Meeting Students Where They Are:

Using Technology to Make Learning Accessible and Engaging

It's frustrating that education—particularly science education—can be incredibly painful and disengaging for so many learners. Tyler DeWitt, creator of one of the most popular instructional channels on YouTube and video author of Macmillan Learning's *Interactive General Chemistry*, is a fervent believer that new technologies and digital content, meticulously built and thoughtfully deployed, are our best bets for creating accessible educational experiences that scale. Let's explore how we can use technology to make education more engaging and accessible, which allows us to connect with students wherever learning happens.

Tyler DeWitt

This whitepaper has been adapted from an original presentation by Tyler DeWitt for Macmillan Learning.

Edited by: Sybil Engleby

Introduction

In Tyler DeWitt's first college-level chemistry class, he received a 37% on an exam. In order to improve his grade and fully engage with the material, he found himself seeking outside materials to supplement the instructor's lectures, and was eventually able to master the material. DeWitt went on to earn a Ph.D. in biochemistry, due in large part to the supplemental materials that he sought out to compliment his professor's lectures. Dewitt's contributions to academia center largely upon producing content that considers the difficulties young learners may encounter with the subject matter, and structuring it in a way that aligns with their optimal learning methods. In other words, DeWitt's academic content **makes complex topics more understandable**

A few strategies that DeWitt employs to do so include:
- Creating your own videos specific to the content and students you are teaching
- "Socratic" by Google (AI tutoring)
- Virtuosi and Cellscape VR (virtual reality in education)
- **Interactive General Chemistry and IGC 2.0**: (EdTech product) An interactive textbook that seeks to understand how students learn and what strategies are going to work for them
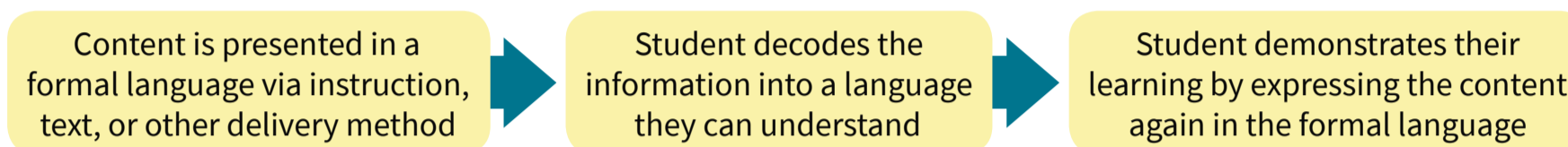
A Shift in Mindset

Increasingly, instructors are moving from thinking, *I learned this way, why can't you* to asking themselves, *what can we do to present this material in new ways*. By focusing on how students learn rather than solely on what they need to learn, educators can create more effective and engaging learning experiences. This mindset shift can help promote a more inclusive learning environment, where diverse perspectives and learning styles are valued and accommodated. As a result, students can achieve better academic outcomes and gain the skills and knowledge needed to succeed in their chosen fields.

"The student with the lowest grade on your exam isn't necessarily intellectually incapable. With the right resources and the right approach, they could go on to earn a Ph.D. from MIT, and might even end up being an author of the textbooks you use in your class."
- Tyler Dewitt

What does it mean to meet students where they are?

The Learning Cycle: Decoding Academic Language

| Content is presented in a formal language via instruction, text, or other delivery method	→	Student decodes the information into a language they can understand	→	Student demonstrates their learning by expressing the content again in the formal language

The learning cycle — through the decoding of academic language — involves a formal presentation of topic content, which the student must then decode and express in a more casual, working language that they can understand. Once the student has achieved this understanding, they must then demonstrate their learning by expressing the content again in the formal language.

This process is particularly relevant for STEM subjects, as it raises important questions about how we talk about formal subject matter and how we communicate it informally among ourselves. In this context, it is important to consider how information is presented to students and to what degree it is formal. Educators must consider how they can present this information in a way that is approachable and understandable to students. By doing so, students can achieve a more thorough understanding of the subject matter, leading to greater academic success and a deeper appreciation for the material.

Tips for presenting academic information to students:
- Use a medium they're fluent in
- Carefully consider when to go high-tech vs. low-tech
- Be patient and remember to walk them through the content step by step.
- Use casual language when possible.
- Incorporate plenty of visuals.
- Consider metacognition.
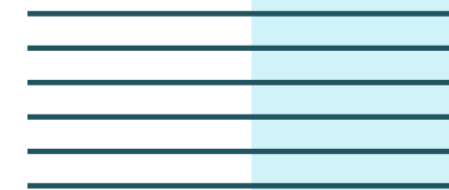
A student-centered process

In order to provide the best possible educational experience, we must first understand where our students are and what they are struggling to understand. This requires a deeper interview process than traditional approaches to teaching, where educators often make assumptions about what students know or need to learn.

By engaging in more meaningful conversations with our students, we can gain a better understanding of their unique strengths and weaknesses, allowing us to develop more effective teaching strategies. This approach puts the focus on the student, ensuring that they are at the center of the learning process and are receiving the support they need to succeed.

The process for creating student-centered tools can benefit from a user research focused approach.

1. Start by conducting initial user research. Get to know your students. Invite them to office hours, and conduct informal interviews.

2. Develop a hypothesis. Try to answer this question — what is holding students back?

3. Devise a minimum viable product. Imagine the simplest thing that you can do that begins to address the problem.

   a. For example, if students are struggling because they are not able to attend office hours, can you offer alternative times, or hold the office hours in more accessible spaces?

4. Collect Feedback. This can be done during class when you already have a captive audience. Consider using iClicker to make collecting feedback easier.

5. Revise. Improve the minimum viable product based on the feedback received.

Here is an example from Tyler DeWitt's own experience of a user research-focused approach to creating student-centered tools.

Hypothesis: Students were not completing the readings because they had difficulty understanding the textbook.

Minimum Viable Product: A fully rewritten textbook that is more student-friendly (admittedly not the minimum viable product, as it was a huge task to take on).

Feedback Collected: Students were still not reading the textbook! The issue might not be the textbook, but how the content was being explained.

Revision: Incorporate videos — a more productive way to create accessible content and free up class time.

This is an iterative process that involves creating a minimum viable product using glimmers of information to see what might be useful for students. Testing the product and receiving feedback allows for improvement. It is not always necessary to create a perfect solution; low-tech options can sometimes be more effective than high-tech. Instead of recreating an entire textbook, for example, smaller steps are often the more effective way to improve the learning experience.

Metacognition: Learn How to Learn

Encouraging metacognition in students is crucial to helping them understand the material better. One way to do this is by using Goal-setting and Reflection Surveys at the beginning of class, which can be done using the Achieve platform. These surveys can help students identify their challenges, study skills they plan on using, and how they learn best. Encouraging this initial reflection helps to build a learning environment that allows students to reflect on their learning and set goals accordingly.

Another effective way to encourage metacognition is by helping students reflect upon and identify potential gaps in their notes. Often, students struggle with going from notes on the page to explaining their thinking. TAs can walk students through their notes and point out gaps in their answers to help them identify what they don't understand. Encouraging students to narrate their notes can also be helpful in this regard. Additionally, creating a documentary video where students explain what is happening in the lab can also be an effective way to help students understand the material better. These different modes of re-encoding information can help students gain a deeper understanding of the material and improve their metacognitive skills.
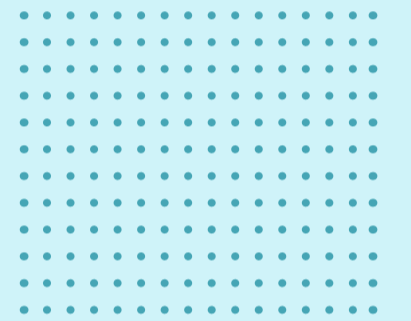
Conclusion

Throughout the process of creating tools that support students diverse learning needs, it's okay if you don't have a clear sense of what's best for students in the beginning. Start each project very small, and approach it as a series of investigations, hypothesis and validations. Pursue each project with an investigatory approach, and keep an open mind. Through this iterative process of user research, hypothesis, minimum viable product, and feedback, teachers can continue to devise and share tools that support our students.

Tyler DeWitt

Educational Technology Innovator, Macmillan Learning Author

I work at the intersection of Science, Education, and Technology. I'm passionate about using new technologies to create teaching and learning experiences that make education more accessible and more engaging. Instructional video, virtual reality, and old-fashioned textbooks are my favorite tools.

If you're looking for intuitive learning support solutions to help you engage all students regardless of level of preparation, wherever instruction happens, look to the breakthrough combination of Macmillan Learning's Achieve platform, and it's fully integrated classroom response system, iClicker. Seamlessly integrated into your campus's Learning Management System, Achieve and iClicker deliver powerful media and assessment tools that give every student a voice.

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