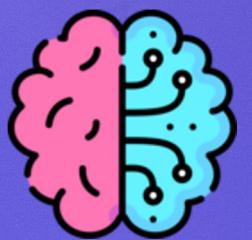


# IYNO

Journal of the International Youth Neurosurgical Organization

IMPROVE EDUCATION AND LEARNING



# About the Journal

*There are so many great neurosurgery journals like CNS Journal of Neurosurgery, Frontiers in Surgery Neurosurgery section, Neurosurgical Focus, Pakistan Journal of Neurosurgery just to name a few. The problem is that all these journals teach how to apply neurosurgical practices, they don't teach you how to get there.*

*This journal was created by the International Youth Neurosurgical Organization (IYNO) for the sole purpose of providing students with the resources required to study and learn neurosurgery. It was established to fulfill the curiosity of students if they would like to know more about neurological surgery.*

*My name is Muhammad Saqib Hussain; a second-year medicine student and a neurosurgery enthusiast. I am the creator and the sole contributor to this journal (up till now; I hope that as more people join IYNO, this can change). My story might resonate with so many neurosurgery aspirants who do not know where to start.*

*When I learned about neurosurgery, I just did not know where to start. There were so many resources for people who were already in medical school or were neurosurgical professionals but there were none for people just starting out. As a high school student, I just could not convince my parents, my teachers and even myself that I loved neurosurgery. I was really passionate about it but, in my opinion, I was not making much progress. I was not learning much. I was not getting to that level of proficiency that was required to understand neurosurgical literature.*

*This organization aims to provide you with a starting point and a rough roadmap to study neurosurgery. We at IYNO will try to provide you with all the help you could possibly need. This journal will provide you with all the learning materials and strategies to learn neurosurgery.*

*Thank you for reading this journal*

*MSH*

# Learning techniques to more efficiently learn new information

Muhammad Saqib Hussain

## Abstract

*Students in medical school often feel overwhelmed by the excessive amount of information they are required to learn. A large body of factual information is already freely available through fellow students, on YouTube and even highly praised scholarly journals (Yale Journal of Biology and Medicine) but the application of these techniques still remains a challenge for most students. This article tries to address this issue and presents practical solutions to implement these techniques.*

## Introduction

To answer the question, “How can learning be improved?” we first need to answer why improve learning and how do we know that our learning is bad. Simply learn some new information and do not revise it for a period of time and voilà, the information disappears. This is the very definition of forgetting (the state in which a certain piece of information is not retrievable even though it is stored). A German psychologist that the process of forgetting follows a forgetting curve (Ebbinghaus’ classic forgetting curve 1880) which was replicated by Jaap M. J. Murre et al. (1).

## Practical Implementations

A paper has already been published on the techniques that are about to be presented (2). This paper merely builds upon the findings of the researchers and fine tunes the methods through personal anecdotes from a medical student.

## The testing effect

The testing effect states that testing is a part of learning and should not be left alone for the very end when an exam is administered. It has been shown to improve learning rather than

memorizing factual information repeatedly. It has been confirmed by a randomized control trial that testing even without feedback generally improved the scores of students in a future test by 3 times. Many students seem to be unaware of the benefits of repeated testing and therefore neglect it.

One major hurdle for students is when to start testing yourself. Higher Year medicine students recommend testing even before reading the chapter. The student is encouraged to find answers for the past exam questions from the learning material. It not only helps separate meaningful information from many examples but also develops the interest of the learner in the given topic. This techniques also exposes the student's areas of knowledge that are weaker so more time can be invested in clarifying the concepts which is a more efficient use of time.

Another difficulty is that some medical students do not receive official past paper questions. This can be mitigated by the fact that most of the factual information in medical schools is same so questions from another medical college will serve just as well.

## Active recall

There are two methods of recall: active and passive.

1. Testing is a type of active recall. A student is asked a question and is allowed time to think of the answer and based on it, feedback is provided. This is the active method of recall. Many computer programs (for example Anki) incorporate active recall along with spaced repetition (presented next). Essentially, active recall is the process to produce information that was memorized previously without using cues.
2. An example of passive learning might be that a student repeatedly reads the course material after a certain amount of time. The greatest flaw with this technique is that it provides almost no feedback. It now depends on the ability of the student to assess his/her performance in the review.

## What is spaced repetition:

Spaced repetition is the active recall of information with expanding intervals. For example after 1 day, 3 days, 7 days and 15 days etc. It has been shown that this method increased the recall of the students by a significant margin than the students who recalled the information after steady intervals like after 1 day, 3 days, 5 days and 7 days.

Another point to note here is the efficient use of time. The students using this method were shown to perform as well or better with the investment of significantly less time than the

students who reviewed the coursework after a steady interval. “The authors conclude that expanding retrieval practice is best used when the learning material is vulnerable to being forgotten” (2) and students using this method outperformed the students who used the steady interval technique by 2 to 1 when the information was made confusing or when it was likely to be forgotten.

This also suggests that spaced repetition is an extremely efficient method of studying in medical school when information from different areas of health sciences is to be remembered like from anatomy, physiology, embryology and histology just to name a few.

## Conclusion

As soon as a student learns some new information, it should be coupled with test questions, actively answering them or finding answers to them and spacing the testing and learning out. This is made considerably easier by using computer programs like Anki which is a free and open source tool which is very widely used by medical students for this very purpose.

## References

1. Murre JMJ, Dros J (2015) Replication and Analysis of Ebbinghaus' Forgetting Curve. PLoS ONE 10(7): e0120644. <https://doi.org/10.1371/journal.pone.0120644>
2. Augustin M. How to learn effectively in medical school: test yourself, learn actively, and repeat in intervals. *Yale J Biol Med.* 2014;87(2):207-212. Published 2014 Jun 6.

# How to improve retention of information with ChatGPT?

Muhammad Saqib Hussain

## Abstract

This paper aims to describe how AI systems like ChatGPT can help students, especially students of medicine, in their academic journeys.

These very powerful systems or programs have the potential to transform education by making the information that a student has to learn more engaging. Inspiration for this paper was taken from ChatGPT User Experience: Implications for Education by Xiaoming Zhai [1] and ChatGPT [2] was also used to guide the content of the paper.

## Introduction

The field of medicine is vast and complex, and requires a deep understanding of various concepts and theories. Medical students often find it challenging to retain information and understand complex concepts, especially when they are studying from textbooks. To overcome this challenge, it is essential to have an interactive and engaging learning experience that can facilitate their retention of information. In this paper, the use of ChatGPT, a large language model developed by OpenAI, to generate questions from textbooks to aid learning in medicine will be discussed. Question generation through language models from texts has been known in the academic community for a long time but its application in an easy to use interface with minimal delay and high accuracy was not available [3]. ChatGPT, in this context, has been shown to bridge the gap between the researchers with innovative ideas and medical students who can benefit from the application.

## Background

ChatGPT is a transformer-based language model [4, 5] that has been trained on a massive amount of text data [6, 7]. It has the ability to generate coherent and coherent sentences based on the input provided to it. ChatGPT has been used in various applications,

including question-answering, summarization, and text generation. In this paper, we propose the use of ChatGPT to generate questions from textbooks to aid learning in medicine.

## Methods

To generate questions from textbooks, we used the ChatGPT January 30 free research release online user interface from OpenAI. The model was used as provided and no fine tuning was performed to improve the questions generated. The input provided to the model was a relevant piece of text from a textbook along with an instruction to generate questions based on the provided text. An example is provided here.

“Generate many questions from the following text: Neuronal “atrophy” is the descriptive term that is given to a wide range of irreversible neuronal injuries that give rise to a relatively slowly-evolving death of the cell. Neuronal “atrophy” is characterized morphologically by retraction of the cell body with diffuse basophilia of the cytoplasm and pyknosis and hyperchromasia of the nucleus of the neuron, in the absence of an inflammatory reaction. Neuronal “atrophy” is thought to occur in many degenerative disorders that involve several interconnected neuronal systems (i.e., multiple system atrophy, in Friedreich ataxia, and even in amyotrophic lateral sclerosis). It is also seen in anterograde and retrograde transsynaptic degeneration, as may occur in the lateral geniculate body following a lesion of the optic nerve. Programmed cell death (apoptosis) is an active, genetically controlled, energy-consuming process frequent in neurodegeneration and involving primarily the nucleus of the cell. Neurons undergoing simple neuronal atrophy or apoptosis have similar morphologic features and may show positive in situ end labeling of internucleosomal DNA fragmentation (Fig.1.1) or be demonstrable by activated caspase-3 immunostaining. Nerve cell atrophy should not be mistaken for what is referred to as “dark neurons.” This phenomenon is now recognized to be an artifactual change of the neuron cell body, seen particularly in brain biopsies fixed in formalin by immersion, and characterized by shrunken cytoplasm and deeply-stained and irregularly-shaped nucleus without other cellular alterations.”

The model returned the following:

1. What is neuronal “atrophy”?
2. What are the morphological characteristics of neuronal “atrophy”?
3. In what degenerative disorders is neuronal “atrophy” thought to occur?
4. What is programmed cell death (apoptosis)?

5. What are the similarities between neurons undergoing simple neuronal atrophy or apoptosis?
6. What is "dark neurons"?
7. How is "dark neurons" different from nerve cell atrophy?
8. What causes "dark neurons"?
9. What is the process of "in situ end labeling of internucleosomal DNA fragmentation"?
10. What is activated caspase-3 immunostaining used for in neuronal atrophy or apoptosis?"

The model generated the response in about 20 seconds.

## Results

To evaluate the effectiveness of the generated questions, we conducted a study with a medical student. The student was given a set of questions generated by ChatGPT, and asked to answer them. The results showed that the questions generated by ChatGPT were well-informed but were not very comprehensive. The model produced questions that mostly resembled fill in the blanks type questions. Nonetheless, the student reported increased engagement with the topic when looking up the answers for the questions generated from the text.

## Conclusion

In conclusion, the use of ChatGPT to generate questions from textbooks to aid learning in medicine has been shown to be an effective method of improving students' retention of information. It is better than merely reading the text without engagement. This is another method that adds to the active recall method described in the previous paper [8]. The generated questions were relevant to the text, and they helped the student to retain information better. This method has the potential to be used in other fields and has the potential to revolutionize the way students learn.

## Future Work:

Future work should focus on improving the quality of the generated questions.

ChatGPT can be fine-tuned to learn more about medicine as, for now, it has only been trained on general information available on the internet. The potential of using ChatGPT in other learning scenarios should also be explored. Additionally, it would be interesting to see how ChatGPT could be used to generate questions from multimedia materials, such as videos and images, to further enhance the learning experience. ChatGPT has initially only been created to be a text based model.

## References:

1. ChatGPT User Experience: Implications for Education by Xiaoming Zhai. <https://dx.doi.org/10.2139/ssrn.4312418>
2. OpenAI Blog <https://openai.com/blog/chatgpt>
3. Ruqing Zhang, Jiafeng Guo, Lu Chen, Yixing Fan, and Xueqi Cheng. 2021. A Review on Question Generation from Natural Language Text. ACM Trans. Inf. Syst. 40, 1, Article 14 (January 2022), 43 pages. <https://doi.org/10.1145/3468899>
4. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A., ... & Polosukhin, I. (2017). Attention is all you need. In NIPS. <https://arxiv.org/pdf/2010.13154.pdf>
5. Devlin, J., Chang, M. W., Lee, K., & Toutanova, K. (2018). BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding. <https://arxiv.org/abs/1810.04805>
6. Konstas, I., Hovy, E., & Jurafsky, D. (2009). Unsupervised Question Generation from Texts. In Proceedings of the Joint Conference of the 47th Annual Meeting of the ACL and the 4th International Joint Conference on Natural Language Processing of the AFNLP (pp. 422-430).
7. Radev, D. R., Hovy, E., & McKeown, K. R. (2002). Generating Questions from Texts. In Proceedings of the 2002 Conference on Empirical Methods in Natural Language Processing (pp. 100-107).
8. Learning techniques to more efficiently learn new information by Muhammad Saqib Hussain.

