David Lear Sulman Computing, Science and Engineering Education Initiative

The David Lear Sulman Computing[1], Science and Engineering Education (CSE) Initiative is a 5 year multi-faceted program to prepare the next generation of 21st Century inventers and innovators. David was an electrical engineer who studied at the Massachusetts Institute of Technology including doctoral course work after earning a master of science degree in electrical engineering in 1969. He spent his entire career at Teradyne Inc., a leading supplier of automation equipment used to test data storage, semiconductors, wireless products and complex electronic systems for consumer, industrial, and government applications. David was a patent holder who viewed his work as a creative endeavor in the design and development of computer-related processes and systems. In keeping with the spirit of David's legacy, his wife, Rose-Jane Sulman, is embarking on a unique education initiative for the benefit of Jewish Day Schools and other K-8 students and teachers. Over the next five years the DLS initiative will develop and implement a comprehensive computer science, physical science and engineering education program at three Jewish Day schools. The proposed plan will facilitate the development of new instructional materials together with the professional development of teachers to enable the implementation of a project-based learning model facilitated by a CSE Lab. A major goal of this initiative is to better prepare students, especially Jewish students, to meet the challenges and opportunities of the future so that they too can become contributing members of our 21st century technological society. Further details of the program are provided below.

CSE Curriculum: Curriculum development activities will focus on grade level appropriate CSE topics, activities, projects, technologies and practices that can be delivered/supported in the CSE Lab and regular classroom including: 1) Computer Science and Coding related topics such as Algorithms and Computer Programming, Recognizing and Defining Computational Problems, Developing and Using Abstractions, Creating Computational Artifacts and Communicating About Computing; 2) Physical Science topics such as Forces and Interactions, Light and Sound, Structure and Properties of Matter and Energy; 3) Engineering Design Topics such as Design Problems, Engineering Design Process and Constructing Explanations and Designing Solutions and others as appropriate.

CSE Lab Facilities: A CSE Lab in each school will feature a variety of computing devices, computer-aided machines, materials, high/low tech tools and other resources focused on developing a wide variety of knowledge and skills. In the spirit of a "Makerspace", students will be able to pursue projects across a broad range of topics based on both curriculum-related and personal interests during and after school. A Makerspace is a place that allows children to create, develop, discover, investigate, pursue and understand new ideas and skills through coding, making, inventing and tinkering with computers, tools and machines. "Making" can also make complicated engineering, math and science concepts understandable to younger children and introduce older children to previously unknown topics or careers. In the CSE Lab students will use computers for coding and design, including generating ideas, testing theories, collecting data, creating innovative artifacts with media and/or solving authentic problems. Students will also have access to new computer assisted machines and processes such as 3D printing, 3D precision laser cutting/shaping, 3D scanning, computer controlled machining and more.

Professional Development: A key element for the success of the DLS initiative is a comprehensive professional development (PD) and support plan for participating teachers that is intensive, ongoing and connected to the teaching of CSE content. Research suggests that PD is most effective when it focuses on learning specific subject matter and allows teachers to do the "hands on" work required to build content knowledge and teaching expertise. Teachers will learn to use a variety of computing devices, APPS, tools, materials and the Internet to transform teaching and learning from "one size fits all" to "personalized learning" and from traditional lecture based delivery of content to "blended learning" in CSE subjects.

Dissemination: While initially focused on 3 specific Jewish Day Schools, the DLS initiative is committed to broadly disseminate the findings, models, materials and resources to a wider audience of other K-8 private and public schools in Massachusetts and beyond. Dissemination will be carried out in 2 different realms, both online and face-to-face, through a web site, social media and various professional conferences. Initially, the DLS initiative web site will facilitate the delivery of the DLS curriculum materials, CSE teaching and learning resources and online collaborative tools for participating schools and teachers. Broader dissemination will occur through conference presentations at various state and national conferences and also through a series of locally hosted conferences at the participating school sites in Massachusetts.

[1] Computing here refers to the use of computers to create and produce original works by coding in the realm of computer science, robotics, electronics, digital media and more.

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DLS CSE PROJECT GOALS & ACTIVITIES TIMELINE	'17	'18	'19	'2 0	'21
1. CSE Curriculum: Research, Identify and Develop grade level appropriate Computer Science, Physical Science and Engineering topics, activities, projects, technologies and practices that can be delivered/supported in the CSE Lab and regular classrooms.					
● Identify and implement Computer Science and Coding related topics such as Algorithms, Programming, Recognizing and Defining Computational Problems, Developing and Using Abstractions, Creating, Testing, Refining Computational and Communicating About Computing and other related topics.	X	X	X	X	X
● Identify and implement Physical Science topics such as Forces and Interactions, Light and Sound, Structure and Matter and Energy and other related topics.	X	X	X	X	X
● Identify and implement Engineering Design Topics such as Design Problems, Engineering Design Process and Constructing Explanations and Designing Solutions and other related topics.	X	X	X	X	X
2. CSE Lab Facilities: Develop and create a CSE Lab at 3 Jewish Day Schools that features a variety of computing devices, computer-aided machines, materials, high/low tech tools and other resources focused on developing a wide variety of knowledge and skills in CSE subjects.					
● Develop a floor plan for conversion of an existing classroom space into the CSE Lab and project based learning environment.	X	X	X		
● Remodel classroom space to accommodate/include air filtration, additional electrical outlets, storage, water access and emergency first aid station.	X	X	X		
● Identify and purchase appropriate storage furniture and student work furniture to accommodate a variety of equipment, materials and processes.	X	X	X		
● Identify and purchase appropriate hand and power tools, and computer aided equipment to accommodate a variety of materials and processes.	X	X	X		
● Identify and purchase appropriate computer coding/robotics platforms that can be used both in the lab and classroom by students and teachers.	X	X	X		
● Identify and purchase appropriate CSE focused instructional packages that can be used both in the lab and classroom by students and teachers.	X	X	X		
● Establish a student "Tech Team" in the CSE lab for student/teacher support.		X	X	X	X
3. Professional Development: Provide summer and school year professional development opportunities and ongoing support for teachers and staff engaged in the DLS CSE initiative.					
● Form CSE Leadership teams including administrators and teacher representatives at each site to guide CSE initiative.	X				
● Engage school staff, administrators and teachers in discussion and reflection about technological change and the value of CSE subjects and skills.	X	X			
● Provide ongoing monthly professional development and support both online and in the classroom throughout the academic year to improve teaching and learning in CSE subjects.	X	X	X	X	
● Identify and provide external subject/grade level professional development opportunities for participating teachers and staff.	X	X	X	X	
● Develop and deliver summer institutes to participating teachers and staff in Computing, Science and Engineering related subjects to build educator capacity in project based learning for the new CSE lab.	X	X	X	X	

4. Dissemination: Broadly disseminate DLS CSE findings, models, materials and resources to a wider audience of other K-8 private and public schools in Massachusetts and beyond.					
● Publish DLS CSE Curriculum under an Attribution-Non-Commercial-Share-Alike (CC BY-NC-SA) Creative Commons License.	**X**	**X**	**X**	**X**	**X**
● Organize and host series of conferences at the participating school sites in Massachusetts to targeted audiences of public and private educators.		**X**	**X**	**X**	**X**
● Present and disseminate findings and materials via national, regional and state conferences and publications.		**X**	**X**	**X**	**X**
5. Assessment and Evaluation: Embed assessment and evaluation activities into development /implementation process to measure effectiveness and modify proposed plans to ensure satisfaction and success for students, teachers and schools.					
● Identify measures of assessments such as student subject matter interests and enrollments to serve as benchmark comparisons for pre-post initiative implementation.	**X**				
● Develop and implement pre-post surveys and focus groups with students, teachers and parents to measure satisfaction with DLS CSE initiative at participating sites.		**X**	**X**	**X**	**X**
● Review and Modify DLS CSE plan based on feedback and evaluation results from surveys and focus groups.		**X**	**X**	**X**	