views and user-generated content in the first five years after its introduction. Specifically,  
34 the platform collects over 2 billion daily views, while users actively upload videos at more  
35 than 35 hours per minute [17]-[19]. Several studies have provided evidence supporting the  
36 usefulness of YouTube in various fields [20]. YouTube is a valuable resource in various  
37 academic fields, including nursing and the acquisition of English as a second language,  
38 among others [21], [22]. The use of YouTube in the educational realm is a development that  
39 has been around for a while. Using YouTube as a teaching tool has attracted great interest  
40 in efforts to optimize educational practices. In March 2009, YouTube announced the  
41 introduction of YouTube Edu, a compilation of channels featuring educational content  
42 provided by various educational institutions such as schools and colleges. By the end of the  
43 first year, more than 300 educational institutions had successfully uploaded more than  
44 65,000 videos covering lectures, the latest news, and school-related activities. The  
45 statements above only represent a small part of YouTube's educational value [23], [24]. This  
46 study aims to examine the potential of YouTube as an educational source for mathematics  
47 learning among **Senior High School or Vocational High School** students and determine  
48 strategies for optimizing the effectiveness of YouTube as a mathematics teaching platform.

## 49 50 **2. METHODS**

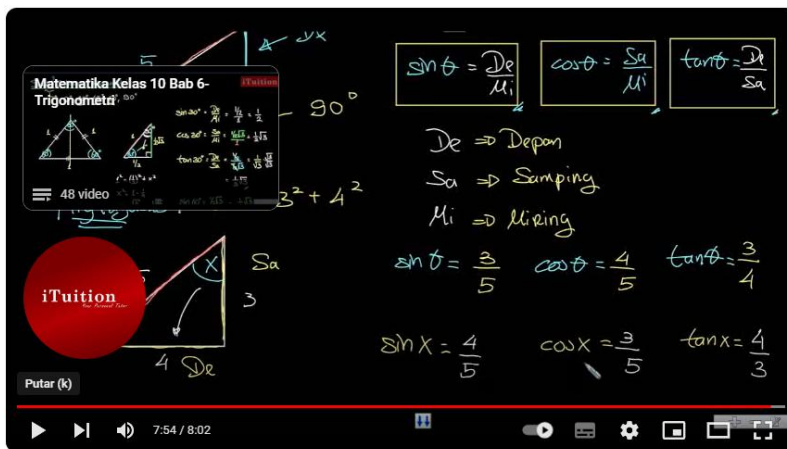
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52 This study employs a descriptive qualitative technique. The primary objective of this study is  
53 to investigate and analyze YouTube as a potential platform for mathematics education,  
54 utilizing students as the primary agents of data collection and analysis. The analysis  
55 conducted by students focused on YouTube channels that engage in discussions about  
56 mathematics. The study uses questionnaire indicators developed as a supplementary tool  
57 for evaluating video content related to mathematics instruction available on YouTube  
58 channels. The channels under investigation in this study include iTuition Indo, Matematika  
59 Hebat, and kafe math. This study will involve interviews with five mathematics teachers and  
60 10 SMA/SMK/MA students. These interviews aim to triangulate the data and assess the  
61 potential of YouTube as a viable source for mathematics learning among students.

## 62 63 **3. RESULTS AND DISCUSSION**

### 64 65 **3.1 iTuition Indo YouTube channel**

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67 The YouTube channel known as iTuition Indo specializes in producing and disseminating  
68 educational videos focused on mathematics. The online educational platform iTuition Indo  
69 can be conveniently accessible on the Internet by utilizing the following hyperlink:  
70 <https://www.youtube.com/@iTuitionindo/videos>. In addition to hosting mathematics  
71 instructional content, iTuition Indo also provides educational videos about physics. The  
72 taxonomic classification and organization of video placement on this channel are  
73 commendable. Videos are classified based on the chapter or subject matter they elucidate.  
74 Regrettably, the content disseminated through this channel is limited to three specific  
75 subjects, namely (1) power forms, roots, and logarithms, (2) functions and quadratic  
76 equations, and (3) systems of linear equations in two variables. The iTuition Indo channel  
77 has ceased producing and publishing maths study videos. The most recent video was

78 published in 2021, indicating that the content featured in the film is derived from the KTSP  
 79 curriculum. Every chapter comprises multiple films, wherein each video elucidates the subject  
 80 matter and illustrative instances of problem-solving about each sub-chapter within the  
 81 studied chapter. The videos provided exhibit high precision and systematic organization,  
 82 facilitating the learning process for students who engage with these instructional materials.  
 83 Each video contains an instructional presentation by the teacher, wherein mathematical  
 84 learning material is elucidated through a computer interface, complemented by the teacher's  
 85 vocal narration. The shape of one of the films released by iTuition Indo is depicted in Figure  
 86 1. The video content provided by iTuition Indo is highly commendable as a valuable  
 87 educational resource for students. The video has a high level of clarity in its image quality.  
 88 The instructor's vocal delivery was articulate and comprehensible. The pedagogical  
 89 approach employed by the teacher involves assigning distinct colors to each written  
 90 component, facilitating comprehension of the instructional content among students.  
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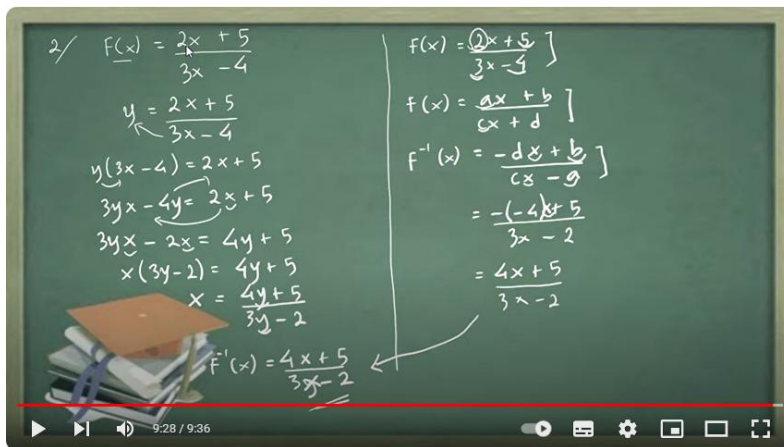
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**Fig. 1.** One of the videos uploaded by iTuition Indo

### 3.2 Matematika Hebat YouTube channel

98 The YouTube channel known as "Matematika Hebat" is dedicated to providing educational  
 99 content focused on the subject of mathematics. The channel belonging to Matematika Hebat  
 100 can be conveniently reached on the Internet by utilising the following link:  
 101 [https://www.youtube.com/@Matematika\\_Hebat/videos](https://www.youtube.com/@Matematika_Hebat/videos). The channel curated by Matematika  
 102 Hebat offers educational content on mathematics spanning from primary to secondary  
 103 education levels. The organisation of video content on this channel is suboptimal. The  
 104 categorization of movies is lacking in organisation, hence posing challenges in locating  
 105 educational videos that align with the requirements of pupils. Matematika Hebat channel  
 106 features a collection of instructional videos pertaining to primary school mathematics. The  
 107 video showcases innovative methods for facilitating children's acquisition of numerical skills.  
 108 There exists a limited number of educational videos specifically designed for middle school  
 109 students. Matematika Hebat selectively uploads content from specific sub-chapters, resulting  
 110 in an incomplete representation of the material. The video does not provide any further  
 111 elaboration on the subject matter. Matematika Hebat has uploaded a substantial number of  
 112 videos, over two thousand in total. Consequently, students may have challenges in  
 113 discerning the availability of specific video content on this particular channel. In addition to  
 114 this, educational videos designed for high school pupils and their counterparts encompass

115 comprehensive elucidations on problem-solving methodologies. The instructor provides  
 116 inquiries that align with the content covered in the National Examination material, and  
 117 subsequently elucidates strategies for effectively tackling these queries. Each video consists  
 118 of the instructor's elucidation of mathematical learning material, utilising white paper and  
 119 coloured markers to illustrate the lesson, backed by the instructor's vocal narration. The  
 120 below content is the structure of a video that has been posted by Matematika Hebat. Figure  
 121 2 depicts a video that has been uploaded by Matematika Hebat. The video content provided  
 122 by Matematika Hebat is deemed satisfactory as an educational resource for students. The  
 123 visual clarity of the presented imagery in the video is satisfactory, but upon juxtaposing it  
 124 with the video uploaded by iTuition Indo, it becomes evident that the latter exhibits superior  
 125 image quality. The clarity of the teacher's voice throughout the explanations is noteworthy.  
 126 The pedagogical approach employed by the teacher involves assigning distinct colors to  
 127 individual pieces of writing, thereby facilitating comprehension of the instructional content  
 128 among students.  
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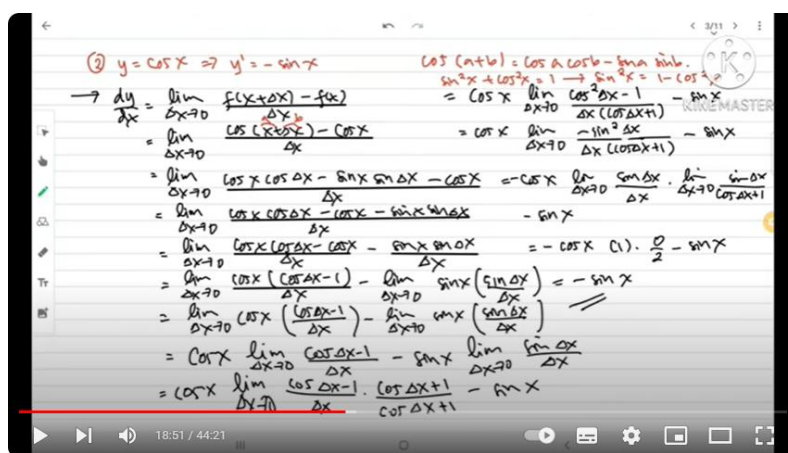
130 Matematika Hebat  
 131 884 rb subscriber

132 **Fig.2. One of the videos uploaded by Matematika Hebat**

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 134 **3.3 kafe math YouTube channel**

135  
 136 The kafe math channel is a dedicated platform that exclusively shares educational films  
 137 focused on the subject of mathematics. The channel in question can be reached by utilising  
 138 the above hyperlink: <https://www.youtube.com/@kafemath03/videos>, but I need more  
 139 information or context in order to provide an academic rewrite. In comparison to the  
 140 established iTuition Indo and Matematika Hebat channels, the kafe math learning channel is  
 141 rather nascent. The inaugural video of this channel was uploaded in the year 2018. The  
 142 content provided is up-to-date and aligns with the curriculum established in 2013. The videos  
 143 provided by the Complete and consecutive Mathematics Learning Channel are meticulously  
 144 organised and presented in a consecutive manner. The Learning Channel known as kafe  
 145 math commences each chapter of uploaded material with an introductory section that  
 146 provides an overview of the content. The introduction encompasses a visual representation,  
 147 in the form of a concept map, of the content covered within the chapters and sub-chapters  
 148 of the material. The subsequent video corresponds to the initial subchapter inside the chapter,  
 149 and this pattern continues until all the content has been addressed. The video title also  
 150 highlights the significance of the video description, which includes links to all sub-chapter  
 151 videos within the topic. This feature facilitates comprehensive studying of the material for

152 students. Regrettably, the content provided by the Complete and Ordered Mathematics  
 153 Learning Channel just comprises mathematics material that is exclusively tailored for the  
 154 field of Mathematics and Natural Sciences (MIPA). Specifically, the material focuses on two  
 155 topics: (1) exponents and logarithms, and (2) polynomials. It is plausible that the kafe math  
 156 channel may produce additional video content in the future, as this channel is now in its early  
 157 stages of development. Each video consists of the instructor providing an explanation of  
 158 mathematical learning material, utilising lined paper that has been initially inscribed with a  
 159 pen. The instructor elucidates the educational content while providing auditory support.  
 160 Figure 3 depicts a video that has been uploaded by the kafe math channel. The educational  
 161 content presented in the videos produced by kafe math is of high quality and serves as a  
 162 valuable resource for students seeking to enhance their learning experience. The  
 163 investigation reveals that the channels examined exhibit varying levels of image quality, with  
 164 the highest quality observed in the channel under consideration. The clarity of the teacher's  
 165 explanation is also evident in their vocal delivery. The pedagogical approach employed by  
 166 the instructor is commendable, despite the preexisting nature of the instructional material.  
 167 The comprehensive elucidation of the subject matter is commendable.  
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Fig.3. One of the videos uploaded by kafe math

### 3.4 YouTube as a Mathematics Learning Resource

YouTube is a frequently utilised educational tool by numerous educational institutions and universities internationally. Nevertheless, a limitation of this particular channel is in the fact that it does not encompass the entirety of mathematical learning materials. In order to access the desired educational content, students are required to utilise the YouTube search engine to locate instructional videos that align with their expectations. In order to effectively utilise YouTube as an educational tool, as suggested by [25], [26], one can follow a series of steps. Firstly, access the website www.youtube.com through an internet browser. Secondly, utilise the search bar located at the top of the page to input relevant keywords, titles, or terms that pertain to the desired video. Lastly, initiate the search process by clicking on the designated "search" button. The internet browser's screen will exhibit a compilation of video titles accompanied by screenshots of videos that satisfy the specified criteria for the desired video. **Type in keywords to select videos based on the required subject, users can select videos by clicking on the appropriate screenshot.** The designated video will be executed. At the lower section of the video interface, there are many functionalities available to the user,

189 including the ability to pause, rewind, fast forward, expand the video display, and alter the  
190 audio volume. Additionally, the interface includes a metre that indicates the duration of the  
191 film. Furthermore, upon completion of the video, users are presented with the choice to either  
192 proceed to another video or replay the current one. In addition to the main video, YouTube  
193 also presents users with titles and screenshots of other videos that have similar material.  
194 Users have the option to save the video directly on the YouTube platform by adding it to their  
195 "Favourites" or "Add to Playlist" feature. Alternatively, users can copy the video's URL from  
196 the navigation box and utilise it elsewhere. In order to enhance the use of the links within an  
197 educational setting, users have the option to obtain supplementary information pertaining to  
198 video viewing and other functionalities on YouTube by selecting the "Help" hyperlink.  
199 According to a review of YouTube channels, it is evident that YouTube possesses the  
200 potential to serve as a valuable platform for mathematics education. In order to validate this  
201 assertion, a series of interviews were carried out with mathematics educators and students  
202 enrolled in secondary education. None of the mathematics teachers who participated in this  
203 study had previously utilised YouTube as a resource for maths education. In the study, it  
204 was found that 30% of the participating students utilised YouTube as a means of acquiring  
205 knowledge in the field of mathematics. However, it is worth noting that participants  
206 inadvertently stumbled into mathematics learning videos on YouTube while utilising the  
207 platform as a source for learning mathematics. Students utilise the Google search engine to  
208 seek for relevant material, subsequently employing YouTube as a platform to locate videos  
209 that align with their specific preferences. The utilisation of YouTube as a mathematical  
210 learning resource was also subject to scrutiny and evaluation by maths educators. The  
211 utilisation of YouTube as an educational tool yields both advantageous and unfavourable  
212 consequences. One advantage of utilising YouTube as a learning resource for students is its  
213 ability to engage students through the use of video content, as opposed to traditional text-  
214 based resources. Additionally, YouTube offers the flexibility for students to explore  
215 alternative subjects or topics when they become disinterested or fatigued with their current  
216 studies, providing a refreshing break from their primary focus on mathematics. One can  
217 enhance his knowledge and skills by engaging in entertaining video-based learning on the  
218 YouTube platform. On the other hand, the use of YouTube as a student learning resource is  
219 accompanied by certain adverse impacts. In contrast, YouTube's use as a student learning  
220 resource is accompanied by certain adverse effects. Firstly, the presence of videos that lack  
221 educational value might serve as a source of distraction for students while engaging with  
222 mathematical content on the platform. Secondly, YouTube may not be conducive to the  
223 learning preferences of individuals who adhere to more traditional or conventional  
224 approaches to education. The mathematics instructor, who served as the focal point of this  
225 study, proposed the creation of a YouTube channel that offers comprehensive and  
226 structured mathematical instruction aligned with the existing curriculum. By utilising a  
227 platform of this nature, educators have the ability to access and retrieve the films hosted on  
228 said platform, subsequently disseminating them among their students. This approach serves  
229 to mitigate the adverse consequences associated with the use of YouTube. The participants  
230 in this study held the belief that YouTube has the potential to serve as a valuable  
231 educational tool for mathematics, provided that teachers provide guidance on which videos  
232 should be utilised as instructional resources for pupils. Many students have a sense of  
233 confusion when confronted with the abundance of films available on the YouTube platform.  
234 Occasionally, students may encounter instances where the video title they desire does not  
235 align with the actual content of the video. The presence of the teacher is important in  
236 effectively leveraging YouTube as an educational tool. Educators possess the ability to  
237 categorise movies and then inform students of the availability of videos that may serve as  
238 valuable educational materials.

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#### **4. CONCLUSION**

Based on the findings and subsequent analysis, it can be inferred that YouTube channels offering mathematics instruction possess the potential to serve as a valuable educational tool for pupils. Nevertheless, of the several channels utilised for research purposes, none can be considered an exhaustive resource for acquiring comprehensive knowledge in mathematics. YouTube has the ability to serve as a viable platform for mathematics education, despite its various detrimental effects.

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

#### **AUTHORS' CONTRIBUTIONS**

'Yuan Anisa' designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. 'Fadhillah Azmi' managed the analyses of the study. 'Muhammad Hafiz' managed the literature searches. All authors read and approved the final manuscript.

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