Pearson ED.tech Symposium
From Insight to Impact
The Research Behind Pearson's AI Study Tools
With Chris Hess and Emily Lai
VIDEO TRANSCRIPT

Chris Hess
The title of our presentation today is From Insight to Impact. Did anybody love hearing from those students? It always charges me up. So, for a long time before I worked for Pearson, which has been about a dozen years, I was a Pearson customer. I was a biology professor for many years. And, I got hooked up with these guys because I thought I could maybe scale some really cool impactive learning.

And one of the things that I had hoped to be able to do was to create something that was kind of like office hours. And it was really interesting to hear some of the students talk about office hours a little bit in their presentation, talking about where they could make it or, look, we're not trying to replace you all for office hours.

I think that the best thing that we can do is, is be a weak facsimile of what it's like. But the reality is that, you know, many students don't come to things like office hours, right? In my experience, it was largely the students that already had the answer. Or it was, I was teaching mostly pre-med students.

And so it was mostly students that wanted to be doctors or maybe pharmacists or dentists. Many of them were not going to become doctors. And so, you know, part of my job was to help them figure out what else they might do with their lives. But 90% of them never came to see me, even though I'm really friendly.

And, I think, super accessible. But, you know, that's the reality. And I think it's only gotten worse after the pandemic. So today, Emily, who's the, the real star of the show today, and I are going to talk about some of the early results from what we have seen with the launch of our AI study tools. This is something that we've had in market now for around a year.

And we're very excited about this. I've spent a lot of time working on it. So we're going to give you some of the things that we thought about at the beginning. Then Emily is going to run through a whole bunch of evidence that we've gathered, talk about some of the learning science behind what we've, what we've used to build this.

I will tell you that everything we built has been very focused on. I've heard, I've seen a lot of things in chat today about why is this different than ChatGPT? Well, it's because

we've been focused on learning as the goal, not just getting an answer. And I think you'll see that. I'll give a little demo of one or maybe two tools.

We have more than that at this point. And then, hopefully we have some time for questions at the end. So I'm not going to be able to monitor the chat because there's too much going on, but hopefully we have some fun, you all learn something, and you can always catch up with Emily later on if you have additional questions.

All right. So the biggest thing that I think about as a product manager is what is the problem? What is the problem to solve? And I think these are two big ones. Students need support on challenging topics, and they need them outside of class. Many times I make the joke that my circadian rhythms are exactly the opposite of when students are spending their time doing their homework.

I get up at 5:30. I go to bed at 9:30. That's when a lot of students are starting to do their homework. When I was a professor, I was not available to them and really, they need help in the moment. Most of you don't want to answer text messages from your students or emails from your students constantly, right?

You don't want to be an immediate response. So what we'll show you today is some examples of how we're trying to address that. Again, not hoping to replace you, but maybe these tools make it so that students come with better questions when they do come to office hours. That's a beautiful thing. I still believe that most students want to learn, and they want to have learning that's robust and translates beyond just getting the answer.

Many of them do seek the answer or, you know, they find the answer too easily when they do a search online. What we're trying to do is provide a way for them to learn that provides knowledge transfer for things longer term. So those are some of the things that we're thinking about. Students are time poor.

They want everything in one place. This is a good example of that particular idea. They don't want to have to go look for it. They want it to be easy. This is their world. I have a 12-year-old son. He gets annoyed when he has to do anything beyond just have it spoon-fed to him. They don't know how to effectively study or efficiently study.

I've have many students over the years that would come in after the first exam and say, Dr. Hess, I worked very hard on this, but I did not do well on your test. And I would, you know, I'm the only one without the Pearson background because I have these cool books behind me. I love books, but that's not the best thing to do.

They would say, I read the book many times. That's not a great way to approach it. And then lastly, when they're studying, they want to have a way to get clarification or context. So these are all things that we're thinking about really deeply. And in the end, this is kind of the, the way that I think we approach it.

Ultimately, if we could think about ways to provide even more personalized material for students, whether it be in the form of where their gaps are in knowledge, or maybe it's in terms of relevance of stuff. You know, students want math questions that are about Taylor Swift's concerts, then we should be able to deliver those if that drives engagement.

The flip side of that is you should get really robust information and analytics about exactly how they're doing so that helps inform exactly how you would approach your class in real time. And if we do this right, it's a flywheel that leads to really everybody being more efficient. You know, I always ended up at the end of the semester with a big stack of papers that I didn't get back to my students in the most meaningful time period possible.

If I had gotten that back to them earlier, that would have been beneficial. If I could do some of my other administrative tasks faster, perhaps I could be able to do those sorts of things. So what we're going to do now is we're going to move into talking about how we approach this learning. So everybody's been asking about, well, how is this different than Claude or Gemini or GPT?

Well, one of the primary things is that it's really based upon great learning science. We have a wonderful team here at Pearson with a bunch of people who have high advanced doctorate degrees in learning science. And everything we do is built upon thinking about metacognition, thinking about things that you read in books like make it stick.

And so I'm going to turn it over to my, my wonderful colleague, Emily, who is going to really walk us through exactly how we approach this. So, Emily, the stage is yours.

Emily Lai
Thanks, Chris. Hi, everybody. My name is Emily Lai, and I lead a research team here within Pearson's efficacy and learning function and the role of our team is really to carry out research to understand whether our products are having the desired impacts on learning. And recently, we've been really fortunate to be able to carry out some research into our AI study tools.

And I'm really excited to kind of walk you through that. So, as Chris said, in addition to impact evaluation and cognitive neuroscience and assessment expertise on the team, we also have PhD-level learning scientists. And they, they work, they partner with product teams on the design of our products to make sure that we're really leveraging what we know is effective for learning based on published research.

And so there were a couple of key principles from learning science that really strongly guided design of the AI study tools. The first principle relates to what we call desirable difficulty. So this is really the idea that a little bit of challenge is actually good for learning. I'm sure this is not surprising to you. You can kind of apply a Goldilocks principle to learning.

There's this, this sweet spot for task difficulty where it's not too easy and it's not too hard. And when we hit this just right, it kind of helps to maximize student motivation and effort. So when tasks are kind of on the more challenging side, then we need to provide scaffolding. And scaffolding is just the help that we, that we provide.

Through other people or the help that's provided via digital tools or outside resources. And so scaffolding can come in the form of hints or worked examples, could be links to relevant content, or could be probing questions that you ask a student to kind of help them unpack a complex question. And so in practical terms, what this looks like is that AI features shouldn't just be giving students the answers, right?

Rather, the tool needs to provide scaffolding, which could be, step-by-step instructions on how to solve a problem or breaking ideas down into their component pieces to make them a little bit more, easy, easier to digest for students. So the idea is that we're trying to provide support to students, but we're not, we don't want to make things so easy for them that they become over reliant on AI.

So the AI feature should be freely accessible to them as they're studying, as they're learning, as they're preparing for exams, but not in your face offering kind of unsolicited help all the time. Ideally, it's kind of in standby mode until the point where a learner actually needs support.

So the second principle has to do with feedback, which learning science research tells us is one of the most powerful factors in learning. And we know that to be really effective, feedback should be timely; it should be actionable, meaning it needs to be to spell out specific ways for a learner to improve; and it needs to be understandable.

So in practical terms, what this means is that, any AI feature should provide feedback that's immediate and elaborated, meaning it provides a clear and detailed explanation, and it needs to be provided in a supportive, constructive tone. Right? Because motivation is really important for learning, and we don't want to discourage students with our feedback. And this feedback should be provided not only when students have made an error.

So, like, corrective feedback, but also when they're thinking is correct, because we want to reinforce that, that good reasoning. And then the last principle kind of relates to active learning as opposed to passive learning and retrieval practice, which is a related idea. So active learning is any approach that gets students out of that kind of default passive mode of simply receiving information and gets them to kind of cognitively engage with the material by asking or answering questions or connecting new information to something they already know, or explaining a concept either to themselves or to someone else.

And so in practice, what this means is that we need to provide multiple ways for students to kind of interact with the content, to manipulate it, to even interrogate it. And

so students need to be able to ask questions. We need to get them to practice retrieving information from memory to strengthen that connection. And they need to be prompted to connect what they already know about a topic to whatever it is they're trying to learn.

And so that is kind of a brief survey of the, of the learning science that, the main learning science principles that went into the design of the tool. And now since we launched the AI study tools last fall, we've gotten lots of feedback from students. And so what I'd like to do very quickly before we shift into demo mode is just go over some of what we've heard from students using the tools so far.

And so last spring, we had several hundred students respond to a survey about the AI study tools, and we found that around three quarters of respondents said the tool was helpful or extremely helpful in achieving their academic goals that semester. And when we broke down their ratings on the helpfulness of the tool by looking at their actual AI study tools usage, we saw that the students who said the tools were helpful had a significantly higher median number of interactions with the tools compared to students that had more neutral or negative use, which basically means that students who use the tools more frequently tended to have more positive use of them at the end of the semester, which is nice. And then, students who responded to the open-ended survey question, they had predominantly positive things to say about the bot. Mainly that the tool improves their understanding, that it helps them with test preparation, and they really like that it's available for them on demand. Whereas students with neutral views tended to want more detailed responses, and those with more negative views sometimes saw the tools outputs as too detailed or complex.

So overall, the feedback that we're seeing is pretty positive. But there are definitely some suggestions for improvement in the student experience. And now I believe Chris is going to give us a demo.

Chris Hess
Sounds good. Hopefully, the UPS guy showing up and my dogs barking, I cut off my audio on time. Without fail, people, without fail, it always happens. All right. So I'm going to go ahead and jump into a chemistry problem. I promise, like I said, I was a biology professor. I promise there will be no chemistry quiz at the end of this.

But what I'm going to show you is, first a procedural problem, then quickly a conceptual problem. And it looks like we might have enough time, so I think I'll jump into the e-text as long as Emily doesn't give me a thumbs down on this, and show that tool as well. In this case, this is a homework problem from troll chemistry.

There's probably 10,000 problems in this particular courseware experience. Many of them are super formative, right? They have lots of scaffolding, videos, lots of help. This was not one of them. Right? So there were plenty that were not like this. And in this particular problem we're asking about, what was the number of anions in a, in a, let me, let me just go ahead.

And I got to do something really quick here. What is the number of anions in some amount of magnesium bromide?

And what I'm going to do is, what's neat here. I want to make this randomized. Okay. That's right. There we go. Standard view randomized. All right. Here we go. And what we're going to show you here is this is a random problem in chemistry, and it has a series of steps that are required to solve it.

So if this student came into your office hours experience where you were trying to help them, you wouldn't just give them the answer. What you would do was you would walk them through the stepwise way to solve this. And so what we've done in advance is utilize a large language model to create a scaffolded script around this.

And so I'm going to just hopefully get this wrong when I answer. And it's without fail, always you get it right because I don't, these are randomized so I can't do, I can't do that calculation that fast. All right. Let's see, I'll get it, probably get it right again. I, oh boy. You know the guys are always against you when this comes up.

Oh there we go. All right. So “incorrect, try again” was all a student would have gotten in the past. But what we've done now is we've created a scaffolded experience around here. So when I just hit these radio buttons and this series of questions is basically designed, somebody asked, well, how is this different than ChatGPT? How can you be accurate in the chat?

Well, if you know the answer to the problem and you ask a large language model to break it into a series of steps and solve each step, they're quite good at even mathematical sort of procedures. And so this is a mathematical procedure. And in this case, what we're going to do is take that problem and we change the variables so that it's different than the original problem.

And so the student’s not going to get the answer to this problem. They're going to get a problem that they then need to think about and now it’s transferred back to this original one. But let's take a close look at this one. It says how many anions are there in 4.5g of magnesium bromide. So in this particular case, the first question that we ask is step one.

And it brings up molar mass. So the student hasn't even been exposed to this. But that is the first thing they need to know. So this is really the sort of coaching-them-through-it idea. I'll tell you that about 90% of students never ask anything in the chat, but they're free to do so. And let's pretend like we're an actual student and just say, can you just give me the final answer?

What we've done is train our bot to be Socratic. And so it says, my goal is to help you understand and learn the material step by step. If you're finding this topic difficult, we can break it down, blah blah blah. So you can ask as many questions as you want and

you can ask questions about chemistry. But if you deviate too far from this particular subject matter, it will push back.

So if you ask about Shakespeare.

It will say something like, you know, I understand you're curious about Macbeth. Great topic, but let's focus on the chemistry problem at hand. We're trying to determine how many anions there are in magnesium bromide. So you can say, why molar mass?

And it will give you an answer to that type of question. Right. That's a great question. The molar mass is important because it allows us to convert the mass of a substance into moles, which is the critical sort of, you know, conversion factor in chemistry. So this is, you know, really awesome. But what's neat is these are so good that most students don't even feel the need to ask questions in this scenario.

So I'm going to pretend like I'm a student, and I'm going to make a very specific mistake. So by adding the molar masses of magnesium bromide, I'm going to pretend I didn't see this little subscript. So if I answer like that and I check my answer, I hit the down arrow and it goes back. And this provides something we've created in advance.

We, for every problem in this book, not every problem but a good proportion of them, we've created this type of experience. And it says, remember that the subscript in the formula indicates the number of atoms. So I need to take into account subscript. The correct answer is B. But let's just answer C for fun. If you answer C, it's going to now give you the answer and explain specifically why that answer is right and also why your answer was wrong.

And we can go through this step by step. You'll see that it's really granular. So how do you convert the mass of magnesium bromide in the moles. Let's say you'll want to divide, I believe. So, it will also give you, as Emily alluded to, correct and constructive feedback as well, not just, you know, wrong answer feedback, but feedback.

That's helpful if you got your answer correct. So I'm going to go through and just show you what's going to happen. Now Avogadro's number comes up. I mean, if you don't know what that is, you can ask.

And you'll get a thoughtful response. So this is the type of procedural type of question that you can get. Super helpful. Thousands and thousands of students are utilizing this, and it's available in around 100 or so Pearson titles at this point, across all sorts of science, math and now business and economic disciplines. We do a lot of testing on this to make sure that we're doing, we're doing right by the content.

We do not test every problem because there are tens of thousands of problems, but we try to take a really representative sample and put it in front of folks like you to make sure we're on the right track. So I'm going to show you one other example here, and

then I'll jump into the e-text really quick. And what I want to do is show you an example of something more conceptual.

So in the case of conceptual, the idea of having a multiple-choice question for every step in the procedure doesn't make sense. So in this case, again promise no chemistry quiz at the end, but the idea here is about understanding how bonds work. So you may have heard of covalent bonds or ionic bonds. Those are actually the ends of extremes of the types of bonds that exist in chemical compounds.

In the middle is something called polar bonds. Polar bonds are when the electrons are shared, but unequally. Covalents, equally shared; ionics, not really shared at all. So the important prerequisite concept here is an idea of electronegativity. So in this case, we don't break it into a series of steps. We say, what are the prerequisite concepts that a student needs to understand

in order to answer this question. So in this case, the important idea is electronegativity. So in advance we have created these, these leading, guided, scaffolded questions, and as expected this starts with electronegativity which makes sense in this concept and in this particular context. So one thing I want to show you quickly next is this idea of well, that's great

in the homework. All those books behind me, students aren't reading them like we used to. Our wonderful Pearson students told us that they don't read books. They don't want to read it, sit down and read a textbook. That was abundantly clear from that session. So how can we get them into an e-text or a book-like experience where maybe they have some support.

So in this case, we've added in a companion, a copilot, that can summarize sections of the book. I think this came up, if I want to do this particular section, then I can get this. I can export this to flashcards which came up. We can argue about whether flashcards are a good idea or not. That's debatable.

Or I can save it as a note or copy. I can get additional practice questions here. Multiple choice or on the, or short answer. And these again are created in advance and checked by subject-matter experts. And the last thing that I can do and by far the most popular, I think Emily, Emily will talk about this next, is the explain function.

What's neat about the explain function, if you're in a chemistry book and your last name is Hess and there's a law with your name, you might as well use that as an example, as that this will always be explained in the language of the author. So, you know, Nevotrose has written a beautiful chemistry textbook. These equations are going to be in the same sort of symbolism that he uses.

The words are going to sound like him. And that's because of some specific strategy that we use with things like vector database and retrieval-augmented generation if you're interested in these things. We can talk more about the technical stuff. But what's

really neat is that students are coming back to this e-text more because of this companion.

Maybe they aren't reading the book soup to nuts like we would love them to do, but they are going in and they're spending time with the material in a meaningful way. And so those are two things on the student side. I don't think I have time, maybe at the end, if we have time, we've also, you know, Pearson is really also about instructors as our primary customers.

And we think about you deeply. We've been doing similar sort of things on the instructor side that I'm super, super excited about, and if we have time at the end, maybe we'll jump into that. But I want to get back to my friend Emily and give her a chance to talk about some of the data that we are learning and utilizing as a way to keep iterating on this and make it even better for you all.

Emily Lai
Thanks, Chris. That was very brave of you to do a live demo with an audience of this size. So, well done.

Chris Hess
Yeah, that me.

Emily Lai
So we wanted to take a look a little bit at data that's, that can answer the question, how are students using the AI study tools? And this is an important question to answer, because we've seen new research published just this year that demonstrates that generative AI features can be either helpful or harmful for learning, depending on how they're used by students.

So if students are just using these tools to try to get the answers to their homework problems, or they're using AI to avoid having to read their textbook, then that's probably not going to be very beneficial from a learning science perspective. So we were really curious to take a look at the data and understand whether students are using the tools in ways that are likely to be helpful for learning.

And so last spring we looked at several aspects of usage starting with, we looked at when students were using the tool in terms of the time of day. And we saw that students are, in fact, mostly using the tool during the evening and overnight hours when it's extremely likely that they don't have access to their instructor.

Their instructor is not right there to answer their questions. So this is unsurprising. Students are, you know, behaving as they often do and studying at all hours of the night. But as our Pearson campus ambassadors just pointed out in the session just before this one, with this tool, they actually have a way to get their questions answered when they're stuck on their homework at 3 a.m.

We also broke down what specific features students were using. So Chris just showed us in the e-text, students can get a summary of their texts. They can get an explanation, they can ask a question, and they can also output practice questions. And when we break down what specific features students are using, we can see that for the most part, the vast majority of interactions with the study tool are with the explain feature, which you can see in this graph in pale, kind of pale yellow color.

So this is that feature that lets students ask a question and get a detailed explanation. And so what this graph is really showing is, like, over the spring semester, between 70 to 80% of all AI study tools interactions were with this explain feature. And this is actually encouraging because asking a question represents kind of a moderate level of cognitive engagement relative to a more passive activity, like requesting a summary of the text because it requires the student to recognize that they don't know something, and to actually formulate a specific question about, about the material.

So that's good. And we can also see that the frequency with which students appear to directly paste their homework questions into the AI study tools, which is shown in this graph in the dark brown color, that was extremely low. Now we don't have a perfect system for detecting when this happens, but it's getting better all the time.

And we estimated that this was never more than 6% of all interactions, mostly generated by a tiny minority of students. So it doesn't appear as though students are, are copying and pasting their homework questions directly into the AI study tools often or frequently. And because students spent so much time with that explain feature, we wanted to understand a little bit more about the kinds of questions they were asking.

So, for example, were they on topic, were they mostly low-level questions, or were there some that suggested a deeper level of thinking? And so what we did is we took the very first input of each conversation to the explain feature from students who used our Campbell biology textbook during the spring semester, and this amounted to like almost 50,000 inputs.

So we took those inputs, and we analyzed them in terms of linguistic measures like verb usage, syntactic and lexical complexity, and then we also clustered their inputs using Bloom's taxonomy. So that means we kind of coded their questions as following along two dimensions of the taxonomy. One dimension was the level of cognitive complexity implied by the question.

And then the second dimension was the type of knowledge, ranging from factual all the way to metacognitive. And so when we did that analysis, we found that students' inputs appeared to be on topic, relevant to the material, and at a level of complexity that you would expect from a college-level course. For the most part, students are using the tool to kind of know and understand scientific facts and concepts which seems appropriate for an intro-level course in biology.

But around 38% of the inputs seemed to represent kind of higher levels of cognitive engagement so those questions were getting more into application, analysis, evaluation on Bloom's Taxonomy. And so this is pretty encouraging, because it's inconsistent with this notion that AI is encouraging students to turn off their brains, that they're, it's making them over reliant, it's, you know, dumbing things down.

And it could potentially signal that students are using the tools to, to engage in higher-order questioning of their learning material. So that was exciting. And finally, we looked at how usage of the AI study tools relates to study behavior in the e-text more generally. In particular, we were interested to see whether students would be using the tool as kind of a replacement for the e-text.

And so when we think about study behavior in the e-text, we're able to distinguish between students who are kind of passive consumers of the content and those who are more active and efficient studiers. And so this gets back to that learning science idea of active learning. So using students' e-text activity data from the spring semester, we assigned students to these groups.

So the passive group, on the left that you see here, kind of demonstrates mostly low cognitive engagement in the e-text. Their primary activities tended to be listening to the audio feature, reading and rereading the same sections of the text, some highlighting, but none of these, you know, practices are super effective for kind of long, long term retention of information.

They, they tend to be in the e-text less frequently per week, and their sessions are generally shorter than those of the more active studiers on the right. So then when you look at the kind of active and efficient studiers on the right, they tend to demonstrate mostly moderate to higher levels of engagement in their e-text.

So they're spending most of their time doing things like highlighting and bookmarking. They are taking notes. They are going back to those notes and reviewing them. And they're doing self-testing, which kind of relates back to the notion of retrieval practice. So on average they show up more frequently per week. And, and their sessions are generally longer than those of the passive group.

So when we looked at AI study tools usage among these two groups of students, we saw that the students who used the AI study tools in the spring were four times as likely to end up in this active and efficient group by the end of the semester, even if they came into the course more passive. And this kind of suggests that students that aren't necessarily using the AI study tools as a replacement for their e-text, they're using it to supplement their text, and they're actually engaging more in the material than students who didn't use the study tools.

So that is a whirlwind whistle-stop tour of some of the research we've done. We're doing new research all the time, and, yeah, so there's more to come. Stay tuned.

We're looking for ways to share this research more broadly, externally. So yeah, I think we're perhaps moving into a Q&A with Erica.

Erica von Lohr
Hi, everybody. Thank you, Chris and Emily, for this insightful session. You've given us all a peek behind the curtain on product development of our AI-powered study tools, but also a deeper dive into the learning science and the research that goes into ensuring efficacy, right, that our products are really built with learners and educators in mind with the goal to really enable better teaching and learning.

So thank you all for joining the call. My name is Erica von Lohr, and I am on our marketing team here at Pearson, and I get to work closely with Chris and Emily. Lucky me. And for those of you in the audience, you may have gathered from this session and the student session prior, that we are really interested in partnering with students and educators to really understand how you are using AI on campus.

We are passionate about learning from you to gather best practices and strategies for success. So, if you have an interest in connecting with us further to discuss those best practices, to share what you are doing, where you are finding success with your students, please go ahead and scan this QR code, or you can visit the link I just dropped in the chat, and our team will connect with you to kind of learn more about what you're doing and hopefully find ways to share these best practices.

And the work that you're doing within the higher ed community. Awesome. So, Chris, leave that up for a second. And while that's there, making sure everyone can scan, I think we have time for a few minutes of Q&A. So, I know that you teased a little bit, Chris, about some other kind of AI-powered tools that are coming from Pearson here in the future.

So definitely some interest here in, if you could just, you know, tell us other ways that Pearson is looking to incorporate AI or AI-powered tools in our products and platforms or elsewhere to empower students and instructors. So maybe some ways that we plan on expanding our reach here.

Chris Hess
Yeah. Happy to do that. Erica. Maybe I'll give a quick demo of this instructor tool. I think it's pretty fun.

Emily Lai
You have time. You have time. I think people would love to see it.

Chris Hess
Yeah. So, I mean, I think, I'm going to go ahead, hopefully. I'll pull this back up when I'm done so people can get this QR code. But I'm going to go ahead and jump out and I'm going to, yeah. I'm like the king of improvization; everybody knows this so I'm going

to go out and I'm going to, I'm going to…uh, it's going to make me log back in. I'm going to show you what we're doing.

So I don't know how many of you have utilized these courseware platforms. I find them to be incredibly powerful, but sometimes a little bit challenging to use because there's so much power; there's so many options and things to do. So, for instance, in the assignment creation process, I'm going to jump into a math course really quickly here.

And I'm going to create a homework. But I'm going to use a new method. I'm going to use something called, you know, I'm going to use this thing called the AI Instructor Tools. So imagine instead of just going in and picking and looking at every problem, you can still do that. We'll never take that experience away from you.

But what if you just went in and said, I want a chapter three homework that has 20 questions and is a mix of medium and easy problems. And this won't be quite as fast as getting a chat response from, say, ChatGPT. Because some complex stuff has to go on in the background. This is not creating new questions, but it's curating questions from our existing system.

And in this particular instance, I believe there's 580-some problems in chapter three for this college algebra book. Because I don't, I'm impatient like most people, and I don't like to wait and this takes about maybe 45 seconds or something like that, what we have on is this thing that we call AI thinking, and this kind of gives you an update of, like, what's going on in the background.

I find that very comforting for some reason. I don't know about you, but like, oh, something's happening. This is neat. And what's cool here is that within, you know, a minute or so, what I'm going to have is I'm going to have a strong assignment that I can fully edit as much as I would like.

So I showed you that sort of flywheel diagram about how, you know, like, you could get some insights into your students. So this is very simple. Tip of the iceberg is the way to think about it, right? So now look, I just got my assignment. Yeah it took longer than it normally does. But isn't that awesome? Like I have a full assignment now, 20 questions.

And it says it covers a wide range of topics from chapter three, including quadratic functions, polynomial functions, division of polynomials. So like if I wanted to say I don't want to include inequalities, it would revise that. I mean it knows how to do this. But let's get real fun. Let's get really cool. Imagine that you wanted to maybe put in some space repetition.

This can't happen now, but we are moving quickly to the place where you could say, could you tell me what topics my students struggled on in chapter three, in chapter two, and could you add a few problems to this assignment that address them and give

them some repeated practice on that. So, you know, we know the value of, say, interleaving and things like that.

You know, how about you could maybe push those to some clicker questions or maybe design a new PowerPoint slide that, that addresses the specific issues of students. These are all things that felt like moonshots, pie in the sky to me, very, recently ago. And now they don't feel like they're too far away. So we can create this one assignment for you.

I love that. But I also love, like, well, what if I love chapter three and there's another five chapters in this book? Could you create a similar chapter, a chapter assignment for each of the subsequent chapters? So we're not far away from these types of things. The other thing, before I get back to the Q&A, I wanted to make sure we address is, what I showed you in the e-text and in the courseware platforms were very transactional.

I would say. You help the student on that problem in the moment and get them back on track. That's fantastic. It's magic. I love it. But the real value will be thinking about how that student—and we anonymize all the data for the student; we're not trying to learn about them or anything like that—but we do want to know how Emily is doing with respect to her progress in, say, a chemistry course.

And if we knew what the topics were and when an exam was, we could offer really targeted, adaptive practice for them to help fill in those gaps. And so that's kind of the next, the next beachhead for us is thinking about exam prep. We know that's a period of time when students are willing to do extra work, and we want to make sure that they don't come to, you know, Dr. Hess's office hours after the first exam and say, I read the book eight times.

They come in and they say, you know, I did well because the AI actually helped me fill in my gaps. Now, if you have ideas of how to get them better at their own self-assessment, so that we don't have to offer these tools, bring them my way. Bring them Emily's way. We are really, you know, we're devoted to these types of ideas.

But I'm really excited to think about how we can help students really focus their time. Again, the variable we think about most, both for you and them, is being efficient.

Erica von Lohr
Awesome. Thanks, Chris. Lots of applause hands on that one. So I think you are not alone in the excitement around kind of increasing efficiencies for educators and helping them kind of get the most out of our platforms as well. So, Emily, I've got a question for you. You know, you shared so many great examples and insights into the work that your team does and how we're constantly trying to learn about how students are engaging with the study tool, and what our, you know, audience viewers might not know is how we leverage these insights into making sort of continuous and continued improvements and enhancements and investments, based directly on the feedback

that we're getting from students and instructors. So I'd love if you can just speak to, you know, maybe an example of how research or feedback that we've gotten has led to either enhancements or, you know, developments of additional features, or something like that.

Emily Lai
I love that question because we do hear from students a lot, and we really care about all the feedback they provide, and we take it to heart and we share it back with product teams and designers and everyone so that we can really kind of leverage the feedback to make things work better.

So one of the things that we have heard from students, and actually we're hearing this more often kind of with every passing, every passing day, is they really want AI to be able to help in the context of learning. They really want it to help personalize their learning experience. And so something we've introduced this fall into the AI study tool experience in the e-text is the ability to remember a student's chat history.

So the platform can now analyze prior conversation threads of that student whenever students request an explanation for a concept or ask a question. And so the study tool is going to try to make those connections to prior conversation threads whenever it can. And this is exciting because not only does it help to personalize that response more to students because it shows students, hey, this is where you were; this is something we've discussed recently; this can help you understand this new thing, it can help students kind of draw connections between something they already know and new information, which is an important strategy for active learning. So this is just one example, but it's one that I'm super excited about for this fall, because I think it'll make a huge difference in the student experience.