Strategies for Inclusive Learning

A FACULTY GUIDE FOR FOSTERING STUDENT SUCCESS

Alexis N. Petri, Ed.D.

TAPDINTO-STEM

NSF's Eddie Bernice Johnson INCLUDES Initiative:
The Alliance of Students with Disabilities for Inclusion, Networking, and Transition Opportunities in STEM

Equity in Education

This guide is a resource to provide educators with simple strategies for creating inclusive learning environments and course design that caters to the needs of students' diverse abilities. In this guide, you will find:

- Tips for modifying STEM classes
- Methodology of Transparency in Learning and Teaching (TILT) Framework
- Smart Pen Technology
- Resources for further professional learning

Introduction

It's time for universities and colleges to ensure equal opportunities for all learners, regardless of their abilities. Many colleges and universities are operating under the assumption that less than 5% of their students have disabilities. The prevalence of students with disabilities, both registered and unregistered with campus accessibility services, is noteworthy. According to the U.S. Department of Education National Center for Education Statistics, almost 20 percent of undergraduate students and 12 percent of graduate students report having a disability. However, these figures likely underestimate the true number, as not all students with disabilities choose to register with access offices. Various reasons, including stigma, lack of awareness about available services, or the belief that their disabilities do not warrant special accommodations, may lead some students to forego registering. Consequently, the actual percentage of students with disabilities in the college classroom could be significantly higher, underscoring the

importance of universally accessible teaching practices that benefit a broad spectrum of learners. In this context, creating an inclusive and adaptable learning environment in STEM fields is more than compliance with the Americans with Disabilities Act. It is also a moral imperative.

Increasing accessibility in STEM education does not mean lowering academic standards. Rather, it involves providing different means for students to access the same rigorous content, ensuring that evaluation is based on the same academic principles for all students. For instance, allowing extra time for exams or using varied teaching methods does not change the nature of the content or the level of understanding required; it simply offers equal opportunity for all students to demonstrate their knowledge and comprehension. Adjustments that offer access to students with disabilities, including neurodivergent students, often benefit the entire class, enhancing the learning experience for everyone. Such adaptations, far from diluting academic content, can improve the clarity and engagement of the course for all students.

Below are a number of strategies to consider incorporating for your course. Some strategies are easy to implement and will improve your students' experiences. Other strategies require reorganizing your course content. In some STEM

disciplines this may feel daunting and perhaps even impossible due to accreditation standards. I encourage you to consider learning more because accrediting bodies also care about retention and completion.

Tips for Modifying STEM Classes

Use a One-Page Syllabus Supplement

Your syllabus may be over 15 pages and this can be overwhelming for even the most dedicated students. Adopt a one-page syllabus supplement that culls the most important parts of the syllabus. This will help students with executive functioning challenges. It will also help students who are working two jobs or are single parents.

Explicit Learning Objectives

Most colleges and universities require course learning objectives. It is a good practice to identify learning objectives for each class. Don't worry about hauling out Bloom's taxonomy every day. Instead, focus on identifying clear objectives that will help students gauge their understanding. This is beneficial for students with specific learning disabilities. Students who want to earn an A also appreciate the added clarity.

Post Class Agendas

You can post the agenda in your learning management system, such as Canvas or Blackboard, add the agenda to the beginning of your PowerPoint slides, or simply write it on the board at the beginning of class. Displaying the class agenda aids predictability and eases anxiety, assisting students with autism and attention disorders.

Start Class with a Retrieval Practice

Ask students to share what they remember from the last class. This could be through a quick quiz, a brief discussion, or a reflective writing exercise. Retrieval practice strengthens memory and enhances long-term retention of information. This practice also helps everyone transition from their busy lives to your class.

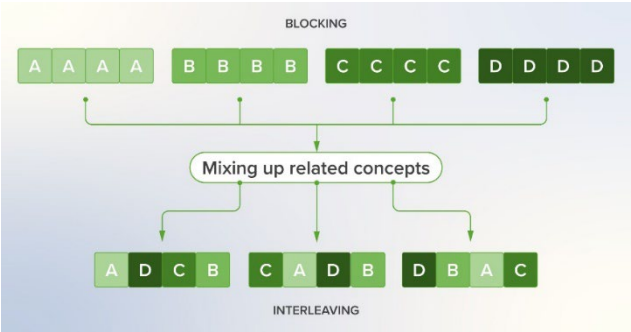
Learn more about Retrieval Practice.

Incorporate Predicting as a Learning Tool

Before introducing new concepts or content, ask students to predict outcomes or concepts based on their current knowledge. This engages students' curiosity and primes their brains for learning, making them more receptive to new information.

Utilize Interleaving in Teaching

Mix up topics and types of problems within a single course or lesson rather than teaching them in blocks (e.g., all of one type of problem or topic at once). Interleaving helps students learn to discriminate between types of problems and to apply different strategies, which enhances their ability to learn and apply new concepts.



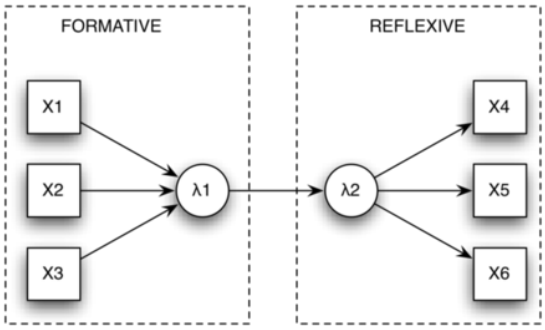
Provide Frequent Low-Stakes Assessments

Regular, low-pressure assessments can help track progress and reinforce learning without the stress of high-stakes testing. These assessments can be in the form of

short quizzes, one-minute papers, or in-class activities that provide immediate feedback to both students and instructors.

Varied Assessment Methods

Different types of assessments can more accurately gauge student comprehension and mastery. If you want to go a step further, offer students choice of assessment method, for example, would they prefer an exam online, on paper, or in person (oral exam).



Daily Formative Reflections

End-of-class reflections assess and address gaps in student understanding.

Optimize Use of Learning Management System

Provide accessible class materials and notes on the LMS, such as Canvas or Blackboard. Take pictures of notes from the board and post those as well.

Write Detailed, Specific Assignments

Taking a page from the TILT method, practice providing detailed and specific assignment write-ups that also share the purpose for the task. Maybe even provide a sample of an assignment that may not be A+ work but is a solid attempt.

Use Rubrics for Assessment

Share the criteria or rubric that will be used to evaluate the assignment. This includes explaining how different aspects of the work will be graded and what constitutes a good quality submission. When students understand how their work will be assessed, they are better able to meet or exceed those standards. When students understand why they are being asked to complete an assignment, they have more momentum for the project.

Adopting these strategies in STEM education enhances the learning experience for all students, fostering a more inclusive, equitable, and dynamic academic environment. This commitment to accessibility and inclusivity is a step towards excellence in education, preparing students to be competent and compassionate professionals in their fields. As the higher education landscape continues to evolve and diversify, it's imperative to strive for inclusivity and accessibility, ensuring that all students, regardless of their abilities, have the opportunity to succeed and thrive.

Transparency in Learning and Teaching (TILT) Framework

TILT, which stands for Transparency in Learning and Teaching, is an educational framework that aims to enhance learning outcomes by making teaching more transparent. Developed by Dr. Mary-Ann Winkelmes, TILT focuses on clarifying the purposes, tasks, and criteria for academic assignments and activities.

TILT Higher Ed
TRANSPARENCY IN LEARNING & TEACHING

Here are four key tips from the TILT framework:

1. **Clearly Articulate Learning Goals**
   Clearly communicate the specific skills and knowledge students are expected to learn from an assignment or activity. This involves explaining not just what they will do, but also why they are doing

it, how it ties into the broader course objectives, and how it will be beneficial in a real-world context.

2. **Provide Detailed Task Descriptions**
   Offer a clear and detailed description of the assignment or task. This should include step-by-step instructions, the format it should take, any required elements, and the resources or tools students might need. Clarity in the task description helps students understand exactly what is expected of them.

3. **Establish Transparent Assessment Criteria**
   Share the criteria or rubric that will be used to evaluate the assignment. This includes explaining how different aspects of the work will be graded and what constitutes a good quality submission. When students understand how their work will be assessed, they are better able to meet or exceed those standards.

4. **Include Examples of Successful Assignments**
   Providing examples of past students' work that successfully met the assignment criteria can be incredibly helpful. These examples give students a concrete understanding of what is expected in terms of quality and content. It’s important that these examples represent a range of successful approaches to accommodate diverse learning styles.

Implementing these TILT principles in teaching practices helps to demystify academic expectations, reduce students' confusion and anxiety about assignments, and improve their learning outcomes by providing a clear roadmap for success.

Learn more from the TILT website.

Smart Pen Technology

If you like gadgets, invest in a smart pen. A smart pen is a high-tech writing tool that combines the functionality of a traditional pen with advanced digital technology. It allows users to write on paper while simultaneously digitizing their notes and drawings.

Also used as a collaborative learning tool, professors can let students take turns writing notes and then distribute those notes to the entire class through the LMS.

Here's an overview of how a smart pen typically works:

Writing and Recording:
The primary function of a smart pen is to write like a normal pen. However, as you write or draw on special digitized paper, the pen uses a small camera or similar sensor to track its movement. This sensor captures the pen's position, movement, and sometimes even the pressure applied while writing.

Digitized Paper:
The special paper used with most smart pens is dotted with a unique pattern of tiny dots, barely visible to the naked eye. These dots help the pen determine its exact location on the page. Each position on the paper corresponds to a unique code, allowing the pen to capture the strokes made on the paper accurately.

Data Storage and Processing:
Smart pens contain internal storage and processing capabilities. As you write, the pen captures and stores the information about your strokes. Some pens have the capability to convert handwritten notes into digital text.

Audio Recording:
Many smart pens also have built-in microphones and audio recording features. This allows users to record audio while they're taking notes. The pen synchronizes the audio with the written notes, which can be extremely useful for reviewing lectures or meetings later.

Connectivity and Synchronization:
Smart pens often include Bluetooth or other wireless technologies to transfer the digitized notes and audio recordings to a computer, smartphone, or cloud-based service. This enables users to access, edit, share, and organize their notes digitally.

Software Integration:
Most smart pens are accompanied by software or apps that enable further functionalities. These might include note management, search capabilities within your notes, sharing options, and sometimes even the ability to transcribe handwritten notes into typed text.

Battery and Charging:
Smart pens are typically powered by a rechargeable battery. They need to be charged regularly, depending on usage.

Smart pens bridge the gap between traditional notetaking and the digital world, making them particularly useful for students, professionals, and anyone who prefers writing by hand but wants the advantages of digital organization and accessibility.

Check out the 9 Best Smart Pens from ElectronicsHub.

Resources for Professional Learning

Burgstahler, S. (2009). "The Development of Accessibility Indicators for Distance Learning Programs". ALT-J, Research in Learning Technology, 17(1), 75-84. In this article, Burgstahler discusses the development of accessibility indicators, specifically for distance learning programs, highlighting the importance of inclusive practices in online education.

Burgstahler, S. (2015). Universal Design in Higher Education: From Principles to Practice, Second Edition. Harvard Education Press. This book, edited by Burgstahler, is a comprehensive resource on applying UDL in higher education settings. It includes contributions from a variety of experts in the field and provides insights into how UDL can be implemented to create inclusive college and university environments.

Braun, Derek C., et al. (2018). Welcoming Deaf Students into STEM: Recommendations for University Science Education. CBE – Life Sciences Education, 17(3). https://doi.org/10.1187/cbe.17-05-0081. Authored primarily by deaf scientists, this essay emphasizes the valuable perspectives contributed by deaf individuals to scientific inquiry, provides expert opinions to identify strategies for creating a supportive environment for deaf individuals, and highlights the importance of including deaf scientists in related research.

Dolmage, Jay. (2017). Academic Ableism: Disability and Higher Education. University of Michigan Press. This work examines the nexus of disability and higher education, advocating for more inclusive practices in academia.

Evans, Nancy J., Broido, Ellen M., Brown, Kirsten R., and Wilke, Autumn K.. (2017). Disability in Higher Education: A Social Justice Approach. Jossey-Bass. This text explores disability in higher education from a social justice perspective, emphasizing the need for systemic changes for inclusivity.

Kelley, Kelly, and Westling, David. (2019). Teaching, Including, and Supporting College Students with Intellectual Disabilities. Routledge. This book is a comprehensive guide that provides practical insights and lessons learned from inclusive college programs for students with intellectual disabilities, serving as a valuable resource for developing inclusive practices and expanding opportunities in higher education.

Lang, J. M. (2016). Small Teaching: Everyday Lessons from the Science of Learning. Jossey-Bass. This book is the foundational source for the Small Teaching concept. Lang presents a range of minor modifications in teaching practices that can have a major impact on student learning, drawing on research from the learning sciences.

Lang, J. M. (2020). Small Teaching Online: Applying Learning Science in Online Classes. Jossey-Bass. In this follow-up to his first book, Lang adapts the principles of Small Teaching to the online learning environment. He provides practical strategies for engaging and educating students in virtual classrooms.

Lang, J. M. (2021). Small Changes in Teaching. The Chronicle of Higher Education. In this series, Lang summarizes key principles of his Small Teaching approach, offering educators quick insights into how they can apply these strategies in their teaching.

Oslund, Christy. (2013). Supporting College and University Students with Invisible Disabilities: A Guide for Faculty and Staff Working with Students with Autism, AD/HD, Language Processing Disorders, Anxiety, and Mental Illness. Jessica Kingsley Publishers. This practical guide addresses the challenges faced by faculty and staff in accommodating post-secondary students with invisible disabilities, offering an overview of various conditions, dispelling myths, and providing practical advice to support these students' unique needs, including insights on adapting teaching methods, offering accommodations, and improving institutional policy.

Winkelmes, M.-A., Bernacki, M., Butler, J., Zochowski, M., Golanics, J., & Weavil, K. H. (2016). "A Teaching Intervention that Increases Underserved College Students' Success". Peer Review, 18(1/2). In this paper, Winkelmes and her colleagues provide evidence from a study demonstrating how a transparent teaching framework can significantly enhance the academic success of first-generation, low-income, and underrepresented college students.

Winkelmes, M. (2019). Transparent Design in Higher Education Teaching and Leadership: A Guide to Implementing the Transparency Framework Institution-Wide to Improve Learning and Retention. Stylus Publishing. This book offers a comprehensive guide on implementing the TILT framework across higher education institutions, detailing its positive impact on student engagement, learning, and retention.

Alexis N. Petri, Ed.D.

Director, Office of Research Development, University of Missouri-Kansas City
Backbone Lead, NSF's Eddie Bernice Johnson INCLUDES Initiative: TAPDINTO-STEM Alliance

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