

Testimony on HB 2466  
House Committee on Education  
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Chairman Huebert and Members of the House Committee on Education,

Good afternoon. My name is Scott DeLoach. I am a Professor and Head of Department of Computer science in the Carl R. Ice College of Engineering. I am a proponent of House Bill 2466 and I appreciate the opportunity to appear before the House Committee on Education providing information for it.

As you know, Kansas is woefully behind in K-12 computing education and has been slow to make advances. However, some initial steps have occurred. In 2019 Kansas adopted model computer standards for PK-12 and in June 2021 the state Board of Education voted to allow students to count computer science courses for graduation credit. Unfortunately, the Kansas Department of Education reported that in 2020, of the 356 public high schools in Kansas, only 27% of them taught even a basic computer science course and only 0.2% of the over 150,000 students in Kansas high schools took an AP computer science exam.

In 2018, the Kansas State University computer science department created the Computational Core Initiative, whose goal is to create a set of online computer science courses that are focused on teaching computer science to a large numbers of non-computer science majors. These courses are delivered online and integrate short, engaging, videos, e-textbooks, interactive hands-on examples, and instant assignment feedback into a single package. The Computational Core is robust, pedagogically grounded, and designed to build computational thinking skills and train students in applying computer science to a diverse set of fields.

One of the program's goals is accessibility. That is why all Computational Core courses are algebra based. Most non-introductory college computer science courses require calculus, which is a major stumbling block for many students. We are also concerned about inclusiveness, as computer science does not have a stellar history of including either women or minorities. As a result, we have purposely designed the curriculum to be culturally relevant to multiple Kansas cultures and have even translated the first two courses into Spanish.

To date, the Computational Core Initiative has been funded entirely by a partnership between Kansas State University, the Carl R. Ice College of Engineering, and the Department of Computer Science.

At Kansas State University, the Computational Core courses have become the foundation of our Computer Science Certificate program, an Integrated Computer Science bachelor's degree, and several new or planned computing-related degrees, such as the Geographic Information Science and Technology bachelor's degree and the planned Digital Innovation in Media bachelor's degree. In Spring 2021 we also started teaching these courses at Manhattan Christian College, making it the first college to offer our courses. We are also currently talking with Dodge City Community College about teaching the courses there as well.

Since the beginning of the Computational Core Initiative, we have always had the vision for teaching computational core courses to high school students across the state of Kansas, with the goal of providing high quality computer science education to all high school students within the state at a reasonable cost. The program for teaching these courses in high schools is called the Cyber Pipeline program.

The Cyber Pipeline program itself consists of three parts: the curriculum, instruction, and teacher preparation.

The Cyber Pipeline curriculum was developed from scratch by K-State faculty whose focus and research areas are computer science education. This means we have created a state-of-the-art curriculum using the latest technologies and educational practices. The curriculum uses a variety of teaching methods within an integrated educational framework called Codio. While there is a small per student cost to use Codio (approximately \$100 per student per year), the curriculum is completely free to Kansas high schools. And using the cloud-based Codio framework means that all that is required for a student to access the course and programming environment is a basic laptop/Chromebook and stable internet connection.

In addition to providing the curriculum, we also provide innovative online instruction that includes short, engaging videos, text, and automatically graded hands-on exercises and projects. Students get instruction directly from K-State computer science faculty with time-tested examples and hands-on exercises. While much of the instruction is integrated into the Codio environment, there is still be plenty of time for high school teachers to provide face-to-face discussions and examples to help students understand the material even better. However, the beauty of the program is that the teachers are not required to be the final expert.

Of course, one of the major problems in teaching computer science in high schools is the lack of qualified teachers. To help with that, the K-State Cyber Pipeline program also provides teacher preparation as well. The K-State department of computer science has been funded by an internal K-State grant to develop a summer teacher training program, which kicked off in the summer of 2021. The program is a 6-week summer program where high school teachers go through the actual course material individually and then have weekly group sessions where they discuss the material, share teaching strategies, and more. There is also a teacher's guide that contains teaching strategies and additional examples that teachers can use in the classroom. Not only can the teachers contact our faculty directly, but we also have plans for creating a 7-day per week help desk where students and teachers can get immediate help on their assignments and projects. In the Codio environment, help desk staff will be able to see exactly what the student or teacher is doing on their project and provide specific feedback and suggestions to them.

Besides just providing quality computer science education to Kansas, the Cyber Pipeline also has the goal of creating a variety of pathways for students to more advanced computer science education. The first two courses in the Cyber Pipeline program are equivalent to the AP Computer Science Principles exam and the AP Computer Science A exam. Thus, students completing these courses should be prepared to take the appropriate AP exam and thus be able to transfer credits to any institution of higher education within the state. In addition, the Cyber Pipeline courses are the exact same as the Kansas State Computational Core courses and thus a student completing a Cyber Pipeline course with an appropriate grade is eligible to receive credit from community and technical colleges offering the courses or from Kansas State University itself.

The first Cyber Pipeline course was taught at Manhattan High School in Fall 2020. The course went well, and we learned a lot from the experience. Of course, starting a new program in the middle of COVID-19 has its own issues. However, in Fall 2021, 6 additional high schools started teaching the courses. Overall, the results have been promising and we have been learning a lot about how to deal with high schools and their students.

The first teacher training was also held the summer of 2021, with 6 teachers attending. These were teachers from the 6 new high schools that started teaching Cyber Pipeline courses last fall. Overall, the teachers found the training to be very useful, although the wide range of experience among the teachers did cause a few problems, which we will fix for this summer. We are currently recruiting additional high schools to offer our courses in Fall 2022.

So far, I would label the Kansas State University Cyber Pipeline program a success. We have taught over 400 students at the college and high school levels and that number will continue to grow. The curriculum and instruction are being developed and continually updated in a way that will make these courses sustainable for the long haul. The program was also set up to be economical to reproduce at colleges and high schools around the state. Since the majority of the curriculum, content, and instruction development is performed centrally, the addition of new high schools to the program can be done at the fraction of the cost and time of traditional approach of creating new high school classes individually by teachers at each high school.

Overall, I believe the Kansas State University Cyber Pipeline program can be instrumental in helping the state of Kansas move from being at the tail end of the computer science education spectrum to be a bright and shining example of how to effectively and efficiently provide high-quality computer science education to an entire state, from overcrowded inner city high schools to small rural high schools.

Chair Huebert, thank you again to you and the members of the House Education Committee for the opportunity to testify on House Bill 2466. I am happy to stand for questions.