

Project Title...

Inspire. Ignite. Innovate...Creating Flexible Learning Space to Nurture a Tinkering Mentality.

Summary of the project...

Elementary schools provide the formative years for students to engage in activities that promote curiosity and excitement. These activities are crucial to developing the long term skills that we need students to have to be prepared for STEAM related jobs. We want to redesign our existing computer lab to shift the student experience from an isolated student-to-computer connection to a collaborative student-to-student relationship that utilizes technology to engage in critical thinking. This flexible space will provide students opportunities to create, explore, and develop questions while providing experiences and tools that will help them learn how to answer those questions.

Need for the project, including how this project will benefit students...

The new Common Core and Next Generation Science Standards are driving the need for increased incorporation of hands-on learning in schools. Students must learn how to embed technology into their learning, and as we increase the number of devices our students have access to, and utilize computers more ubiquitously in classroom instruction, the use of a traditional computer lab to provide academic instruction and assessment becomes redundant.

The computer labs of yesterday must evolve into innovation labs of today...areas where students can work on skills that support learning in many forms - from digital to face-to-face - and offer students some autonomy to decide how to learn (steelcase.com). We surveyed students and asked them what they would want a computer lab to be. Overwhelmingly, the students response was to work collaboratively on tasks that include coding, robotics, video production, and "making things." Students must have the opportunity to do this in multiple platforms in a variety of ways. Each unique opportunity they have piques curiosity to explore further.

- Coding is a critical skill for the future as it powers our digital world. Every website, smartphone app, computer program, calculator and even microwave rely on code in order to operate. This makes coders the architects and builders of the digital age. (International Business Times)
- Students will be able to use their coding skills to control a variety of robots. Watching a robot perform, based on commands one writes for it, moves the algorithm from something virtually on a screen to reality.
- Using a variety of mediums (themselves, peers, Legos, and other manipulatives) to create videos helps students develop the skills to work together to tell a story and connect ideas for a large audience. Shifting the view of technology from

something students use as a substitute, to re-designing opportunities for learning is critical and will lead to infinite student created outcomes.

To make this happen, there are two needs: (1) the “stuff” that students need to engage in these activities and (2) the environment for the students function in. New schools in Irvine and throughout the country are creating learning spaces that allow students to interactively engage in critical thinking while communicating and collaborating with their classmates. The design of these spaces is critical to provide an environment to engage in these types of activities. Once students have this environment, they need the activities and projects that provide the opportunity to explore. Innovators in the United States and abroad have adopted a new pedagogy, project-based learning coupled with performance assessment, as the best way to engage and challenge students and provide them with the learning experiences that lead to 21st century knowledge and skills. (Solution Tree) That is why I am seeking funding to provide both. We want to redesign our outdated computer lab and create a space where students can explore their interests. We need to build an adaptable space that supports flexibility and collaboration, and provides teachers and students with a variety of activities to highlight this transformation of instruction. As students experience small successes, they will better be able to identify what they want and need, and teachers will better be able to support them.

What, in educational research, supports the efficacy of this idea or program? (Provide information from publications, links to online resources, and /or other evidence that the project is likely to be effective in improving learning outcomes.)

Bob Pearlman, a key designer in 21st Century Schools, identifies three themes that emerge from a review of research and literature on the design of school facilities. First, facilities’ designs have been shown to have an impact on learning. Second, these designs have been shown to have an impact on students and others who work in the schools. Third, there have been few innovations in school facilities design. (Solution Tree)

We need to give kids the chance to practice whatever makes them passionate and feel encouraged—even if they’re obsessed with making “stuff” exclusively with duct tape! It’s crucial that kids learn how to be passionate for the rest of their lives. To start, they must first learn what it feels like to be simultaneously challenged and confident. Children are more eager to learn when they are engaged in something they are passionate about. (Parent Co.) David Lang, author of *Zero to Maker*, calls for a “persistent tinkering mentality.” It’s a combination of unshakable optimism, unlimited opportunity, and never ending satisfaction. This is the same as a growth mindset, which is critical to satisfy the district initiative of intellectual risk-taking.

Schools supporting 21st century learners realize that new pedagogies - project-based learning and active student use of technology and making tools - are what enables and motivates these learners. Existing classrooms and computer labs inhibit "makers" from "making" and learners from collaborating. New learning environments linking this constructivist pedagogy and flexible space are needed to support 21st century learners. (P21.org) USC Professor Henry Jenkins' highlights the importance of creating a participatory culture. This idea asks us to build in "low barriers of entry" so that any student at any level of proficiency, even if they don't speak English, can immediately do something independently. Allowing all students to be "makers" helps to build this culture.

According to a 2010 research report by the American Association of University Women titled *Why So Few? Women in Science, Technology, Engineering, and Mathematics*, girls generally have more difficulty acquiring spatial thinking and reasoning skills than boys due to the type of play they engage in as children. Since many STEM fields rely heavily on spatial skills, especially in advanced studies, this puts young women at a significant disadvantage compared to their male peers. In that same report, however, the authors noted that there is also clear evidence that consistent exposure at a young age to activities that promote spatial skills, even activities as simple as taking things apart and putting them back together, can alleviate this imbalance and attract more girls to STEM studies. (AAUW)

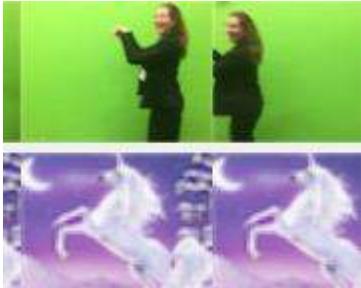
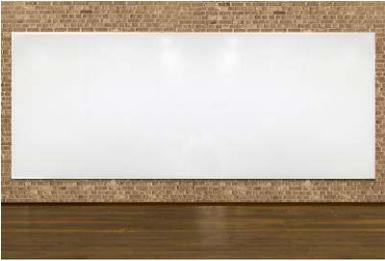
Goals of the project...

Our goal is to begin the process of providing an interactive innovative space that provides students with an environment to engage in activities that promote intellectual risk-taking, curiosity, creativity, collaboration, exploration, tinkering, and "maker" mentality. This is the initial phase of a project that will never stop evolving as we will provide students with materials that are determined by their interests and desires. The key to this grant is to create a space we can grow into that allows students to easily collaborate and cooperate while utilizing space in new and engaging ways. Ultimately, our space will be designed to be more than just a robotics and engineering lab. It will be a tinkering studio for the entire school, outfitted with a collection of tools that can transform what opportunities we are providing for the students.

The foundation of this space would be the purchase of 17 movable tables so that students will have the ability to create the environment they need to engage in any activity they are working on. This allows for students to configure the classroom to work in groups of two or four, push all of the tables to the side, or anything in between. We will use our existing chairs, as they have wheels. Two other key components that satisfy the need for creating the space are: (1) a full wall-sized whiteboard and (2)

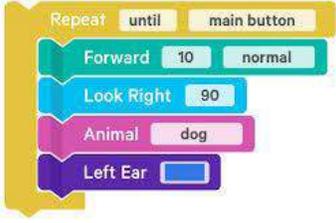
painting one entire wall Chroma Green for “green screening.” This provides students with large interactive spaces to create. The final piece of the environment is to purchase shelves for storage as students will need easy access to tools and devices.

Movable Tables	Movable Chairs	Shelving
		

Green Screen Process	Green Screen Final Product	Wall-sized Whiteboard
		

The other part of the purchase would be the devices for students to use. The goal is to provide a variety of devices based on student interests per the survey we administered. This is only the beginning of a student developed innovation space.

We would purchase 8 Dash and Dot robot sets, and 8 Bee-Bot and Pro-Bot robot sets. These devices interact with “Wonder,” “Blockly,” and “Logo” coding language and allow students to control them per the code that is written.

Wonder	Blockly	Logo
		

Dash and Dot are characters that ignite curiosity and confidence while providing fun ways of learning the essential skills of collaboration, communication, and digital literacy. *Bee-Bot* is an exciting new robot designed for use by young children, and is a perfect tool for teaching sequencing, estimation, problem-solving, and just having fun! *Pro-bot* is Bee-Bot's big brother and takes skills learned and honed with Bee-Bot to the next level. A turtle robot, cleverly disguised as a race car, offers students an enticing, engaging, and hands-on experience with Logo programming as well as robotic controls.

Dash and Dot	Bee-Bot and Pro-Bot	Lego WeDo
		
		
https://goo.gl/c8jc12	https://goo.gl/uBK0am	http://goo.gl/RlkwQf

The purpose for purchasing 4 different robots is to provide students with variety and to provide appropriately-aged devices for each child. We will also purchase an advanced set of Lego WeDo Kits (to accompany the beginner level kit we purchased last year). This kit will allow us to enrich student understanding with more complex machines.

We would also like to purchase 20 iPad for exclusive use in the innovation lab. The robots listed interact with an iPad, and students must write code for the robots on the device. The iPads would also be used for film-making and green screening. We would also like to purchase 4 MacBooks so students can perform some higher end video editing. (Basic editing can be done on the iPad or on a Chromebook, but design and creation for some students will need more processing power). We will purchase a Chromebook cart of 40 Chromebooks to keep in the lab so students have the ability to research and have access to activities they may need. We will also use our existing

laptops to provide students access to a PC for Lego WeDo kits as they run on software that must be used on a PC, and to Minecraft EDU.

We would also like to purchase 5 iOgrapher cases, 2 tripods, and two microphones for film-making.



This is the beginning of what will evolve into a makerspace for students...a space where students can bring their own problems and questions and work to solve them. One of the first steps in making this a reality is providing students with the opportunity to tinker and engage in self-guided and self-directed exploration. We need to provide students with a workable space along with materials that provide them with opportunities to play and explore. Maintaining a sense of structure will build teacher confidence in the process while building curiosity of the children to further explore unanswered questions. It's about getting the process into our school. The materials, devices, and toys we have that help shape that process will evolve, based on the desires of the children. The variety of devices we have to begin creating this lab provide students with a great foundation to explore.

How the project will improve current instruction

The current lab setups are archaic and function as an independent interaction between student and computer. Students do not need to have lab time to perform the routine tasks such as word processing or online program completion (ST Math, First In Math, Lexia, AR quizzes, STAR testing, Typing Agent) as we have portable devices to provide ubiquitous access to those programs throughout the day.

An innovation space will utilize student motivation to engage students in their own problems. The design problem comes from them, and they take their own path to solve the problem. Student centered learning or problem based learning provides students with opportunities to plan and explore topics they are interested in while exploring coding, robotics, and creation opportunities such as green screen video development and LEGO creation. This space will also allow students to move and adjust their learning space to provide a comfortable environment that allows them to explore.

We must unleash the creativity and tinkering that is implied by the engineering component of the Next Generation Science Standards as well as connecting to the Common Core State Standards. If we truly want to redesign and modify how students learn, we must provide students and teachers with the environment and tools they need. Having a flexible space that adapts to student needs will enhance learning opportunities, increase enthusiasm, and lead to deeper learning.

How this project is innovative or aids the implementation of creative approaches to learning and teaching...

Students are curious by nature, and providing students with a variety of opportunities to embrace ambiguity and learn from failure is critical to developing mindsets that will serve them well in school. Our district focus is on intellectual risk taking. Providing students with an environment that embraces this idea while providing students with opportunities to develop future ready skills is our responsibility. As our Superintendent Terry Walker has expressed, it is our duty to provide an incubation of innovation for students. These skills must be developed with a loose structure so teachers can support student learning while students begin to develop a mindset to ask questions about what they want to find out more about.

Shifting the structure of part of our existing school day by providing activities and opportunities for students to explore *their* unanswered questions will increase their desire to create outcomes to their questions. This will ultimately lead to increased confidence to attack all problems. We must provide opportunities for students to exercise this part of their mind and engage in collaborative conversations while engaging in higher-level skills.

We will work with our District Ed Tech team, the globally recognized Ed Tech Team (edtechteam.com), and with our own innovative teachers to provide professional development for teachers. This investment in training will help teachers develop ideas of how to modify and redesign their instruction as they observe students in non-traditional academic areas. These ideas will then be transferred to core subject areas and lead to seamless integration of technology into the CCSS and the NGSS which will prepare students for life after IUSD.

How this project might be developed beyond your school or classroom...

All schools are going to go down this path eventually. We want to be on the forefront of the movement and provide this opportunity for our students now. Other schools could replicate what we do as we all need to adjust existing spaces to try and replicate the new spaces being built in the new schools.

Specify the anticipated number of students and the grade levels that will benefit annually from the project...

The most wonderful part of this project is that every student in the school will benefit from it. All students will have access to a learning space that promotes collaboration and creativity, and the tools and toys we have in the room will provide the curriculum and content to engage the students. We will be able to add devices to the innovation lab in upcoming years based on student and teacher interest to ensure students are consistently being provided with opportunities that are challenging and appropriate.

How do you anticipate assessing the program's effectiveness, including quantitative and/or qualitative indicators to assess the impact of the project on students and on teaching in your school?

This will be measured by an attitudinal survey of students' interest and desire in both coming to school and participating in the innovative lab. We will also be able to measure qualitatively how students are performing in school in core subject areas. The expectation is that as students come to school more positively, their overall attitude towards school will have a positive impact on academic performance.

Funding Request

1. The items listed below are prioritized in order. The first four items (totaling \$4550) would be necessary to create the innovation lab environment that allows students to engage more meaningfully. The other items provide the tools and devices students expressed an interest in that will allow them to explore and engage in meaningful activities.
2. We will be using existing chairs and other small furniture to support the overall vision of the space. The Chromebooks will be purchased using our school site's Base money and PTA funding, and we will use existing laptops to run any programs that need a PC. We will utilize both supplemental and Title I funding to provide teacher professional development to ensure the devices are being used appropriately and teachers develop the mindset to allow students to engage in collaborative discussions while participating on an individualized learning path.
3. All equipment is approved by Kris Linville. IUSD's Director of Education Technology.

Itemized Breakdown of Expenses...

Item	Cost per Unit	Total Cost
Movable Tables	17 @ \$143	\$2500
Wall-sized whiteboard	1 @ \$1500	\$1500
Green Screen Wall Paint	1 @ \$100	\$100
IKEA 16 divider shelves	3 @ \$150	\$450
Dash and Dot	8 @ \$280	\$2240
Bee-Bot and Pro-Bot	8 @ \$200	\$1600
Lego WeDo (simple and motorized 30 pack)	1 @ \$2600	\$2600
iOgrapher cases	5 @ \$100	\$500
Tripods	2 @ \$80	\$160
Microphone	2 @ \$50	\$100
iPad	20 @ \$400	\$8000
iPad cart	1 @ \$1000	\$1000
MacBook	4 @ \$1000	\$4000
TOTAL		\$24,650

Works Cited

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