



**A COMPUTING, SCIENCE AND ENGINEERING EDUCATION PLAN TO EXPAND
AND SUPPORT 21st CENTURY JEWISH EDUCATION**

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Lander-Grinspoon Academy is an independent Jewish day school in the Pioneer Valley welcoming children of families from all Jewish traditions and backgrounds. Our mission is to provide a rich, academically rigorous, and values-based education integrating general and Jewish studies in a nurturing environment. Our high standards of academic excellence and forward-looking general studies curriculum provides stimulating, in-depth instruction in the core disciplines of language arts, mathematics, science, social studies, and the arts. We place great value in supporting active inquiry and mastery by encouraging each child to excel to the best of his or her abilities. In this spirit we are embarking on a new initiative that will focus on the development of new mindsets and skillsets in the areas of “computing”¹, physical science and engineering (CSE). The initiative will also develop and support teacher capacity to deliver new CSE related subjects and activities such as computer coding, engineering design and more.

Technological literacy today encompasses skills such as computer coding, communication, collaboration, creativity, computational thinking, design, invention, problem solving and cultural fluency.² Technological literacy also fosters better understanding and critical thinking across the curriculum in Jewish studies, social studies, math, science, art, music and more. New applications and environments for using computers together with a variety of resources and tools can ensure students develop the mindsets and skillsets needed to succeed in the world of tomorrow. Access to and engagement with various computing devices for both students and teachers can enhance and transform traditional methods of teaching and learning. Tablet computers enable students to work individually and collaboratively at different paces accessing various information sources to develop new knowledge and skills. They also enable new teaching methodologies that can reach students at different levels while freeing up students and teachers to utilize class time for more challenging and engaging learning activities and projects. As we move from simply being users of computers to technological literacy we hope to enable students and teachers to use technology to design imaginative solutions to the real-world problems they may confront now and in the future.

Initial funding for the LGA CSE initiative is being provided through a legacy gift from Rose-Jane Sulman in honor of her husband David Lear Sulman. David was an electrical engineer who studied at the Massachusetts Institute of Technology for many years 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 processes and systems for testing semiconductors. In keeping with the spirit of David’s legacy, Lander-Grinspoon Academy is embarking on a unique Computing, Science and Engineering initiative in the context of Jewish Education. Through this initiative we hope to better prepare our students to meet the challenges and opportunities of the future so that they too can become contributing members of our 21st century technological society.

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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While computers can enhance student understanding of subject matter and increase student engagement, the rapid pace of technological development in our society is challenging individuals and established institutions in ways that were unimaginable only a few years ago. For the past 50 years the speed of the computer processor has increased annually while decreasing in cost and size.³ Students and teachers now have mobile computer devices in their pockets that would have been considered “supercomputers” just a few years ago. At the same time the Internet and mobile communications technology has “connected” almost half of the world while bringing rich digital content and engaging social media to our fingertips.⁴ Education and learning opportunities are no longer limited to the classroom or school as individuals and organizations of all types develop and deliver rich learning applications and content on the World Wide Web (WWW). Khan Academy, one of the most prominent learning environments on the WWW, began a few years ago with a few math videos produced by one man, Salman Khan. Khan Academy now includes an adaptive Math practice engine and over 4500 instructional videos encompassing a variety of subjects including Math, Science, History, Humanities, Philosophy and Computer Science.⁵

In response to these challenges and opportunities LGA proposes a multi-faceted computing, science and engineering (CSE) education initiative that will impact both teaching and learning across all subjects and grade levels. A leadership team including the LGA Executive Director Ellen Frank, Principal Deborah Bromberg Seltzer, together with teachers Andrea Olkin, Julie Kearns, Becky Lederman and education technology consultant Michael Mino will facilitate and guide the initiative with input from the LGA Board, staff and parents. The LGA initiative will upgrade our computer infrastructure, increase access to the latest computing devices, establish a new laboratory for teaching and learning about computing, physical science and engineering while also facilitating the development of teacher capacity to use 21st century computing devices and learning resources both in the CSE lab and the regular classroom.

Network Infrastructure and Systems – An easily accessible and technically reliable network infrastructure is a critical element of the LGA CSE initiative. Student and teachers must have regular routine access to the computer network and the Internet in classrooms and throughout commons areas of the LGA facility. Administrative staff must also be able to utilize computers connected to the LGA network efficiently for increased productivity in their management tasks. In order to ensure the needed accessibility and reliability a review of the existing network infrastructure will be carried out by our local IT contractor. The scope of work to be carried out by the contractor will be determined based on the survey results and the anticipated needs required to accommodate an increase in wireless computer devices accessing the network. If needed, additional wireless access points will be placed in strategic locations throughout the building to improve network functionality and access speeds for student, teachers and staff.

Computing Devices – A variety of new computing devices will be purchased to provide the most effective computer platforms for students, teachers and administrative staff. It is vital that all LGA staff have access to up to date operating systems and computer platforms to facilitate completion of every day administrative tasks. For this purpose new laptop computers with

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Windows 10 operating systems have been selected for the administrative staff while Apple iPad computers have been selected for LGA teachers and students. Apple iPad tablet computers will provide access to new learning environments and place powerful applications and content creation tools in the hands of students and teachers. Apple tablet technology has been selected due to their ease of use, ease of management, reliability, support service and overall lower total cost of ownership.⁶ LGA students will have access to 2 new 20 iPad Mobile carts for use individually, in small groups or in a whole class at one time. All teachers will be assigned an Apple iPad Pro computer with Smart Keyboard and Apple Pencil for use in routine student management tasks and as a platform for creation and presentation of learning content. Teachers will also receive an Epson wireless enabled projector that allows projection from up to 4 wireless devices at a time. Teachers will be able to use their iPad for both personal and school use so that they become more familiar and comfortable with the device for the classroom. iPads for students and teachers will provide unprecedented mobile access to a variety of high quality learning applications and tools across grade levels and subjects.

Computing, Science and Engineering Lab – A major outcome of the computing, science and engineering initiative will be the establishment of a new project-based learning laboratory at LGA. LGA students and teachers will have access to the CSE lab throughout the day and after school including both scheduled and free time to work on class assignments or independent projects of choice. Project based learning will be the primary instructional strategy employed in the CSE lab. Project based learning is a research based strategy for engaging students in inquiry and problem solving while creating work that is substantial, meaningful and shareable.⁷ Project based learning can also connect classroom curriculum topics to activities in the CSE lab so that students gain deeper understanding or explore a topic further based on their own particular interests or skills. The LGA CSE lab will be a vibrant laboratory for the exploration of computing, physical science and engineering while giving both students and teachers opportunities for deeper levels of teaching and learning than are typically possible in the regular classroom.

The LGA CSE lab will feature a variety of computers, computer-aided machines, materials, high/low tech tools and other resources focused on developing knowledge and skills in the areas of computer science, physical science and engineering. In the spirit of a “makerspace”, students will be able to pursue projects across a broad range of CSE topics based on both curriculum-related and personal interests. A “makerspace” is a place that allows children and adults 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.⁸ 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.⁹ Students will have access to new computer assisted machines and processes such as 3D printing, 3D precision laser cutting/shaping, 3D scanning, and computer controlled machining. Additional resources will include Arduino programmable electronics prototyping boards,

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soldering stations and a variety of components for creating robots, programmable devices and wearable electronics. To facilitate teaching and learning in some of the targeted physical science and engineering subjects, comprehensive curriculum resource packages such as LEGO® WeDo, Kinderlab® KiBo and/or other science kits that include materials, parts, computer components and more will be available for use in the lab and/or for use in the classroom.

Learning Environments – The CSE Initiative will also focus on the further development and deployment of online and mobile learning environments to enhance and extend teaching and learning at LGA. According to the Partnership for 21st Century Skills, “Learning Environments are the structures, tools, and communities that inspire students and educators to attain the knowledge and skills the 21st century demands of us all.”¹⁰

The LGA Google Apps for Education environment is one example of an online learning environment that includes a suite of web-based messaging, collaboration and multimedia applications that Google hosts. To access these applications, LGA students and teachers use a secure account in a web browser on any computer or mobile device that's connected to the Internet. Initially, students and teachers have been using GMail, Google Docs and Google Classroom for word processing, document sharing and communication. The coming school year will introduce students and teachers to Google Sites, Google Photo and YouTube to create, communicate, collaborate, document and present student work. With YouTube students and teachers can create, edit and share video with a class, the school or our community for a whole new level of communication and collaboration. Using their LGA Google account students and teachers can access their own YouTube Channel and upload or manage their videos all within a secure environment managed by a LGA administrator. With Google Sites, students can create and manage a website for class projects including; videos, slideshows, presentations, or photos while limiting access to only those people invited by the student. Google sites will also be the platform used for the development of digital portfolios for students in grades 4-6. The digital portfolio will be a repository of student work that documents personal development, knowledge and skills developed across subjects over time. The student portfolio will include a variety of work from each subject, each year and in various formats such as text, images, links and video.

The Apple iPad computers will also give students and teachers access to new mobile learning environments. The Apple iPad can be used to access a wide variety of mobile teaching and learning materials and resources in the classroom, home or community. A unique feature of the Apple iPad is the suite of installed applications including all MS Office and Google Apps together with Apple software such as Keynote, Pages, Numbers, iBook, iMovie and iTunes. In addition, the Apple App Store features over 80,000 education apps (30K free Apps) that cover a wide range of subjects for every age, grade level and learning style. In addition to free learning apps, iPads put thousands of free eBooks, including all of the classics, in the hands of students. iPads are not only devices for the consumption of content but also a platform for the creation of art, creativity, design, music, media and more. The implementation of new learning environments will afford unprecedented opportunity for more engaging teaching that can facilitate deeper learning for students of all ages and abilities in the classroom and beyond.

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Professional Development – A key element for the success of the LGA technology initiative is a comprehensive professional development (PD) and support plan that is intensive, ongoing and connected to the teaching of classroom content.¹¹ 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.¹² 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” modalities. Personalized learning is when the teacher tailors the content or the delivery of content to the abilities and unique needs of individual students. Blended learning is when students in a classroom learn in part through delivery of content online or via digital media with some element of student control over time, place, path or pace.¹³ Summer professional development sessions will introduce teachers to new CSE related topics and practices in the context of the applications and environments that they will be using in the classroom with students. Teachers will be engaged in activities such as coding, creating, design, programing and tinkering with a variety of devices, materials and tools so that they gain a deeper understanding of how to teach these skills to students. The sessions will be tailored to the subject specific interests according to the needs of the different grade levels. Monthly ongoing sessions will provide teachers with additional support including mentoring and modeling as they implement new instructional practices and engage students in the new learning environments in their classrooms and the CSE lab. Teachers will also be given the opportunity to identify and pursue individualized professional development outside of the regular school based sessions that are specifically related to subject areas and grade levels. Teachers will each receive an Apple iPad Pro that will become their personal property after 2 years of program participation. The LGA PD program will create an effective teacher community of practice while also developing teaching content knowledge and pedagogy skills. As a result of participation teachers will develop confidence and capacity with new instructional tools and new learning environments to enhance and extend learning and to support one another throughout the school.

Goals & Activities – Over the next three years LGA will develop and implement a comprehensive computer science, physical science and engineering education plan that will provide the environments, devices, practices and systems to develop 21st Century technological literacy across all grade levels. A multifaceted plan is proposed that will facilitate the implementation of new devices, the development of new physical and virtual environments, the implementation of new instructional content in Computer Science, Physical Science and Engineering together with the professional development of teachers to enable a project-based model facilitated by the CSE Lab. Existing LGA CSE curriculum together with guidance from National Standards documents such as the K–12 Computer Science Frameworks¹ and the Next Generation Science Standards¹⁴ will inform the work of the CSE Advisory team. CSE related subjects and activities will be identified and incorporated over a three year period in accordance with the Goals and Timeline that are identified in Table 1.

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can be used both in the lab and classroom by students and teachers. Establish a student "Tech Team" in the CSEL for student/teacher support.	X		
4. Learning Environments: Identify, develop and deploy online and mobile platforms for extending and enhancing CSE related teaching and learning. - Evaluate the existing Library environment and resources to determine how it can best be utilized to support the CSE initiative. - Identify and deploy subject specific, age appropriate, iPad applications for class, small group and individual use by students in grades K-6. - Further Develop and implement LGA Google(G) Apps for education such as Google Classroom, Google Docs, Google Drive, Google Sites, Photos and YouTube for teachers and students in grades 3-6. - Develop and deploy a Digital Portfolio using the GApps for Education Suite for students in Grades 3 - 6.	X X X	X X X X	X X X X
5. Professional Development: Provide summer and school year professional development opportunities and ongoing support for teachers and staff. - Form CSE Leadership team including LGA administrators and teacher representatives from lower and upper grades to guide CSE initiative. - Engage LGA staff, administrators and teachers in discussion and reflection about technological change and technology use at LGA. - Provide ongoing monthly professional development and support both online and in the classroom throughout the academic year in the use of GApps for Education and Apple iPads for teaching and learning. - Identify and provide specific subject/grade level professional development opportunities for participating teachers and staff. - 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 X	X X X X X	X X X X X
6. Assessment and Evaluation: Embed assessment and evaluation activities into development and implementation process to measure initiative effectiveness and modify proposed plans to ensure satisfaction and success for students, teachers and parents. - Identify measures of assessments such as student subject matter interests and achievement to serve as benchmark comparisons for pre-post initiative implementation. - Develop and implement pre-post surveys and focus groups with students teachers and parents to measure satisfaction with CSE initiative. - Review and Modify LGA CSE plan based on feedback and evaluation results.	X X X	X X X	X X

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