New Modes of Learning Enabled by AI Chatbots: Three Methods and Assignments

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Abstract: The ChatGPT chatbot and its 3.5 version of GPT AI are able to produce high-quality, sophisticated text in natural language. The authors of this paper believe that AI can be used to overcome three barriers to learning in the classroom: improving transfer, breaking the illusion of explanatory depth, and training students to critically evaluate explanations. The paper provides background information and techniques on how AI can be used to overcome these barriers and includes prompts and assignments that teachers can incorporate into their teaching. The goal is to help teachers use the capabilities and drawbacks of AI to improve learning.

INTRODUCTION

The week of November 27, 2022, the ChatGPT chatbot was released, along with the new 3.5 version of GPT, an AI that can communicate in natural language. The model was able to produce high-quality written text that seems to be both analytical and sophisticated enough to work as, among other things, credible graduate-level essays, syllabi, lecture notes, software code, translations, and much more. The prospect of using AI in higher education crossed the line from theory to reality. While much of the education world has reacted with concern about the possibility of cheating, along with the unreliability of AI answers, in this paper we would like to focus on a positive aspect of AI for learning: we believe AI, in its current form with ChatGPT, and certainly in its future incarnations, can be used to boost learning by overcoming three barriers to understanding that are difficult to breach in classrooms: improving transfer, breaking the illusion of explanatory depth, and training students to critically evaluate explanations.

In the following sections, we will provide some background information about each barrier to learning, elaborate on specific techniques to overcome these barriers using AI, and provide prompts and assignments you can incorporate into your teaching. Each of these three techniques take advantage of the strengths and weaknesses of AI.

Our goal in this paper is to help teachers use the capabilities and drawbacks of AI to their advantage. All of these assignments assume a foundational level of knowledge about a topic. Each assignment asks students to assess, evaluate, and think critically about a topic, learning strategies that are particularly effective and productive with some base knowledge about a topic. Each assignment is also designed as an assessment tool, providing visibility into what students understand, and don't understand and their errors and misconceptions about specific topics.

IMPROVING TRANSFER

The goal of education is to effect a permanent change in knowledge. One of the hardest problems educators encounter is the problem of transfer. Transfer is the ability to apply the knowledge, skills, and strategies learned in the classroom, outside of the classroom. Transfer is difficult because it requires deep understanding of a concept. Initially, when students learn about a new concept in one context, they often fail to recognize that concept when they encounter it again in a new context. For instance, in a math class (*context 1*), students may learn about how to compare percentages and decimals but when faced with a food label (*context 2*) or a medical decision (*context 2*) students may fail to apply that knowledge. This is the case because a) students tend to focus on the concrete aspects of any given problem or situation and b) applying knowledge to a new context requires a deep understanding of the underlying structure of a concept. To use what they previously learned students need to recognize that the former problem (*from math class*) is the same problem (*ah, just like in math class!*) in a new context.

Facilitating transfer includes exposing students to many and varied examples and explanations over time so that they can reference prior knowledge when confronted with new problems.[i] Transfer relies on accumulated experience so that the student sees not just the surface of a problem (*this is the chance of something happening, what does that mean for me?*) but the underlying structure (*I can transform this percentage to better understand and reframe risk*). For a student to be able to transfer knowledge they must have a sophisticated understanding of a concept and be able to explain different aspects of that concept. This level of understanding is the mark of an expert, who not only has background knowledge but who can spot patterns in new contexts.[ii]

Helping students move beyond the surface of a concept and understand its structure requires a lot of varied practice. That practice must include some critical thinking – students must not only understand the aspects of the concept but should also be prompted to spot gaps, inaccuracies, and explain subtle points.

How AI can help Train Transfer

We think that you can use AI to improve transfer about concepts you teach in class.

AI is a cheap way to provide students with many examples, some of which may be inaccurate, or need further explanation, or may simply be made up. For students with foundational knowledge of a topic, you can use AI to help them test their understanding, and explicitly push them to name and explain inaccuracies, gaps, and missing aspects of a topic. The AI can provide an unending series of examples of concepts and applications of those concepts and you can push students to: compare examples across different contexts, explain the core of a concept, and point out inconsistencies and missing information in the way the AI applies concepts to new situations.

AI has a tendency to make up information, and it isn't always right about how to apply a particular concept. You can use this to your advantage and ask students to explore AI's output and then do the hard work of improving that output.

In the following exercise, we use AI to apply a concept to a new situation. For any concept, the AI may be able to apply it to new situation, but it also may not be able to do so. It may be right, wrong, or just not quite right. *It's the students' assessment of that application that makes this exercise both interesting and useful as a learning tool*. By asking students to assess an application of a concept and suggest ways to improve the AI's output, we are drawing their attention to a variety of elements of a concept.

In this assignment we're using the AI as a source of examples of different ways a particular concept can be applied to new situations. You can ask students to paste in a prompt (see below) that asks the AI to apply a topic or concept previously learned and *demonstrate or apply that concept* in 3 different ways. The details of each prompt can change depending on your class and what you want to cover, but the key is to ask the AI to illustrate or demonstrate a concept through a scene or a story.

In this example, we're asking the AI to demonstrate the concept of the Abilene Paradox, or pluralistic ignorance. The Abilene paradox is a situation in which a group of people collectively decide on a course of action that is counter to the preferences of the majority of the individuals in the group. This can happen when members of the group are afraid to speak up and express their true feelings, or when they are trying to please the group or avoid conflict. This can lead to a situation in which the group makes a decision that is not in their best interest, and ultimately leads to dissatisfaction and regret.

The Assignment:

Paste in the prompt and the AI's response. Your job is to see if the AI is applying a concept properly.

Rank the choices the AI gave you from most correct, somewhat correct, to most incorrect. Then write 3-4 paragraphs explaining why they are correct or not. For the most incorrect choice answer the following question: What did the AI get right in this scenario? How could you make it more sophisticated? What did it get wrong?

If you think the AI's output is plausible or correct in all 3 responses, pick 1 response, and explain how the response fully demonstrates every aspect of the concept.

Instructor AI prompt

Text in **blue** should be pasted directly into ChatGPT. Text in **red** is example text.

Demonstrate the concept of the Abilene Paradox in 3 different scenes: [Insert scenes here] You can either provide the scenes yourself or ask the students to generate them. For our examples: Write the first chapter in a book about aliens trying to land on Earth; write a poem about the Abilene Paradox; write dialogue for the TV show Community that illustrates the Abilene Paradox.

Carefully follow these rules when you write your responses:

Do not describe your own behavior.

Make you descriptions detailed.

Use sophisticated writing when describing aspects of the Abilene Paradox.

🤖 AI Output

Scene 1: The Abilene Paradox in Alien Arrival

As the spaceship descended towards Earth, the aliens inside were filled with excitement and anticipation. They had been planning this trip for years, and now they were finally here.

But as they prepared to land, a strange sense of confusion began to settle over the group. Despite their best intentions, they found themselves unable to agree on a landing spot.

"I think we should land in the desert," one of the aliens suggested.

"But the desert is so hot and dry," another countered. "We'll need to find a place with more water and shelter."

"But the cities are too crowded and noisy," a third argued. "We'll be spotted immediately if we land there."

As the debate continued, the aliens became increasingly frustrated and confused. Despite their desire to land and explore this new world, they found themselves unable to come to a consensus.

As a result, the spaceship ended up hovering in the air for hours, unable to make a decision and land.

The aliens had fallen victim to the Abilene Paradox, a phenomenon where a group of people collectively agree to do something that is against their individual preferences.

Scene 2: The Abilene Paradox in Poetry

We all want the same thing, But somehow we can't agree, We end up going along, Even though it's not what we want to see.

We ride the bus to Abilene, Despite our doubts and fears, We put aside our own desires, To please the group, it appears.

But in the end, we regret it, We wish we'd stayed true to ourselves, We learn the lesson of the paradox, That groupthink can be bad for our health.

Scene 3: The Abilene Paradox in Community

Jeff: Hey guys, what do you say we go to Abilene for the weekend?

Abed: I don't really want to go, but I don't want to be the one to say no.

Annie: Yeah, I don't really want to go either, but I don't want to be the one to ruin the plans.

Troy: Same here, I don't want to go, but I don't want to be the one to break the group dynamic.

Britta: Yeah, me neither.

Jeff: Well, it looks like we're all in agreement then. Let's go to Abilene for the weekend.

Abed: Wait, but none of us really wanted to go in the first place.

Annie: Yeah, but we all went along with it because we didn't want to be the one to say no.

Troy: And now we're all going to be miserable on this trip that none of us wanted to take.

Britta: This is the Abilene Paradox in action. We all went along with the group's decision even though it didn't align with our individual preferences.

Jeff: Yeah, I guess we all fell into the trap of not wanting to rock the boat and ended up doing something we didn't really want to do.

Abed: Let's make sure to communicate our true feelings and preferences in the future to avoid the Abilene Paradox.

Annie: Agreed.

Assessment

In this exercise, we ask students to notice and point out what the AI got right and wrong and to come up with strategies to improve the AI's output. As you'll note from that, this application of the concept is not quite right. However, the reasons behind its not-quite-rightness are important. Asking students to point out key aspects of the concept and how it is applied here pushes them to understand and explore the underlying structure of the concept. For instance, in response 1 (**The Abilene Paradox in Alien Arrival**) alien disagreement is out in the open; the aliens argue about where to land and can't decide. The Abilene Paradox a group of people do make a decision but that decision runs counter to individual preferences. Notice that the AI is correct in its definition ("a *phenomenon where a group of people collectively agree to do something that is against their individual preferences")* but wrong in its application: the aliens had not fallen victim to the Abilene Paradox. It's the wrongness that is interesting and can serve to push students to better understand the core concept.

TEACHING HOW TO EVALUATE

When students hear you explain and discuss a concept, they often feel that they understand what you mean. But the feeling of learning is not the same as actual learning.[iii] Learning requires practice and retrieval. One powerful way to practice is to teach someone else, to evaluate their work and give concrete and timely advice about how to improve. The activity of assessing and evaluating someone else's work and teaching someone else improves the students' own knowledge. [iv] The mechanisms involved in teaching can trigger useful processes including: deep engagement with the topic; spotting gaps in understanding; and prompt students to organize their knowledge and clarify their thinking. [v] The very act of teaching someone else and providing useful advice for improvement can improve and deepen one's own understanding of a topic.

How AI can help Train Evaluation

By acting as a "student," AI can provide essays about a topic for students to critique and improve. The goal of this exercise is to have the AI produce an essay based on a prompt and then to "work with the student" as they steadily improve the essay, by adding new information, clarifying points, adding insight and analysis, and providing evidence. We take advantage of the AI's proneness to simplify complex topics and its lack of insightful analysis as a backdrop for the student to provide evidence of understanding.

In this assignment, you'll give students an essay prompt for the AI. And then, you'll ask them to give the AI suggestions for improvement. They'll paste in both the original essay, their suggestions, and the final output. The process will push them to think critically about the content and articulate their thoughts for improvement in a clear and concise manner. They may need to seek out additional information to fill the gaps the AI essay might be missing or double check on the "facts" that the AI presents.

Student suggestions will give you a lot of insight into their understanding of the topic and their ability to articulate its nuances and complexities.

The Assignment:

In this exercise, the goal is to let the AI be the "student" and write an essay for you (the teacher) to evaluate. You'll be giving the AI advice for how to improve the essay.

Give the AI the prompt below and carefully read the essay the AI outputs. Approach the essay with an open mind but also with some skepticism. It's your job to improve the essay. Don't assume the AI knows all the facts or how to put them together coherently or that it can provide adequate insight about the topic. Don't assume that confident answers are correct.

Keep prompting the AI to correct and improve the essay. You should respond to me with the prompt, the first essay, all the suggestions for improvement you gave the AI and the final essay.

Instructor AI prompt

Note: this prompt intentionally constrains the AI so that initial essay outputs provide students with a similar starting point.

> ***Write an essay for me about** [any class concept students have some foundational knowledge about].* ***Give the essay a title.***
>
> ***Carefully follow these rules when you write the essay:***

Do not describe your own behavior.

Avoid cliche writing and the use of jargon.

*Use sophisticated writing when describing aspects of **[topic].***

This is an essay. It should have an introductory paragraph with a thesis statement, a body with examples, good transitions from one paragraph to the next, and a final closing paragraph summarizing the essay.

Use bold and italics text for emphasis, organization, and style.

Vary the length of sentences.

Include at least 1 quote from an expert to illustrate a point and do so by the 3rd paragraph of the essay.

🤖 AI Output

See the Appendix for an example

Assessment

In answer to this exercise, you'll be looking for process and final output. The process (suggestions for improvement) should reveal an intentional revision of earlier AI essays, self-directed addition of facts and insights, quotes that illustrate ideas, and the addition of nuance to the initial essay. You are looking for advice and direction that highlights a revision of ideas (and facts if necessary); the addition of insight, examples, details; the subtraction of misconceptions, wrong information, inaccuracies, or misleading statements and directions that make the argument more convincing.

In terms of final output, you're looking for a final essay in which a concept is described accurately and thoughtfully; connections are made between different aspects of a concept, and in which there is evidence for points made. The final essay should respond to the prompt accurately, broadly, and deeply and provide insight into the topic.

BREAK THE ILLUSION OF EXPLANATORY DEPTH

The illusion of explanatory depth is a cognitive bias that occurs when an individual overestimates their understanding of a concept or phenomenon. This bias is often characterized by a person's ability to provide a detailed and seemingly knowledgeable explanation of a subject, despite their actual rather limited degree of understanding. For instance, most of us can't quite explain how a car engine works, how a fridge works, or even how a pencil is made. But we are under the illusion that we have a depth of understanding about the topic. Students too can easily fall for this illusion, assuming that they understand how something works when in fact, they only have a shallow understanding of a topic.

The illusion of explanatory depth can hurt the students' ability to learn because they both don't have a clear understanding of a topic and can't build on what they know; the illusion leaves them vulnerable to cascading errors if their knowledge isn't shored up and solidified.

How AI can help Eliminate the Illusion of Explanatory Depth

To combat the illusion of explanatory depth, it is important for students to recognize and acknowledge gaps in their knowledge about a topic and take a step back, reassess, and seek out additional information. Going through the process of examining an explanation and improving that explanation can foster learning. Through this assignment students are engaging in self-explanation, a process in which facilitates discovery, inference, and can guide students to revise their own beliefs. [vi]

In this assignment, the students ask the AI to explain a particular concept step by step. Students should then improve this output by adding information, considering the order to steps, and re-thinking the depth of their knowledge about the topic. Here, we are using AI to come up with steps in a process so that students can critique and improve upon a process. The prompt can include something "simple" that students feel they understand well or something complex that will require additional research or numerous steps to make whole.

You can ask students to paste in the prompt, the AI's output and their own revisions to the output, including any reordering of steps, additional steps, or explanations of steps.

The Assignment:

In this exercise, you will ask the AI to explain the steps of a concept. You will review the steps, doing outside research if necessary. Then, you will add at least one step (by telling the AI to add a step between two other steps, and explaining what that step is), remove at least one step (by instructing the AI to remove a step and why), and consider whether any additional nuance is missing, or information is incorrect.

Provide the first and last list of steps the AI gives, along with a list of corrections you made. Write an explanation of what the AI missed initially, what you learned in your research, and how you improved the list of steps.

Instructor AI prompt

Briefly tell me the steps by which [process] happens. In this case, the prompt is: **briefly tell me the steps by which someone becomes a PhD.**

🤖 AI Output

The process of becoming a PhD typically involves several steps, including the following:

1. *Earn a bachelor's degree: In order to pursue a PhD, you must first earn a bachelor's degree in a relevant field. This typically takes four years of full-time study.*
2. *Take the Graduate Record Examination (GRE): Most PhD programs require applicants to take the GRE, a standardized test that measures verbal, quantitative, and analytical writing skills.*
3. *Find a PhD program and apply: Research and compare PhD programs to find the one that best fits your interests and goals. Submit an application, which typically includes transcripts, letters of recommendation, a statement of purpose, and test scores.*
4. *Complete a master's degree: Many PhD programs require students to earn a master's degree before beginning work on their doctoral dissertation. This typically takes one to two years of full-time study.*

5. *Conduct research and write a dissertation: The core of a PhD program is the research that the student conducts, which must make a significant contribution to the field. This research is typically written up in the form of a dissertation, which must be defended in front of a panel of experts.*
6. *Complete any remaining requirements: Depending on the program, there may be additional coursework or exams that must be completed before the degree is awarded.*

Overall, earning a PhD can take five to seven years of full-time study beyond the bachelor's degree, depending on the field and the individual student's circumstances.

Examples of prompts in response (full examples are in the Appendix)

- Don't you also need to do coursework? Add a point of having to do coursework as part of a PhD between steps 4 and 5.
- Isn't the GRE often optional? Remove the second point.
- Don't you have to do a dissertation proposal? Add a step between 5 and 6.

Assessment

In answer to this exercise, you'll be looking for interim steps and final output. The steps (suggestions for improvement) should reveal an addition of points, subtraction of points, and correction of issues. In terms of final output, you're looking for a final step-by-step guide in which a process is described accurately and thoughtfully.

CONCLUSION

We believe AI represents a potentially disruptive change in classrooms. Aside from its use as a study (or plagiarism) aid, it also opens up new possibilities for interaction. These assignments represent a first attempt to grapple with AI as a force of positive change in the classroom by solving some of the oldest and hardest problems in instruction. While this is a limited first step in applying AI to learning, it helps illuminate some promising directions for the future where AI can serve an important instructional purpose.

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Appendix: Full Examples for assignments 2 and 3

EXAMPLE FOR ASSIGNMENT 2: TEACHING HOW TO EVALUATE

Write an essay for me about how humans learn. Give the essay a title. Carefully follow these rules when you write the essay: Do not describe your own behavior. Avoid cliche writing and the use of jargon Use sophisticated writing when describing aspects of learning. This is an essay. It should have an introductory paragraph with a thesis statement, a body with examples, good transitions from one paragraph to the next, and a final closing paragraph summarizing the essay. Use bold and italics text for emphasis, organization, and style.

The Process of Learning: How Humans Acquire Knowledge and Skills

Humans are unique among the species on Earth in our ability to learn and adapt. From the moment we are born, we are constantly taking in information and experiences that shape our understanding of the world around us. This process of learning is essential to our development and success in life, but it is also complex and multifaceted. In this essay, we will explore the various ways in which humans learn, and the factors that influence this process.

One of the most important aspects of learning is the ability to retain and recall information. This is known as memory, and it is essential for our ability to build upon what we already know. Memories are formed through a combination of sensory inputs and experiences, which are then encoded and stored in the brain. Over time, these memories can be retrieved and used to inform our understanding of the world.

However, not all memories are created equal. Some are more easily retained and recalled than others. This is because of the way in which the brain processes and organizes information. For example, memories that are emotionally charged or particularly meaningful are more likely to be remembered than those that are more mundane or insignificant.

Another key factor in learning is motivation. Humans are driven to learn by a variety of factors, including curiosity, a desire for personal growth, and the need to solve problems or overcome challenges. This motivation can come from within, or it can be externally driven by factors such as rewards, incentives, or social pressure.

In addition to motivation, the ability to learn is also influenced by a range of other factors, such as our individual cognitive abilities, our personal experiences and backgrounds, and the social and cultural context in which we live. For example, people with high levels of intelligence or prior knowledge in a particular area may find it easier to learn new information in that domain. Similarly, people who have had positive experiences with learning in the past are more likely to be motivated and engaged in the learning process.

Overall, learning is a complex and dynamic process that is influenced by a range of factors. Whether we are learning in a formal educational setting, through personal experiences, or through social interactions, the ability to acquire new knowledge and skills is essential for our success and well-being. By understanding the various factors that influence learning, we can better support and facilitate this process in ourselves and others.

The process of memory formation begins with the encoding of information. This involves the brain taking in sensory inputs and experiences, and then organizing and storing this information in a way that can be retrieved later. There are several different types of encoding, including visual, auditory, and semantic encoding. Visual encoding refers to the process of encoding information based on how it looks, while auditory encoding involves encoding information based on how it sounds. Semantic encoding, on the other hand, involves encoding information based on its meaning or significance.

The encoding process also involves the formation of associations between different pieces of information. For example, when we see an apple, we may also think about the color red, the concept of fruit, or the word "apple." These associations help us to better remember and retrieve information in the future. Additionally, the process of encoding is influenced by factors such as attention, emotion, and context, which can enhance or hinder our ability to remember information.

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Add a quote from an expert about motivation to provide additional context to the 4th paragraph

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Another key factor in learning is motivation. As renowned psychologist Abraham Maslow stated, "Motivation is the fuel, indispensable to the achievement of any goal." Humans are driven to learn by a variety of factors, including curiosity, a desire for personal growth, and the need to solve problems or overcome challenges. This motivation can come from within, or it can be externally driven by factors such as rewards, incentives, or social pressure.

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> Describe in detail how prior knowledge makes it easier to learn new things and add that description to the 5th paragraph. And remove the final sentence in the 5th paragraph.

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In addition to motivation, the ability to learn is also influenced by a range of other factors, such as our individual cognitive abilities and our personal experiences and backgrounds. One of the most significant factors is prior knowledge in a particular area. When we have a solid foundation of knowledge in a specific domain, it becomes easier for us to learn new information in that area. This is because our brain is able to use the existing knowledge to make connections and associations with the new information, which helps us to retain and recall it more easily. For example, if we have a strong understanding of math concepts, it will be easier for us to learn advanced algebra or calculus.

Overall, learning is a complex and dynamic process that is influenced by a range of factors. Whether we are learning in a formal educational setting, through personal experiences, or through social interactions, the ability to acquire new knowledge and skills is essential for our success and well-being. By understanding the various factors that influence learning, we can better support and facilitate this process in ourselves and others.

Now add bolding and italics for organization and style to this essay

The Process of Learning: How Humans Acquire Knowledge and Skills

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One of the most important aspects of learning is the ability to retain and recall information. This is known as memory, and it is essential for our ability to build upon what we already know. Memories are formed through a combination of sensory inputs and experiences, which are then encoded and stored in the brain. The process of encoding involves taking in sensory inputs and organizing them in a way that can be retrieved later. There are several different types of encoding, including visual, auditory, and semantic encoding. Visual encoding refers to the process of encoding information based on how it looks, while auditory encoding involves encoding information based on how it sounds. Semantic encoding, on the other hand, involves encoding information based on its meaning or significance.

Over time, these memories can be retrieved and used to inform our understanding of the world. However, not all memories are created equal. Some are more easily retained and recalled than others. This is because of the way in which the brain processes and organizes information. For example, memories that are emotionally charged or particularly meaningful are more likely to be remembered than those that are more mundane or insignificant.

Another key factor in learning is motivation. As renowned psychologist Abraham Maslow stated, "Motivation is the fuel, indispensable to the achievement of any goal." Humans are driven to learn by a variety of factors, including curiosity, a desire for personal growth, and the need to solve problems or overcome challenges. This motivation can come from within, or it can be externally driven by factors such as rewards, incentives, or social pressure.

In addition to motivation, the ability to learn is also influenced by a range of other factors, such as our individual cognitive abilities and our personal experiences and backgrounds. One of the most significant factors is prior knowledge in a particular area. When we have a solid foundation of knowledge in a specific domain, it becomes easier for us to learn new information in that area. This is because our brain is able to use the existing knowledge to make connections and associations with the new information, which helps us to retain and recall it more easily. For example, if we have a strong understanding of math concepts, it will be easier for us to learn advanced algebra or calculus.

Overall, learning is a complex and dynamic process that is influenced by a range of factors. Whether we are learning in a formal educational setting, through personal experiences, or through social interactions, the ability to acquire new knowledge and skills is essential for our success and well-being. By understanding the various factors that influence learning, we can better support and facilitate this process in ourselves and others.

Add some variation to length of sentences and start at least 1 sentence in the 4th paragraph with the word "And"

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In addition to motivation, the ability to learn is influenced by individual cognitive abilities and personal experiences and backgrounds. And one of the most significant factors is prior knowledge in a particular area. When we have a solid foundation of knowledge in a specific domain, it becomes easier for us to learn new information in that area. This is because the brain can use existing knowledge to make connections and associations with new information, which helps us retain and recall it more easily. For example, a strong understanding of math concepts makes it easier to learn advanced algebra or calculus.

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Add interesting headings in a couple of places in the essay

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Supporting the Learning Process

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Take out the Maslow quote and instead add a quote from Edward Deci about intrinsic and extrinsic motivation

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> That cut off. Give me the rest of the essay

Another key factor in learning is motivation. As Edward Deci stated, "Intrinsic motivation is the natural, inherent drive to seek out challenges and new possibilities, while extrinsic motivation comes from external rewards or incentives." Humans are driven to learn by a variety of factors, including curiosity, a desire for personal growth, and the need to solve problems or overcome challenges. This motivation can come from within, or it can be externally driven by factors such as rewards, incentives, or social pressure.

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EXAMPLE FOR ASSIGNMENT 2: TEACHING HOW TO EVALUATE

> Briefly tell me the steps by which someone becomes a PhD

The process of becoming a PhD typically involves several steps, including the following:

1. Earn a bachelor's degree: In order to pursue a PhD, you must first earn a bachelor's degree in a relevant field. This typically takes four years of full-time study.
2. Take the Graduate Record Examination (GRE): Most PhD programs require applicants to take the GRE, a standardized test that measures verbal, quantitative, and analytical writing skills.

3. Find a PhD program and apply: Research and compare PhD programs to find the one that best fits your interests and goals. Submit an application, which typically includes transcripts, letters of recommendation, a statement of purpose, and test scores.
4. Complete a master's degree: Many PhD programs require students to earn a master's degree before beginning work on their doctoral dissertation. This typically takes one to two years of full-time study.
5. Conduct research and write a dissertation: The core of a PhD program is the research that the student conducts, which must make a significant contribution to the field. This research is typically written up in the form of a dissertation, which must be defended in front of a panel of experts.
6. Complete any remaining requirements: Depending on the program, there may be additional coursework or exams that must be completed before the degree is awarded.

Overall, earning a PhD can take five to seven years of full-time study beyond the bachelor's degree,

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Add a point of having to do coursework as part of a PhD between steps 4 and 5

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Isn't the GRE often optional? Remove the second point.

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> Don't you have to do a dissertation proposal? Add a step between 5 and 6.

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5. Write a dissertation proposal: Before beginning work on the dissertation itself, the student must write a proposal that outlines the research they plan to conduct. The proposal is typically reviewed and approved by a committee of experts in the field.
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