The STEM Lab Notebook
A Monthly Newsletter of the STEM Lab Podcast
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Dear STEM Lab Listeners,

In our first four episodes, we've delved into the future of STEM education, exploring themes of technology integration, the importance of interdisciplinary approaches, and the ethical considerations that come with innovation. As we navigate these changes, our guests have shared valuable insights that can inform and inspire STEM teachers and administrators.

Episode 1 featured Clemson University's Dr. Alex Feltus, who discussed the potential of AI-powered virtual labs and the evolving role of human instructors. Dr. Feltus emphasized the importance of using AI as an augmentation to human instruction, rather than a replacement, and highlighted the need for ongoing conversations about academic integrity in the digital age.

In Episode 2, Joyce Symoniak of the Illinois Math and Science Academy (IMSA) highlighted the integral role of art in STEM education, demonstrating how art and science are intertwined and both crucial to innovation and creation. By integrating art into the STEM curriculum, we can enhance the learning experience and better prepare students for the future job market.

North Carolina State University Professor Emeritus, Dr. Eric Wiebe, our guest in Episode 3, shared insights into the intersection of technology, education, and STEM, with a focus on game-based programs and virtual learning platforms. Dr. Wiebe emphasized the importance of thoughtful integration of technology into the classroom and the need for educators to be prepared to embrace emerging trends in STEM education.

Lastly, in Episode 4, Dr. Matt Martin, the Dean at the South Carolina Governors School for Science and Mathematics (SCGSSM) discussed the critical aspects of academic integrity, trust, and the unique challenges associated with STEM education. Dr. Martin emphasized the importance of instilling the value of integrity within the school's community and highlighted the need for ongoing dialogue and professional development to navigate complex matters of academic integrity effectively.

In summary, our first four episodes have provided valuable insights into the future of STEM education, highlighting the importance of technology integration, interdisciplinary approaches, and ethical considerations. As we continue our journey in STEM Lab, we hope these conversations inspire and inform you, our valued listeners, in your roles as STEM teachers and administrators.

Thank you for joining us on this journey, and we look forward to exploring more exciting topics in future episodes!

Sincerely,
Michael A. Newsome, Host
STEM Lab

Guest Quotes from Episodes 1-4

Quotes from Dr. Alex Feltus in Episode 1:

"So what I do right now is I teach a class at the university and I have an AI generative AI assistant who is my co-instructor...And I have learned in the last few months of doing this, and my students are starting to understand, that there is no way to do this kind of really complicated education that anybody needs right, without an assistant. And so everybody's going to have an assistant in their pocket. There'll be a person who isn't leading the instruction, but you can actually teach more people or fewer people with the same effectiveness, with everybody having access to some AI assistant."

"I've opened up science and I've opened up the opportunity for people to learn and not just say, 'Here, this is it.' You know, this is a thing that we don't really do in science a lot, which is let other people in that are not in our group, not in our club. Right? I think that's the part that I hope they say."

Quotes from Joyce Symoniak in Episode 2:

"True confidence isn't about being fearless; it's about navigating your fears and choosing to show up. We've all got a spark, and I'm here to help you turn it into a blaze."

"They all go hand in hand. And we just have to remember that we can't eliminate the sciences from the arts and we can't eliminate art and science because without the two, neither one exists."

Quotes from Dr. Eric Wiebe in Episode 3:

"Game -based learning situates itself nicely in contemporary progressive pedagogy. They can situate themselves nicely in problem-based learning, in collaborative work among students, in students being able to explore issues they find personally relevant, customization of those game based environments. We find that for many students, with increased customization, we can create challenging, doable environments where almost all students can find some interest and motivation."

"Classroom is a high-performance environment. We need human factors just as much in classrooms as we do on spacecraft. Teachers are making decisions a mile a minute."

Quotes from Dean Matt Martin in Episode 4:

"I always like to say that GSSM is not about our buildings and programs, it's about our people. And I try to really help our students understand that being part of a community where you have integrity and you trust each other is really a place where you can thrive and achieve the kind of excellence that we all are into."

“All great scientists, all great technologists, are not simply robots recreating problems. They're creative thinkers who are trying to see how to solve problems. And that's what we want to give

our students: the foundation to be able to leave the school and thrive. And I think that's the basis of all great STEM education."

Longform Episode Summaries

Episode 1: AI Teaching Assistants and Virtual Labs: Using Discovery in STEM Ed

In this debut episode of STEM Lab, host Dr. Michael Newsome welcomes Dr. Alex Feltus, a professor specializing in genetics, biochemistry, and biomedical data science from Clemson University. Dr. Feltus serves as the Chief Scientist Officer for Praxis, an online service that offers AI-powered virtual labs and other high-level teaching resources.

The conversation kicks off with a glimpse into the future of STEM education in 2045. Dr. Feltus envisions students logging into computers to code and simulate chemical reactions, using AI to optimize experiments. The ultimate goal is to eliminate the gap between research and education.

Regarding the impact on schools, Dr. Feltus sees the traditional brick-and-mortar structures remaining but with technology seamlessly integrated. He imagines students accessing controlled learning experiences that involve research and discovery, making education more accessible and flexible, especially for those in remote or rural areas.

He shares a compelling analogy about a future where augmented reality transforms classrooms, allowing learners to customize their virtual learning environments. While it's fascinating, it also raises questions about how much technology is the right amount.

The conversation shifts to the evolving role of human instructors, who are poised to become facilitators. Dr. Feltus describes his own experience using an AI generative assistant, highlighting how AI can enhance the educational process. He emphasizes that AI should be seen as an augmentation rather than a replacement for human instructors.

Dr. Feltus is confident that the integration of AI can lead to more personalized, effective education. The use of AI assistants can help reach more students with the same level of effectiveness, making education more inclusive and customized.

The episode explores the potential obstacles to change in education, with Dr. Feltus identifying habits and resistance to change as significant challenges. He calls for a faster pace of change to address pressing global issues, like climate change and healthcare.

The discussion delves into the concept of academic integrity and AI. Dr. Feltus argues that cheating has more to do with the students' mindset and understanding of cheating. He encourages a shift in focus from discouraging cheating to encouraging genuine learning and the responsible use of AI.

Dr. Newsome and Dr. Feltus agree on the importance of project-based learning and inquiry, providing students with authentic experiences that minimize cheating concerns. They acknowledge the need for ongoing conversations about the changing nature of academic integrity in the digital age.

Dr. Feltus expresses his passion for teaching and the satisfaction of seeing students learn and discover. He emphasizes that, as a teacher and scientist, he's focused on closing the gap between research and education, inspiring more individuals to become discoverers and explorers.

The episode ends on a hopeful note, with Dr. Feltus sharing his vision of a future where more people are empowered with the skills and drive to make genuine discoveries, ushering in a new era of human exploration and understanding.

In summary, this episode of STEM Lab with Dr. Alex Feltus explores the potential of AI in STEM education, the changing role of educators, and the importance of fostering a love for genuine discovery in students. Dr. Feltus's passion for teaching and his dedication to bridging the gap between research and education shine through, making it clear that he envisions a future where everyone can become a discoverer and explorer.

Episode 2: Integrating Art into the STEM Curriculum: Art is Science

In the second episode of STEM Lab, STEM lab co-host Dr. Nicole Kroeger welcomes Joyce Symoniak, a visual arts teacher at the Illinois Mathematics and Science Academy (IMSA) with over 30 years of experience. The episode explores the integration of art into STEM education and how art enhances the learning experience in STEM subjects.

Joyce explains that art doesn't just fit into STEM; STEM fits into the arts. She gives examples of how artists play crucial roles in designing products, such as cell phones, making them user-friendly. She highlights the creation of classes at IMSA, like scientific illustration, where students draw specimens borrowed from the science lab. This course incorporates math and science by teaching scale, proportion, and research skills.

The discussion also delves into 3D design classes, where students model complex structures, emphasizing the intersection of art and science. Additionally, the podcast mentions how art can help in fields like graphic design, infographics, and presentation design.

Joyce shares her passion for teaching and the joy of seeing the "light go on" in students when they grasp a concept, emphasizing the importance of students learning something new every day. She also discusses her experiences with AI in the art classroom, teaching students to use AI as a tool for creating artwork while maintaining academic integrity.

The episode concludes with the idea that art and science are intertwined, and they both play crucial roles in innovation, design, and creation, emphasizing that the two should never be separated.

Joyce's insights demonstrate the strong connection between art and STEM, showing how they complement and enhance each other in education and the future job market.

Episode 3: Game-Based Programs and Virtual Learning Platforms in STEM Ed

In the third episode of the STEM Lab podcast, co-host Dr. Crystal McGee sits down with Dr. Eric Wiebe, a distinguished professor in STEM education from North Carolina State University. The episode aims to explore the intersection of technology, education, and STEM, delving into Dr. Wiebe's research on game-based programs and virtual learning platforms.

Dr. Eric Wiebe opens the conversation by humbly acknowledging his contribution to the broader field of STEM education, focusing on how technology can be harnessed to improve the teaching and learning experience. He emphasizes the importance of integrating technology with instructional methods, with a specific interest in cognitive learning outcomes and the emotional responses of students.

The episode then delves into the data collection techniques employed in STEM education. Dr. Wiebe shares his approach, which includes using biometric data, facial recognition, heart rate, galvanic skin response (measuring anxiety levels), and posture analysis. He underlines the significance of privacy and ethical considerations in gathering this data.

Moving on, the conversation centers on game-based and virtual learning platforms. Dr. Wiebe explains how these platforms, when thoughtfully designed, can boost motivation, engagement, and cognitive skills among students. However, he also acknowledges the potential pitfalls of poorly designed technology, which can lead to distractions and a reduced cognitive load for both students and teachers.

The episode concludes with a discussion about the preparedness of educators to embrace emerging trends in STEM education. Dr. Wiebe advocates for flexibility and creativity, encouraging future teachers to develop the skills to strategically implement new technologies in the classroom. He also highlights the unique position of current STEM students who can contribute to the development of educational technology.

Episode 4: Integrity, Trust, Caring and Real-World Research in STEM Ed

In Episode 4 of the STEM Lab podcast, the hosts welcome Dr. Matt Martin, the Dean at the South Carolina Governor's School for Science and Mathematics (GSSM). The conversation delves into the critical aspects of academic integrity, trust, and the unique challenges associated with STEM education.

Dr. Martin, with a background in English and extensive experience in higher education, shares his insights into transitioning from teaching college-level students to the enthusiastic and talented high school students at GSSM. He emphasizes the value of a STEM-focused institution that also places importance on a well-rounded education, including liberal arts.

A central theme of the discussion is academic integrity, especially in the age of easily accessible digital information. Dr. Martin acknowledges the increasing pressure on students and the temptations of external resources. However, he highlights the significance of not just deterring cheating but instilling the value of integrity within the school's community. Dr. Martin emphasizes that trust and integrity are fundamental for creating an environment where students can truly excel.

He also touches upon the challenges of establishing a consensus on how to address academic integrity issues. The conversation underscores the need for ongoing dialogue and professional development to navigate these complex matters effectively.

Dr. Martin's perspective sheds light on the multifaceted landscape of STEM education, with a particular focus on ethics and integrity as crucial components of nurturing a culture of trust and learning at GSSM.

Dr. Martin discusses the evolving landscape of academic integrity and how technology has transformed the educational experience. He emphasizes the importance of helping students navigate the digital

world, teaching them to critically evaluate and use online resources, and fostering ethical behavior in their academic pursuits.

The hosts also touch on the unique challenges posed by remote learning during the COVID-19 pandemic. Dr. Martin highlights the need for adaptability and creative solutions in ensuring academic integrity in virtual classrooms.

Furthermore, the discussion revolves around the role of teachers and educators in guiding students toward responsible use of technology and information. Dr. Martin emphasizes that building trust and integrity within educational institutions requires a collective effort, involving both students and faculty.

Dr. Martin reiterates the significance of maintaining academic integrity as an essential foundation for STEM education. He expresses optimism about the potential for technology and ethics to coexist harmoniously in shaping future STEM leaders.

The conversation with Dr. Matt Martin continues to explore the challenges posed by technology in STEM education, specifically regarding academic integrity and the use of artificial intelligence (AI).

Dr. Crystal McGee raises an important question about how educators can identify instances of plagiarism and prevent students from misusing AI tools to hinder their intellectual growth. She also emphasizes the need to teach students how to think critically about AI, fostering a culture of responsible AI usage.

Dr. Martin acknowledges the complexity of the issue, describing the current educational landscape as akin to the "Wild West" due to the rapid evolution of technology. He highlights the importance of raising awareness about AI's capabilities and limitations while encouraging educators to explore the positive aspects of AI integration in classrooms.

The hosts discuss their experiences with AI in education, including using AI to grade student work and the importance of students understanding the application and relevance of mathematical concepts beyond rote calculations.

Dr. Martin reflects on the broader cultural context of education, where obtaining a college degree is often seen as a certification for higher-paying jobs. He stresses the significance of framing education as a way of thinking, problem-solving, and engaging with the world rather than a mere credential.

Dr. Michael Newsome and Dr. Nicole Kroeger join the conversation, expressing optimism about the future of STEM education. They discuss the importance of interdisciplinary and project-based learning, along with the potential for educators to create a spark in students' lives through engaging discussions and human interactions.

Dr. Martin concludes by emphasizing the importance of educators caring about their students and their subjects, as this caring approach forms the vital spark for effective education.