

Praxis AI Case Study Clemson University

The COVID-19 pandemic forced colleges and universities around the world to teach their courses online. Instantly, digital learning became the new normal in higher education. Over the summer and fall of 2020, millions of teachers in higher education, K-12, and enterprise learning & development were forced to transform their courses online.

Suddenly, these teachers found themselves wearing many hats: designing and implementing content, employing various teaching styles, juggling the needs of students, and managing the virtual classroom. Teaching became a delicate balance between classroom facilitator, instructional designer, teacher, and course developer.

At Clemson University, Professor Frank Alex Feltus found himself with several disparate platforms (Canvas LMS, Zoom conferencing, and Slack collaboration) and no easy way to make them work together for his students. Further, his Bioinformatics program was in critically high demand during the pandemic as the need for science graduates skyrocketed.

CHALLENGE: convert a traditional face-to-face Bioinformatics course (with labs) into a unified, compelling, hands-on digital course, quickly. Then, seamlessly deliver the program to one-hundred science students and single-handedly manage their interactions, labs, and grades.



To meet this challenge, Professor Feltus employed a five-step design, development, and delivery process for implementation of his digital learning solution. In step 1, Professor Feltus met with the university technical staff and briefly surveyed the students to determine their level of access to digital devices, Internet bandwidth and proficiency with digital tools (e.g. video conferencing, digital learning platform, mobile applications). It was determined that Clemson University students had a “Great” level of digital access.

Next, in step 2, Professor Feltus worked with several colleagues to match his learning activity type to the desired competency outcomes and specific circumstances of his students, content complexity, and timeframe (4-month semester). Given these variables, he determined that a “virtual ILT course” was the best target activity type:

- Asynchronous – 50%
- Synchronous – 50%
- Digital Access – Great
- Instructor Contact – High
- Content Proficiency – Mastery (35 hours of content)
- Content Complexity – Hard (28 learning objectives)

With the right delivery blend in mind, Professor Feltus turned his attention to course development and content curation – aka, step 3. He took the opportunity to reinvent his traditional F2F classroom into a hybrid, interactive, virtual learning experience. Building an effective online course requires more than just transferring existing classroom-based content into a digital format. One must decide how to transform that content in a way that will engage learners in the online environment.

The online conversion began with his existing syllabus. This traditional class-based approach was rapidly converted to a microlearning taxonomy for ingestion into the digital platform. No more 1-hour lectures, big labs, and giant midterms. In building his online course, Professor Feltus learned that he was trying to squeeze too much content into one block – and it was difficult for his students to consume. Breaking content into smaller pieces made that process much more natural and supported the concept of multisensory diversity.

Professor Feltus organized his course into 26 skills comprised of the essential components of digital micro-learning – resources, activities, and assessments.

- **Resources** encompass the knowledge aspects of the online course: videos, PDFs, AI-curated content, etc.
- **Activities** are where the action is. They include experiential hands-on labs for hard skills, video assessments for soft-skills, and collaborative group projects for virtual teamwork.
- Finally, **assessments** provide the opportunity for faculty to test and score learners in a variety of creative ways.

In step 4, Professor Feltus communicated the new Bioinformatics course to his students (via his company Praxis AI), sent them registration materials, and delivered the program. This is where the knowledge transfer occurred.

To optimize his students' learning experience, Professor Feltus partnered with Praxis AI and Avaya to roll out a Praxis AI version of **Praxis LXP**. Together, each pioneer provided a critical component of the digital learning solution – three legs of the stool:

SOLUTION:

1. Professor Feltus – digital content, lab materials, teaching, and students
2. Avaya – synchronous platform (Spaces™) for virtual classroom, student interactions, and collaboration
3. Praxis AI – asynchronous learning platform for delivery of labs, resources, assessments, and grades

The Clemson Bioinformatics digital learning platform comprised interactive learning resources, data-intensive research labs, virtual collaboration, online classrooms, AI-powered curation, assessment, and mentoring all delivered in a virtual, centralized learning experience.

Refer to Figure 1 for an illustration of the online Bioinformatics course dashboard in the Praxis LXP digital platform.

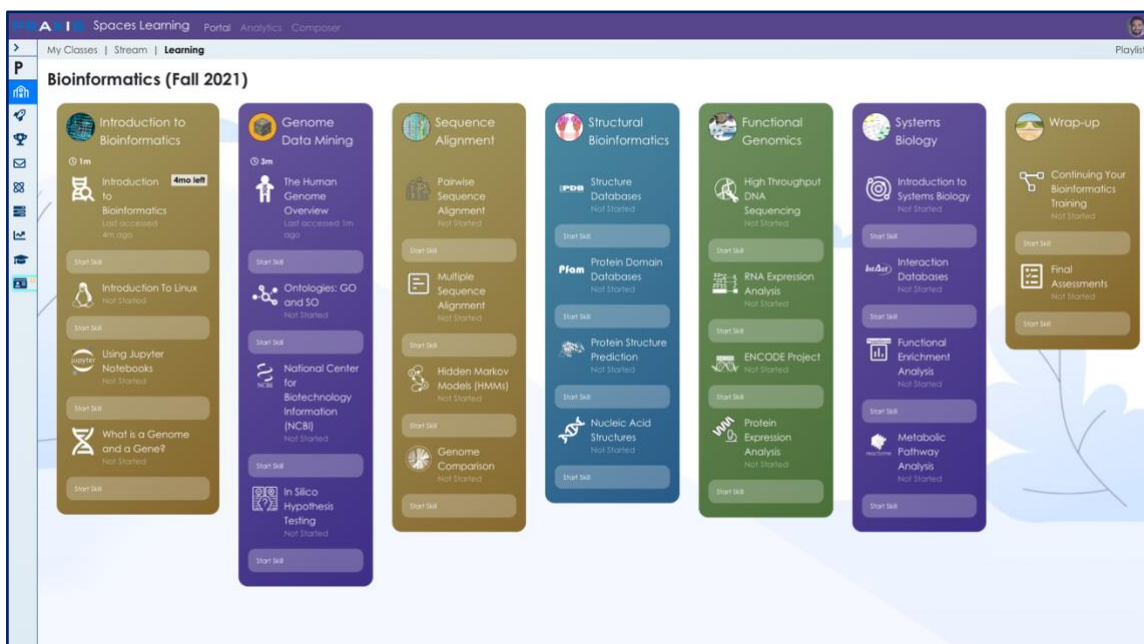


Figure 1: Clemson University Bioinformatics course in Praxis LXP

In the cloud-based digital learning environment, Professor Feltus and his students were able to collaborate on experiential research computing projects asynchronously and in real-time to significantly enhance their foundational research computing skills. This turned out to be particularly important given the critical role genetic research and bioinformatics play in our new normal.

Beyond the digital content, Professor Feltus innovated his student-teacher and peer-to-peer interactions. As it turns out “communication” is a big problem with lecture-based teaching, especially in large classes. It’s impossible to communicate with everybody effectively. With the online digital learning platform, Professor Feltus and his students were empowered to communicate more frequently and effectively – through discussion boards, one-on-one mentoring, office hours, and the asynchronous content itself.

The Praxis LXP platform also provided automated ways of nudging students based on thresholds of certain performance – or lack of performance. Professor Feltus used nudging to encourage lagging students to catch up with the rest of the class. This type of communication is critical for student engagement.

Professor Feltus was inspired to innovate his assessments as well. His course began and ended with the remote, hands-on science labs. These labs also offered opportunities for experiential assessment. In the remote asynchronous course, he was also empowered to break up his knowledge-based assessments as well (aka, micro-assessments). Then, at the end of the course, he used a summative video assessment to allow students to record themselves answering questions in real-time. Being able to combine all these types of assessments provided tremendous flexibility and the ability to bring hard skills and soft skills together, to bring qualitative and creative assessment into a holistic quantitative course.

Refer to Figure 2 for an illustration of the Praxis LXP course carousel that Professor Feltus used to deliver his digital resources, activities, and assessments.

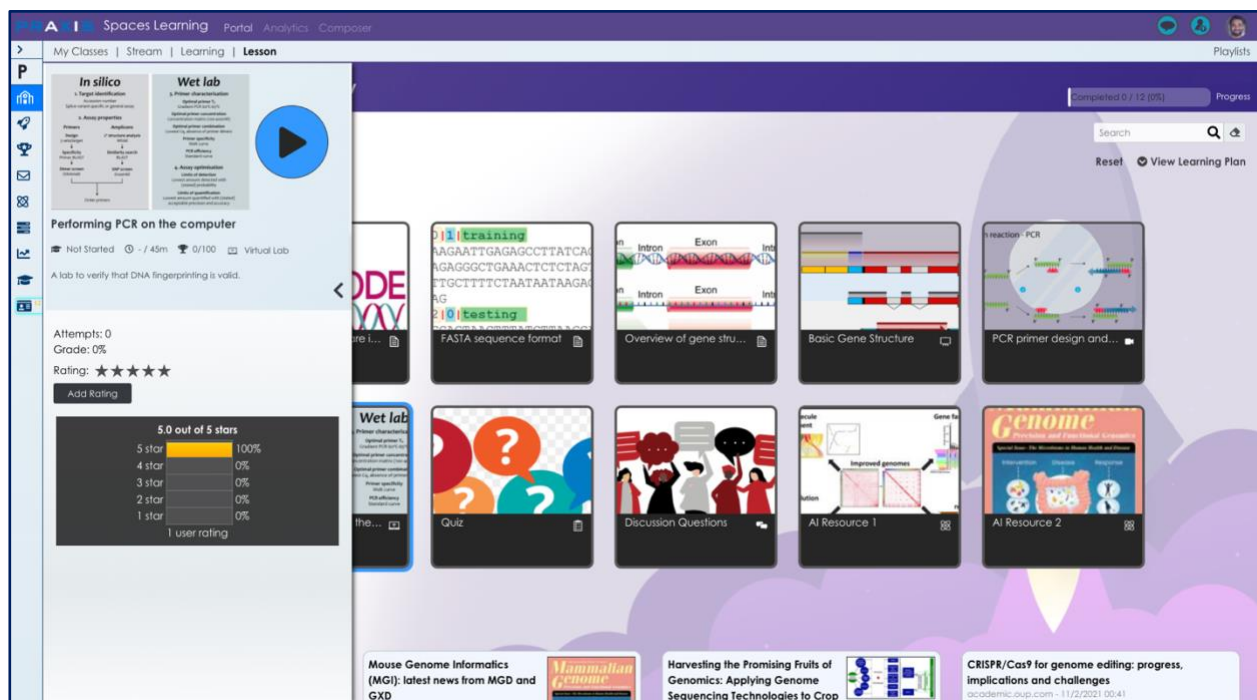


Figure 2: Clemson University Bioinformatics resources in Praxis LXP

Finally, in step 5, Professor Feltus followed up with his students to ensure that they perform their role as change agents and realize the desired outcomes and results from the Bioinformatics course. This is the key step for knowledge application.

Following are select observations from Professor Feltus' COVID-accelerated digital learning course in Bioinformatics at Clemon University. In short, he is convinced that the digital version of the course is significantly better than the in-person version he has been teaching for 14 years.

RESULTS:

- Professor Feltus' biggest surprise was the level of engagement and interactivity on the forums and mentoring channels – 50 messages a day. It was exciting for him to see how many students embraced remote collaboration. He is convinced that he is interacting with his students more online than in any previous in-person version of his course.
- Based on the comments from the channels above, Professor Feltus' students loved the experience. They agree that the level of communication has improved dramatically.
- The remote, hands-on labs are a big hit. In his non-digital course, Professor Feltus didn't have the platform to provide anytime, anywhere labs for his students. Also, he has learned how to use the platform to streamline the grading process for 27 labs x 100 students. Workflow efficiency is key.
- The depth and breadth of online analytics are insightful and powerful. Professor Feltus believes he had much more visibility into student performance and usage than with his previous courses. Students can't hide in the back row anymore.

The true value in these innovations is the repeatable, rapid, immersive process of transforming traditional science lectures and labs into a collaborative online research platform. Professor Alex Feltus from Clemson University spearheaded the conversion of his own Bioinformatics course as a template for other innovations in science education, including climate science, artificial intelligence, nursing, and behavioral health.

Although we are currently suffering through a very difficult pandemic, the crisis will end soon, and we will be left with a profoundly new and improved system of digital learning. Professor Feltus is honored to play a small role in that revolution.

"Praxis LXP enables me do whatever I want. It tracks activity, hosts virtual labs, administers quizzes, etc. It has made me a better teacher. Once this is all over, I will never go back to in-class only as I will always use a platform like Praxis LXP."

- Professor Alex Feltus

"It's actually hard to imagine this class operating within a normal classroom. In my research CI, I've been adjacent to these databases and bioinformatic tools—but they've always been somewhat daunting. Taking this step wise, hands-on approach is really working. Already, these resources look friendly and useful rather than feeling like a huge wave of information I don't understand."

- Clemson Student

"Yeah, it's super awesome to feel yourself getting comfortable with each new skill! I also agree with your take about the format of this class--I think this setup could be really helpful for professionals and people outside of 4-yr universities who want to master bioinformatics without having an extensive comp. sci. background."

- Clemson Student

THE STORY CONTINUES ...

Based on the success of Professor Feltus' Clemson University course, his company (Praxis AI) has developed and delivered several ground-breaking digital programs using Praxis LXP. These programs are providing much-needed digital skills to challenged and diverse audiences, including climate science for agricultural resiliency, data science for contemporary employment, and health sciences to underserved American Indian populations.

Below is a summary of some of these programs:

- **Clemson University Medical Bioinformatics** – the faculty of the College of Genetics and Biochemistry at Clemson University voted to promote Professor Feltus' digital version of Medical Bioinformatics to all major students.
- **AIHEC Aseto'ne Virtual Institute** – the American Indian Higher Education Consortium (AIHEC) delivers NSF- and NIH-funded programs to 37 Tribal Colleges and Universities (TCUs) throughout the United States. The Aseto'ne Virtual Institute is a health-oriented education and research program for TCU college students and faculty.
- **Auburn University Plant Genomics** – a semester-length graduate-level digital course for research labs and education in Plant Genomics.
- **GSSM Digital Biology** – the world-famous Governor's School of Science and Mathematics (GSSM) adopted Professor's Feltus' Digital Biology course for high school students in South Carolina.
- **AIHEC Climate Collaboratory** – a semester-length foundational digital course delivering digital skills in climate science and agricultural resiliency.
- **AIHEC Advanced Manufacturing Program** – ten digital courses over two semesters for TCU students and faculty to develop digital skills in advanced manufacturing technology, including designing and producing 3D-printed materials and houses.
- **Bioinformatics and Data Science Workshops** – Professor Feltus uses his version of Praxis LXP to deliver periodic data science and bioinformatics workshops to TCU students, TCU faculty, and members of the Historically Black Colleges & Universities (HBCU) ecosystem.