

Creative Coding in Central Texas: Scratch After School Programs

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ABSTRACT

We teach Scratch coding clubs for elementary students in San Marcos, Texas. We're a team of undergraduate students from Texas State University who are on the journey to become educators. We're figuring out how to balance the confusion that leads to learning and the flow of making in learning environments, through our own experiences as learners. Our team, called Families Learning Together, runs after school coding sessions that last for six weeks. In Spring 2019, we will be expanding to multiple elementary schools in our community. We have a wide range of learners, ranging from elementary school to high school, who come from a variety of backgrounds.

It is possible to create exploratory and creative coding experiences for elementary school children that teach them problem-solving, computational fluency, endurance in working on a long-term project, creativity, logical thinking, and innovation. Children learn a variety of skills through coding that can be applied to any profession and can help them at any stage of life. Our coding programs have been a positive influence in our community of San Marcos, reminding us as educators that all communities deserve access to creative coding and CS education.

Keywords

Scratch; CS Education; Maker Education; Coding; Scratch Educators; Computer Literacy; Creative Coding; Texas; Rural Communities; Small Towns; University Students; Elementary Students; K-12; San Marcos; Austin; Central Texas;

1. DESCRIPTION

1.1 Description of your setting

Families Learning Together facilitates after school programs teaching Scratch for elementary students in San Marcos, Texas. The students are third, fourth, and fifth graders from a variety of backgrounds. The facilitators for these coding sessions are a team of undergraduate students from multiple majors such as art education, history education, health education, communication design, biology, and dance at Texas State University. The project is sponsored by Texas State University's School of Art and Design.

The broader purpose of our team, called Families Learning Together (FLT), is to build sustainable computational fluency in Central Texas. We're simultaneously learning Scratch and learning how to teach kids Scratch. Our goal is to understand what works in teacher CS education and then to implement that understanding across K12 learning ecologies, including schools, after school clubs, community centers, and libraries. This past fall 2018 semester we have focused on developing, running, and training for the after school coding sessions.

1.2 Description of the educational experience

We started the after school Scratch coding sessions to promote computer literacy and creativity for children in San Marcos. We created a program of six weekly sessions that introduce children to Scratch and teach them the basic concepts needed to code by asking them to tell a story. Within the interface, the students create animations using images, drawings, voices, and text. The curriculum encourages critical thinking and social interaction, as



Figure 1: A student explains part of his project's code to a facilitator, Analisa Esther.

well as creativity and logical problem-solving. We make sure that our students never sit alone, always with a partner. The facilitators introduce concepts and skills, and the children are free to lead their own learning, to build and explore whatever creative project they have in mind. Children learn not just computational fluency, but the process of working on a long-term project. Children are encouraged to continue working on the same project each session and to keep asking “what’s next?”



Figure 2: Two students collaborating and learning from one another as they work on their projects.

2. CONCLUSION

2.1 Results

Students love learning how to make their own unique story or game in Scratch. We saw that children put time, effort, and focus into their Scratch projects, and that each project and each child’s learning experience was unique.

One of the best results is watching children gain an understanding of how the coding process works. For elementary school children, coding even something simple in Scratch, like getting their characters to talk to each other or having a character move across the screen, requires a momentous leap of logic and understanding. Despite a growing familiarity with technology, coding is by no means an intuitive process for most children. Some of the most growth in learning comes from “getting stuck,” and then having to apply logic, creativity, and the available coding tools to figure out how to solve the problem and get unstuck. This kind of learning is about more than just mastering a technical skill. Developing the ability to understand logical processes and machines, to put disparate pieces together to create something new, and to use ingenuity to solve unexpected problems are skills that are of great value to anyone at any stage of life or any profession.

As students ourselves, we as program facilitators are also learning from the experience of teaching and coding with the students. The way that we lead and teach Scratch feels unfamiliar at first for our students and us as facilitators. With FLT, we’ve created a student centered classroom. Instead of completely leading our students through their challenges and telling them exactly what keys to press, we have them lead each other and we follow their learning. We give them the tools to explore, adjust to our students’ needs, and ask them to help one another so it becomes second nature. Because the possibilities for coding in Scratch are so open-ended and individualized, teaching it is an adventure. No two sessions are the same, even if the curriculum content is identical. Due to the nature of coding, unexpected glitches and problems often occur that neither facilitator nor student will know how to solve. There are many opportunities for collaborative problem-solving between facilitators and students as they work together to fix bugs and tackle coding challenges. Because we are not experts in computer science or in Scratch, the children have the opportunity to experience making new discoveries on their own and being the expert in the room. They also gain the understanding that sometimes there is no clear cut solution or answer to a question. This level of uncertainty can be nerve wracking at times from the teacher’s perspective and sometimes even for the children as well, but it leads to growth for both the facilitators and the students as we make new discoveries together.



Figure 3: The classroom of students all focused on building their scripts to create a story of their own.

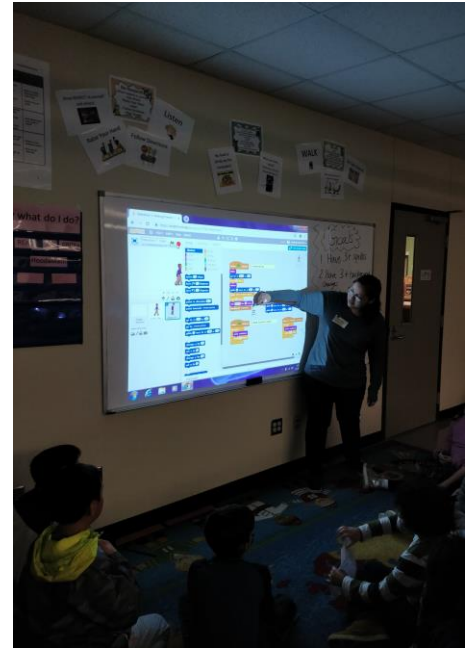
2.2 Broader Value

Creative coding experiences for children in elementary schools can be successful when the learning ecology is structured as an open-ended and exploratory guided play session. Our program is expanding, from one elementary school in 2017, to two in 2018, and to three in 2019. We would like to share the design and concepts of our program and how it maximizes skills that will benefit children in all areas of their lives and when they grow up to be adults. We believe this could inspire the creation of other CS education projects.

We are a diverse team with majors ranging from art education to wildlife biology, and we share the learning adventure alongside our elementary students. As students who are teaching a relatively new coding curriculum to elementary children, we have a unique perspective as educators-in-training that are watching and developing a new CS education program as it takes flight in our community. A discussion on how university students of different backgrounds experience the field of CS education would be valuable for other educators who are interested in involving university students in their projects.

Educators may also take value in discussing the benefits, challenges, and long-term goals of our whole-community approach that tries to go beyond a single classroom or a single school to create a strong and positive long-term impact for children and families in San Marcos.

Figure 4: At the beginning of each session, facilitators gather the class together to discuss the goals of the day. Here a facilitator, Nidia Mendoza, is using an analogy to explain how the broadcast tool works. For example, the facilitator explains that the broadcast tool is similar to using a walkie-talkie, or how a radio operates.



2.3 Relevance to Theme

We have witnessed that teaching kids Scratch helps to equip them with the skills they need to thrive in a changing world. When kids code, they confront challenges head on. We've seen our students becoming okay with uncertainty. We've seen them be experimental when trying to get unstuck. Our students begin to understand the algorithms that make their sprites move across the screen. Our Scratch coding sessions are teaching the next generation how to work through challenges rather than avoiding them. They've become more inclined to be a contribution to their neighbor or be contributed to. The creativity and problem-solving skills we've seen kids learn through Maker Education will empower the next generation of leaders to adapt to change and take on the tough challenges of a changing planet.

Families Learning Together has already been grappling with change and challenge, and was created in response to a need we saw in our small San Marcos community. The nearby major metropolis of Austin is growing fast but unevenly. At the center, a booming tech sector fuels extraordinary innovation, but at the edges we find increasing disparity, unemployment, and low achievement in schools. In San Marcos, the fastest growing suburban community in the metropolitan region, 71% of public school children qualify for free lunches, and 3rd and 4th graders lag in reading, writing, and math. Additionally, for the parents of these children, the tech boom has pushed the cost of living almost beyond their means. In spite of their geographical and economic entanglement, San Marcos does not benefit from Austin's boom. Research suggests that economic and educational development in Central Texas is uneven, particularly in the fastest growing areas, where residents are the least likely to finish high school or go to college. Even with the growth of Texas State University and the business sector, our college town is one of the least affluent in the state.

Small communities like San Marcos should not be left in the shadows of the larger cities: these communities have so much to gain from Maker Education and the focus on computer literacy that some tech-focused communities might take for granted. Small towns like San Marcos may have the most to lose as economies, environments, and communities change, and our work seeks to prepare children and families of our community for whatever changes may lie in store. We want to see leaders and innovators everywhere, not just in big cities or the places that are already home to tech giants and big business.

4. BIOS

Alexa Briones. I am passionate about self-expression and community. I was born and raised in Central Texas. I'm an artist and have become fascinated with the marriage between traditional art making materials and technology. I'm currently a senior at Texas State University studying art education and I'm committed to transforming art education in my communities.

Emily Blumentritt. I am a Wildlife Biology major because of my deep interest in the natural world and how organisms relate to their environments, but I also believe that an enriching education for all children is vital for our future. I have worked closely with toddlers, pre-teens, and elementary school students, and my fascination with how children learn has led me to child development classes and jobs within

the field of education. I love teaching Scratch because it's wonderful to see children learning new skills, and exploring logic and creativity that will help them understand and engage with the world in a very positive way.

Analisa Esther. In my lifetime, I have had the pleasure of working with many age ranges. From adults to small children, I have always treasured education. I firmly believe knowledge is a great gateway to success. The expansion of my own personal knowledge has lead me to this wonderful program. I am currently a senior in college, majoring in both History and Dance. I like to incorporate many different subjects through multiple platforms to demonstrate the perks of being well educated. My hope is to express that knowledge will get you far in life. I love teaching Scratch because it encompasses more than just knowledge of technology, but is inclusive of all subjects. Not only that, there is no limit to the level of creativity and imagination one could use. Working with students by using Scratch's technology has been by far one of the most rewarding experiences.

Arlie Wood. When I was in the sixth grade I was asked to participate in a summer program that had to do with science and math innovation. In this program one of the tools we worked with was scratch. Many years went by, and now as a junior in college I am again working with and teaching scratch. Although it is from a bit of a different angle the actual scratch program and the core values it teaches have not changed. When I work one on one with the students in the after school programs I find them not wanting much help. They enjoy figuring it out for themselves, and love having a product where they are able to say I created that.