Maplesoft
Mathematics • Modeling • Simulation
A Cybernet Group Company

Your Online Students Aren't Paying Attention!

(And What You Can Do About It)

Online courses have become a key part of the instructional offerings of most learning institutions, from prestigious universities to local high schools. They allow students greater scheduling flexibility, reach a broader geographic pool, and reduce costs. Schools today have to offer online courses and supplementary resources to stay competitive. But the fact remains – these courses can be really dull.

Schools try hard to make online courses more than static text on the page. Online courses frequently offer a mix of text and videos, chat rooms, and forum discussions with mandatory participation. But while some courses greatly benefit from class discussions as part of the learning process, in science, technology, engineering, and mathematics (STEM) subjects, the forums are mostly there to provide logistical information about the course. The content is not learned through discussion but from the text and the videos. And that's where the problem comes in.

Anyone who has tried to teach themselves new STEM material by sitting quietly and reading a textbook can tell you that this is a very difficult way to truly absorb most STEM concepts. Even bright, motivated students will find it challenging to maintain sustained concentration on this content, never mind fully understanding it. Students can skim, skip ahead before they are ready, and not even notice that their attention has wandered and they are not taking in what they are reading. In a traditional classroom, this problem does not arise to nearly the same extent because there is a human instructor in the room. Students do not have to rely exclusively on a textbook to learn. So, including videos to online courses appears to be a natural solution.

And it helps, certainly. But many students find it hard enough to pay sustained attention to a lecture even when they are physically in the same room with the lecturer. When the lecture is in the form of a recorded video, the temptation to switch to another tab, check social media, send a quick text, rummage through playlists, and even get up to get a cup of coffee, *all while the lecture is playing*, can be overwhelming.

So how do you get your online students to pay attention and actually learn?

Well, how does it work in the classroom? Instructors use a variety of techniques to keep their class engaged, such as:

1) The instructor looks for cues that students are not understanding, and adapts what they are saying accordingly. If even the bright students are looking puzzled, the instructor may choose to work through another example, repeat a definition, or remind the class of a theorem they learned previously.

2) The instructor offers a variety of experiences during a single class – students may spend some time listening to a lecture, some time working through problems on their own, getting hints from the instructor if needed, some time reading the textbook, and some time working through an interactive activity using software, online tools, or graphing calculators.

3) The instructor asks the class questions. If the students can answer the questions, they move on. If the students can't, they don't.

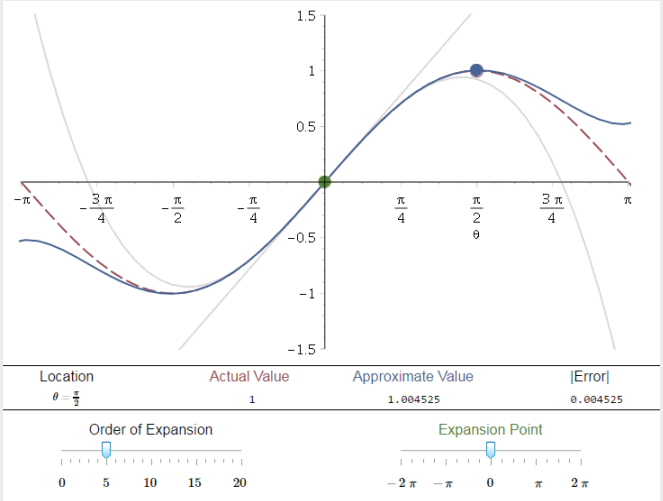
Wouldn't it be great if you could offer the same experience in your online courses?

Well, you can.

Online STEM Courses Done Right

Imagine you are taking an online calculus course, and are learning about Taylor series. You read the definition at the beginning of the lesson, and then start a slideshow. You hear an explanation of the definition while looking at animated plots showing the concept. Then the voice tells you to try it yourself. An interactive plot appears, showing an example curve. As you move a slider that controls the number of terms, you see that plot of the Taylor series change. As you add more terms, you can see that the approximation improves.

Take away some terms, you can see that it gets worse. Okay, that makes sense. You move on.



Interactive applications let students see for themselves the concepts you are teaching, such as the effect of changing the number of terms of a truncated Tayler series on the accuracy of the approximation

A quick question appears. When you increase the number of terms, what happens? You select "the approximation improves" from the list. Correct! You move on.

The voiceover then talks through an example of actually calculating a Taylor series of a polynomial, going step by step like an instructor would on a blackboard. Seems to make sense. Then the video stops again. You're asked to find the first 3 terms of the Taylor series of a different polynomial. You work out the problem, enter your response, and click on "How Did I Do?" Oops, that wasn't right. You're given a hint, pointed to notes where there is a full written explanation if you want it, and encouraged to watch the previous section again. You skim through the notes and rewatch part of the video,

and everything seems to make sense. You look through your problem and realize you made a silly mistake. So that's probably all it was, but you want to be sure. Click the "Try Another Problem" button. New polynomial, different number of terms. This time, you get it right. Confident now, you move on.

After you're done with the slideshow, you move on to your homework questions for this unit. You answer the questions, click on Grade, and immediately see that you got 4/5. You look at the feedback of the question you got wrong. With the assignment still fresh in your mind, the feedback makes immediate sense. You won't make that mistake again.

Curious, you go back to the interactive plotting tool. What do Taylor series look like when you aren't working with polynomials? What if the function is discontinuous? What happens if you move the expansion point? Can you "break" it? More learning ensues.

Active Slideshows in Möbius

This isn't fiction. This is Möbius™, a comprehensive online courseware environment from Maplesoft that focuses on science, technology, engineering, and mathematics. Möbius is built on the notion that people learn by doing. With Möbius, your students can explore important concepts using engaging, interactive applications, visualize problems and solutions, and test their understanding by answering questions that are graded instantly. Throughout the entire lesson, students remain actively engaged with the material and receive constant feedback that solidifies their understanding. In other words, they have to pay attention.

A key method of presenting course content in Möbius is the Active Slideshow. The Active Slideshow is like a great classroom lecture: a methodical presentation of information in an order that makes sense, combines a variety of learning elements with frequent "checking in"

Challenges of Taking Math-Based Content Online

Online course environments are only suitable for STEM course if they can handle math-based content. Here are just a few of the challenges that must be addressed:

- The math needs to "look right", whether it is displayed in the text or the student enters it as the response to a question.
- The system must be capable of displaying a wide variety of 2-D and 3-D plots, preferably that change dynamically, preferably without requiring intensive work on the part of the authors.
- Assessment questions must be free-response. Students must be able to show they have worked out the correct solution, not simply picked the correct answer out of a list.
- Automatic grading must deal with mathematical equivalency. Since

  $$1+\frac{1}{2}\sin(x)^2=-\frac{1}{2}\cos(x)^2+\frac{3}{2}\ ,$$

  often both answers should be graded as correct.
- The assessment engine should be able to handle a wide variety of mathematics, so it can handle a wide variety of STEM courses.

with the students to ensure understanding, and provides additional help when it is required. And unlike a traditional classroom, the experience is tailored to each student. Students who show understanding move on quickly, while students who are having difficulties can take more time to consolidate their understanding before continuing.

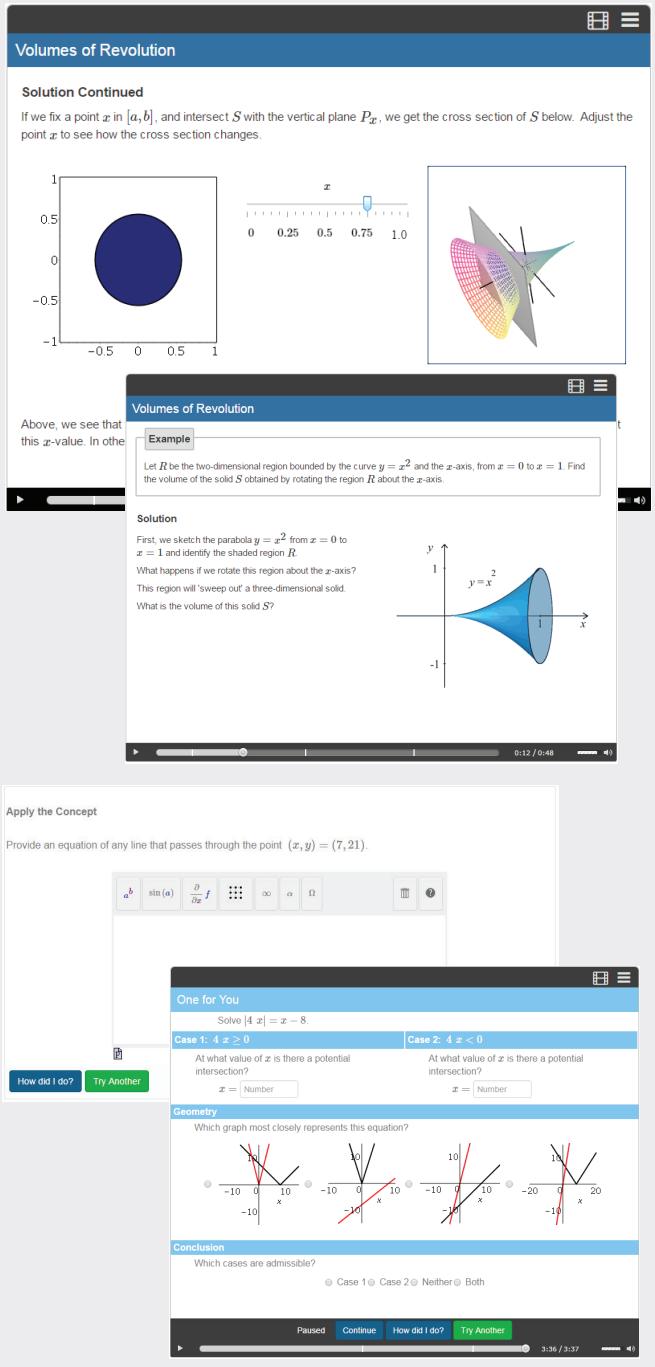
Möbius course content can include text, graphs, animations, videos, interactive applications, and formative and summative assessments. Any and all of these elements can also be combined in a slideshow, so they only appear when the instructor wants them too. Slideshows can also include voice-over narration that is synced to the slides, so each definition, graph, next step in the problem etc. appears exactly when the voice is talking about it, and not before. In this way, the instructor can control the flow of information to their class, preventing students from jumping ahead before they are actually ready. In addition, the system:

1) Reliably monitors student understanding throughout the entire lesson, so students are confident when they should be and find out immediately when they've gone off-track.

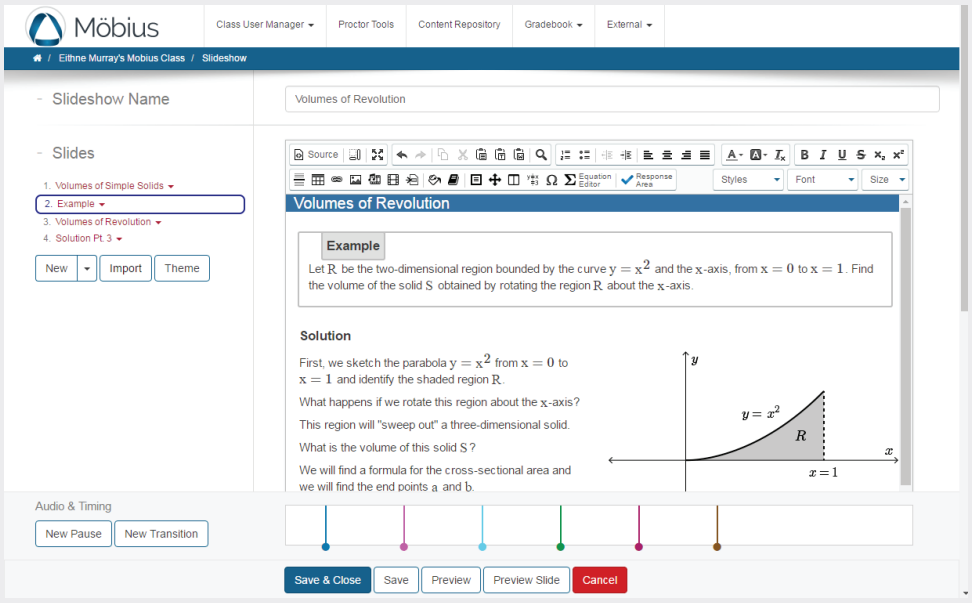
2) Offers a variety of experiences in a single lesson, all of which are directly relevant to the materials being taught.

3) Asks each and every student questions, and provides immediate feedback and even the opportunity to try additional questions if the student would benefit from the extra practice.

In other words, the Active Slideshow in Möbius provides the same experience students would get with a good instructor, with the additional benefit that each student receives a tailored experience based on their individual needs.



Active Slideshows in Möbius can combine text, plots, animations, and voice with interactive explorations and questions for students to answer.



Möbius includes comprehensive authoring tools for the creation of Active Slideshows and other content.

Authoring

Okay, so it sounds good, but one of the main reasons online classes don't work like this already is that creating such course materials can be a vast undertaking involving a large number of separate software tools and technologies, making the process cumbersome, time-consuming, expensive, and hard to maintain. These problems are exacerbated when dealing with STEM content, where the need to deal with mathematical content adds additional challenges.

With Möbius, content development is simple. Möbius is a single tool that lets you do it all, from creation of your content to deployment to students. No more juggling tools from different vendors, no cross-tool compatibility concerns, just a unified environment that makes it easy to develop and deliver great content. Möbius gives you all the authoring tools you need to create or modify Active Slideshows and everything that goes into them, like effective assessment questions, enlightening visualizations, and interactive explorations. It lets you build up your slideshow by dragging-and-dropping the slideshow components into your selected order, and provides built-in tools for recording and syncing audio. For the individual slideshow components, Möbius offers a comfortable authoring environment to programmers and non-programmers alike, with both point-and-click and text-based authoring of all HTML-based content.

Conclusion

So can you make your online student pay attention? Emphatically, yes. With Möbius and the Möbius Active Slideshow, you can offer an online experience that emulates and improves upon a good classroom experience. With high levels of engagement, relevant interactivity, and integrated instant assessment, your students will be forced to sit up and pay attention to their online courses (and learn something in the process!).

Maplesoft
Mathematics • Modeling • Simulation
A Cybernet Group Company

www.maplesoft.com | info@maplesoft.com
Toll-free: (US & Canada) 1-800-267-6583 | Direct:1-519-747-2373