

## **Making the MCDB/CU Boulder SkillsCenter more interactive through AI-generated podcasts: first steps**

**Michael Klymkowsky & Michael Stowell**

Molecular, Cellular, and Developmental Biology

University of Colorado Boulder, Boulder, Colorado 80309

**Summary:** A key step to getting the most out of a college degree program in the sciences is the opportunity to "do science". Unfortunately these opportunities are often limited, with only a minority of students able to take advantage of them. To address this limitation, the SkillsCenter program was initiated; it allows students to establish their expertise with various techniques at their own pace within a supportive community. To improve the interactivity of these experiences we have used generative artificial intelligence (genAI), in the form of Notebook LM, to generate technique-specific podcasts that are available to students. We speculate on how the next generation of interactive podcasts can help students develop both technical mastery and a sense of belonging within the scientific community.

### **Background and description**

It has long been recognized (see Seymour et al., 2004; Linn et al., 2015) that undergraduate research experiences have positive effects on students. Unfortunately, there are many reasons that such experiences are not available to or not pursued by all students. As a point of clarification, we are discussing here what are known as "independent study" experiences; such experiences are one-on-one and outside the context of a scheduled class, classes that often involve many (20-30) students at predetermined times.

Many reasons combine to explain the fact that most students do not take part in such skills and confidence building opportunities. First, the number of openings in research labs is often limited, constrained by the availability of mentors who can help students work through a technique or an experiment, and resources, that is the funds needed to purchase the (often expensive) reagents students will need to use. Second, many students have constrained whether financial or emotional that makes devoting the time involved in a meaningful independent study project difficult to commit to or succeed at. There is also the combination of these two factors; a lab's independent study project may be based on a skill set that students may not possess and have not had the opportunity to acquire.

As described by Hazlett et al (2024) the MCDB SkillsCenter (<https://skillscenter.colorado.edu/>) provides a flexible alternative. Students "engage" with the SkillsCenter by signing up for courses (MCDB 1234, 3456 & 4567); each course requires them to complete a set of SkillsCenter modules. When students work on a module is flexible in order to fit into their schedules. Course completion depends upon successfully completing laboratory modules (both wet-lab and computer-based). The completion of these modules depends upon understanding and applying specific techniques, such as designing DNA primers, identifying reaction conditions needed to amplify a specific DNA region from a DNA sample, etc. In their efforts they have access to teaching assistants who are present to answer questions and provide advice.

Type of module	Title of module
computer-based	Searching the patent literature
computer-based	Searching the Allen Brain Atlas -1
laboratory-based	Polymerase chain reaction – 1
laboratory-based	Tissue cell culture
computer-based	Chimera Structure Analysis
computer-based	Blast Sequence Analysis,
computer-based	Cochrane Clinical Trials DataBase
computer-based	In-silico Drug Design 1

The goal of this OER-funded pilot project is to enhance and up-date the process by which students approach and work 'through various modules through the use of interactive podcasts, generated in this instance through the Notebook LM system. The approach is straightforward. Papers dealing with or describing underlying concepts and technical details are uploaded into Notebook LM as pdfs. The system then generates a two-speaker podcast. This podcast can be used as is as an MP3 audio file, or it can be edited to remove unwanted aspects and then converted to an MP4 file. An alternative version allow for the student to interrupt the podcast to ask a question. Currently this feature is limited, it must be used within Notebook LM. Upon responding to the question, the podcast returns to its pre-established "script". Nevertheless, the discussions generated are a potentially useful and alternative way to introduce students to the major ideas involved in successfully completing the module.

To avoid a "passive" experience often associated with using genAI to "tell me the answer", as opposed to helping us understand that apply underlying concepts and facts, we are working to adapt the SkillsCenter website to pose two to three "on ramp questions" that are designed to get students ready for the podcast and working on the module. This is a strategy that we have used in our beSocratic formative assessment system, a system that has been integral to the success of our alternative (and OER) Chemistry, Life, the Universe, and Everything (CLUE) introductory and organic chemistry course design (Cooper. & Klymkowsky, 2003; Underwood et al., 2023). At the same time, we are considering using tools, such as the CustomGPT bot Dewey, to analyze learning outcomes by examining students' "extended" responses to multiple choice questions (see Klymkowsky & Cooper, 2024).

### Future Plans and Goals

The major advance we see in the specific area of genAI-generate podcasts is the ability for "the podcast" to revise itself in response to students' questions. This may involve customization to specific students or a consideration of the common questions raised by students when they listen to and interact with the podcast. It is also worth keeping in mind that few can accurately predict where and when genAI systems are going, and their future costs.

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