



National Journal of Medical and Allied Sciences

[ISSN Online: 2319 – 6335, Print: 2393 – 9192|Original article |Open Access]

Website:-www.njmsonline.org

EVALUATION OF AVAILABILITY OF ONLINE ANIMATIONS TO FACILITATE VISUAL LEARNING IN GENETICS FOR MBBS Ist YEAR STUDENTS

Dr Ravi Kishore P

Professor, Department of Biochemistry, MVJ Medical College and Research Hospital,
Hoskote Taluk, Bengaluru Rural District-562114, India

ABSTRACT

Background: As per the latest “Competency Based Medical Education” (CBME) curriculum prescribed by National Medical Commission (NMC) of India, genetics is an important component of Biochemistry for MBBS Ist professional students. Learning concepts in genetics is important for clinical application of knowledge in diagnosis and management of diseases. Visual media like animations have been shown to assist learning of complex molecular concepts. To the best of our knowledge, there are no studies that have assessed availability of free online animations in genetics. This study aimed to assess the availability of free animations and evaluate their characteristics in relevant topics under genetics for MBBS Ist year students.

Materials and methods: A total of 16 topics in Genetics were shortlisted amongst competencies under Biochemistry as per the NMC curriculum. Keywords containing the title of topics were used to search www.google.com (Google) and www.youtube.com (You Tube) separately to shortlist the animations available. These animations were characterised based on the total views and time duration.

Results: A total of 101 online animations under the shortlisted topics in genetics based on our search criteria were included. Sixty of these animations were shortlisted from YouTube and 41 animations were from Google. These animations had combined views of 3,01,07,775. Thirteen percent and 54% of animations belonged to highly popular and less popular categories, respectively. Majority (85%) of animations had time duration of 6 minutes or less.

Conclusions: It was observed that www.google.com and www.youtube.com can act as online resources for accessing animations to assist visual learning in genetics for MBBS Ist year students. However, students and teachers have to verify the knowledge content of animations before using them as learning resources.

Key words: Genetics animations, animations availability, medical students, online resources, Biochemistry

Author for correspondence: Dr Ravi Kishore P Email: writekishore@yahoo.co.in

INTRODUCTION

As per the “Competency Based Medical Education” (CMBE) curriculum of National Medical Commission (NMC) of India, an Indian Medical Graduate at the end of his undergraduate training course is expected to “Demonstrate knowledge of normal and abnormal human structure, function and development from a molecular, cellular, biologic, clinical, behavioral and social perspective”. Genetics forms an important component of Biochemistry Syllabus as prescribe by NMC [1]. Learning concepts in Genetics is critical for MBBS students to

understand the principles behind the diagnosis and management of many diseases. Furthermore, it is imperative to have a strong foundation in Genetics in order to be able to critically appraise vast amounts of evidence that is being generated in research studies. Many of the critical concepts in Genetics are complex making them difficult to visualize, thereby hindering the understanding and application of concepts in Genetics in health and disease. Animations visualising complex molecular concepts have been created with an aim of making visualising and learning easier. In fact, animations have been shown to improve

understanding and memorisation of molecular processes. Animations used with traditional lectures have been shown to aid memorisation of sequence of molecular events when compared with lectures alone [2,3,4]. Animations explaining various molecular concepts are freely available online and MBBS students have been shown to access these animations to learn complex concepts [5]. However, there have been no studies to the best of our knowledge that have evaluated the availability of free online animations in genetics on internet. Such studies would help us determine the availability of relevant animations and the same could be used in teaching learning processes. In the absence of relevant animations, such animations may be developed by publishing companies and individuals to fill the gap.

In this study, our objective was to assess the availability of free online animations in relevant topics in genetics for MBBS Ist year students.

MATERIAL AND METHODS

This is a cross-sectional study involving availability of online animations. Ethical approval was not needed for this study for two reasons- First, this study does not involve human subjects; second, all the data (animations) used in this study is available online for public. Competencies as mentioned in MBBS Ist year Syllabus in Biochemistry prescribed by NMC in 2019 were used to shortlist complex and difficult to visualize concepts in Genetics [1]. As a next step, online resources for accessing animations on internet were shortlisted. Since www.google.com (Google) and www.youtube.com (YouTube) happened to be top two search engines, we selected these two search engines for our online search [6]. Using the title of topics as key words search for animations were performed. Boolean operators “AND” was used as needed. For example, search terms used for DNA Replication were “DNA Replication AND animation”. We did not deliberately make the search criteria complex as our intention was to simulate the usual search strategy of learners/students. A total first 30 search results in Google and first 50 search results in YouTube were scanned for the presence of animations on shortlisted topics. If relevant animations were not found, further search of 30 and 50 results on

Google and You tube was performed, respectively.

For the purpose of our study, an Animation was defined as “A collection of still images called “cels” that when viewed in rapid succession gives the impression of movement” [3].

Inclusion criteria for the animation to be shortlisted were-

1. Animation should fit the above definition
2. Animation should have content relevant to the topic

An exclusion criterion was:

1. Videos that have only transitioning images in a slideshow.
2. Animations that were used as marketing tool to promote a certain product.
3. Animations that require payment for access.

Statistical analysis: Data was represented using median, interquartile range and frequency distribution (proportion).

RESULTS

A total of 16 topics in Genetics were shortlisted amongst competencies under Biochemistry as per the NMC curriculum. We found a total of 101 online animations under the shortlisted topics in genetics based on our search criteria. Of these animations, 41 were accessed on Google and 60 animations were accessed on You Tube (Table 1). Date of access was December 4th and 5th, 2021.

Table 1: Topics and corresponding number of animations accessed on Google and You Tube

Topic of Animation	Number of Animations on You tube	Number of Animations on Google
Structure and function of DNA	6	3
Structural Organisation of DNA to form Chromatin	3	1
Cell cycle	6	3
DNA replication	5	3
DNA repair mechanisms	4	2
DNA transcription	5	3
Translation (Protein synthesis)	3	2
Regulation of Gene expression	4	5
Protein targeting	2	1
Gene Therapy	3	4
Recombinant DNA technology	3	1
DNA cloning	3	2
Polymerase Chain Reaction	4	6
Blotting Techniques	4	1
DNA Microarrays	3	3
Human Genome Project	2	1
Total animations	60	41

Table 2: Online resources and corresponding views of animations

Online resource	Total number of animations	Animations with viewership data (n)	Total number of views
Google	41	7*	28,16,034
YouTube	60	60	2,72,91,741
Google + YouTube	101	67*	3,01,07,775

*Data on views was not available for all the animations accessed on Google.

Only 17% (7 out of 41 animations) on Google had data on views, whereas 100% of animations on YouTube had viewership data. (Table 2)

Table 3: Descriptive statistics of animations on different online resources

Online resources	Variable	Minimum	Maximum	Median	Interquartile Range
Google	Views (n=7)*	705	27,34,411	12,468	32,355
	Duration of animations (n=37)**	00:23	08:20	03:06	01:57
YouTube	Views (n=60)	132	68,76,053	93,533	3,79,969
	Duration of animations (n=60)	00:48	25:67	03:11	02:52
Google + YouTube	Views (n=67)	132	68,76,053	59,655	3,63,564
	Duration of animations (n=97)	00:23	25:67	03:08	02:16

*Data was not available for all the animations

** Four Animations accessed through Google did not have time duration data, as they were user controlled i.e. Users had to click to move to a subsequent step and hence, play time would be dependent on individual users.

Note: Duration of animations is in mm:ss format

Google videos had a median duration of 3 minutes 6 seconds [Interquartile range (IQR)=1 minutes 57 seconds], with median views of 12,468 (IQR=32,355). For google animations, data regarding views was available for only 7 animations and regarding duration was available for 37 animations (out of 41 animations). YouTube videos had a median duration of 3 minutes 11 seconds (IQR= 2 minutes 52 seconds), with median views of 93,533 (IQR=3,79,969). (Table 3)

Table 4: Distribution of animations based on duration

Category of animation based on duration	Duration of animation (mm:ss)	Number of animations	Percentage in each category
Short	00:01-03:00	44	45
Medium	03:01-06:00	39	40
Long	>06:01-30:00	14	15

Majority of the animations (85%) belonged to “Short” and “Medium” duration category with a runtime of 6 minutes of less; whereas 15% of the animations belonged to “Long” duration category, with a runtime of more than 6 minutes and up to 30 minutes. (Table 4)

Table 5: Distribution of animations based on views

Category of animation based on views	Duration of animation	Number of animations	Percentage in each category
Less popular	1-1,00,000	36	54
Popular	1,00,001-10,00,000	22	33
Highly popular	10,00,001-1,00,00,000	9	13

More than half the animations (54%) belonged to “less popular” category having views ranging from 1-1,00,000, whereas 13% of animations were in “highly popular” category having views ranging from 10,00,001-1,00,00,000 (Table 5).

Table 6: Number of Views of Individual Animations belonging to “highly popular” category (YouTube)

Topic	Number of Views
DNA Microarrays	10,45,671
DNA Replication	68,76,053
Structure of DNA	25,80,252
Translation	10,39,888

Note: The above table includes a few examples of topics of animations in the “Highly popular category”.

Examples of such animations/topics with their corresponding individual viewership include DNA microarrays, translation etc. (Table 6)

DISCUSSION

In this study, we evaluated the availability of free online animations for various topics in Genetics as prescribed by NMC [1]. We found the 101 animations pertaining to Genetics on Google and YouTube. Animations have been shown to aid learning of complex molecular concepts [3]. Medical students use online animations to learn complex concepts [5].

These animations accessed in our study were hosted by various entities including medical publishing companies, entities sponsored by academic organisations and individuals. Table 1 indicates a representative sample of online animations on various topics in Genetics based on search results and is not meant show list of all available online animations under a particular topic. An alternate independent search at a different point of time by a different person may yield different results, since the search algorithms of Google and YouTube are determined by various factors, which include person performing the search, timing of search and other factors[7]. This study does not intend to document all the animations in Google and YouTube, as that is not intended purpose of this study. To the best of our knowledge there have been no studies that have evaluated the availability of animations pertaining to genetics for Medical students. A total of 101 animation animations belonging to 16 topics in genetics were found through specific search criteria used in our study on www.google.com and www.youtube.com. Animations were found in all the shortlisted topics. Data related to views was present in only (17%) of animations accessed through Google. In contrast, 100% of animations accessed through YouTube exhibited the views data by default, allowing the users to assess the popularity of animations. Though You Tube had higher aggregate viewership than Google for the given animations, the two cannot be compared for two reasons- first, viewership data is not available for Google for 83% of the animations; second the number of animations with viewership data is far lesser for Google (7 animations) as compared You Tube (60 animations). Combined total views of animations were 3, 01, 07, 775 suggesting the huge popularity of online animations related to concepts in genetics among learners/students.

Animation duration

Majority (85%) of the animations belonged to “short” and “medium” duration categories (≤ 6 minutes). In contrast, a minority (15%) of the animations belonged to “long” duration category (> 6 min). The possible reasons for the short duration of animations may be: First, animations with brief duration are more likely to viewed by learners. Second, these animations tend the focus on illustrating the core concept, without delving into details, as it happens in lecture sessions. Third, creating animations is an expensive process.

Animation Views

Majority (54%) of the animations belonged “less popular” category, whereas a minority (13%) of the animations belonged to “highly popular” category. Some examples of animations in ‘highly popular’ category belonged to topics like “DNA microarrays”, “DNA replication”, “Structure of DNA” and “Translation (protein synthesis)”. Popularity of these animations may be determined by many factors including complexity of the topic, duration of animations, popularity of the channels/websites hosting animations and quality of the animations.

Advantages of Google and YouTube as access points for animations

There are certain advantages of accessing Google and You tube for animations. Most of the animations are free for access. An animation related to any topic can be easily searched based on a combination of relevant key words. Learners have an option to choose to view a particular animation amongst multiple animations.

Limitations of Google and YouTube as access points for animations

Nevertheless, there are few limitations of these online resources. First, the content accessed through YouTube and Google is dynamic. Learner has not control over it; ex. a good animation that is available today may not be available tomorrow. In addition, an animation that is ranked higher in search results today may not be at the top of the search results at a later point of time, posing challenges to access. Ease of access does not guarantee the quality of animations in terms of design and knowledge content, as concerns have been raised regarding quality of online

educational videos [8,9,10,11]. Moreover, the quality of content is determined by the person/organisation creating it and Google/YouTube has no role to play in it. In addition, entry of search term containing key words relevant to topic may sometimes return huge number of searches, which may include irrelevant search results, putting the onus on the learner to scrutinise and select an appropriate animation resulting in expenditure of time and energy.

To circumvent this problem, teachers can systematically search animation online for topics of interest using relevant key words, shortlist animations based on appropriate design and accuracy of knowledge content and create an online database of links of such animations. Such a database can be shared with students, so that best of animations are readily available for learning.

Strengths of the study

To our knowledge, this is one of the first studies that has explored the availability of online genetics animations for MBBS students. We have used two most popular searching engines for shortlisting online animations, thereby reflecting to some extent the search patterns of students[6]. Sixteen topics in genetics were chosen for shortlisting animations thereby reflecting a wide spectrum target topics for animations. These topics were chosen from MBBS Ist year syllabus thereby making the findings relevant for MBBS students and teachers [1].

Limitations of the study

Given the dynamic nature of online resources like Google and YouTube as discussed above, these search results are applicable on the date of access. An alternate search at a different point in time by a different person may yield different results [7]. Though we evaluated the availability of online animations in genetics, we did not focus on detailed analysis of knowledge content of animations, as it is beyond the scope of the study. Future studies can be done to assess the content in these animations to decide whether these animations can serve as credible learning aid for MBBS Ist year students.

CONCLUSION

MBBS Ist year students can use search engines- www.google.com and www.youtube.com for accessing free online animations for learning concepts in genetics. However, students should verify the knowledge content of these animations before using them as a learning aid.

REFERENCES

1. Medical Council of India, Competency based Undergraduate curriculum for the Indian Medical Graduate, 2018; 1: 119-135.
2. McClean P, Johnson C, Rogers R, Daniels R, Reber J, Slator BM, et al. Molecular and cellular biology animations: development and impact on student learning. *Cell Biol Educ.* 2005 Summer; 4(2):169-79.
3. O'Day HD. *Animated Cell Biology: A Quick and Easy Method for Making Effective, High-Quality Teaching Animations.* CBE—Life Sciences Education. 2006 Fall; 5: 255-63.
4. Stith JB. Use of Animation in Teaching Cell Biology. *Cell Biol Educ.* 2004 Fall; 3(3):181-88.
5. Ravi Kishore P, Keshavamurthy HR. Patterns of Internet use and their implications in Indian Medical students. A study from a south Indian Medical College. *J Evid Based Med Healthc.* 2016;3(36):1779-1783.
6. Davies D. Meet the 7 Most Popular Search Engines in the World. *Search engine journal [Internet];* 2003 Available from <https://www.searchenginejournal.com/seo-guide/meet-search-engines/#close> [Last cited 2021 Dec 04].
7. Kelly Bowden. Does Google Personalize Search Results Anymore? [+6 Factors that Influence Search Results]; 2020. Available from: <https://www.webfx.com/blog/seo/does-google-personalize-search-results/> [Last cited 2021 Dec 04].
8. Gonzalez-Estrada A, Cuervo-Pardo L, Ghosh B, Smith M, Pazheri F, Zell K, et al. Popular on YouTube: a critical appraisal of the educational quality of information regarding asthma. *Allergy Asthma Proc.* 2015;36(6):e121-6. doi: 10.2500/aap.2015.36.3890.

9. Kocyigit BF, Akaltun MS. Does YouTube provide high quality information? Assessment of secukinumab videos. *Rheumatol Int.* 2019; 39(7):1263-1268. doi: 10.1007/s00296-019-04322-8.

10. Derakhshan A, Lee L, Bhama P, Barbarite E, Shaye D. Assessing the educational quality of 'YouTube' videos for facelifts. *Am J Otolaryngol.* 2019;40(2):156-159. doi: 10.1016/j.amjoto.2019.01.001.

11. Villafañe JH, Cantero-Tellez R, Valdes K, Uselli FG, Berjano P. Educational Quality of YouTube Videos in Thumb Exercises for Carpometacarpal Osteoarthritis: A Search on Current Practice. *Hand (N Y).* 2018;13(6):715-719. doi: 10.1177/1558944717726139.

Conflicts of Interest: Nil Source of Funding: Nil

Citation: Ravi Kishore P. Evaluation of Availability of Online Animations to Facilitate Visual Learning in Genetics for MBBS Ist Year Students. National Journal of Medical and Allied Sciences 2022; 11(1): Online first

Date of Acceptance: 15:12:2021

Date of Submission: 08:12:2021